THE COLLECTED WORKS OF L.S. VYGOTSKY

Volume 4
The History of the Development of Higher Mental Functions

Edited by
ROBERT W. RIEBER

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Volume 4
The History of the Development of Higher Mental Functions

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PROLOGUE

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The forms and structures of academic publication, and the manner in which professional fields move and develop, have a great deal to do with how thinkers are understood and interpreted by their colleagues. In L. S. Vygotsky's case, these underlying dynamic forces, seldom commented upon except in history books, are dramatically revealed.

Unraveling History

Lev Semyonovich Vygotsky died in 1934 but many of his publication dates, both in Russian and in English, are contemporary. The order of appearance of his works in publication in either language does not replicate the order of their production. Some of the works published in his name are pastiched selections woven into a seamless text but representing fragments from different years, snatched from more complete works which had not been published.

All of this leads to a sense of historical dislocation in dealing with Vygotsky's works, and the contemporary uses to which they are put. 1934 is not 1962/1986/1987 (the dates of publication of *Thought and Language* in Russian and in various English versions respectively), 1925 is not 1971 (the dates of publication of the *Psychology of Art*), nor is 1978, which is the date of publication of *Mind in Society*, the same as the late 1920s and early 1930s.

How is Vygotsky to be understood? As a hidden treasure who can now be revealed to the world? As an historical figure; part icon, part relic? As the construction of an historical figure used for contemporary purposes to ventriloquate contemporary arguments? As a lost contemporary, speaking to us across time? There is no exclusively correct choice among these alternatives, he is all of these.

Indeed, in reading Vygotsky within the context of contemporary debates within which he is often inserted, I have been time and again struck by the *dual character* of Vygotsky's writings only one pole of which is developed as he is introduced into contemporary arguments. On the one hand he is actively engaged in debate with his forebears and contemporaries, with the frequent invocations of names such as Wundt, Thorndike, Kraetchmer, Köhler, Piaget, Pavlov, Bühler, Stern, Werner, etc., with respect to whom Vygotsky articulates his positions, seeing in some conceptual allies and in others positions to be surpassed. In this regard Vygotsky is remarkably

in and of his time with a wide knowledge of developments in a number of languages and continents. At the same time his texts seem to transcend his historical location, and seem to speak directly to us about matters that matter here and now.

Vygotsky wrote in an exciting but dangerous climate. Not everything could be published. And what was published had to be couched in an acceptable language. It awaited Stalin's death in 1956 for the English translation of Vygotsky's capstone *Thought and Language* to be published in 1962. The epochal *Tool and Symbol*, written in 1930 by Luria and Vygotsky and intended for the first *Carmichael's Manual of Child Psychology*, didn't make it to the light of day until it first appeared as a fragment in *Mind in Society* published in 1978, and as a whole piece (from the *English* manuscript) in 1994. Some works of Vygotsky and Luria (his close collaborator) appeared first in English and then only later in Russian.

There were politics with dire consequences operative in Vygotsky's time which impacted on what did and did not appear in publication, in what order and with what theoretical language that framed the issues. These historical features lead in turn to a unique weaving of the full tapestry of Vygotsky's work. Things have appeared out of sequence and, at least in the case of English language publications, at great temporal distance from the original writing.

Our normal habits of reading the development of a life's work have to be reorganized. We cannot rely on order of publication as a direct "clue" to the order of the development of ideas. Factors other than the internal development of Vygotsky's thinking are at work, and factors other than authorial intent governed what saw the light of day and what didn't.

These must be factored into our understanding of Vygotsky. We have to factor into our reading the principles of selection employed. We have to understand what was selected, and therefore highlighted, against what was not selected, and hence left for later discovery or for obscurity.

In short, particularly in the case of Vygotsky, we must understand the principles by which texts and a body of work are constructed, and, by such analysis, deconstruct the processes of textual production in order to have a hope of reaching across the time period that separates us from him. We must "see through" our own habits of reading in order to enter into the fullness of his theoretical milieu.

Given this, there is an almost irresistible temptation to explain Vygotsky and to translate theoretical positions for contemporary audiences. Indeed there is no shortage of such attempts. There has been a steady expansion of both an exegetical literature and the publication of original sources made available for the modern reader.

But, such exegesis can obscure the fact that Vygotsky seems to be speaking both *then* and *now*. While this is a normal process of text construction, the problem with respect to Vygotsky is profound, since we are separated by some 62 years from his death and 100 years from his birth. Many of his contemporaries are unknown to us, except perhaps in the most superficial ways. In a basic sense we do not share his history and, given no history, contemporary discussions of Vygotsky tend to center on his theoretical contrasts with a figure whose early work was known to Vygotsky and whose work as a whole we know in a more contemporary way—Jean Piaget.

In 1996 (the time of this writing) it seems that you cannot avoid centennial conferences commemorating the century that has passed since the birth of two of the giants of developmental analysis, Vygotsky and Piaget. No matter that Vygotsky died in 1934 and that Piaget was active until his death in 1980. Indeed, this circumstance has accentuated a trend for Vygotsky and Piaget to be analyzed in re-

lation to each other, with grounds sought either for their irreconcilable differences or their deep-seated similarities.

But, this contest between Vygotsky and Piaget is unevenly constructed. Many of us have seen Piaget's work as it unfolded within the contemporary field. We know both his original works and the works of followers and critics. Vygotsky, we are just getting to know. He has been resurrected and placed into contemporary debates as a new voice—with a difficult to construct history, and as a solution to contemporary problems. In short, we know Piaget and Vygotsky in different terms—and we know them as subjected to very different scrutiny. The problems, both empirical and theoretical, with Piaget's approach are well known and have been hotly debated over the past few decades; Vygotsky is still new, and in the process of being discovered in contemporary terms. In short, we know Piaget through his followers and Vygotsky through his disciples.

On the Dangers of Exegesis

It is tempting to look to the introduction of a work to find a short-cut to understanding that work. The introducer often takes the role of highlighting the important arguments and winnowing them down into a sort of conceptual index to the piece being introduced. Such exegetical moves are, in Vygotsky's case, dangerous. The temporal distance that separates reader and audience from author requires a more circumspect approach, all the more so since there is ample evidence that the crucial factor in the popularity of Vygotsky's writings in contemporary discourse is not only the strength, clarity and force of the arguments made, but, as well, the contemporary state of the field within which Vygotsky's texts are inserted.

For example, the first major presentation of Vygotsky's thinking in English is the 1962 publication of *Thought and Language*, translated by Eugenia Hanfmann and Gertrude Vakar and introduced by Jerome Bruner. While those who were close students of developmental psychology read and were impressed by the book, it did not "take off." Very little work in the "Vygotskian mode" followed it. It seemed a one-time event, the discovery of a refreshing historical root.

Even those who would later be closely associated with bringing Vygotsky to prominence in the United States, Michael Cole and Sylvia Scribner, had scant reference to Vygotsky in their seminal book on cross-cultural psychology *Culture and Thought: A Psychological Introduction*. Vygotsky was referred to through reference to Luria, and only then in the narrow context of some cross-cultural studies that had been performed by Vygotsky and Luria.

Sixteen years after the first book-length publication of Vygotsky in English, and 4 years after *Culture and Thought*, the publication of *Mind in Society* carrying Vygotsky's name, but carefully composed from many sources (including selections from *The History of the Development of Higher Mental Functions*) edited by Cole, Scribner, John-Steiner and Souberman, was a hallmark event.

The Vygotsky of *Mind in Society* took off, spawning many publications dwelling on and expanding its basic concepts, and leading to an active era of publications by and about Vygotsky. 1983 and 1984 saw the launching and publication of 5 volumes of Vygotsky's collected works in Russian (of which this Plenum series is a translation). 1985 saw Wertsch's scholarly exegesis of Vygotsky's thought in *Vygotsky and the Social Formation of Mind* and in the same year a collection of papers edited by Wertsch devoted to Vygotskian topics, *Culture, Communication and Cognition: Vygotskian Perspectives*. 1986 saw a retranslation of *Thought and Language* by Kozulin, and in the very next year the first volume of this Plenum series on Vygotsky

led off by Minick's retranslation now titled *Thinking and Speech* followed in 1990 by Kozulin's intellectual biography of Vygotsky, and in 1991 by Wertsch's integration of Vygotskian and Bakhtinian perspectives in *Voices of the Mind.* Van der Veer and Valsiner in 1991 produced another Vygotsky biography, *Understanding Vygotsky: A Quest for Synthesis*, and in 1994, *The Vygotsky Reader* containing many complete texts (such as the complete text of *Tool and Symbol*) and other heretofore unpublished articles. The list could go on easily listing hundreds of Vygotsky-related or Vygotsky-inspired articles.

Something happened between 1962 and 1978 to affect the interest in and fascination with Vygotsky's ideas, or what were taken to be Vygotsky's ideas. In 1962 the publication of *Thought and Language* seemed a one-time event. In 1978 *Mind in Society* spawned a generation. It is unlikely that one can find an answer in looking at the development of Vygotsky's ideas themselves. *Thought and Language* was written *after* the pieces that were assembled into "*Mind in Society*." The reasons lay elsewhere.

It is an examination of what some of those reasons might possibly be which should lead one to be cautious about any attempt at a contemporary exegesis of Vygotsky, since it is likely that what anyone takes to be the core Vygotskian ideas are precisely those ideas which address a contemporary theoretical need, and which do not reflect the full scope of Vygotsky's thinking on its own terms,

Behaviorism, Piaget and Vygotsky

In the United States, positivism, theoretical and methodological behaviorism dominated psychological thinking until the early 1960s. For a number of reasons, the constraints imposed by this narrow conception of psychological processes began to be recognized—and a new discipline, Cognitive Psychology, began to emerge.

Chomsky's 1959/1964 review of Skinner's behaviorist account of language was a hallmark event, as was Neisser's 1967 publication of *Cognitive Psychology* which reviewed studies that, even in narrow experimental terms, seemed to necessitate a more complicated psychological architecture than behaviorism invited. And, in developmental psychology, Piaget was discovered.

The opening shot in this discovery of Piaget was in 1962 with the publication of a SRCD monograph, edited by Kessen and Kuhlman, titled *Thought in the Young Child.*

Clearly, something was happening in the 60s—and the something that was happening was a rediscovery of "structure" and the placing of structural issues at the core of inquiry. The essence of the cognitive movement was to recognize that there were structural aspects of behavior and thinking that necessitated a form of theorizing that went beyond the physicalistic metaphors of behaviorist canon.

Recognition of these structural aspects further indicated that treatments of human learning and development must take into account such structural limitations. The shift involved a refocusing from learning to structure-dependent development. Since structure-dependent development was a focal concern of Piaget he became a center of focal concern for developmental psychologists. 1963 saw the publication of Flavell's distillation of Piagetian theory for English-speaking audiences, along with a steady stream of Piaget's books. From the mid 60s to the late 70s Piagetian concepts and their verification or refutation occupied center stage.

It was against this backdrop that the initial English language publication of Vygotsky's *Thought and Language* appeared in 1962. While Vygotsky focused on a number of deep developmental problems, the emphasis of his writings, as known

through the early translation of *Thought and Language*, did not hit the fascination with structure dead center.

The era from the early 60s through the late 70s saw many aspects of the Piagetian paradigm battered from a number of directions, not all of which were relevant to core Piagetian ideas. The issues were not so much Piagetian theory as intended by Piaget, but rather the way in which Piagetian theory was consumed by the English-speaking psychological establishment.

There were three foci of concern with received Piagetian theory—all related to the underlying problematic implications of the structure-dependency idea. In the American context these amounted to:

- A attempt to escape the inherently conservative and limiting aspects of the structure-dependency position—which saw possible future developments as constrained by initial conditions. Studies were conducted to show the limits of such structure dependency by showing that what Piaget treated as developmentally constraining factors could be overcome by "training" which could show accelerated acquisition.
- A rejection of the "universalism" associated with the structure-dependency idea. Studies were designed to test the limits of the notion of structure, by examining whether supposedly common underlying structures showed up in different content areas (the problem of horizontal décalage) or by comparing differing populations to see if they attained the same structural landmarks at approximately the same developmental age.
- A questioning of the "processes" presumed to underlie development. For Piaget, constrained developmental structures were seen as a result of the dynamics of a "constructive" process depending heavily on initial states in interaction with a physically constrained world. The constructive idea was challenged from three different directions: (1) an emerging "nativism" which, expanding on the structural aspect of Piaget's theory, saw many aspects of that structure as "inbuilt" and not constructed or, alternatively and from another direction, (2) a shift from the consideration of construction as an intra-individual process to an exploration of social structuring processes, and (3) a focus on the "knowledge base" and strategies that characterized particular domains, which were seen as defining "expertise" in an area, which was posited as a more relevant factor than structure constraints.

Clearly, Piaget was under frontal attack from a number of directions. It was at this point that Vygotsky was reintroduced to the English-speaking audience via the publication of *Mind in Society* in 1978. In contrast to the earlier introduction of Vygotsky in *Thought and Language* the Vygotsky of *Mind in Society* proved generative.

This publication came at the point of disenchantment with the Piagetian treatment of structure—and hence seemed to be an answer to the problems encountered over a two-decade involvement with Piaget. And, not incidentally, the rediscovered Vygotsky seemed to be more compatible with the stress on learning that behaviorism had championed before being put into retreat by the Piagetian onslaught.

The Vygotskian Approach

Many of the main tenets, as understood by modern scholars, of Vygotsky's approach seemed particularly well suited as an answer to Piaget.

- The concept of the Zone of Proximal Development (ZPD) was given center stage since it was taken to mean that development structure dependency was not an absolute limiting factor. Rather than following development and depending on it, learning could be seen to actually lead developmental change (Vygotsky, 1978, pp. 86-91)
- The concept of "mediation" similarly implied that factors external to the developing organism could influence its development (Vygotsky, 1978, pp. 52-55)
- And, the assertion of the social origins of development was given law-like status, asserting that every function appears twice, first in interpersonal process and then as intrapersonal process (Vygotsky, 1978, pp. 56-57).

By now these three notions are currently quite well understood and seem to be the essential characteristics of the Vygotskian approach.

But things are not quite so simple. To a large extent, the Vygotsky as received by the field of developmental psychology via *Mind in Society* was a subtly different Vygotsky from the one introduced in 1962. Some of the topics now taken as central to a Vygotskian view are topics which showed a slight alteration between *Thought and Language* and *Mind in Society*.

In general, the shifts had to do with whether one sees the central concepts of Vygotsky as representing "laws of acquisition" of advanced behaviors, or as an attempt at "differential diagnosis" of differing developmental levels. The Vygotsky of *Mind in Society* was received as if his central concern was with acquisition, while the Vygotsky of *Thought and Language* and the present volume (*The History of the Development of Higher Mental Functions*) seems more concerned with the analytic problem of sorting out the compositional structure of various levels of behavioral development. This shift is marked in the manner in which the texts are developed. There is one Vygotsky who is engaged with the analysis of the concrete details of empirical phenomena and examining the nuances of behavior that allow one to make differential diagnoses, and another Vygotsky who is seen, in a more general sense, as giving new processes and new laws of developmental change.

As an example of this shift we can look at the treatment of the "zone of proximal development" in the two volumes (and much of the work that followed each). In *Thought and Language* (1962 version) the ZPD is mentioned and is discussed in 3 pages (pp. 103-105), and is not given an index entry. The discussion of the ZPD is framed within a treatment of a particular topic—the development of a particular kind of concept, which Vygotsky termed "the scientific" concept (or alternatively, the "academic" concept). Vygotsky's treatment is tipped toward the interpretation of the ZPD in "diagnostic" terms. The basic idea behind the ZPD as expressed in *Thought and Language* concerned the issue of developmental assessment. It is quite elegant in concept. The idea is that most tests of developmental level consider that level to be defined by the level of achievement that the child is capable of on her own, under some form of noninteractive and noninterventive testing regime. Vygotsky argued that this only allows us to see the "completed" part of development and does not give us a view of developmental potential—which can be indicated by the degree to which a child can profit from external intervention. Vygotsky bounds his discussion quite clearly in the development of school-like concepts—precisely those concepts which are not capable of being individually "constructed" and which were not of particular interest to Piaget.

In *Mind in Society*, the concept of the ZPD reappears, but it is treated in a different manner. Rather than being a subtopic within a discussion of the diagnosis of children's abilities and readiness to profit from school-based instruction, the ZPD

now appears as a topic in its own right—announced by a major heading—"The Zone of Proximal Development: A New Approach." (Vygotsky, 1978, p. 84). Along with this textual shift there is a shift to a "law-like" statement of the role and function of the ZPD in developmental analysis:

> " . . . what we call the Zone of Proximal development . . . is the distance between the actual developmental level determined by individual problem solving and the level of development as determined through problem solving under guidance or in collaboration with more capable peers." (ibid., p.86)

The specific bounding of the ZPD in issues of diagnosis and with respect to the effects of learning and instruction on a particular class of concepts has disappeared. The Vygotskian text of 1978 now addresses the issues with a new language contrasting the "fruits of development" (p. 86) with the "buds and flowers" of development (p. 86), a botanical metaphor that is categorically rejected in the full text version of "Tool and Symbol" (Luria and Vygotsky in Van Der Veer and Valsiner, 1994).

A related interpretive shift occurs in the 1978 volume as well—one which fits quite seamlessly in with the generalized interpretation of the ZPD. In Chapter 4 of *Mind in Society* there is an extended discussion of processes of "internalization"—which is given a "law-like" formulation, perhaps best summarized in the following language: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, *between* people (*interpsychological*) and then *inside* the child (*intrapsychological*)." (Ibid., p. 57)

With these and similar moves of textual construction, the Vygotsky of the 1962 volume is transformed from an interesting new voice into a voice which somehow embodies the reaction of the field to the Piagetian paradigm. By 1978 interest in Piaget was fading, and alternatives were being sought. The Vygotsky of 1978 was such an alternative. Where Piaget posed structural constraints, Vygotsky was taken to emphasize open possibilities. Where Piaget posed individual constructive processes which posed sharp limits on learning, Vygotsky posed internalization of interpersonal processes as being the substrate of development.

The Vygotsky as presented in *Mind in Society* posed an interesting and appealing alternative to Piaget. Indeed, this Vygotsky could be construed to have a great deal in common with the behaviorism that had preceded the "discovery" of Piaget—a feature not unnoticed by the editors of *Mind in Society*, who cautioned English-speaking readers that though Vygotsky might look like a behaviorist at first glance, he wasn't really one. It is not clear that many got the message.

Constructing, Deconstructing and Reconstructing Vygotsky

The gap between the reception of Vygotsky in 1962 and in 1978 by the English-speaking world, and the relation between that differential reception to a growing unease with Piaget's theory, suggests that in reading Vygotsky we are faced with a rather complex phenomenon. We are reading both a thinker whose ideas have been too long hidden, and a thinker whose long-hidden ideas were introduced, and perhaps changed, by the contemporary context into which his discovered ideas were introduced, and which is, of necessity, a different context than the context within which his ideas were produced.

This possibility is made more probable when we consider the manner in which Vygotsky's texts have been constructed for consumption by English-speaking audiences. The 1962 edition of *Thought and Language* is not simply a translation of the

Thought and Language that appeared in Russian shortly after Vygotsky's death in 1934. As explained in the translator's introduction:

> "Perhaps because the book was prepared in haste, it is not very well organized and its essential inner unity is not readily apparent . . .. It was agreed that excessive repetition and certain polemical discussions of little interest to the contemporary reader should be eliminated, in favor or a more straightforward exposition. In translating the book, we have simplified and clarified Vygotsky's involved style, while striving always to render his meaning exactly." (E. Hanfmann and G. Vakar, translators' introduction to *Thought and Language*, pp. xi-xii).

Nor was *Mind in Society* quite the unearthed Vygotsky that Vygotsky's name on the title page would indicate. The editor's preface makes the principle of construction quite clear:

> "We have constructed the first four chapters of this volume from *Tool and Symbol.* The fifth chapter summarizes the major theoretical and methodological points made in *Tool and Symbol* and applies them to a classic problem in cognitive psychology, the nature of choice reactions. This chapter was taken from Section 3 of the *The History of the Development of Higher Psychological Functions* . . .. At several places we have inserted material from additional sources in order to more fully explicate the meaning of the text. In most cases these importations are from sections of *The History of the Development of Higher Psychological Functions* other than the one included here. In putting several essays together we have taken significant liberties. The reader will encounter here not a literal translation of Vygotsky but rather our edited translation of Vygotsky, from which we have omitted material that seemed redundant and to which we have added material that seemed to make his points clearer." (Cole, Scribner, John-Steiner and Souberman, editors' introduction to *Mind in Society*.)

The processes of editing, clarifying, reducing seeming redundancies, eliminating polemical arguments of no contemporary interest and constructing volumes out of other volumes cannot but help to mold an author into a contemporary voice. The judgments of what is dated, what is redundant, what is unclear, and in what terms, are contemporary judgments, and, as is inevitable, contemporary construction addresses contemporary needs and understandings of what the core problems are.

The Vygotsky of *The History of the Development of Higher Mental Functions*

In reading *The History of the Development of Higher Mental Functions* the modern reader will be immediately struck by two contradictory impulses. On the one hand, many passages of the text are quite familiar. Given the appropriation of portions of this manuscript and their incorporation into *Mind in Society*, this is to be expected. On the other hand, these "familiar" passages occur in contexts of discussion which have not been previously exposed, alongside of concepts we haven't seemed to encounter before (e.g., the discussion of establishing the "cultural age" of the child in addition to the more familiar "mental age" and "chronological age" measures used to define IQ). Some of these discussions will seem startlingly new and others dated or possibly "of no interest to contemporary readers."

It is tempting to attempt an exegesis to make clear what is new and to highlight what hasn't been highlighted before. To do so, however, would, I believe, violate the spirit and the essential contribution of the monumental publishing effort of which this is the fourth volume.

The main outlines of Vygotsky's theory are well known—and given admirable discussion by A. M. Matyushkin, the editor of the Russian volume in his concluding remarks. However, I believe that the major task confronting us now is not to further

identify and reinforce central Vygotskian constructs; our task is rather to reconstruct the contexts within which they were framed, to sort out the concerns of Vygotsky as an inspirational but historical figure, and to distinguish those constructs from the modern uses to which they have been put.

Modern readers could profit well from recognizing that Vygotskian scholarship is entering into a new phase. We should no longer be dealing with the Vygotsky introduced as an answer to Piaget, whose main points and law-like statements about developmental change serve as a clear contrast to the limitations of Piagetian theory. Vygotsky knew only the early works of Piaget, which are quite different from what is now understood as Piagetian theory. The more systematic contrasts of Vygotsky and Piaget, at the level of developmental processes, are a more modern construction.

We need a deeper and more historically rooted understanding which attempts to meet Vygotsky on his own terms and in his own milieu. This will necessarily involve a complex process of refiguring our understandings of Vygotsky.

This publication of *The History of the Development of Higher Mental Functions*, which is Vol. 3 in the Russian 6-volume series, presents an at once familiar and somewhat surprising Vygotsky. Some of the concepts with which he has been associated by modern understanding, e.g., the Zone of Proximal development, scarcely appear in these pages, and the passage printed in *Mind in Society* concerning the shift from interpersonal to intrapersonal function is not further elaborated and occupies a small fragment of the manuscript. Instead, the focus is on language which was the main topic of *Thought and Language* and only a subordinate topic of *Mind in Society*.

In *The History of the Development of Higher Mental Functions* we find Vygotsky fighting against theoretical reductionism, and attempting to understand developmental issues as representing a complexly woven tapestry of functions. The spirit of the enterprise is admirably expressed in an extended passage in Chapter 5 of this work:

> "All psychological methods used thus far for studying the behavior of the normal and the abnormal child . . . have one common characteristic that links them in a certain respect . . . the negative description of the child that results from existing methods. All the methods speak of what the child does not have . . . . Such a picture tells us nothing about the positive uniqueness that distinguishes the child from the adult and the abnormal child from the normal child . . . . But a positive description is possible only if we radically change our representation of child development and take into account that it is a complex dialectical process that is characterized by a complex periodicity, disproportion in the development of separate functions, metamorphoses or qualitative transformation of certain forms into others, a complex merging of the processes of evolution and involution, a complex crossing of external and internal factors, a complex process of overcoming difficulties and adapting." (pp. 98-99)

Some of Vygotsky's ideas concerning these complexities are revealed in another passage which reveals connections between Vygotsky's thinking and other intellectual traditions with which he is generally not associated:

> " . . . Two completely equally tenable problems confront science: disclosing the lower in the higher and disclosing the development of the higher from the lower . . . . Werner maintains that the psychological structure is characterized by not one but many genetic strata superimposed on one another. For this reason even a separate individual considered genetically displays in his behavior certain phases of developmental processes that are already genetically concluded. Only the psychology of elements represents human behavior as a single closed sphere. In contrast to this, the new psychology establishes that man displays genetically different stages in his behavior." (p. 102)

The Vygotsky whom we encounter in these passages is a thinker enmeshed in the core issues of developmental analysis—as these issues were understood by traditions of thinking and research that were fundamentally opposed to the behaviorism ("psychology of elements" in the above passage) that had preceded the "discovery" of Piaget in the English-speaking world.

As is amply clear in this book, Vygotsky, as a thinker, was deeply involved in developments within psychological theory on a wide number of fronts, in many different languages, and in a number of different analytic traditions. As such, his theoretical frame of reference was broader than the theoretical frame of reference within the English-speaking world, and in a very real sense he represented not only a Marxist approach to theorizing development, but a broadly "European" approach as well.

Within the European tradition of the time, the major analytic thrust was precisely to "differentially diagnose" and to examine the complex layering of different developmental strata underlying behavior. The analytic metaphors were geological. And, since the problems were to uncover different strata, methods had to be developed which would prove "differential"—first showing the composition of behavior and then "testing its limits."

Careful reading of *The History of the Development of Higher Mental Functions* will show that this is precisely the tack that Vygotsky takes throughout, often providing strikingly illuminating insights derived from this orientation to a complex developmental geology. As is evident throughout this book, Vygotsky is centered on a core theme—to develop a theoretical and methodological approach that will differentiate "higher" mental functions from the more basic functions that many other theorists of his time were positing as the functions upon which the psychological apparatus was built. For Vygotsky, such reductive accounts, either in the direction of reducing thinking to perceptual structures (the tack that the Gestalt Psychologists, here represented by Köhler, took) or to elementary associations (the tack that many behaviorists took) or to maturational laws (asserted by others), missed the point of the specifically human form of adaptation that constituted the "higher" functions. For Vygotsky, the higher functions reflected a uniquely "cultural" form of adaptation which involved both an overlay on and a reorganization of more basic psychological functions. It was therefore of key theoretical concern for Vygotsky to engage in the sort of analytic enterprise that would allow for the identification of the differences between the higher and lower forms, since different developmental factors applied to each. Not all behaviors were of the higher form, and just as certainly were not all behaviors the lower forms. In any given instance the issue was to find ways to differentiate the two by close analysis. Only when this is accomplished could one speculate upon the means by which these behaviors developed.

There is pleasure to be derived from the intellectual adventure that we are taken on in this book. We can see Vygotsky reasoning through his positions, and developing them carefully. He discusses, with respect and interest, the work of his contemporaries and forebears. The modern reader has not been well served by an elision of these aspects of Vygotsky as thinker in process. He is not well served by serving him up as a finished product with the answers to all of our questions. What others have taken to be disorganized and rambling and repetitive I take to be the essential process of working through a profound theoretical position. In this book, in its datedness, its length, in the long, "polemical" and "not of interest to contemporary readers" discussions, there is much to be discovered, not only about the past of a field, but about what its future ought to look like.

A Tribute to Sylvia Scribner

This volume of the Vygotsky series has been dedicated to Sylvia Scribner. As this introduction has already indicated, Sylvia was very much a part of the reintroduction of Vygotsky into contemporary discourse via her participation in the construction of *Mind in Society*.

Sylvia was a scholar, perhaps as restless as was Vygotsky himself. Her frame of reference was broad, and her understanding of developmental issues, both what is known and what is yet to be known, was profound. Although Sylvia might well have rested with her efforts in *Mind in Society*, she was an early and enthusiastic supporter of the project to translate and make fully and deeply available the original texts.

Sylvia was my colleague, and in our discussions of Vygotsky it was clear that she saw the need for a re-engagement with his thought in more complex terms than had become customary in the field. She saw too, that many of his meanings needed scholarly and historical discussion in order to deconstruct them so they might be more carefully brought into contemporary discussions. Her article on "Vygotsky's Uses of History," published in *Culture, Communication and Cognition* (Wertsch, 1985), is a jewel of such analysis.

Though Sylvia died in 1991, her spirit is very much alive. Sylvia knew how texts live, and reinvent themselves in close readings and in extended intellectual debate. Although Sylvia knew and read an early translation of *The History of the Development of Higher Mental Functions* (I have her copy of the original English translation) she would be with us now, rereading it, rethinking it, and making it newly alive with each reading. Her voice would have infused the discussions with a unique energy, vigor and perspective that sadly we will miss.

REFERENCES

Chomsky, N. (1964). A review of B. F. Skinner's *Verbal Behavior*. In J. A. Fodor and J. J. Katz, eds., *The Structure of Language: Readings in the Philosophy of Language*. Englewood Cliffs, NJ: Prentice-Hall. Original work published in *Language* 35 (1959).

Cole, M. & Scribner, S. (1974). *Culture and Thought: A Psychological Introduction*. New York: Wiley.

Flavell, J. H. (1963). *The Developmental Psychology of Jean Piaget*. Princeton, NJ: Van Nostrand.

Kessen, W. & Kuhlman, C. eds. (1962). Thought in the Young Child: Report of a conference on intellective development with particular attention to the work of Jean Piaget. *Monographs of the Society for Research in Child Development*, Vol. 27.

Kozulin, A. (1990). *Vygotsky's Psychology: A Biography of Ideas*. Cambridge, MA: Harvard University Press.

Luria, A. R. & Vygotsky, L.S. (1930/1994). *Tool and Symbol*. In R. Van Der Veer & J. Valsiner, eds., *The Vygotsky Reader*. Cambridge, MA: Blackwell.

Neissser, U. (1967). *Cognitive Psychology*. New York: Appleton-Century-Crofts.

Scribner, S. (1985). Vygotsky's uses of history. In J. Wertsch (ed.). *Culture, Communication and Cognition*. NY: Cambridge University Press.

Van Der Veer, R. & Valsiner, J. (1991). *Understanding Vygotsky: A Quest for Synthesis*. Cambridge, MA: Blackwell.

Van Der Veer, R. & Valsiner, J. eds. (1994). *The Vygotsky Reader*. Cambridge, MA: Blackwell.

Vygotsky, L. S. (1962). E. Hanfmann & G. Vaker (translators). *Thought and Language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1971). *The Psychology of Art*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). M. Cole, S. Scribner, V. John-Steiner & E. Souberman, eds., *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). A. Kozulin (translator) *Thought and Language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1987). R. W. Rieber & A. S. Carton, eds., translated by N. Minick, *The Collected Works of L. S. Vygotsky: Problems of General Psychology, including the Volume "Thinking and Speech"* (Vol. 1). NY: Plenum.

Wertsch, J. V. (ed.) (1985) *Culture, Communication and Cognition*. NY: Cambridge University Press.

Wertsch, J. V. (1985). *Vygotsky and the Social Formation of Mind*. Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1991). *Voices of the Mind: A Sociocultural Approach to Mediated Action*. Cambridge, MA: Harvard University Press.

CONTENTS

Chapter 1: The Problem of the Development of Higher Mental Functions 1
Chapter 2: Research Method 27
Chapter 3: Analysis of Higher Mental Functions 65
Chapter 4: The Structure of Higher Mental Functions 83
Chapter 5: Genesis of Higher Mental Functions 97
Chapter 6: The Development of Speech 121
Chapter 7: Prehistory of the Development of Written Language 131
Chapter 8: Development of Arithmetic Operations 149
Chapter 9: Mastering Attention 153
Chapter 10: The Development of Mnemonic and Mnemotechnical Functions 179
Chapter 11: Development of Speech and Thinking 191
Chapter 12: Self-Control 207
Chapter 13: Cultivation of Higher Forms of Behavior 221
Chapter 14: The Problem of Cultural Age 231
Chapter 15: Conclusion; Further Research; Development of Personality and World View in the Child 241
The Question of Multilingual Children 253
Epilogue 261
Notes to the Russian Edition 279
References 287
Author Index 289
Subject Index 291

Chapter 1
THE PROBLEM OF THE DEVELOPMENT OF HIGHER MENTAL FUNCTIONS[1]

More and more eternal laws of nature
are turning into laws of history.
*—F. Engels**

The history of the development of the higher mental functions is a field in psychology that has never been explored. Despite the enormous importance of studying the processes in the development of higher mental functions for proper understanding and logical elucidation of all aspects of the child's personality, no precise boundaries of this field have yet been established, neither has a formulation of basic problems or tasks confronting researchers been methodologically realized nor has an appropriate method of investigation been devised; no elements of a theory or at least of a working hypothesis, have been set up or developed that might aid a researcher in thinking through and tentatively explaining facts and observed patterns discovered in the process of his work.

Also, the very concept of development of higher mental functions as applied to child psychology—in our opinion, one of the central concepts of genetic psychology—still remains vague and obscure. It is inadequately distinguished from other close and related concepts, the outlines of its sense are frequently diffuse, the content ascribed to it, inadequately defined.

It is very clear that with this state of the problem, we must begin by explaining the basic concepts from the standpoint of basic problems, from defining precisely the problem of the research. Just as exploring a new area is impossible without precisely and clearly stating the questions to which it must give an answer, a monograph on the history of the development of higher mental functions of the child which marks a first attempt at a systematic presentation and theoretical bringing together of many individual studies in this area must start with a clear understanding of the subject whose study it must serve.

The question is also complicated by the fact that elucidation of this subject requires a basic change in the traditional view of the process of mental development of the child. A change in the usual aspect from which facts of mental development are regarded is an indispensable prerequisite without which a proper formulation of the problems that interest us is impossible. But it is easier to assimilate a thousand new facts in any field than to assimilate a new point of view of a few already known facts. Moreover, many, many facts stably embedded in the system of child

*Karl Marx and F. Engels, *Collected Works*, Vol. 20, p. 553 [in Russian].

psychology are as if torn up by the roots from firmly established sites and appear in a completely new light when they are considered from the aspect of the development of higher mental functions of the child, but they are not yet recognized specifically from this aspect. The difficulty of our problem consists not so much in underdevelopment and novelty of the questions entering into it as in the one-sided and erroneous formulation of these questions, affected by all the factual material accumulated over the decades and by the inertia of erroneous interpretation which continues to have its effect to this day.

The one-sidedness and erroneousness of the traditional view of facts on development of higher mental functions consist primarily and mainly in an inability to look at these facts as facts of historical development, in the one-sided consideration of them as natural processes and formations, in merging and not distinguishing the natural and the cultural, the essential and the historical, the biological and the social in the mental development of the child; in short—in an incorrect basic understanding of the nature of the phenomena being studied.

There are many individual studies and beautiful monographs on separate aspects, problems and instances of the development of higher mental functions of the child. Children's speech and drawing, mastery of reading and writing, logic and world outlook, development of number concepts and operations, even the psychology of algebra and the formation of concepts have been the subject of model studies many times. But all of these processes and phenomena, all mental functions and forms of behavior were studied mainly from the innate aspect, from the aspect of the natural processes that formed them and were a part of them.

Higher mental functions and complex cultural forms of behavior with all their specific features of functioning and structure, with all the uniqueness of their genetic path from inception to full maturity or death, with all the special laws to which they are subject usually remained outside the field of vision of the researcher.

Complex formations and processes were partitioned into component elements and no longer existed as wholes, as structures. They were reduced to processes of a more elementary order occupying a subordinate position and fulfilling a definite function with respect to the whole of which they were a part. As an organism partitioned into component elements discloses its composition but no longer exhibits specifically organic properties and patterns, in the same way these complex and integral mental formations lost their basic quality and stopped being themselves when reduced to processes of a more elementary order.

Such a formulation of the question had the most disastrous effect on the problem of the mental development of the child, for it is precisely the concept of development that is radically different from the mechanistic representation of the emergence of a complex mental process from separate parts or elements like a sum derived from an arithmetical addition of separate components.

As a rule, as a result of the dominance of this approach to the problems of the development of higher mental functions of the child, an analysis of a developed form of behavior replaced explaining the genesis of this form. Frequently, genesis was replaced by an analysis of some complex form of behavior at various stages of its development so that a notion was formed that what was developing was not a form as a whole but its separate elements which, as a sum, produced at each given stage one phase or another in the development of the given form of behavior.

Putting it more simply, with this state of the matter, the very process of development of complex and higher forms of behavior remained unexplained and unrealized methodologically. Data on genesis were usually replaced by purely external mechanical, chronological coincidence of the appearance of one higher mental process or another at one age or another. For example, psychology informed us that

formation of abstract concepts occurs in definite forms in a child at the age of fourteen approximately just as baby teeth are replaced by permanent teeth at the age of seven approximately. But psychology could not answer either the question as to why formation of abstract concepts occurs at just that age or the questions as to what gives rise to it and how it arises and develops.

Our comparison is not casual: it reflects the real state of the matter in child psychology. Psychology has not yet explained adequately the differences between organic and cultural processes of development and maturation, between two genetic orders different in essence and nature and, consequently, between two basically different orders of laws to which these two lines in the development of the child's behavior are subject.

For child psychology—old and modern—an exactly opposite direction is characteristic: placing the facts of cultural and organic development of child behavior in one order and considering both as phenomena of one order, of one psychological nature that discloses basically identical laws.

We can close the circle of our critical description of the traditional perspective of cultural development by returning to the point with which we started, specifically, to indicating how and at what price such a reduction of two different orders of phenomena and laws to one order was attained in child psychology. It was at a cost of giving up the study of specific patterns of one order, at the cost of reducing mental processes from complex to elementary, at the cost of doing a one-sided study of mental functions from their innate aspect.

In separate chapters on analysis and elucidation of the functional structure and genesis of forms of human behavior, we will make a special study of the problem of the whole and parts as applied to the development of higher mental functions and the problem of reducing higher forms of behavior to elementary forms. Then we will attempt to present theoretically the more important specific patterns of the process of mental development of the child as they are found in the study of the main mental functions. Our abstract discussion may then turn into something concrete and be clothed in the flesh and blood of scientific facts.

But now the proximate and only goal of our discussion is to compare the two principal perspectives of the process of mental development of the child. One was dominant during the whole period of existence of child psychology in the form of a silent premise not expressed or formulated by anyone, but nevertheless a directing and basic prerequisite of all research; in an almost unchanged form, it continues to exist even now in new studies and is silently present on every page of a psychology book or text dealing with facts of development of higher mental functions.

The second perspective was prepared by all the preceding development of the problem, all the accumulation of factual material, all the contradictions and blind alleys to which the old perspective led researchers, the whole enormous mass of questions unresolved in their old formulation, the whole mass which, together with the accumulation of facts, grew and accumulated for decades on an erroneous base, the whole course of the psychological crisis, successes in other areas of genetic psychology—animal psychology and the psychology of primitive peoples—and finally the introduction of the dialectical method into psychology.

But even this second perspective, as far as we know, has not yet been expressed or formulated at all precisely and fully by anyone. In the process of exposition, we will try to collect and present all these allusions to a new understanding of the history of the cultural development of the child, all those elements of the new methodological formula that are found dispersed among separate researchers. But even collected together, they still will not make up what we need, what might serve as a starting point for our research. For this reason we must try to determine more

precisely the essence of both perspectives and mark the starting point of our own research as well.

As we have already indicated, the first perspective is characterized by three points: the study of higher mental functions from the aspect of the natural processes comprising them, reducing processes from higher and complex to elementary, and ignoring specific features and patterns of cultural behavioral development. These points are common to both the old subjective, empirical psychology[2] and the new objective psychology—American behaviorism[3] and Russian reflexology.[4]

With all the major, basic differences between the old and the new psychology, which we must not lose sight for a moment, both perspectives are linked by one common formal methodological point which various authors have already indicated many times. This point is that in both perspectives, the purpose of analysis is to equate the problems of scientific study with decomposing higher forms and structures into primary elements and reducing them to lower forms while ignoring problems of quality, which is not reducible to quantitative differences, that is, to nondialectical scientific thinking.

The old subjective psychology saw the basic problem of scientific research to be the isolation of primary, irreducible elements of experience that it found by abstraction in elementary mental phenomena such as sensation, feeling, pleasure–displeasure and voluntary effort, or in elementary mental processes and functions such as attention and association isolated in the same way. Higher and complex processes were decomposed into component parts and, without remainders, were reduced to combinations of these primary experiences or processes different in complexity and form. In this way, an enormous mosaic of mental life developed comprised of separate pieces of experience, a grandiose atomistic picture of the dismembered human mind.

But even the new objective psychology knows no other way toward knowing the complex whole except for analysis and decomposition, except for elucidation of composition and reduction to elements. Reflexology closes its eyes to the qualitative uniqueness of higher forms of behavior; for it, there is no basic difference between these forms and lower elementary processes. In general, all behavioral processes can be decomposed into associative reflexes that vary according to length and number of links in the chain, inhibited in some cases and not manifested externally. Behaviorism operates in units of a somewhat different type, but if we replace one set of units in reflexological analysis of higher behavioral forms by another, if we use reactions instead of reflexes, then the picture will be remarkably similar to the analyses of objective psychology.

True, behaviorism—in its most consistent and extreme form—is inclined to emphasize the role and significance of the organism as a whole, inclined even to see, from the perspective of behavioral processes as a whole, the essence of the difference between psychological and physiological research. Sometimes it attempts to consider the complex wholes specifically as wholes. In these cases, it speaks of instinctive and emotional functions and, in contrast to these, about acquired functions, that is, systems of habits developed and ready for use in appropriate situations.

The concept of system and function differs basically, of course, from the concept of an arithmetical sum and a mechanical chain of reactions. It assumes a certain regularity in the construction of a system, a unique role of the system as such, and finally, a history of development and formation of the system, whereas for a sum or chain of reactions nothing is assumed for its elucidation except a simple coincidence of external contiguity of known stimuli and reactions. In the same way, the concept of mental function—even in the sense in which it is used by extreme partisans of behaviorism who reject seeing in it anything beyond a system of pre-

viously developed habits—necessarily assumes and includes in itself, first, a relation to the whole with respect to which a certain function is carried out and, second, the idea of the integral character of the mental formation itself which is termed a function.

In this sense, introducing the concepts of system and function into behavioral psychology undoubtedly represents a step forward from the purely mechanistic conception of behavior. In scientific development, both of these concepts may sooner or later lead researchers who use them to rejecting this conception completely. But in the form in which the indicated concepts are developed in behavioral psychology now, they signify scarcely anything more than a timid hint of the inadequacy of former terms and concepts and for this reason they have not produced and, at the present stage of development, cannot produce what is needed for a study of higher behavioral processes adequate to their psychological nature.

But this is exactly what we assert in bringing subjective and objective psychology together into one specific relation: only that the atomistic formulation of empirical and objective psychology makes the study of higher mental processes commensurate with their psychological nature basically and factually impossible. In essence, each of the concepts is only a psychology of elementary processes.

For this reason, it is not by chance that in child psychology only chapters are written that pertain to the earliest age when predominantly elementary functions mature and develop but higher functions are still in a rudimentary state and are going through what is essentially their prehistoric period. In the future we will see that without a proper understanding of this prehistoric period in the development of higher mental functions a scientific development and tracing of the very history of their development will be impossible. But there is no doubt about one thing: specifically, during this period, the innate, natural aspect of the development of cultural higher forms of behavior predominates, specifically during this period, they are most accessible to elementary analysis.

It is not surprising, therefore, that the history of the development of children's speech, for example, ends for most researchers with an early age when actually only the process of establishing speech-motor habits, the process of mastering the external, innate aspect of speech approaches completion, but when only the first steps have been taken along the path of development of speech as a complex and higher behavioral form.

Further, it is not accidental that child psychology as represented by its best exponents concludes that its main interest must always be concentrated around the first years of a child's life. In the eyes of these researchers, child psychology is the psychology of early childhood when basic and elementary mental functions mature. These authors assume that a child takes great steps along the developmental path soon after birth and it is specifically the first steps (the only thing accessible to modern psychology) that the psychologist must study. This is like saying that in the study of the development of the body in essence only embryos would be studied.

This comparison reflects the real state of the matter in child psychology. All discussions of the central meaning of first steps of mental development and the main defense of the position that child psychology is essentially a psychology of the infantile and very early age agree as much as possible with what we have said above. In the very essence of its direction, modern psychology has access only to the study of the embryonal development of higher functions, only the embryology of the human mind, to which it consciously wants to turn, realizing more fully its own methodological limits. In child psychology also essentially only embryos are being studied.

But a comparison with embryology is not just objectively true; it is a traitorous comparison as well. It points up the weak situation of child psychology, gives it an Achilles heel, discloses the forced abstention and self-limitation which psychology wants to make into its own virtue.

Striving to know the basic laws of development in the simplest relations and comparing mental development of the child with embryonal development shows absolutely obviously that in traditional psychology, the development of behavior is regarded as being analogous to embryonal development of the body, that is, as a purely innate biological process. In essence, this situation is based on the well-known and undoubtedly fundamental fact of the coincidence of intensive development of the brain in the first three years of life, during which the principal increase in its weight is attained, with the development of basic elementary mental functions of the child in those years.

We are far from the thought of even slightly belittling the significance of the first steps of mental development for the whole history of the child's personality or the significance of studying these steps. Both are indisputably very important not only because in itself the biological development of behavior that occurs with special intensity soon after birth is a most important subject for psychological study, but also because the history of the development of higher mental functions is impossible without a study of the prehistory of these functions, their biological roots, their organic properties. The genetic roots of two basic cultural forms of behavior are established at the infantile age: *using tools and human speech*; this circumstance in itself places the infantile age at the center of the prehistory of cultural development.

We would wish at least to point out that striving to limit child psychology to the study of embryonal development of the higher functions indicates that the psychology of higher mental functions itself is in an embryonal state; that the very concept of development of higher mental functions is foreign to child psychology; that because of necessity, it limits the concept of mental development of the child solely to the biological development of elementary functions that are directly dependent on maturation of the brain as a function of organic maturation of the child.

A similar situation also exists in objective psychology. It is no accident that the most developed, most consistent and methodologically rich section of reflexology is the reflexology of the infantile age. Neither is it an accident that the best studies in behavioral psychology pertain to early childhood and to the elementary instinctive-emotional reactions of the child.

But the paths of objective and subjective psychology of cultural development of the child diverge when higher mental functions are approached. While objective psychology consistently rejects differentiating lower and higher mental functions and limits itself to dividing reactions into innate and acquired and to considering all acquired reactions as a single class of habits, empirical psychology, with magnificent consistency, exhausts the mental development of the child with the maturation of elementary functions on the one hand and, on the other, constructs a second story of unknown origin above every elementary function.

Together with mechanical memory, logical memory was differentiated as its higher form, voluntary attention was added above involuntary attention, creative imagination was added above reproductive imagination, thinking in concepts rose as a second story above figurative thinking, lower feelings were symmetrically supplemented with higher feelings, impulsive volition, with foresight.

Thus, all studies of the principal psychological functions were constructed in two stories. But since child psychology dealt only with the lower story and the de-

velopment and origin of higher functions was left completely unexplained, by the same token, a rupture developed between child psychology and general psychology. What general psychology found and isolated under the name of voluntary attention, creative imagination, logical memory, foresight, etc., that is, higher form, higher function, remained *terra incognita* for child psychology.

The history of the development of will in the child has not yet been written. In one of the concluding chapters of our monograph, we will try to show that, in essence, this is tantamount to an assertion that the history of the development of all higher mental functions has not yet been written or that the history of the cultural development of the child has not yet been written. In essence, all three statements are equivalent—they express one and the same idea. But now we will use this indisputable position as an example which, owing to the factual similarity of the scientific fate of many related problems, can be extended also to the remaining higher functions, leaving aside for the time being the complex course of further thought that would bring to our attention three basic concepts of our research: *the concept of higher mental function, the concept of cultural development of behavior, and the concept of mastery of behavior by internal processes.* Just as the history of the development of child volition has not yet been written, the history of the development of the remaining higher functions has not yet been written, of voluntary attention, logical memory, etc. This is a fundamental fact which we must not bypass. In essence, we know nothing about the development of these processes. Except for fragmentary observations frequently found in two or three lines of text, we may say that child psychology passes over these questions in silence.

The inexplicability of the genesis of higher functions leads inevitably to the essentially metaphysical conception: higher and lower forms of memory, attention, and thinking exist together with each other independently of each other, they are linked genetically, functionally, or structurally; indeed they were primordially created in a double form just as the existence of various animal species was represented before Darwin.[5] This closes the path to scientific study and elucidation of higher processes and to general psychology so that not only the history of development, but the theory of logical memory and voluntary attention is absent from modern psychology.

The dualism of lower and higher levels, a metaphysical division of psychology into two levels, has its most extreme expression in the idea of dividing psychology into two separate and independent sciences: into physiological, natural-science, explanatory or causal psychology[6] on the one hand, and interpretive, descriptive[7] or teleological psychology of the mind[8] as a basis of all humanistic sciences on the other. This idea of W. Dilthey,[9] H. Münsterberg,[10] E. Husserl,[11] and many others, exceptionally widespread in our time with many supporters, exhibits in a pure form two heterogeneous and, in the ordinary sense, contradictory tendencies that clashed throughout the whole period of existence within empirical psychology.

As the historical and methodological study of the contemporary crisis in psychology shows, empirical psychology was never united. Under cover of empiricism, a secret dualism continued to exist that was finally formulated and crystallized in physiological psychology on the one hand and in psychology of the mind on the other. Psychology of the mind is derived from the completely correct position that empirical psychology cannot rise above a study of the elements of mental life, that it cannot become the basis for humanistic sciences: history, linguistics, art criticism, social sciences.

From this incontrovertible position idealistic philosophy reached a single conclusion: psychology of the mind in its essence cannot be a discipline of natural science; life of the mind requires understanding, not explanation; the experimental

and inductive method of research must yield to an intuitive discretion and comprehension of the essentials, to analysis of direct data of consciousness; causal explanation must be replaced by teleological; the precisely defined materialism of explanatory psychology must be conclusively dismissed from higher psychology; in the study of the mind, all material ties and all methods of natural science of deterministic thinking[12] must be renounced. Thus, the old psychology was restored, in the literal and precise sense of the word, in a new form as the science of the mind.

There can be no more convincing evidence of the insolubility of the problem of higher mental functions on the basis of empirical psychology than the historical fate of this science, which split in two before our eyes and, favoring natural science, aspired to sacrifice its lower part in order to save the higher in pure form and in this way to render to God what is God's and to Caesar what is Caesar's. So the dilemma, recognized by empirical psychology as fatal and unavoidable, consists in choosing either physiology of the mind or metaphysics. Psychology as a science is impossible—such is the historical end of empirical psychology.

It is not difficult to be convinced that reestablishment of metaphysical psychology, complete rejection of the causal and materialistic consideration of psychological problems, a return to pure idealism in psychology, neo-Platonism—all of this comprises another pole of the nondialectical, atomistic thinking about which we spoke previously in connection with the mechanical division of the mind into separate elements and which is the beginning and end of empirical psychology. Higher behavioral forms, bound by their origin to historic development of man, may be placed on par with physiological, organic processes (in which case their development is limited to the first years of life during which the whole brain grows rapidly) or they give up everything material and begin a new, this time eternal, supratemporal and free life in the realm of ideas, open to intuitive cognition that takes the form of a timeless "mathematics of the mind." Either—or. Physiology or mathematics of the mind, but not history of human behavior as part of the general history of man.

Psychology from the aspect of culture was based on the assumption of purely innate, natural laws or laws purely of the mind with a strictly metaphysical character, but not on historical laws. We will repeat again: the eternal laws of nature or eternal laws of the mind, but not historical laws.

Even those modern researchers who attempt to find an escape from the blind alleys of empirical psychology in a structural theory[13] of mental development or in a functional-genetic consideration of the problem of cultural psychology are affected by this anti-historical disease. True, these researchers know that the genetic laws of psychology that they have established and disclosed apply only to a specific child, a child of our era. It would seem that there would be a single step to admitting the historical character of these laws. But instead of a step forward, the researcher rapidly and boldly takes a step back—to zoology—and maintains, for example, that laws governing the development of speech at an early age are the same as the laws that appear in the behavior of a chimpanzee in mastering tools, that is, laws of a biological character. No room remains for the uniqueness of higher, specifically human forms of behavior.

The concept of structure is similarly dispersed over all forms of behavior and mind. Again, in the light, or more correctly, in the dusk of structure all cats are gray: the only difference is that one eternal law of nature, the law of association, was replaced by another, also an eternal law of nature, the law of structure. For the cultural, the historical in human behavior again there are no appropriate concepts. The concept of structure gradually penetrates the physiology of nervous ac-

tivity, then even lower and deeper, into physics, and the historical (everything cultural is by its nature a historical phenomenon) is again dissolved in the innate, the cultural in the natural.

The internal contradiction, the methodological illegality of approaching historical categories of psychology as if they were natural categories, appears especially clearly and sharply in studies that are so bold as to go beyond the limits of studying embryos of higher forms of behavior and leave the criteria that are safe and guiding but obviously inadequate for explaining higher behavior: the parallelism between mental development and increase in brain weight. These studies are based on the assumption that development of higher mental functions with its main traits does not end in the first three years of life; that it is not exhausted by the development of natural processes that form the structure of higher forms of behavior; that psychology can and must seek specific laws of cultural-psychological development.

But even in the best studies of this type devoted to the development of speech and thinking in the preschool and school child, the development of judgment and deduction in childhood, development of the child's world view, concepts of the world and about the causality and development of other higher and more complex functions, formations and aspects of child personality, in relation to all these problems there is a peculiar methodological approach as if they were innate, natural categories of psychology. Everything is taken outside the historical aspect. The concepts of the world and of causality of a modern European child from an educated milieu and the same concepts of a child of any primitive tribe, the world view of a child of the stone age, the middle ages and the 20th century, all of these are basically the same, identical, equivalent to each other.

Cultural development is as if isolated from history and considered as a self-satisfying process governed by internal, self-contained forces, subject to its own immanent logic. Cultural development is considered to be self-development.

This is the source of the immovable, static, absolute character of all the laws governing the development of the child's thinking and world view. Again we are confronted by the eternal laws of nature. Children's animism and egocentrism, magic thinking based on participation (the concept of connection or identity of completely different phenomena) and artificialism (the concept of creation and production of natural phenomena) and many other phenomena present themselves to us as some kind of psychological forms, primordial, always present in child development, unavoidable, always the same. The child and the development of his higher mental functions are considered *in abstracto*—outside the social environment, outside the cultural environment and the forms of logical thinking, world view, and concepts on causality that govern these functions.

Actually we did gain a little from parting with the parallelism of development of higher mental functions and increase in brain size, and we have left the younger years. True, we have before us not embryos but developed and mature complex forms, but what is the use of that when now the realistic-naturalistic approach dominant in child psychology is replaced by a conditional-naturalistic approach confirmed by new studies? There, facts of development of higher mental functions were considered from their innate aspect as natural processes; here, immeasurably more complex facts of the same order are considered from the cultural aspect, but completely as if they were natural facts.

This functionalism, now celebrating not just one victory, this triumphant *als ob* ("as if"),[14] did not essentially improve the situation by an iota and did not bring us closer by even a step to an adequate comprehension of the psychological nature of the cultural development of behavior. The naturalistic approach to facts and

phenomena of cultural development remains intact. The nature of the phenomena being studied remains completely dark and confused.

A step forward consists of approaching child psychology from a new perspective; the step includes introducing into child psychology new and profound problems compared with traditional psychology and is balanced out by a serious shortcoming, a great step back that must be made by anyone who wants to approach new phenomena from the new perspective while retaining the old perspective entire and whole. The naturalistic approach to cultural-psychological problems was inadequate, one-sided, here and there incorrect, but to a certain extent, completely finished and tested in biologically oriented psychology of infants and of early childhood.

It is already vindicated by the fact that all problems of studies of this kind were on the plane of biological psychology, that elucidation of the innate structure of any higher mental function or operation was a completely regular and indispensable link in the whole chain of the investigation. The error lay in something else. It consisted of the fact that one link was taken as the whole chain, that analysis of cultural forms of behavior from the aspect of their structure replaced elucidating the genesis of these forms and their structure.

In new studies[15] in which the problems were transferred to a new plane, in which cultural forms of behavior are considered as such and the naturalistic approach is retained intact, there is a serious internal contradiction. In that case, if the naturalistic approach to higher mental functions was appropriate to research problems, then here, with changed problems, it came into irreconcilable contradiction with the problems. There it was insufficient and inadequate to the phenomenon studied; here it is simply false and contradicts the nature of what is being studied. The golden rule of psychological mechanics triumphs again: what we won in formulating the problem, we lost in the basic approach to its solution. We played without a result. The matter remained at the same point at which we left it several pages ago. If we move yet another step and pass from school age to the period of sexual maturity, to the transitional age and the age of youth, we will again for a short time have to experience the illusion that we have just left behind. Again, as in the transition from early childhood to preschool and school age, it will become inescapably apparent to us that we are getting farther and farther away from embryos not only chronologically, but also, in essence, factually. A minute of attentive scrutiny, and the illusion disappears. We are back again at the same point.

The illusion is created by the circumstance that problems of cultural psychology clearly begin to dominate in studies of the behavior of the juvenile and young person. Some researchers openly differentiate two forms of maturation: primitive and cultural. Others see the basic and more essential psychological mark of every age in the fact that the juvenile grows into the culture. The problems themselves brought out by age are extremely complicated in comparison with problems of the behavior of the very young child. One can explain nothing here by the increase in size of the brain. In connection with this, the research plan becomes more complex. The impression arises that the genetic psychology of higher functions is generated and created here, the psychology of cultural development of the child and juvenile (these are synonyms in our eyes).

Careful study shows that even here we still meet with the same two basic formulations of the problem of cultural-psychological development that we have known for a long time. Only the form and some details are new. The essence is the same.

The naturalistic approach proper to biologically oriented psychology is represented in this case by psychoanalytic theory,[16] and the metaphysical approach—by an interpretative psychology oriented toward idealistic philosophy. For the one, all development of higher mental functions is nothing other than a study of the sexual

instinct, a metamorphosis of erotic attraction, a masked and sublimated sexual development. For the other, the development of higher mental functions is a process purely of the mind about which it can only be said that it chronologically more or less coincides in time with certain processes maturing in the body, but which in itself does not admit causal consideration and requires not elucidation, but understanding.

For psychoanalysis, everything cultural in psychology of the personality is another aspect of sex, an indirect disclosure of tendencies. Exposure of masked biological tendencies, disclosing the innate nucleus that is contained in every cultural form of behavior, biological decoding of historical formations in human psychology, excavating the unconscious subsoil of the culture of the individual and society, reducing them to archaic, primitive, primordial forms of mental life, translation of culture into a language of nature, searching for an equivalent of cultural-psychological functions, all of this taken as a whole is the very essence of the psychoanalytic approach to the problems of cultural psychology and, in questions related to higher mental functions, leads to limiting extremely one of the two trends in modern psychology.

Naturally, a basic ignoring of specific features of higher functions is combined with a fundamental aim toward a biological interpretation of all psychological formations generated by culture.

A high ideal of similar research is the attempt to present a Shakespearean tragedy, a Dostoevski novel, or a Leonardo da Vinci painting from their psychological aspects as facts from the history of the sexual development of the author and as encoded artistic pictures of a sexual dream of the reader and viewer. From this aspect, cultural formations in human psychology seem to be only tertiary sexual signs produced in the mind. If above we characterized the general predominance of the biological point of view in problems of cultural psychology as the naturalistic approach, then the point of view of psychoanalysis with respect to this problem may justifiably be called ultranaturalistic.

A complete antithesis and paradoxical supplement of this theory of the development of higher mental functions is interpretive psychology of the transitional age. As enunciated by the brightest of its representatives,[17] it shows irreconcilable contradiction as well as partial concurrence with both aspects.

They concur in that both derive methodologically from the requirements advanced by E. Spranger[18] in *"Psychologica psychological,"* requirements which demand that psychological phenomena and facts must be understood and explained from psychological facts, that is, psychologically. In the next chapter in discussing the method of our own studies, we will return to the criticism of this methodological position and will try to disclose two different and nonconcurrent ideas contained in it. Now we will only say that for psychoanalysis and for interpretive psychology, in essence, the principle of approaching the psychological psychologically does not mean what is directly included in these two words. For both theories this means mental–psychological, that is, mental phenomena and facts must be explained on the basis of mental facts. When understood thus, this two-word formula becomes a device of idealistic psychology. Spranger also salutes S. Freud[19] for overcoming the physiological materialism of earlier psychology.

But a very serious divergence of the two theories begins where the fateful problem of elucidation arises for all of empirical psychology, where psychology itself begins to split in two. It is true that psychoanalysis tries to explain the mind from the mental, and for this reason it introduces the concept of the unconscious and in this way reestablishes the continuousness of mental life, insures itself against the need to turn to physiological concepts. But in spite of all this, psychoanalysis did

not manage to overcome the heavy biologism in psychology. For psychoanalysis, an organic tendency is primary: sex—the biological substrate of all subsequent metamorphoses. For psychoanalysis, the cultural in human psychology is a derivative, secondary phenomenon, always a product and never primary.

Here psychoanalytical theory, as has been indicated in its criticism, falls into irreconcilable internal contradiction with itself. Freudism explains the displacement of sexual tendencies and ideas related to this displacement, which lies at the base of all psychoanalytical teaching, through the action of those forces that, according to this theory, arise only as a result of the displacement: cultural requirements and motives are simultaneously both the cause and the result of the displacement. This contradiction is the basis of the whole doctrine, a glaring example produced by the naturalistic approach to the problem of cultural-psychological development and the attempt to explain, at any cost, everything in human psychology from a single starting point.

For interpretive psychology, mind is primary. Even the erotic and the sexual, since they are represented in experience and comprise the subject of psychological consideration, have nothing in common with the maturation of sex glands. The one and the other simply coincide in time. In an independent, self-contained ideal being, both natural and cultural beginnings of personality unfold equally.

And although interpretive psychology gives primacy to the problem of development of higher mental functions, although it—hardly the first in the history of our science—develops the historical aspect and realizes it in research, developing the psychology of the juvenile years from the historical aspect, as a matter of fact, hidden behind words, it too still stands completely on the old ground with no differentiation between the innate and the cultural in the psychology of child development.

The one and the other disappear in the mind, which does not know the difference between nature and culture. It would be more correct to say that this psychology stands on the far side of nature and history. It is metaphysical. A better illustration may be the circumstance that this theory recognizes no difference—neither functional nor structural nor genetic—between the psychology of sexual tendencies and the psychology of formation of concepts or ethical functions: both are reduced to a common denominator, equated in interpretation, accepted in ideal essence.

We are least inclined to belittle the significance of this theory derived from the idea of the historical method, or, *limine* (in the final analysis), to reject it for the reason that it includes ideas of interpretive, essentially metaphysical, psychology in an idealistic system. We, on the other hand, believe this idea up to the limit to which idealistic psychology succeeded in rising with the working out of the problem of higher mental functions of the child. We want only to point out that this great and serious idea is presented metaphysically in interpretive psychology, that only from the formal-logical aspect, but not in essence, not in content and real meaning, does it approach the idea of forestalling the narrow biologism in psychology, of introducing the historical perspective into psychological research.

This theory frees psychology from the power of eternal laws of nature in order to confirm in their place eternal laws of the mind. As has been said already, it does not know the difference between the natural and the cultural in human psychology because it stands on the far side of nature and culture. It is asocial and, although it says much about history, it does not recognize the simple truth that historical development is development of human society and not only of the human mind, that the mind developed together with the development of society. Its conclusions and positions pertain only to German youth of a certain historical era and

a certain social class: the youth of educated classes, the bourgeois youth of the historical type that appeared during the last 100 years.

But it does not so much introduce the mental development of a youth into a historical context as it discloses history as a realm of the mind. In essence, bringing a historical aspect into psychological science in the form in which it was done by Spranger includes nothing new, nothing revolutionary. More likely, it is a simple tautology, a simple equating, within the mind, of processes that are very different in cold reality such as the historical development of humanity and the mental development of juveniles. Not only the maturing youth's growing into separate spheres of culture—law, ethics, art, religion, professional life—but these very cultural spheres arise due exclusively and purely to a mind process, an internal, self-powered mind. With this understanding of history and culture and with this understanding of psychology, to say that psychology must be studied historically is to make a tautological statement, to define *idem per idem*, that is, in essence, that the mind must be brought together with the mind. And not an iota more.

For this reason, formally bringing psychology close to history is still inadequate; we must also ask *what kind* of psychology and *what kind* of history we will bring together. Metaphysically, whatever one wants can be brought together with everything else. The following circumstance may be better evidence of the fact that interpretive psychology more than any other is far from an adequate resolution of the problem of cultural development understood primarily as a real, causally stipulated process and not as an abstract equation from the "mathematics of the mind." This psychology makes no basic distinction between biological and historical categories in the mental development of juveniles: as has already been said, from the psychological aspect, sexual instinct and formation of concepts are considered as processes of a single order: the difference in type of juveniles of different historical eras, social classes, nationalities, and differences in type of juveniles of different sex and age, that is, historical and biological determiners of mental development, form a single order.

We can apply the results to our delayed critical consideration of the formulation of the problem of development of higher mental functions in the principal directions of modern psychology. We can summarize the results of our review and note the conclusions. But first we must say that our review pursued not only critical goals. No, we were guided only by trying to explain the point of view whose rejection was the starting point of our research. We attempted to disclose the contemporary state of the problem of development of higher mental functions and those numerous blind alleys into which it was led in the major psychological systems of modern times in order, first, to note in basic lines the concrete content and subject of our research, to disclose the content of the concept "development of higher mental functions," or "cultural development of the child"; second, to state the problem of development of higher mental functions as one of the basic problems of child psychology, and to show that the fate of the whole new system of child psychology which we are developing depends on proper solution of this problem; finally, to outline schematically the methodological comprehension of this very complex and exceptionally confused problem and to note the basic approach to it.

We tried to handle both tasks that confront us in the critical consideration of various methods of formulating the problem that interests us. In doing this, we noted the basic methodological difficulties that confront the researcher and make a proper formulation of this problem on the basis of all principal contemporary psychological systems practically impossible. Overcoming these difficulties is the first and indispensable condition for a new approach to the questions of the cultural development of the child. By the same token, we formulated—in a negative form,

it is true—the basic methodological points that determine the plan and direction of all our research. In their positive form, these points must find their expression in the research itself.

We considered exactly this kind of concrete description of the major methodological difficulties to be most appropriate; we see overcoming them as the principal task of this book. We chose this way, which is perhaps less direct, in our opening chapter since it permits the closest merging of the methodological and experimental parts of our research. Determining our tasks by comparing them to the traditional understanding of the problem of cultural development in child psychology presented us with a formulation of the problem most appropriate to the present state of the problem itself.

There are two different methods for the methodological formulation of concrete psychological research. In one, the methodology of research is derived apart from the research itself; in the other, it permeates the whole exposition. We could name many examples of both. Some animals—mollusks—carry their skeleton externally, like a snail carries its shell; in others, the skeleton is within the organism and forms its internal framework. The second type of organization seems to us to be the higher not only for the animals, but also for psychological monographs. We selected it specifically for this reason.

Returning to the results of our critical review, we must first of all establish what the concrete content is concealed behind the words, "development of higher mental functions" and consequently, what is the immediate subject of our research.

The concept "development of higher mental functions" and the subject of our research encompass two groups of phenomena that seem, at first glance, to be completely unrelated, but in fact represent two basic branches, two streams of the development of higher forms of behavior inseparably connected, but never merging into one. These are, first, the processes of mastering external materials of cultural development and thinking: language, writing, arithmetic, drawing; second, the processes of development of special higher mental functions not delimited and not determined with any degree of precision and in traditional psychology termed voluntary attention, logical memory, formation of concepts, etc. Both of these taken together also form that which we conditionally call the process of development of higher forms of the child's behavior.

Actually, as we have seen, in this perception, the problem of higher forms of behavior was not at all recognized by child psychology as a special problem. It is completely absent from the contemporary system of child psychology as a single and special area of research and study. It is dispersed in parts over the most various chapters of child psychology. But each of the two basic parts of our problems taken separately—development of speech, writing, and drawing by the child and development of higher mental functions in the true sense of this word—could not work out an adequate solution in child psychology, as we have seen.

Basically, this can be explained by the following. Child psychology has not yet mastered the incontrovertible truth that two essentially different lines in the mental life of the child must be differentiated. As far as the development of child behavior is concerned, child psychology does not yet know about which of two lines of development we are speaking and lumps together both lines, assuming this mixture—the product of nondifferentiated scientific understanding of a complex process—to be the real unity and simplicity of the process itself. More simply, child psychology still continues to consider the process of behavioral development of the child as simple while actually it is complex. This is undoubtedly the source of all the principal errors, wrong interpretations, and mistaken formulations of the problem of the development of higher mental functions. Elucidating the position of the two

lines of mental development of the child is indispensable for all of our research and all further exposition.

If we leave aside the problem of ontogenesis, the problem of child development, the behavior of a modern, cultured adult is the result of two different processes of mental development. On the one hand, it is the process of biological evolution of animal species leading to the appearance of the species *Homo sapiens*; on the other, it is the process of historical development by means of which the primordial, primitive man became cultured. Both processes—biological and cultural development of behavior—are represented in phylogenesis separately as autonomous and independent lines of development comprising the substance of separate autonomous mental disciplines.

All originality, all difficulty of the problem of the development of higher mental functions of the child consists in that both these lines are merged in ontogenesis and actually form a single, although complex process. Specifically for this reason, child psychology has not yet become aware of the originality of higher forms of behavior while ethnic psychology (psychology of primitive peoples) and comparative psychology (biological evolutionary psychology), which deal with one of two lines of phylogenetic development of behavior, have both long been aware of their subject. The representatives of these sciences would never think of these processes as identical, or consider the development of man from primitive to cultured as a simple continuation of development from animal to man or reduce cultural development of behavior to biological. This is specifically what is done at each step in child psychology.

For this reason we must turn to phylogenesis, which does not recognize a union and merging of both lines in order to untangle the complicated knot that has formed in child psychology. We must say that we are doing this not only in the interests of a more precise and complete expression of the basic idea of our study, but also in the interests of research itself and even more in the interests of all teaching on the development of all higher forms of behavior from the ontogenetic aspect. Elucidation of basic concepts, which is indispensable for a formulation of the problem of development of higher mental functions in the child, a formulation adequate to the subject, must be based at the present level of our knowledge of this problem on an analysis of how the human mind developed at sequential steps of historical development.

It is understood that depending on these data does not at all mean transferring them directly into the teaching on ontogenesis: not for a minute must we forget the uniqueness that results from the merging of two different lines of development in ontogenesis. This is a central, all-determining fact. We must always keep it in mind even when we leave it aside for a time in order to discern separately and more clearly each of the lines in phylogenesis.

We cannot dwell now on biological development—from protozoa to man. The evolutionary idea in its application to psychology has been sufficiently assimilated and has become so generally recognized that it needs only to be mentioned rather than elucidated. Together with evolution of animal species, behavior also evolved; there is quite enough of this reminder in the subject that interests us now. True, there is much we do not yet know in the area of comparative psychology; many links in the evolutionary chain are still unknown in science, specifically, partly because links closest to man have disappeared, dropped out of the chain and partly because they have not been sufficiently studied for us to form a conclusively complete picture of the biological development of behavior. Nevertheless, we know the basic lines of this picture and recently, owing to the study of higher nervous activity by the method of conditioned reflexes and the discovery of rudiments of intellect

and use of tools in humanoid simians, the biological roots of human behavior and genetic prerequisites have placed it before us in a new and quite clear light.

The matter is more complicated with the other line in the development of human behavior beginning where the line of biological evolution ends—the line of historical or cultural development corresponding to the whole historical path of humanity from the primordial, half-animal humanity to our contemporary culture. We will not even begin to treat in detail or completely this question which could be so instructive for our problem since this would lead us a bit far from the actual subject of our study—away from the child—and we will limit ourselves only to certain of the most important points that characterize the new and, for child psychology, completely unknown path and type of development.

The root and principal distinction of historical development of humanity from the biological evolution of animal species is sufficiently known, and we can again limit ourselves to just a mention in order to have the right to reach a completely clear and incontrovertible conclusion: to the extent that the historical development of humanity is different from the biological evolution of animal species, to that extent, obviously, cultural and biological types of development of behavior must differ from each other since each process is part of more general processes—history and evolution. Thus, we have before us a process of mental development *sui generis*, a process of a special type.

The basic and all-determining difference between this process and the evolutionary process must be the circumstance that development of higher mental functions occurs with a change in the biological type of man, while change in biological type is the base of the evolutionary type of development. As we know and as has been demonstrated many times, this characteristic is also the basic difference in the historical development of man. In a wholly different type of adaptation in man, the development of his artificial organs, tools, and not a change in the organs and structure of the body, is of primary importance.

This position on development without a change in biological type acquires a completely distinctive and exceptional significance in psychology because, on the one hand, no elucidation has been produced yet for the problem of what kind of direct dependence there is of higher forms of behavior, higher mental processes, on structures and functions of the nervous system and, therefore, to what extent and, what is most important, in what sense is a change and development of higher mental functions possible without a corresponding change or development of the nervous system and the brain. On the other hand, a completely new and, for psychology, still a fateful question arises: we usually say that in man, owing to the features of his adaptation (use of tools, work activity), the development of artificial organs replaced the development of natural organs; but *what* replaces the organic development of the nervous system in mental development, what in general do we have in mind when we speak of the development of higher mental functions without a change in biological type?

We know that every animal species has its own type of behavior that distinguishes it and corresponds to its organic structure and functions. We also know that every decisive step in biological development of behavior coincides with a change in structure and function of the nervous system. We know that development of the brain occurred, in general, by building on new stories above the older stories, that, therefore, the ancient brain in all lower animals was arranged in the same way, that every new degree in the development of higher mental functions occurred simultaneously with the building on of a new story in the central nervous system. It is enough to mention the role and significance of the cortex of the cerebral hemispheres as an organ for closure of conditioned reflexes to illustrate the connection

between every new step in the development of higher mental functions and a new stage in brain development. This is a basic fact.

But primitive man does not disclose any substantial differences in biological type, differences which might be responsible for the whole vast difference in behavior. As newer studies agree, this pertains as well to the most primitive man of the tribes now extant to whom, as one researcher[20] put it, the full title of man must also be granted, and to prehistoric man of an era closer to ours of whom we know that he does not disclose such noticeable somatic differences as would justify placing him in a lower category of humanity. In both cases, we are dealing with, in the words of the same researcher, a fully human type, only more primitive.

All studies confirm this position and indicate that there are no substantial differences in the biological type of primitive man that might be responsible for a difference in the behavior of a primitive and a cultured man. All elementary mental and physiological functions—perceptions, movements, reactions, etc.—show no deviations in comparison with what we know of these same functions in cultured man. This is as elementary a fact for the psychology of primitive man, for historical psychology, as the reverse position is for biological psychology.

Two assumptions arise that we must at once discard without consideration: one—as clearly insupportable and rejected long ago by science, the other—as being generally outside the limits of science. The first is, as was assumed by followers of associative psychology[21] working on problems of primitive culture, that the human mind is always one and the same, unchanging, that unchanging also are the basic psychological laws, laws of association, and that the uniqueness of behavior and thinking of primitive man can be explained exclusively by the poverty and limitations of his experience. As we have now said, this opinion is derived from the assumption that in the process of historical development of humanity, mental functions were unchanging, that only the content of the mind changed, the content and sum of experience, but methods of thinking themselves and the functions of mental processes are identical in primitive and in cultured man.

In essence this assumption continues to exist in a cryptic form in those systems of child psychology that do not recognize the difference between cultural and biological development of behavior, that is, in almost all of child psychology. For ethnic psychology, this theory now has only a historical significance. Two of its main errors are, first, in the attempt to find a base in the laws of individual psychology (laws of association) in elucidating the historical development of behavior and thinking (ignoring the social nature of this process) and, second, in an unsupported blindness to those deep changes in higher mental functions that actually create the content of the cultural development of behavior.

To the extent that elementary psychological functions have not changed in the process of historical development, to the same extent higher functions (verbal thinking, logical memory, formation of concepts, voluntary attention, will, etc.) have undergone a deep and thorough change.

The second assumption escapes more easily from its situation, solves the problem more simply. It simply eliminates the scientific problem by transferring its solution to the realm of the mind. Like other researchers of primordial culture, it believes that culture actually consists not of material facts and phenomena, but of those forces that elicit these phenomena—of the mind's capabilities, of functions of consciousness that perfect themselves. From this perspective, mental development without a change in biological type can be explained by the fact that the human mind develops of itself. Or, as one of the researchers expresses this idea, the history of culture can be called the history of the human mind.

We can dismiss both of these assumptions without further discussion; one eliminates the question we are interested in by simply rejecting the existence of cultural development of mental functions and the other dissolves culture and its development in the history of the human mind.

We are once again confronted with the former problem: what is the development of higher mental functions without a change in biological type?

In the first place, we would like to note that the content of the development of higher mental functions, as we attempted to determine it above, corresponds completely with what we know from the psychology of primitive man. The sphere of development of higher mental functions, which we first tried to define on the basis of purely negative characteristics—the gaps and problems in child psychology that have not been solved—is now delineated for us with adequately clear boundaries and delimitations.

According to one of the most serious researchers of primitive thinking,[22] the idea is not new that higher mental functions cannot be understood without sociological study, that is, that they are a product not of biological but of social development of behavior. But it was factually supported only in recent decades in studies on ethnic psychology and can now be considered an incontrovertible position of our science.

From the perspective that interests us, this means that development of higher mental functions comprises one of the most important aspects of cultural development of behavior. It scarcely needs special proof, and the idea that the second branch of cultural development that we noted, specifically mastery of external means of cultural behavior and thinking or development of language, arithmetic, writing, drawing, etc., also finds complete and incontrovertible confirmation in the data of ethnic psychology. Thus, we can consider the concept of "cultural development of behavior" as adequately elucidated for preliminary orientation.

At this point, we could break off the requisite digression into other areas of genetic psychology, a digression that has diverted us for a time from our primary goal, and return again to ontogenesis. But first we must briefly formulate the conclusion which we might, it seems to us, justifiably reach on the basis of our digression. The conclusion is this: culture creates special forms of behavior, it modifies the activity of mental functions, it constructs new superstructures in the developing system of human behavior. This is a basic fact confirmed for us by every page of the psychology of primitive man, which studies cultural-psychological development in its pure, isolated form. In the process of historical development, social man changes the methods and devices of his behavior, transforms natural instincts and functions, and develops and creates new forms of behavior—specifically cultural.

We shall not now define the unique patterns of the appearance, functioning, and structures of higher forms of behavior. We must find the answer to these questions in our research. Now we can only formally answer the two questions posed above: speaking of the cultural development of the child, we have in mind the process corresponding to the mental development that occurs in the process of the historical development of mankind. Subsequently, we will try to answer these questions in detail in the language of research.

But we would find it difficult to reject *a priori* the idea that a unique form of human adaptation to nature, radically distinguishing man from animals and making infeasible a simple transfer of laws of animal life (struggle for existence) to a science on human society, the idea that this new form of adaptation, which lies at the base of all historical human life, would be impossible without new forms of behavior, without this basic mechanism for equilibrating the organism with the environment. The new forms of relating to the environment which arise in the presence of certain

biological prerequisites, but themselves grow beyond the limits of biology, could not bring to life a principally different, qualitatively distinct, differently organized system of behavior.

It is difficult to propose beforehand that society does not create supraorganic forms of behavior. It is difficult to expect that the use of tools, differing in principle from organic adaptation, does not lead to the formation of new functions, new behavior. But this new behavior, arising in the historic period of mankind, this behavior which we conditionally call higher behavior as distinct from biologically developed forms, must certainly have had its own distinct process of development, its own roots and paths.

Thus, again we return to ontogenesis. In the development of the child, two types of mental development are represented (not repeated) which we find in an isolated form in phylogenesis: biological and historical, or natural and cultural development of behavior. In ontogenesis both processes have their analogs (not parallels). This is a basic and central fact, a point of departure for our research: differentiating two lines of mental development of the child corresponding to the two lines of phylogenetic development of behavior. This idea, as far as we know, has never been expressed; nevertheless it seems to us to be completely obvious in the light of contemporary data from genetic psychology, and the circumstance that it has thus far stubbornly escaped the attention of researchers seems completely incomprehensible.

By this, we do not mean to say that ontogenesis in any form or degree repeats or produces phylogenesis or is its parallel. We have in mind something completely different which only by lazy thinking could be taken to be a return to the reasoning of biogenetic law. In planning our research, we will turn occasionally for heuristic purposes to the data of phylogenesis in those cases where there is a need for a pure and clear determination of basic initial concepts of cultural development of behavior. In the following chapter, we will explain in detail the significance of such digressions. Now it is enough to say that speaking of the analogous nature of the two lines of child development through two lines of phylogenesis, we do not in any way include in our analogy the structure and content of either process. We limit it exclusively to one point: the presence of two lines in phylo- and ontogenesis.

Even with the initial step, we are forced to make the first and radical departure from biogenetic law. Both processes represented in separate forms in phylogenesis and combined with respect to continuity and succession are presented in a merged form and actually form a single process in ontogenesis. In this we are inclined to see the greatest and most basic uniqueness in the mental development of the human offspring, which, with respect to structure, makes the development incomparable to any other similar process and is radically different from biogenetic parallelism. This is where the basic difficulty of the whole problems lies.

Let us elucidate this circumstance which is of central importance for us. If, as we have said above, cultural development of mankind occurred with the biological human type relatively unchanging during a period of relative immobility and a pause in evolutionary processes under conditions of known stability of the biological species *Homo sapiens*, cultural development of the child is still characterized primarily by the fact that it occurs under conditions of dynamic change in organic type. It is superimposed on processes of growth, maturation, and organic development of the child and forms a single whole with these. Only by abstraction can we separate some processes from others.

The growing of the normal child into civilization usually represents a single merging with processes of his organic maturation. Both plans of development—the natural and the cultural—coincide and merge. Both orders of changes mutually

penetrate each other and form in essence a single order of social-biological formation of the child personality. To the extent that organic development occurs in a cultural environment, to that extent it is turned into a historically conditioned biological process. At the same time, cultural development acquires a completely unique and incomparable character since it occurs simultaneously and is merged with organic maturation, since its carrier is the growing, changing, maturing organism of the child. The development of speech in the child may serve as a good example of such a merging of two plans of development—the natural and the cultural.

The uniqueness of cultural development superimposed on the processes of organic growth and maturation can be elucidated with a simple and obvious example from the sphere of problems that directly interest us in this book, specifically, with the example of the development of the use of tools during childhood. H. Jennings introduced into psychology the concept of *systems of activity*. This is the term he uses to designate the fact that the methods and forms of behavior (activities) which each animal has at its disposal represent a *system* conditioned by the organs and organization of the animal. For example, an amoeba cannot swim like an infusorian and an infusorian has no organ that would enable it to fly.

Undoubtedly, on the basis of this extremely important concept, researchers working on the psychology of the child's first year of life came to establish a decisive critical moment in the development of the infant. Man is no exception to Jennings' law. Man also has his system of activity that keeps his methods of behavior within limits. In his system, for example, flying is impossible. But man surpasses all animals because he can extend the radius of his activity limitlessly by using tools. His brain and hand made his system of activity, that is, the sphere of available and possible forms of behavior, infinitely broad. For this reason, the decisive moment in the development of the child in the sense of determining the circle of forms of behavior available to him is his first step on the way to independently finding and using tools, a step that the child makes at the end of the first year.

For this reason, an inventory of methods of child behavior may encompass only the behavior of the child up to that decisive moment if it must stop, it is understood, at the biological inventory compiled according to the established principle of the system of activity. Research has shown that actually even in a six-month-old infant there is a preliminary step in the development of using tools; of course, this is not using tools in the real sense of the word, but it is already a basic step beyond the limits of the system of activity that is a preparation for the first use of tools: the child acts on one object with another and makes attempts to get something with the help of some object. As observations show, at ten to twelve months, he demonstrates knowing how to use simple tools, solving problems similar to those that chimpanzees solve. K. Bühler[23] proposed that this age be called the chimpanzee-like age, meaning that the child at this time reaches the method of using tools that we know from the behavior of higher humanoid simians.

In itself, the fact that use of tools creates a basically different condition in the system of human activity is not anything new, although thus far insufficient consideration has been given to biological psychology which tries to construct a system of human behavior based on Jennings' formula. The new determination of the crucial moments in the development of a system of activity unknown in animals conditioned by the use of tools is what is new and decisive for all of infant and child psychology. Until recently, child psychology simply did not note this fundamental fact and could not realize its significance. The merit of the new studies is that they disclose and show the critical genetic process in all its true complexity while the

old psychology either simply saw a flat plane or proposed an intellectualistic explanation instead of the genetic process.

But even the new studies did not clearly realize one point, since even they are still slaves to the old intellectualistic theories. Moreover, this point is of central significance for the whole problem and it is this point that is now the subject of our direct interest.

All the uniqueness of a transition from one system of activity (animal) to another (human) made by a child consists in the fact that the one system does not simply replace the other, but both systems develop simultaneously and together: a fact which is unlike any other in the history of the development of animals or in the history of the development of man. The child does not move to a new system after the old, organically conditioned system of activity unfolds to its end. The child does not move to the use of tools like primitive man having finished his organic development. The child transcends the boundaries of Jennings' system when that system itself is still at an initial stage of development.

The brain and the hands of the child, the whole range of natural movements available to him have not yet matured when he goes beyond the limits of this range. A six-month-old infant is more helpless than a chick, at ten months he still cannot walk and feed himself independently; also, during these months, he passes through a chimpanzee-like age, taking up tools for the first time. This example most obviously shows the degree to which the whole order of phylogenetic development is confused in ontogenesis. We do not know a stronger or more powerful refutation of the theory of biogenetic parallelism than the history of the first use of tools.

If in biological human development the *organic* system of activity is dominant, and in historical development the *tool* system of activity is dominant, if, consequently, both systems are represented separately and developed separately from each other in phylogenesis, then in ontogenesis, and in this alone, the reduction of both plans of development of behavior, the animal and the human, into one makes the whole theory of biogenetic recapitulation completely insupportable—both systems develop simultaneously and together. This means that in ontogenesis, the development of the system of activity has a dual conditionality. Jennings' formula continues to have its effect while the child has already entered a period of development in which completely new laws are dominant. This fact should be called the basic cultural-biological paradox of child development. Not only the use of tools is developing, but also a system of movement and perception, the brain and the hands, the whole organism of the child. Both processes merge into one, forming, as has been said, a completely unique process of development.

Consequently, the system of activity of the child is determined at each given step by both the degree of his organic development and the degree of his mastery of tools. The two different systems develop jointly, forming, in essence, a third system, a new system of a unique type. In phylogenesis, the system of human activity is determined by the development of natural or artificial organs. In ontogenesis, the system of activity of the child is determined by the one and by the other simultaneously.

We considered Jennings' formula in detail because this example discloses both basic features of cultural-psychological development of the child: the main difference between this type of development and biological development and the merging of organic and cultural development into a single process. The process of cultural development of child behavior on the whole and development of each separate mental function is completely analogous to the example given in the sense that each mental function in its time goes beyond the limits of the organic system of activity proper to it and begins its cultural development with limits of a completely

different system of activity, but both systems develop jointly and are merged to form an interlacing of two essentially different genetic processes.

The interlacing of the two processes must be strictly differentiated from the displacement of both lines in the development of behavior about which we spoke above as the distinguishing mark of the old psychology. The old psychology did not distinguish at all the two processes of development of child behavior and accepted child development not only as the only process, but also as a simple process. The new perspective in establishing the true unity of the process of child development does not for a minute forget the complexity of this process. If the old psychology considered it possible on the whole to build into one order all the phenomena of child development—the development of speech as well as the development of walking—then the new perspective is based on understanding child development as a dialectical unit of two essentially different orders, and it sees the basic problem of research to be a thorough study of the one order and the other and a study of the laws of their merging at each age level.

Research that understands development of higher mental functions in this way always tries to comprehend this process as part of a more complex and broad whole, in connection with biological development of behavior, against a background of an interlacing of both processes. For this reason, the subject of our research is the development that occurs in the process of biological development of the child and merges with it. For this reason, in our consideration, we strictly differentiate, but do not sharply separate the one process from the other. In our research, we are far from indifferent to the biological background against which cultural development of the child occurs, or to which forms and at which level a merging of both processes occurs.

We assume—and all our research supports this assumption—that specifically different forms of merging of both processes determine the uniqueness of each age level in the development of behavior and the unique type of child development. For this reason, we can repeat after E. Kretschmer[24] that contrasting "nature" and "culture" in human psychology is only theoretically correct. In contrast to Kretschmer, however, we assume that differentiating the one from the other is a completely indispensable prerequisite of any thorough study of human psychology.

In this connection, an exceptionally important methodological problem arises that consists, naturally, of basic points of formulating the problem we are interested in: how can we in the process of research differentiate cultural from biological development and isolate cultural development which, in fact, cannot be found in a pure and isolated form? Does not the requirement of differentiating both processes contradict recognizing their merging as a basic form of mental development of the child and is not their merging an obstacle that makes comprehending unique features of cultural development of the child impossible?

Outwardly the matter does seem to be so, but actually we have touched only an exceptionally serious difficulty, but not the impossibility of studying the development of higher mental functions in the child. Research uses two basic methods of avoiding this difficulty: first, genetic examination, and second, a comparative method of study. The merging of two heterogeneous developmental processes examined in a genetic section itself represents a changeable quantity. At each step of development of both processes, special laws are dominant, special forms of merging. Although both processes over the whole course of childhood are found in a complex synthesis, the character of merging of both processes, the law of constructing the synthesis does not remain one and the same.

The history of the development of higher mental functions is full of examples of what W. Wundt,[25] referring to speech, called premature development. Actually,

it would be good to recall the example cited above of the merging of the first use of tools with an immature biological structure of a six- or ten-month-old infant or the example of Wundt in order to be completely convinced: child psychology abounds in cases of similar premature inadequate merging of biological and cultural processes of development.

In genetic consideration, the merging itself exhibits a series of shifts which, like geological fissures, disclose different strata of some complex formation. The development of higher forms of behavior requires a certain degree of biological maturity, a certain structure as a prerequisite. This closes the path to cultural development to even the highest animals closest to man. In the absence or inadequate development of this prerequisite, an inadequate, incomplete merging of the two systems of activity arises, a kind of displacement or shift of one form. As we have already said, over the whole course of the genetic line, these displacements or shifts, this incomplete merging and correspondence of the two systems themselves, change and as a result, we have before us not a single, unbroken, completely and tightly closed line, but a line of junctions that differ in kind, character, and degree.

The second basic means of research is a comparative study of the different types of cultural development. In relation to our problem, a deviation from the normal type, a pathological change in processes of development, represents, as it does in general, or rather in relation to all problems of child psychology, a kind of specially managed natural experiment that discloses and exposes, frequently with tremendous force, the true nature and structure of the process which interests us.

It may seem a paradox that we are hoping to find the key to comprehending the development of higher mental functions in the history of the development of the so-called defective, that is, biologically inferior child. An explanation of this paradox lies in the very nature of development of higher forms of behavior in the child burdened by some physical handicap.

We have already developed the idea that the basic uniqueness of child development consists in a merging of cultural and biological processes of development. In a handicapped child, this merging of both orders is not observed. Both plans of development usually deviate more or less sharply. The reason for the deviation is an organic defect. Human culture was formed and built up under conditions of a certain stability and constancy of the biological human type. For this reason, its material tools and adaptations, its social-psychological institutions and apparatus are calculated for a normal psychophysiological organization.

The use of tools and apparatus assumes as an obligatory prerequisite the presence of organs and functions proper to man. A child's growing into civilization is conditioned by the maturing of corresponding functions and apparatus. At a certain stage of biological development, the child masters language if his brain and speech apparatus develop normally. At another, higher stage of development, the child masters the decimal system and written language, and still later, basic arithmetical operations.

This connection, the timing of one or another stage or form of development to certain points of organic maturity, occurred over centuries and millennia and led to such a fusion of the one process and the other that child psychology stopped differentiating the one process from the other and became convinced that mastery of cultural forms of behavior is just as natural a symptom of organic maturity as of any bodily trait.

As a result, symptoms came to be taken for the content itself of organic development. For the first time it was noted that a delay in development of speech or inability to master written language at a certain age are frequently a symptom

of mental dullness. The phenomena then were taken for the substance itself of the state of which they might be symptoms under certain conditions.

All traditional defectology, all teaching on development and peculiarities of the anomalous child, even more than child psychology, was permeated with the idea of homogeneity and unity of the process of child development and classified as a single order: the primary—biological—features of the handicapped child and the secondary—cultural—complications of the defect. This was evoked basically by the circumstance which we mentioned above: the gradualness and sequence of the process of growing into civilization conditioned by the gradualness of organic development.

The defect that creates a deviation from the stable biological human type, resulting in elimination of separate functions, an inadequacy or damage to organs, a more or less substantial reconstruction of all development on a new basis, according to a new type, of itself naturally disrupts the normal course of the process of the child's growing into the culture. Of course, culture is adapted to the normal typical man, accommodated to his constitution, and atypical development due to a defect prevents spontaneous and direct growth into the culture such as that of a normal child.

The difficulty that an abnormal child faces in growing into culture will be defined more completely in the sphere which we termed above the sphere proper to cultural-psychological development of the child: in the sphere of higher mental functions and mastery of cultural means and methods of behavior. For their development, both of these, more than any other aspects and forms of cultural life, require intactness of the psychophysiological apparatus of the child, since both are the special forms of behavior arising in the process of historical development of humanity and the special forms produced by culture that are a kind of a cultural continuation of natural psychophysiological functions just as tools are a kind of extension of organs. Just as the use of tools assumes the development of the hand and the brain as a necessary biological prerequisite, so does the normal type of psychophysiological development of the child serve precisely as a necessary prerequisite of cultural-psychological development. For this reason the development of higher mental functions of an abnormal child takes a completely different course. Traditional defectology did not recognize the idea that a defect creates difficulties, a delay and deviation not only in the sphere and in the plan of biological development of behavior, but also in the sphere of cultural development of behavior. As a result of this, the cultural development of the abnormal child has scarcely been studied. Moreover, defectological practice, so-called medical pediatrics, was not developed on the basis of the most important principle realized thus far, which we might describe as the creation of *circuitous paths of the cultural development* of the abnormal child.

Let us explain by means of examples what it is that we have in mind when we speak of the circuitous path of cultural development. A blind child cannot master written speech because writing is a system of graphic symbols or signs that replace the separate sounds of speech. Writing is based on a system of optical stimuli inaccessible to the blind. This form of behavior, this cultural function, which has an enormous significance for the development of internal speech and thinking (reading), the cultural forms of memory, etc., remained inaccessible for the blind child until the creation and introduction of a circuitous path of development of written speech, the so-called point script of Braille.[26] The tactile alphabet replaced the optical, making reading and writing accessible to the blind. But this required the creation of a particular auxiliary, special, artificial system adapted to the peculiarities of the blind child. Medical pediatrics is full of examples of this kind. With-

out exaggerating, we can say that the alpha and omega of cultural development lies in creating circuitous paths.

In a similar way, together with the oral language of all mankind, a language of gestures was created for the deaf-mute, dactylology, that is, a hand alphabet that replaces oral speech by writing in the air. The processes of mastering these culturally auxiliary systems and using them differ in their exceptional uniqueness in comparison with the use of the ordinary materials of the culture. Reading with the hand as a blind child does and reading with the eye are different mental processes regardless of the fact that both fulfill one and the same cultural function in the behavior of the child and have a basically similar physiological mechanism.

Just as blindness results in a delay in the development of written speech and leads to a circuitous path of its development, deafness makes it impossible to master oral speech, creating one of the most difficult complications for all cultural development. All cultural development of the deaf child will take a different course than that of the normal child. The defect creates one set of difficulties for biological development and a completely different one for the cultural. Thus, deafness is not a particularly disruptive and serious inadequacy for organic development. A deaf animal is usually more adapted than a blind animal. But in cultural development, deafness is one of the most serious obstacles. Circuitous paths of speech development result in new, incomparable, and exceptional forms of behavior.

In conjunction with what has been said above about the development of the normal child, we might say: The basic differentiating characteristic of mental development of an abnormal child is divergence and nonconformity in the two plans of development, the merging of which is characteristic for the development of the normal child. The two lines do not coincide, but diverge; they do not form a merged, single process. Gaps and omissions in one line result in other gaps in the other line and at other places. Circuitous paths of cultural development create special forms of behavior as if they were constructed deliberately for experimental purposes.

For example, observing how rudiments of speech development found in the normal child at six months appear in the deaf child only at school age and then in a completely different form, we have the opportunity to study development of speech comparatively and thus obtain a key to comprehending the merging of cultural and biological development in the normal child. In a comparative study, divergence and merging mutually illuminate and elucidate each other. This general position is true for all cultural development on the whole. Following it, we will study the history of cultural development of the normal and abnormal child as a process that is the same in kind, but different in the form of its course.

The concept of *child primitiveness,* developed comparatively recently, creates a bridge from one process to the other. Regardless of the fact that there is still something debatable in the definition of this concept, isolating a special type of mental development of the child, specifically, the *child-primitive*, it seems that there is now no objection on any one's part. The sense of the concept consists in the opposition of primitiveness and culture. Just as a handicap is the negative pole of giftedness, primitiveness is, in the same way, the negative pole of the cultural. The child-primitive is a child who has not gone through cultural development or, more precisely, who is at the lowest step of cultural development.

For a very long time, primitivism of the child's mentality was taken for a pathological form of development and confused with feeble-mindedness. Actually, the external manifestations of both forms are frequently quite similar. Both exhibit identical symptoms. But actually these are phenomena of a different order. The primitive child under certain conditions exhibits normal cultural development, attaining

intellectual level of a cultured person. This is what differentiates primitivism from feeble-mindedness. The latter is the result of an organic defect. The feeble-minded person is limited in his natural intellectual development, in the development of the brain, and *as a result of this*, complete cultural development, such as occurs in normal children, becomes possible for him only along circuitous paths. The primitive, however, does not deviate from the norm in natural development; he only remains, for some reasons, mostly external, outside cultural development.

Clinical observations to isolate a special type of child underdevelopment, primitiveness, indicated that primitiveness may exist in itself as an isolated delay in cultural development. But it may be combined with the most various forms of child, abnormality and talent. As important as isolating a pure type of the child-primitive and realizing how he differs from the mentally retarded, that is, feeble-minded child, may be in itself (undoubtedly demonstrating the existence of two heterogeneous processes of mental development in childhood from the aspect of underdevelopment), even more important is the next step, which has not yet been taken, but which without fail and inevitably will be taken in the study of child primitiveness as soon as cultural development of the normal and abnormal child is adequately studied.

This step consists of recognizing that every normal child exhibits to varying degrees at different ages the whole complex of symptoms of primitiveness, that primitiveness is a common and normal state of the child who is not yet culturally developed. This position applies even to a greater degree to the abnormal child whose organic inadequacy, as we have seen, always results in a delay in cultural development and, consequently, in primitiveness. A pure type of the child-primitive is simply a concentrated and emphasized, abnormally delayed and lingering state of normal child primitiveness.

Once again we can close the circle, this time finally. We began with differentiating two lines of mental development in childhood. The subsequent unfolding of this idea led us to establish two heterogeneous types of childhood underdevelopment—mental backwardness and primitivism, which are, of course, a dark reflection of both lines of normal development. But in both cases—in the normal and in the pathological—we had to establish yet another symmetrical position, specifically, a merging, an interlacing of two lines in both plans: the developed and the underdeveloped. The biological and cultural in pathology and in normal conditions were heterogeneous, peculiar, specific forms of development which did not exist together with each other or one on top of the other and were not mechanically connected with each other, but were fused together into a higher synthesis, complex but still one. To establish the basic laws of the structure and development of this synthesis—this is the basic task of our research.

As we have seen, child psychology did not know the problem of higher mental functions or, what is the same, the problem of cultural development of the child. For this reason the central and greater problem of all psychology, the problem of personality and its development, still remains closed. Child psychology, according to its best representatives, comes to the conclusion that describing the inner life of man as a whole belongs to the art of the poet or the historian. Actually this implies a *testimonium pauperitatis*—evidence of the insupportability of child psychology, admitting the basic impossibility of studying the problem of personality within the limits of those methodological boundaries within which child psychology arose and developed. Only a decisive departure beyond the methodological limits of traditional child psychology can bring us to a study of the development of that same higher mental synthesis that, on a solid basis, must be called the personality of the child. The history of the cultural development of the child brings us to the history of the development of personality.

Chapter 2
RESEARCH METHOD

In studying any new area, it is necessary to begin by seeking and developing a method. In the form of a general position, we might say that every basically new approach to scientific problems leads inevitably to new methods and ways of research. The material and method of research are closely related. For this reason, research acquires a completely different form and course when it is linked to finding a new method suitable to the new problem; in that case, it differs radically from those forms in which the study simply applies developed and established scientific methods to new areas.

This difference can be likened to the difference that exists between equations with one and two unknowns. The research that we have in mind is always an equation with two unknowns. Developing the problem and the method proceeds, if not in parallel, then in any case, by jointly moving forward. Finding a method is one of the most important tasks of the researcher. The method in such cases is simultaneously a prerequisite and product, a tool and a result of the research. If we point the description of the method toward an introduction to the history of the cultural development of the child, we do this mainly in the interest of a systematic exposition. For this reason, in the present chapter, we will limit ourselves to a schematic description of the path that our research took. A complete description of the method must be the task of the exposition as a whole.

The method must be adequate to the subject studied. As we have stated above, child psychology has not enjoyed an adequate approach to the problem of higher processes. This means that it had no method for research. It is obvious that the uniqueness of this process of changing behavior that we call cultural development requires very unique methods and ways of research. Knowing the uniqueness and deliberately beginning the research from this point is the first condition for adequacy of the method and the problem; for this reason, the problem of method is the beginning and foundation, the alpha and omega of the whole history of the cultural development of the child.

Knowing the method and its principal basis is a necessary condition for analyzing all the chapters of this history properly. The facts that we will encounter in the exposition, the generalizations to which we will be led by our factual material, the laws which we will try to establish on the basis of those generalizations—all of this will be determined in this most basic and substantial method, how these facts are obtained, how they are generalized and subjected to the known law. For this reason, to depend, as in the past, on a method, to understand its relation to other methods, to establish its strong and weak points, to understand its principal basis, and to develop a correct attitude toward it—to a certain extent implies developing a correct and scientific approach to all future formulation of the most important problems of child psychology from the aspect of the history of cultural development.

We shall begin with the basis for the method of our research and with elucidating its relation to other psychological methods, and then we shall move on to a schematic presentation of the concrete methodology, that is, the technique and organization of experimental study. The concrete method may assume various forms depending on the content of the particular problem itself (a study of memory, thinking, etc.), on the personality of the subject (children of different ages and types), on special tasks of the given research (analysis, genesis of some process), and finally, on the nature of the research (experimental or clinical).

We cannot yet systematize or definitively establish all the basic facts and devices, kinds and types of the concrete methodology. We believe that their variety is at least not infinite. But we shall try to describe its basic form and the more important variations and, what is most important, the reasons for the structure which forms its basis. In separate chapters presenting concrete particular studies, we shall have the opportunity to return to a consideration of the special forms of the methods and experimental techniques we used.

All psychological methods used at the present time in experimental studies, regardless of the great variety, are constructed according to one principle, according to one type, according to one scheme: stimulus–response. No matter how unique and complex the type of setting of a psychological experiment might be, this universal basis can always be easily found in it. No matter on what or how the psychologist was experimenting, what was always discussed was how to affect the subject, how to present to him whatever kind of stimulus, how to stimulate his behavior or experience in one way or another, and then to study, analyze, and describe the response to this action, the response elicited by the given stimulus.

Of course, the very idea of the experiment consisted of the researcher's artificially eliciting the phenomenon under investigation, varying the conditions of its course, modifying it according to his own purposes. Consequently, a very important and basic resource for the psychological experiment still is the only possible path of correlative analysis of stimuli–responses. As far as such objective trends in psychology as behaviorism and reflexology are concerned, they recognize the stimulus–response method universally as the only way to study behavior. If we consider the question of method more broadly and include all other trends in modern psychology and even the physiology of higher nervous activity, the principal basis of the method remains unchanged.

All deviations in methodology in the various trends and schools, all variety of concrete forms and methodologies, all varieties of methods are bound by their origin to the further branching of the basic psychological method, its principal concepts and concrete application. All of this begins beyond the threshold of basic assumption. The stimulus–response principle may be like a common root of all psychological methods, like their common origin or common coefficient placed outside the brackets, and may be considered as a common characteristic of the method in contemporary experimental psychology.

If, with respect to objective psychological trends, this position is obvious and, therefore, requires no further consideration or evidence, then in its application to subjective, empirical psychology, it requires certain additional explanation. Of course, the stimulus–response principle as the basic origin of the psychological method is frequently taken as a special achievement of objective psychology, frequently considered a specific distinction of the objective method, frequently contrasted with the subjective method of empirical psychology. The impression is easily formed that in empirical psychology, the situation is different, that it knows some kind of basically different forms of experimentation.

With careful consideration of the question, it is not difficult to be convinced that this not so. The deceptive impression is based on external characteristics that lead to error. First, the impression that the method of response in traditional psychology is regarded usually as one of the experimental methods; second, that formulation of the idea of stimulus–response as a basis of the method was created outside empirical psychology within trends competing with it, and was not recognized or accepted by it. Finally, on account of an internal property, but extraneous and not related to the substance of the matter: the very understanding of the relation and nature of stimulus–response changed radically in the new psychology and this, in a sense, changed the content of the concept and, together with the novelty of the verbal formulation, created the impression of a change and novelty in the formal beginning of the experimental method in psychology.

In essence, the old psychology constructed the experiment from the formal aspect on the same foundation as the new. Admitting this means at least an erasing of the boundaries between the old and the new psychology or depreciating the principal significance of various separate trends and psychological methods. This means only that the introduction itself of the experimental method into psychology fed the revolution in empirical psychology from within and brought the method of psychology closer to the method and spirit of natural science and historically prepared the rise of objective psychology. This means only that through force of circumstances, spontaneously, even supporters of the old empirical psychology, standing partially on the hard ground of natural science, in experimenting comprehended correctly the reactive character of mental life.

In the sphere of psychophysics and psychophysiology, we first find the historical roots of experimental psychology, and in the sphere of simpler mental phenomena, most unambiguous and directly connected with external agents and determined by them, the common beginning of the experimental method took shape. Wundt sees the essence itself of the psychological experiment in the change in the material stimulus that elicits a change in the mental process directly connected to it and in the objective registration, as far as possible, of the external manifestations of the mental process elicited. In essence, the whole idea of the experimental method is already contained in this, wholly and in a completely developed form. True, here the response is understood as a purely mental process, and in the relation between the mental process that comprises the real object of the study and its external manifestations detected in the experiment, we feel a large portion of that dualism that lies at the base of all of empirical psychology. But this does not change at all the formal structure of the experiment itself. From the real aspect, it is an experiment constructed according to the pattern, stimulus–response, but interpreted in the spirit of empirical psychology.

True, Wundt himself ascribed an auxiliary-methodological, not a primary-methodological significance to both the role of the stimulus and the role of the response in the psychological experiment. These were the framework that limited mental processes. There, the principal thing was done within. Self-observation remained in the center. But it acquired stability within the framework of experimental action and registration of external discoveries. The stimulus and response were taken in essence as conditions of reliable self-observation. In Wundt's opinion, the experiment, while strictly controlled by the coercion of physiological effects, strives to free internal perception from the instability which is its distinguishing mark. But even for Wundt, it was no secret that in its purpose, this experiment was still wholly within the framework of empirical psychology, in form and in the real position of things, it was always a psychophysical experiment, an experiment of the stimulus–response type. Also, the contemporary psychological experiment, historically arising

before Wundt, differs from the first psychological experiments more substantially according to principal interpretation and understanding of the values that comprise it, according to the formal type of structure.

As a result of this incongruity of the formal structure and the basic understanding, Wundt's psychological experiment did not realize the idea on which it was based. From the point of view of the relation between the mental process, on the one hand, and the stimuli and responses on the other, Wundt differentiated three types of psychological experiment to which he reduced all the diversity of the research methods applied: the method of stimulation, the method of expression, and the method of response. It is easy to be convinced that from the aspect of formal structure all three types are reduced essentially to one general type of experiment based on the pattern stimulus–response.

We do not even have to speak about the last of the three types, the method of response, since it displays the scheme under consideration in a pure form. But even the other two, the method of stimulation and the method of expression, are constructed in essentially the same way. In the method of stimulation, the change in mental state elicited by stimulation of some sense organ is a mental response to the stimulus that is studied on the basis of responses of the subject. We again see the complete pattern of a type we know. The only difference is that in the response, only its mental aspect is studied, and verbal responses of the subject do not play the role of material being studied, but of symptoms of the mental process.

In the second method, the method of expression, the situation seems to be opposite in appearance, but in point of fact, is identical. Here again the research method consists in using emotionally tinged stimuli (substances pleasant or unpleasant in smell or taste) to elicit emotional experiences and expressive movements connected with them that are studied with special apparatus. Again it is the same pattern. The only difference is that this time the external symptoms of mental response consist of reflex changes in pulse, respiration, and blood pressure, and not of verbal responses of the subject.

Thus, a short analysis allows us to conclude on a solid basis that even the old experimental psychology constructed experiments on the stimulus–response principle. We repeat—the differences between the old and the new psychology and between separate trends in the new consist in the interpretation of this principle, in the content ascribed to these words, in the role that stimulus and response play in the experiment. In the relation between stimulus and response, some psychologists see the immediate material of research and understand response as a purely objective process analogous to all other processes in nature. Others consider the stimulus and response as the external framework that facilitates conditions of the psychological experiment, sometimes as symptoms of the internal process, and they fully identify the response, itself the subject for psychological study, with the internal mental process or experience.

In any case, from the aspect of formal structure, we are justified in considering the stimulus–response principle as a common base of all the various types of psychological experiments and in taking it out of the brackets as a common coefficient. It is understood that by this we do not want to say that all types of experiments are constructed according to one pattern. We must not close our eyes to the enormous, frequently basic, differences in methodological character between separate trends in the application of this principle. Specifically, we might point to the objective, subjective, and objective–subjective understanding of the response process itself.

Further, it is completely justifiable to speak, as is usually done, about two principally different types of experiments in empirical psychology depending on the ba-

sic goal and methodological purpose of the whole investigation: in one case, the experiment has the task of eliciting and presenting the mental process being studied, in another, it pursues the goals of the causal-dynamic, natural-science disclosure of real causes or genetic connections of one process or another. In the first case, self-observation plays the central role; in the second, the experiment on activity, in the main, may skip self-observation completely or ascribe a subordinate role to it. But behind this and behind the other type of experiment stands the same universal pattern in which the place of response is occupied one time by experience and another time by activity.

Further, we must not remain silent about the divergence between the mechanistic and structural understanding of the relations and connections between stimulus and response. In the one case, these relations and connections are taken to be associations mainly of any elements summarily united due to a purely external coincidence in time; in the other case, most important is the study of these connections and relations as whole formations and processes or structures that must be understood specifically as wholes that determine the role and significance of the parts.

Structural understanding of mental processes, as we shall see, undoubtedly contains in itself rudiments of completely new experimental forms. It has already resulted in many studies of the new type. Specifically, it creates the necessary methodological prerequisites especially for this type of experiment, which we are inclined to consider a basic and adequate method for studying the cultural development of the child; disclosing this method is the subject of this chapter. But with all this, the reform of the psychological experiment carried out by structural psychology, which attempts to rise above the extremes and one-sidedness of subjective and objective points of view in psychology and to unite and synthesize them in an integral approach to the mind and behavior, touches on the principal aspect to a much greater extent than on the formal structure of the psychological experiment.

Structural psychology does not even confront the task of creating a new type of experiment side by side with its basic task of a new interpretation of experimental data. Specifically, in the sphere of development of higher mental functions, since it posed problems of this kind, the new psychology made no attempt to develop a method adequate to the specific nature of the given problem. In a general form, however, we may say that with a deeper change in the understanding of the relations between stimuli and responses and tasks of the study, the new psychology on the whole prepared the way for further development of the basic scheme of the psychological experiment, created the necessary methodological prerequisites for it, but did not itself take a decisive step in this direction and remains thus far completely within its own experimental practice and experimental methodology on the old ground of stimulus–response.

We are intentionally simplifying the matter in order to isolate the most essential characteristic of the experimental method in psychology. It is understood that actually the matter is much more complex. Not one stimulus, but a whole series of stimuli, sometimes complexly constructed groups of stimuli and, corresponding to this, not one response, but a long chain of responses or their complex combinations characterize an experiment. Frequently, the subject is confronted by a more or less complex task that requires a coordinated system of responses directed toward a certain goal and deserving to be called a mental operation, for example, the subject must compare, memorize something, interpret, think over, make a choice, etc. But even here the principle of the experiment remains unchanged. Let us assume that a series of stimuli are presented—words, meaningless syllables, figures—and these

must be memorized and reproduced. But in all such complications, the pattern of the experiment remains unchanged.

Undoubtedly, this research method is based on the basic premise, on the basic psychological law according to which mental processes are the substance of the response to the stimuli eliciting them. Moreover, the basic experimental pattern, stimulus–response, is also the basic law of behavior. In psychology, all possible kinds of connections, depending on the constellation and change in stimuli and responses, have been studied, but we know of no single study which took the main step beyond the limits of the basic, essentially elementary law of behavior. All changes remained within the common pattern. Even the method of conditioned reflexes essentially finds its place in the same place, within the common circle. So different from other methods in all other relations, in this it holds to their common core.

In this respect, psychology does not know the principal difference between the research method of lower, elementary and higher, complex processes and functions. So the principal research of the simple and the complex response was constructed according to one and the same method. Complex processes—recognition, differentiation, selection, association, and even judgment—were brought forward between the stimulus and the response and appeared in this form before the experimenter. But it is specifically the study of higher mental processes that is the Achilles heel in experimental psychology. The sharpest of all the crises it has experienced unfolded specifically along this line. This circumstance is not at all accidental. It is, as might be expected, the result of the very nature of the traditional psychological experiment and the basic apparatus of psychological research.

In essence, the experiment in the form in which it was set up by Wundt was an adequate means for studying lower, elementary processes of a psychophysiological character, clearly connected with external stimuli. Many psychologists have repeatedly expressed the idea that experimental research is possible only in this sphere. Higher mental processes and functions generally do not permit such a method of research and remain forever closed to experimental psychology. Specifically, with respect to child psychology, such views were expressed particularly categorically and confidently. If we recall the position of the whole problem of higher processes in child psychology and its tendency toward concentrating interest around elementary forms of behavior, which we noted in the preceding chapter, such a decision will not seem surprising or unexpected to us.

It is true that Wundt himself isolated the spheres of applying the three experimental types that he outlined according to degree of complexity. Only with respect to the method of stimulation did he propose the requirement that the mental response elicited by the stimulation be uniform and directly connected with the stimulus that elicited it. The method of expression encompasses a sphere of emotional responses that are more complex, although, of course, still in their elementary form. Finally, the method of response, which allows a conditional relation between stimulus and response and an artificial construction of the task confronting the subject, also includes, as we have seen, methods of studying associations and judgments, that is, processes of thinking. But, in general, even for Wundt it was hardly a secret that the experiment in the form that he considered to be its basic and unchangeable essence would actually be applied only in the sphere of the psychology of elementary processes.

In any case, two positions evoke no doubt as to their correctness, and these are also important with respect to what interests us. The first: regardless of how the matter looked from Wundt's own views, the objective practice of experimental research and further development of psychology wholly confirmed that the Wundtian experiment would be applied predominantly only to the study of lower

mental functions. Second: Wundt himself, the founder of both experimental psychology and ethnic psychology, having worked out the problems of cultural development from the psychological aspect, separated these two spheres of research as far as methodology was concerned with an impassable boundary. The boundary proposed by Wundt between ethnic and experimental, between historical and physiological psychology agrees wholly with the boundary that separates the study of language and other complex cultural-psychological forms from the study of more elementary processes. On a sound basis, H. Werner terms this fact as paradoxical as it is significant.

If we were looking for new evidence to confirm the idea that general and experimental psychology did not recognize the problem of cultural development and basically allowed the study of the mind and behavior only from the natural aspect, from the aspect of natural processes, we would scarcely be able to find a more convincing example. While we believe that this question is sufficiently elucidated, we cannot bypass the fact that in the area of cultural psychology there was no place, according to Wundt, for experimentation. As we know, all ethnic psychology was devised by Wundt through the method of interpretation, that is, interpreting such objective mental formations as language, art, customs.

The matter did not stop here, of course. Experimentation was introduced into ethnic psychology and general and experimental psychology and ethnic psychology—each from its own aspect—were brought by the course of development itself to a certain rapprochement; true, it was insignificant and external, but nevertheless it broke the main methodological boundary between them. However, neither of the two disciplines or branches of psychology has recognized the principal significance of this rapprochement, the whole enormity of the methodological reconstruction that it entails for both sciences. This can be easily seen from the fact that the same experimental methods that were developed in the psychological laboratory for use with an adult cultured person were used with a person growing up in culturally backward conditions.

The situation is no better in child psychology, where only recently has the experiment started to gain a place for itself. Thus far, the opinion which was dominant in the beginning and which considered experimentation inapplicable in child psychology has not been completely overcome. An unspoken prerequisite that a psychological experiment is possible only as an experiment on self-observation was responsible for this. Nevertheless, recently we were witnesses to a fruitful and intensive development in experimental child psychology. But as soon as we turn to the question of methods of this new branch of our science, we see that experiments used in child psychology can be divided according to origin and character into three types or groups. As Karl Bühler completely correctly states, some of them are set up on the example of experiments with adults, while others arise on the basis of child psychology itself and are derived from chance observations in connection with everyday incidents in a child's life.

We would again reject the idea of looking for more eloquent evidence for the position that in child psychology there is no adequate method of studying cultural development, that it knows only one, the naturalistic approach to this problem, that together with the method, two-thirds of child psychology transfers the principal approach to the behavior of animals and adult persons directly to the study of the child and one-third translates more or less accidental observations into the language of the experiment. In this situation, there is no place for the problem of the cultural development of the child. If, regardless of this, experimental child psychology has achieved undoubted and great successes, it is due exclusively to the fact that in

elucidating the natural dependences and connections discovered in psychological studies, the indicated methods were completely suitable and were justified.

H. Volkelt,[27] in a review of achievements of experimental child psychology, noted this distinctive feature of most studies: that they were constructed following the example of zoopsychological experiments and used methods that completely eliminated the need for speech. In this admission, which is completely substantiated, we are inclined to see the truly distinguishing characteristic of the experimental study of child behavior. But to admit this is to say in different words the same thing that was said in the preceding chapter: child psychology is fully and entirely permeated with a purely naturalistic approach to the child; it knows and studies him predominantly as a natural, but not as a social being.

But we will put aside incidental remarks and corroborations of positions developed earlier. The problem of the relation of various branches of genetic psychology among themselves and their connections with general and experimental psychology will emerge again at the end of this chapter. Now we will consolidate the conclusion that we must reach in connection with the common problem of the experimental method. The conclusion may be expressed quite laconically: since the experimental method has entered into ethnic and child psychology, the same principle of the method's structure, the principle of stimulus–response, dominates everything in them.

It remains for us to take one more step in the same direction before finally concluding the elucidation of the fate of this universal pattern and going further. We must ask what the fate of the study of higher processes is and what the structural principle of experiments in this area is. We have already seen that in part, the higher processes, considered from the aspect of cultural development, have been completely removed from the sphere of effect and application of the experiment, and in part—from the psychophysiological aspect—have been studied principally in the same way as elementary processes (for example, the complex response of judgment).

The matter could not, of course, stop here. Research very soon came up against the fact that higher processes, and particularly thinking, do not fit the pattern of the Wundtian experiment, that processes of thinking are not unequivocally connected with any kind of external stimulus as is the case in the area of sensation, and that, consequently, the pattern of the experiment must be restructured. This was done in the research on thinking processes in the Würzburg school,[28] by O. Külpe[29] and his students, and A. Binet[30] in Paris. These researchers extended, but did not break, the basic and primary pattern of the psychological experiment. They, like all other innovators, looked for a way out in a new understanding of stimulus and response and the role they played, but not in an attempt to go beyond the basic pattern in general. The concept of the stimulus underwent reform first, then the concept of the response. But the pair itself remained undisturbed.

On this topic, Binet wrote that not only the action on our sense organs of any material agent should be understood as a stimulus, but also any change in general that we experimenters evoke at will in the consciousness of the subject; thus, in the hands of the psychologist, language, speech is a stimulus, finer and no less definite than the usual sensory stimuli; language as a stimulus presents a significant range to psychological experimentation.

Thus, language and experiment, which Wundt separated from each other with the ineradicable boundary drawn long ago between physiology and the history of the mind, between the natural and the cultural in human psychology, were brought closer in new studies, and by a quite simple operation and at quite a high cost. Speech was compared—in its role in the psychological experiment—to ordinary sen-

sory stimuli and essentially placed at the same level with them. The naturalistic approach to speech as a stimulus of higher processes of thinking, the one-sided approach to it exclusively from its natural aspect, as to an ordinary sensory stimulus, essentially links two polar directions: the idealistic conception of thinking derived from the Würzburg school and the mechanistic materialistic conception of thinking that appeared on the grounds of behaviorism and reflexology. Realizing completely the ties of the methodological approach to the extreme polarity of both conceptions, not for nothing did Bekhterev[31] bluntly state that the data of the Würzburg experiments were absolutely identical with results of reflexological analysis if the subjective terms were just replaced by objective terms in the description of the processes of thinking.

All subsequent conceptions of thinking that appeared on the basis of the new studies were contained in advance along this path, but in a twisted form. For if speech were simply an ordinary sensory stimulus on par with other agents that elicit a change in consciousness, if its role were limited in advance by this and reduced to a stimulus, a necessary material cause for the appearance of processes of thinking, then we might have expected that what happened would happen; in imageless thinking devoid of all sensory traces, not dependent on speech, researchers saw the *actus purus*, a purely mental act. Again we find ourselves on the path to ideas that Külpe asserted as a result of these studies.

Regardless of how paradoxical this seems at first glance, on questions of thinking, the conception of behaviorism and reflexology is also contained in a twisted form in this same definition. But Binet took a different route. In his logical development, he could arrive at the idea of Bekhterev and J. Watson.[32] In imageless, wordless thinking, Binet saw an unconscious process, a series of mental units, essentially of a motor nature, analogous to physiological processes, which he called internal mimicry. With a greater refinement of this idea, it was not difficult to reach the formulation of Watson, which held that thinking differs in no way from other motor skills, for example, swimming or playing golf.

From the preceding chapter, we know both of these blind alleys, which moved in different directions but were equally blind. We have seen that in the absence of the problem of cultural development of behavior and higher mental functions, psychology—general psychology and child psychology—unavoidably came up against these blind alleys. We will not repeat or develop what has been said above. We will only say: if the common assumption that methods are known by their works applies in this case, this means that together with the Würzburg school's conception of thinking, its method was also bankrupt; it means that the verdict of history applies equally and simultaneously to the theory and the method.

But the method—and this is what interests us primarily—of both the Wurzburg school and behaviorism is still the same method of stimulus–response. Külpe and his students understood the role of the stimuli and responses used differently than did the reflexologists; they determined the goal and material of research differently. Using verbal stimuli and responses and assigning them a secondary, auxiliary role, some studied mental responses essentially totally unconnected with them; others made verbal stimuli and responses in themselves the subject of research in the belief that nothing is hidden behind them except signs and phantoms; but both considered verbal stimuli and responses—speech—exclusively from the natural aspect as an ordinary sensory stimulus; both stood equally on the ground of the principle of stimulus–response.

Actually, in verbal instruction, verbal command, considered in the methodology of reflexological research as an associative stimulus completely analogous to all others, we have an extreme expression, taken to the limits, of the theoretical behav-

ioristic approach to verbal instruction which considers the subject's signals as simple motor responses and leads the naturalistic approach to verbal response to the extreme limit. But we are inclined to state that between these positions carried to extremes and the ordinary use of verbal instructions with ordinary consideration of the subject's signals, in experimental psychology in a certain respect, there is rather a difference in degree than in substance. Of course, in one case the mental is ignored completely and in the other, it is the only thing that interests the researcher. In this sense, the old psychology and reflexology are the poles. But in a certain respect, we can again bring them closer together. Neither the one nor the other—one to a lesser degree, the other, to a greater—made any basic distinction between verbal spoken instruction and any kind of natural sensory stimulus.

In experimental psychology, verbal instruction is the basis for any experiment. With it, the experimenter creates the required attitude in the subject, elicits the process to be observed and establishes connections, but here, the psychological role of the instruction itself is usually ignored. The researcher then deals with the associations, processes, etc. created and elicited by the instruction just as if they appeared in the natural course in themselves without the instruction.

Usually the decisive moment of the experiment—the instruction—is left outside the field of vision of the researcher. It is not subjected to analysis and is reduced to a secondary, auxiliary process. The experiments themselves were usually considered after the elicited process involuntarily set in motion had stopped. The first trials were usually discarded, the processes were studied *post mortem*, while the active effect of the instruction was dropped behind, into the shadows. The researcher, forgetting the origin of the artificially elicited process, naively trusted that the process went forward in exactly the same way as if it had appeared of itself without instruction. This uniqueness of the psychological experiment, comparable to nothing else, was not taken into account at all. Experiments with responses were studied, for example, just as if responses of the subject were elicited actually by the appearance of the stimulus and not of the given instruction.

We will return again to the problem of instruction in the psychological experiment. For this reason we have no intention of exhausting it with a brief mention. But for a proper evaluation of the basic position of the present chapter, an analysis of the role that was assigned to speech in the psychological experiment has a decisive significance. Speech was considered at the same level as other sensory stimuli. Instruction was formulated within the framework of the basic plan. True, individual psychologists such as N. Ach[33] and others tried to approach the psychological analysis of instruction, but exclusively from the aspect of its effect on the process of self-observation and its determination. Jumping ahead, we can say that the whole problem of an adequate approach to higher mental functions lies completely within this single, seemingly singular fact.

The basic failure to differentiate the role of speech and the role of other sensory stimuli in the psychological experiment is the direct and inevitable consequence of the undivided dominance of the basic stimulus–response pattern. It is understood that speech may absolutely legitimately be considered in this way. From a certain point of view, speech may be considered completely justifiably as a motor skill among other skills. In the process of forming concepts or meanings of speech, mechanisms of association and other still more elementary mechanisms play their own more elementary role also. Finally, we may also study the natural structure of speech as a sensory stimulus. But specifically because the S–R method is applied equally to all forms of behavior, the lower and the higher, it is insufficient for the study of higher functions, inadequate to their nature, since it captures in them only

what they have in common with lower processes and does not capture their specific quality. This method approaches cultural formations from the natural aspect.

Curiously, the physiology of higher nervous activity for which such a theoretical approach, leveling the differences between speech and other stimuli, is more natural and understandable and an approach from the natural aspect to all phenomena of behavior, including the cultural, is absolutely obligatory, does not repeat this mistake. Even in the physiological plan, I. P. Pavlov[34] notes the peculiarity that sets apart the "grandiose signalistics of speech" from the whole other mass of signal stimuli.

"Of course," Pavlov says, "for man, the word is the same real conditioned stimulus as all others that he has in common with animals, but at the same time, it, more than any other stimulus, is so multiply encompassing that it cannot be quantitatively or qualitatively compared in this respect to conditioned stimuli of animals" (I. P. Pavlov, 1951, pp. 428-429). The multiply encompassing quality of the word to which Pavlov pointed as its distinguishing mark does not, of course, exhaust the whole uniqueness of the word in the psychological plan and does not even express the main trait of this uniqueness. But the most important thing is that biological research leads to establishing and admitting the quantitative and qualitative uniqueness of the word and its incomparability in this respect to conditioned stimuli of animals.

It is understood that consciousness of the uniqueness of speech in this plan was not strange to psychology either. But in its own plan, it placed all sensory stimuli, including the human word, at the same level. In this sense, it factually coincided with physiology in its approach to higher behavior of man. The one and the other were united by the methodological S–R pattern. In essence, the pattern forced experimental psychology, in the words of Binet, to equate the word with the ordinary sensory stimulus. It was necessary to reject the pattern, to disrupt it, or to subject everything to it.

We see that this pattern lies at the base of the psychological experiment regardless of any differences in the forms it might assume in various courses of research or whatever areas of psychology it might penetrate. This pattern encompasses all trends, from associative to structural psychology, all areas of research, from elementary to the higher processes, all divisions of psychology, from general psychology to child psychology.

This situation, however, has an opposite side that seemingly depreciates the result of the generalization we reached, that is, our basic conclusion. It seems so at least at first glance. The opposite side consists in the fact that to the extent that our pattern was generalized and extended to all the broad areas of psychology ever more in all directions, the concrete content of the pattern evaporated and disintegrated in direct proportion to these processes. We saw that it might conceal approaches to the mind and behavior of man that were most varied and even poles apart, the most various purposes and research tasks, and finally, areas of research most remote from each other. The question arises: this being the state of the matter, is not the whole pattern an empty, meaningless form which conceals no specific content at all, and for this reason is not the generalization we reached devoid of any sense?

In order to answer this question, we must establish the positive content that stands behind the S–R pattern, what the significance is of the fact that it lies at the base of every experimental method in psychology, or, in other words, what all the various forms and aspects of the psychological experiment have in common, what the pattern that is their base conceals.

That which is common, which unites all types and forms of the psychological experiment and which is present in all of them in different degrees since they are based on the S–R principle, is the naturalistic approach to human psychology; unless this is disclosed and surmounted, it is impossible to find an adequate method for studying the cultural development of behavior. In its essence, this view seems to us to be related to the naturalistic understanding of history, the homogeneity of which, in the words of F. Engels, consists of the fact that it recognizes "that only nature affects man and that only natural conditions determine his historical development everywhere..." and forgets that even "man in turn acts upon nature, changes it, creates new conditions of existence for himself" (K. Marx and F. Engels, *Collected Works*, Vol. 20, pp. 545-546).

The naturalistic approach to behavior as a whole, including the approach toward higher mental functions, that was formed during the historical period of the development of behavior does not take into account the qualitative difference between the history of man and the history of animals. In essence, the pattern is applied equally to the study of behavior of man and behavior of animals. Even this fact alone contains in itself, in a twisted form but fully, the idea that all qualitative differences in the history of man, all the change in the nature of man, the whole new type of human adaptation—all of this was not reflected in human behavior and did not evoke in him any changes of a basic character. Essentially, this idea implies the recognition that human behavior is outside the common historical development of humanity.

No matter how slightly valid or even wild such an idea is in its naked form, nevertheless in its cryptic form it continues to be a silent prerequisite, an unspoken principle of experimental psychology. We must not assume that work, which radically changes the character of human adaptation to nature, is not connected with a change in type of human behavior, if we accept with Engels that "a tool implies specifically human activity, a transforming reverse effect of man on nature—production" (ibid., p. 357). Is it possible that in human psychology, in the development of behavior nothing corresponds to this difference in relations to nature that separates man from animals and which Engels had in mind when he said that "an animal only *makes use of* the environment . . . man on the other hand . . . *dominates* it," that "all systematic acts of all animals did not succeed in placing the stamp of their will on nature. This only man could do" (ibid. p. 495).

Returning to the example cited earlier, we might ask: what is the significance for the psychological experiment of the circumstance that the Jennings formula relative to the organic condition of the *system of activity* becomes inapplicable to man at the moment when his hand picks up a tool for the first time, that is, in the first year of his life. The S–R pattern and the naturalistic approach to human psychology hidden behind it assume that a passive character of human behavior is its basic feature. We use the word "passive" in the literal sense in which it is ordinarily used in speaking of the passive character of animal adaptation in contrast to the active adaptation of man. In animal and human behavior, we ask, does anything correspond to this difference in the two types of adaptation?

If we pay attention to these purely theoretical considerations and add to that the virtual impotence of experimental psychology, which we have pointed out above and which no one has disputed, in applying the S–R pattern to the study of higher mental functions, it becomes clear that this pattern cannot serve as a basis for the construction of an adequate method of research of specifically human forms of behavior. In the best case, it may help us detect the presence of lower, subordinate, secondary forms that do not exhaust the essence of the main form. Applying a universal, all-encompassing pattern to all degrees in development of behavior may

only lead to establishing a purely quantitative range, a complexity and increase in stimuli and responses in man in comparison with animals, but it cannot detect a new quality in human behavior. About its quality, we can say, in the words of Hegel,[35] that something is what it is because of its quality, and losing its quality, it ceases being what it is, for development of behavior from animal to man resulted in the appearance of a new quality. This is our main idea. This development is not exhausted by a simple increased complexity of those relations between stimuli and responses which were already presented to us in animal psychology. Neither does it proceed along the path of quantitative increase and branching of these relations. At its center is a dialectical leap that leads to a qualitative change in the relation itself between the stimulus and the response. We might formulate our basic conclusion thus: human behavior differs by the same kind of qualitative uniqueness in comparison with the behavior of animals as the whole type of adaptation and historical development of man differs from the adaptation and development of animals because the process of mental development in man is part of the total process of the historical development of humanity. In this way, we are forced to look for and find a new methodological formula for the psychological experiment.

We have come right up to the most difficult place in our exposition. We are faced in the course of developing our ideas with formulating in a few words the principal basis and structure of the method we will use to carry out our research. But because of the close tie between the method and the material of our research, of which we spoke at the very beginning of this chapter, to present a formula means to disclose beforehand the central idea of the whole study, to anticipate to a certain degree its conclusions and results which might be fully understood, convincing and clear only at the very end of the exposition. Now to provide a firm basis for the method, we must state what we mean to develop in the present book, in what the beginning and end of all our research is indivisibly merged, what represents the alpha and omega of the whole history of the development of higher mental functions.

We have decided to present the formula which is the basis of our method and to develop the basic idea of our research as a working hypothesis at first. In choosing this way of presenting it, we might depend, in this case, on the words of Engels, which precisely express the methodological significance of our way of thinking. He says, "The form of development of natural science, insofar as it thinks, is the *hypothesis*. Observation discovers some new fact which invalidates the former method of explaining facts pertaining to a specific group. From that moment the need arises for new methods of explanation based at first only on a limited number of facts and observations. Subsequent experimental data lead to refinement of these hypotheses, eliminate some of them and correct others, until finally a law is established in pure form. If we should want to wait until the data is ready for the law in a *pure form*, it would mean suspending thoughtful research until then, and for this reason alone, we would never get to the law" (K. Marx and F. Engels, *Collected Works*, Vol. 20, p. 555).

We began our research with a psychological analysis of several forms of behavior that are found, not frequently it is true, in everyday, common life and are thus known to everyone, but are also to a high degree complex, historical formations of the earliest epochs in the mental development of man. These techniques or methods of behavior, arising stereotypically in given situations, represent virtual solidified, petrified, crystallized psychological forms that arose in remote times at the most primitive stages of cultural development of man and in a remarkable way were preserved in the form of historical survivors in a petrified and in a living state in the behavior of modern man.

We know that the selection itself of such techniques as the initial point of all research and the immediate subject of our analysis from which we expect to derive the formula for constructing a new method cannot but seem unexpected and strange. These forms of behavior usually are not taken seriously even in everyday life. They never caught the attention of the research psychologist. Mentioning them usually is prompted by curiosity as to psychological oddities that do not command any different regard. The observer and researcher always pass them by since they undoubtedly do not and cannot fulfill any significant functions whatever in the behavior of modern man and stand detached, outside his basic systems, on the edges, on the periphery, tied by nothing and no one to his guiding and deep-seated patterns. Even when using them, resorting to them, modern man usually does this with a smile. It would seem that something might be said about human behavior by these weathered, historical scraps which have lost their meaning, these psychological survivors of a remote past that enter into the common tissue of behavior in an alien body, so atypical, impersonal, having lost almost all meaning in the mental adaptation of modern man.

This verdict undoubtedly is firmly based in the unusually low practical, vital value assigned to these insignificant, trifling facts that do not attract attention in any way, a value unconditionally valid and deserved. For this reason it would be the deepest fallacy to introduce these and similar facts devoid of almost all vital significance into the center of the study and to ascribe to them meaning and interest for their own sake. In themselves they undoubtedly are the last task for psychological explanation; even an account with pretensions toward the broadest and deepest scope could do without them. In themselves, they are nothing or even less than that.

But the vital value of any phenomenon and its scientific-cognitive value do not always coincide and, what is most important, they sometimes cannot coincide immediately and directly when the given phenomenon is considered as indirect proof, insignificant material evidence, a trace or symptom of some great and important process or event that is reconstructed or disclosed on the basis of research and study, analysis and interpretation of its fragments, remnants that become a valuable means of scientific knowledge. The zoologist reconstructs a whole skeleton from an insignificant fragment of bone of some excavated animal and even a picture of its life. An ancient coin, which has no value as a coin, frequently reveals to the archeologist a complex historical problem. The historian, deciphering hieroglyphics scratched into a stone, penetrates into the depths of vanished ages. The doctor diagnoses illness from insignificant symptoms. Only recently has psychology overcome its fear of a vital evaluation of phenomena and begun to learn from insignificant trifles—that rejected material of the world of phenomena, if we use the expression of S. Freud, who called attention to the psychology of everyday life—to see psychological documents that are frequently important.

We would like to take the same path and demonstrate in the area of the problems that interest us how the great is manifested in the very small, as Freud said in this connection.

With respect to this, the "rejects from the world of phenomena" that we collected for analysis represent unusually convenient material from the most diverse aspects. In the world of psychological phenomena, they occupy a completely exceptional, although also highly inconspicuous place. Neither experimental data nor data from the psychology of primitive man, much more vital, complex and valuable, can be compared with them with respect to untangling the fundamental knot of our problem and finding the initial point for applying our method.

These insignificant and at the same time deeply significant phenomena might completely justifiably be called rudimentary mental functions analogous to rudimentary organs. As we know, these organs are exceptionally widespread and can be found in the organic world at every step. Thus, I. I. Mechnikov[36] says that we find vestigial eyes in creatures living in darkness, or vestigial sex organs in plants and animals incapable of reproduction. For this reason, essentially the expression "rudimentary function" is in its literal sense contradictory because the basic feature of rudimentary organs consists exactly in that these are inactive organs that have no function, no role in the general vital activity of the organism. In a figurative sense, we might designate in the same way the mental functions that have been retained to the present but have no essential role in the behavior of a person and are remnants of older behavioral systems.

Rudimentary functions, like rudimentary organs, are documents on development, living witnesses of ancient epochs, clear proof of origin, most important historical symptoms. In exactly this sense, biology and the theory of evolution long ago recognized the important significance, in the opinion of Mechnikov, of rudimentary organs as documents that may serve to reestablish the genealogy of organisms. These organs, useless in themselves, are remnants of similar, but more developed organs that served a useful function in ancestors. The unusually large number of rudimentary organs in man serves as extra evidence of his animal origin and supplies science with substantial data for a philosophical understanding of human nature, Mechnikov concludes.

All this, almost word for word with only small changes, could be repeated after Mechnikov by the psychologist studying rudimentary functions, only with the difference that the inactive functions we have in mind are living remnants not of biological evolution, but of the historical development of behavior. For this reason, the study of rudimentary functions must be the initial point in expanding the horizons in psychological research. At this point, the past and present are inseparably merged. In it, the present stands in the light of history and we find ourselves simultaneously in two planes: that which is and that which was. It is the end of the thread that ties the present to the past, the higher degrees of development to the elementary.

The rudimentary functions that we find in any system of behavior that are remnants of similar, but more developed functions in other, older psychological systems are living proof of the origin of these higher systems and their historical tie with older layers in the development of behavior. Thus, studying them may reveal to us substantial data for understanding human behavior, data that we need for determining the basic formula of the method. For this reason, we decided to begin with the small and insignificant facts and elevate the study of them to a high theoretical level, to attempt to discover how the great is revealed in the very small.

Analysis of these psychological forms shows us what were earlier higher mental functions integrated with them into one system of behavior and what the system itself was in which rudimentary and active functions coexisted. Analysis provides us with the initial point of their genesis as well as the initial point of the whole method. Only the initial point, it is understood. Not an iota more. Not for a second can we forget the differences between them and active functions. Knowing the structure of rudimentary functions sometimes cannot disclose for us either the structure or the character of activity of higher living functions or the whole path of their development. These functions are proof, but not an integrated picture of the whole process. They place in our hands the end of the thread for further research, but in themselves cannot either replace it or make it unnecessary. They are not even in a position to help us untangle completely the whole thread of which they are

the end. They only bring us up to research, but do not lead us into it. But this is all we expect of our analysis. We need a method.

As we know, the presence of rudimentary organs of the opposite sex found in certain plants and animals is evidence that at some time these organisms were hermaphrodites. This, however, does not save us from the need to study all the uniqueness of the structure and function of sex organs of modern single-sex organisms. Precisely in the same way, the presence in the behavior of modern man of rudimentary cultural functions undoubtedly indicates that a certain system of behavior developed from ancient primitive systems in which the rudimentary modern functions were at one time an active, integral and organic part. But this does not in the least mean that a study of the whole uniqueness of a higher cultural system is no longer necessary. Rudimentary human organs reveal man's relationship to the simian, but this fact does not for a minute close our eyes to the significant difference between the structure and functions of the human organism and the simian. In the same way, evidence from rudimentary functions that the behavior of modern man developed from more primitive systems does not in the least force us to erase the boundaries between the primitive and the cultural man. No one would think that knowledge of the fact that a chicken developed from an egg would lead us to identify the egg with the chicken.

There is no doubt about one thing that is of prime importance for the problem of method that is of interest to us. Rudimentary functions in the system of higher cultural forms of behavior and analogous, developed, and active functions of the same kind in more primitive systems make it possible for us to connect lower and higher systems genetically. They supply a point of support for a historical approach to higher mental functions and for connecting the psychology of primitive man with the higher psychology of man. Also, they provide a scale for transferring data from ethnic psychology to experimental psychological research and a measure of homogeneity and similarity of mental processes elicited in a genetic experiment and of higher mental functions. Appearing as a connecting link, a transitional form between experimentally simplified forms of behavior and the psychology of primitive man, on the one hand, and higher mental functions on the other, rudimentary forms are a kind of knot that joins three areas of study, a kind of focus in which all lines of cultural development meet and intersect, a kind of center of the whole problem. They lie halfway between what we observe in an experiment in child psychology and ethnic psychology and what we call higher mental functions that are the final link of all of cultural development.

We do not at all want to say that the working principle of higher mental functions is the same as the principle of structure of rudimentary functions or that the latter discloses fully the path and mechanism of development of higher processes of behavior. But we assume that the two principles are similar and that one is close to the other and, for this reason, instructs us in the approach to higher functions, in the construction of an experimental model of them. As we see it, rudimentary and higher functions are opposite poles of the same system of behavior, its lowest and highest points defining the limits within which all degrees and forms of higher functions are located. Both of these points taken together determine the historical axial cross-section of the whole system of individual behavior. This requires elucidation.

Thus far, many are still inclined to present the idea of historical psychology in a false light. They identify history with the past. For them, to study something historically means necessarily to study one fact or another from the past. This is a naive conception—seeing an impassable boundary between historical study and the study of present forms. Moreover, historical study simply means applying categories

of development to the study of phenomena. To study something historically means to study it in motion. Precisely this is the basic requirement of the dialectical method. To encompass in research the process of development of some thing in all its phases and changes—from the moment of its appearance to its death—means to reveal its nature, to know its essence, for only in movement does the body exhibit that it is. Thus, historical study of behavior is not supplementary or auxiliary to theoretical study, but is a basis of the latter.

In accordance with this, we can study both present, available forms and past forms historically. Historical understanding extends also to general psychology. P. P. Blonskii[37] expressed this in the general statement: behavior can be understood only as the history of behavior. This is a truly dialectical point of view in psychology. Consistently advanced, this view inevitably extends to the psychology of the present. The drawing together of general and genetic psychology that results from this, not anticipated by the old researchers, shows that the behavior of the contemporary, cultured adult is not homogeneous and not uniform in the genetic respect. As Blonskii and Werner established, his psychological structure contains many genetically different layers.

In behavior, the individual exhibits in a solidified form various phases of development that are already concluded. The genetic multilevel personality containing in itself layers of various ages gives it an exceptionally complex structure and at the same time serves as a kind of genetic ladder that unites, through a series of transitional forms, higher functions of the personality with primitive behavior in onto- and phylogenesis. The presence of rudimentary functions confirms as well as possible the idea of the "geological" structure of personality and introduces this structure into the genetic context of the history of behavior.

Rudimentary functions themselves become clear only as a result of the study of cultural-psychological development. It is due only to lengthy experimentation and interpretation of results in the light of data from ethnic psychology that we were able to disclose their mechanism and establish their central position in the system of research on cultural development of behavior. The chronological order of separate instances of research does not always fully coincide with the logical order of its ideas, which compels analysis of these functions at the very beginning as the moment that most significantly corresponds to the nature of the research itself. The chronological order teaches us how to create a model of higher functions in an experiment.

Like early formations that appeared in the very first periods of cultural development, rudimentary functions in a pure form retained the principle of structure and activity, the prototype of all other cultural forms of behavior. That which in a cryptic form exists in infinitely more complex processes is presented here in an open form. All ties connecting these formations with the system that once generated them have died off, the ground on which they appeared has vanished, the background of their activity has changed, they have been torn from their system and transported in a flood of historical development to a completely different sphere. For this reason, it seems that they have no roots or connections, but exist as if autonomously, of themselves, representing a fascinating, somehow deliberately isolated subject for analysis. For this reason, we repeat, they exhibit the principle of their construction in a pure form, which fits the problem of higher processes like a key in a lock.

The fact that rudimentary functions stand alone as an alien body without roots or connections, in an unnatural, heterogeneous environment, gives them the character of seemingly deliberately set-up models, patterns, examples. Their genealogy is written in their internal structure. They carry their history within. Analysis of

every such form requires a small and final separate monograph in a page of the large [monograph]. But in contrast to *a priori* constructions, artificially created examples and patterns, the functions in which we are interested are real formations that have found their direct and immediate continuation in the experiment reproducing their basic forms and in research of primitive man, disclosing their history.

Not an artificial bond, but a real bond built into them—in their nature—unites them with the more important lines in the cultural development of behavior. Their history is majestic, but in their time, they were rejects from the world of phenomena. In their time the appearance of each new form heralded a new victory of man over his own nature, a new epoch in the history of functions. They form real nodal paths along which humanity at one time crossed the boundaries of animal existence. They are real monuments of major encounters of culture eking out a miserable existence in an epoch foreign to them. If anyone should want to disclose the history of each such rudimentary form, he would see it on one of the great historical roads of humanity. If we were to disclose it ethnologically, we would see a universal stage of culture to which, in different epochs and in different form, all peoples rose.

But this would mean to complicate the matter and take away from the rudimentary forms their most important merit. They are good specifically in the form in which they are given. Of course, they are interesting to us not in themselves. In them, we are looking for a key to a method. They unite in themselves two advantages that are rarely combined. On the one hand, they are ancient, primitive, coarsely made, like a primitive tool. This means that they are simple to the utmost. They retain the plasticity, the primary significance, the primordial quality that compelled W. Köhler[38] to turn to a study of anthropoids in the hope of finding the first use of tools as a natural initial point for a theoretical understanding of the nature of intellect. On the other hand, we are confronted with forms that are finished, having fully completed their development, devoid of hints of underdeveloped properties, transitional traits, showing completely what they are.

Our psychological fossils show, in a petrified and arrested form, their internal development. The beginning and end of development is united in them. They actually are outside the process of development. Their own development is finished. In this combination of plasticity and fossilization, initial and final points of development, simplicity and completeness lies their great advantage for research, making them incomparable material for study. They were as if destined to become its initial point, the door, the basis of its method.

Before studying development, we must explain *what* is developing. A preliminary analysis of rudimentary functions is indispensable and must answer the question. The fact that these functions died and live at one and the same time, move together with a living system in which they are included and were also fossilized allows us to find in them the indispensable *what* that interests us in the process of development. This *what* must also lie at the base of the formula, of the method which we seek, must form its real basis and transform it into an analog of a true process.

An analysis of rudimentary functions to which we now turn and the methodological significance and basis of which we tried to show in our protracted discussion is offered to disclose the real basis of our methodological formula.

The first form of behavior in which we are interested may be presented primarily in connection with the specific situation in which it usually appears. This situation—in its extreme and simplified expression—is usually called the situation of Buridan's ass[39] (in whose works, by the way, this example is not found at all). The ass, being hungry and finding himself at equal distances from two completely similar sheaves of hay hanging on the right and left sides, starves to death, since

the effective motives are completely equal in value and opposite in direction. This is a famous anecdote illustrating the idea of absolute determinacy of behavior, the idea of no free will. What would man do in a similar ideal situation? Some intellectuals say that the fated destiny of the ass would befall man. Others think that man would be an even more shameful ass and not a thinking being, *res cogitans*, if he were to die in such circumstances.

In essence, this is the basic question of all of human psychology. In it, in an extremely simplified, ideal form is presented the whole problem of our research, the whole problem of stimulus-response. If two stimuli act with identical force in opposite directions eliciting simultaneously two incompatible responses, complete inhibition occurs with mechanical certainty, behavior ceases, there is no escape. Those who saw an outlet for man from this situation, inescapable for the ass, ascribed the solution of the problem to mind, for which material certainty does not exist and which blows where it will. This philosophical "either-or" corresponds precisely to the spiritualistic or mechanistic interpretation of human behavior in such a situation. Both directions are developed in psychology with the same clarity.

W. James[40] had to borrow, very insignificantly, it is true, as a pragmatist would prefer, from the spiritual energy of the divine *fiat*—let there be—by which the world was created and without the help of which James saw no possibility of scientifically explaining an act of will. The next behaviorist, if he wished to remain faithful to his system, had to admit that in an analysis of such a situation we would lose the concept of any difference between the man and the ass, we would forget that the ass is an animal and that before us we have a man, imaginary it is true. We shall have occasion in closing our research to return to the philosophical perspective opening up from this point of our problem and to translate into philosophical language what we would like now to establish in a different plane, in the plane of real, empirical research.

For philosophers this whole invented, fictive situation was exclusively an artificial logical construction that made it possible to illustrate in a concrete-visual form one solution or another of the problem of free will. Actually, this was a logical model of an ethical problem. Now, however, we are interested in how an actual and a real man would act, how he would conduct himself in a real situation of the same kind. When the question is posed in this way, naturally, the situation itself, the reacting subject and the research path all change. From the ideal everything is transferred to the real with all its great imperfections and all its advantages, which are just as great.

First of all, actually, such an ideal situation is, of course, never encountered. Instead quite often we encounter situations more or less like the given situation. These situations then make experimental research or psychological observation possible.

Even with respect to animals, experimental research showed that the collision of opposite nervous processes, of a somewhat different type, it is true, but in general of the same order—excitation and inhibition—results in a reaction of a kind entirely different from mechanical immobility. Pavlov said that in a difficult meeting of opposite nervous processes there occurs a more or less prolonged deviation from the norm of cortical activity that frequently cannot be measured by any of our scales. A dog responds to a difficult meeting of opposite stimuli with frustration, pathological excitation or inhibition, and becomes neurotic.

Pavlov tells of one incident where the dog fell directly into a frenzy: its whole body moved continuously, it yelped and barked unbearably and salivated continuously. Its reaction was very much like what we call peracute movement, the reaction of an animal that finds itself in a hopeless situation. In other dogs, neurosis took

a different course, resembling a different biological reaction to a hopeless situation—the reflex that mimics death, torpor, diffuse inhibition. These dogs were cured, in the words of Pavlov, with a proven therapeutic agent, bromide. Thus, a dog in a Buridan situation will sooner go into neurosis than mechanically neutralize the opposite nervous processes. But we are now interested in man in a similar situation. We will begin, as we have said above, with rudimentary functions, with observation of facts of everyday life. We will turn to a literary example. "Shall I enlist and go into the army or wait?" Pierre asked himself this question a hundred times. He took a deck of cards lying on the table and began to play solitaire. If I win, he said to himself, shuffling the deck, holding it in his hands and looking up, if I win, that will mean . . . what will it mean? . . .

". . . Regardless of how the game came out, Pierre did not join the army but remained in deserted Moscow, always with the same anxiety, indecision, fear . . ." (L. N. Tolstoy, *Complete Collected Works*, Moscow, 1932, Vol. 11, pp. 178-179 [in Russian]).

That which in Pierre Bezukhov, the hero of Tolstoy's novel, *War and Peace*, appeared in the form of a rudimentary, passive function and what must, in the plan of the author, be conveyed in a graphic, active form, that state of indecision that seized his hero, opens our eyes to the capital, overriding importance of a psychological fact. His analysis is simple, but significant. He shows that a man who finds himself in a Buridan situation looks for help in artificially introduced auxiliary motives or stimuli. A man in the position of the Buridan ass would toss a coin and in that way master the situation. The same thing is confirmed concurrently by observations of rudimentary forms of the function of selection when, as in our example, it appears, but is not effected, and by observations of the behavior of primitive man as well as by experimental studies of the behavior of the child where special, artificially created conditions elicit similar behavior in a child of a certain age.

We will discuss these experiments subsequently. Now the important fact for us is the fact that an inactive function has a long and highly complex history. In its time, it was not a simple, symptomatic action producing our internal state, but it is meaningless in the system of behavior in which it appears, having lost its initial function and become useless. Once this was the boundary point that separated one epoch in the development of behavior from another, one of those points of which we spoke earlier, saying that in them humanity once crossed the boundary of animal existence.

Fate plays an enormous role in the behavior of people growing up under conditions of a backward culture. As researchers tell us, in many such tribes not one important decision in difficult circumstances is undertaken without resorting to throwing bones. Bones thrown and falling in a certain way are a decisive auxiliary stimulus in the struggle of motives. L. Lévy-Bruhl[41] describes many methods of deciding on one alternative or another by using artificial stimuli that have no connection to the situation and are introduced by primitive man exclusively as a means to aid in making a selection between two possible reactions.

Lévy-Bruhl tells of tribes of South Africa in which, if a native meets with difficulty, he either simply throws bones or proceeds like the leader of one of the tribes who, when asked by a missionary to send his son to school, responded: "I will have a dream about it."

With a solid basis, R. Thurnwald[42] sees in these facts the beginning of conscious self-control of one's own actions. And actually, man, who first came to throwing bones, took an important and decisive step along the path of cultural development. This is not at all contradicted by the fact that a similar operation inhibits any serious attempt to use reflection or experience in real life: why should one study and think

when one can see in a dream or throw dice. Such is the fate of all forms of magical behavior: very soon they are turned into an impediment to further development of thinking, although they themselves at a given stage of historical development of thinking are the embryo of certain trends.

However, we cannot now be interested in this great complex problem in itself no matter how complex and deep is the question of a psychological explanation of the magical aspect of fate. We will note only that the magical character of the operation, rooted, as Lévy-Bruhl demonstrated, in the depths of primitive thinking, compels us to reject instantly the idea that we have before us a purely rational, intellectualistic device of the primitive mind. The matter is infinitely more complex. But in the connection that interests us, what is not important now is how it appears and to what extent it is unconscious and eclipsed, how subordinate a role the basic psychological principle plays on which the whole operation is constructed. What is of interest now is the ready form of behavior, along which pathway it developed, the principle itself of constructing the operation. It is important for us to show that the rudimentary function was once an exceptionally important and significant moment in the system of behavior of primitive man.

If we isolate in pure form the principle of construction of the dice-throwing operation, it is easy to see that its most essential characteristic consists in the new and completely unique relation between stimuli and responses. In our experiments, we artificially created for the child and adult a situation halfway between the solitaire of Pierre Bezukhov and the throwing of bones in primitive tribes. On the one hand, we aimed for an operation that would have sense, would be a real escape from a situation, and on the other, we excluded any complicating magical effects connected with throwing dice. Under the artificial conditions of an experiment, we looked for a halfway form of the operation between its rudimentary and initially magical manifestations. We wanted to study the design principle that lies at its base in a pure, noneclipsed, uncomplicated, but active form.

The experiments will be discussed in a subsequent chapter. In a few words, we would like to present the principle of forming behavior which we discovered by analyzing the dice-throwing operation. The discussion will be schematic. In a given situation, a man is affected by two stimuli different in strength and opposite in direction of the reaction elicited: *A* and *B*. If simultaneous action of stimuli *A* and *B* results in a mechanical complication of their effect, that is, a complete absence of any reaction, we have before us what, according to the anecdote, had to happen with the Buridan ass. This is the highest and most pure expression of the stimulus–response principle in behavior. Complete determination of behavior by the stimulus and complete possibility for studying all behavior according to the S–R pattern are presented here in a maximally simplified ideal form.

A man in this situation throws dice. He artificially introduces into the situation new auxiliary, totally unrelated stimuli *a–A* and *b–B*, and changes it. If *a* comes up, he follows stimulus *A*, if *b*, he follows stimulus *B*. Man himself creates an artificial situation and introduces an auxiliary pair of stimuli. He determines his behavior, his choice, beforehand with the help of a *stimulus-device*. Let us assume that when the dice are thrown, *a* comes up. So *A* wins. Stimulus *A* elicits the corresponding response, *X*. Stimulus *B* remains ineffective. Its corresponding response, *Y*, could not develop.

Let us analyze what happened here. Response *X* was elicited by stimulus *A* of course. Without it, the response could not have occurred. But *X* was not elicited only by *A*. *A* in itself was neutralized by the action of *B*. Response *X* was elicited also by stimulus *a*, which had no relation to it and was artificially introduced into the situation. Thus, a stimulus created by the man himself determined his response.

Consequently, we might say that the man himself determined his response with the help of an artificial stimulus.

An adherent of the S–R principle can completely justifiably raise the objection that we have fallen into illusion. What happened can also be wholly explained by the S–R pattern. Actually, our opponent says, we see nothing substantially different in your experiment from what was pointed out in the anecdote. If in the second case—with the dice—a response occurred that was previously inhibited, this happened because the situation changed. The stimuli changed. In the first case *A* and *B* were operative; in the second, *A–a* and *B–b*. Stimulus *A* was supported by *a* and *B* was weakened by the unsuccessful *b*. Behavior in the second case, just as in the first, was, on the whole, determined entirely and fully by the S–R principle. The opponent concludes his objection: you speak about a new principle that is the basis of the operation with dice, about a new unique relation between stimuli and responses. We do not see any kind of basic difference between the first and second variants—with dice and without dice. You say that the man himself determined his response. Excuse me: a second before, the man himself did not know how he was going to act, what he would choose. It was not the man who determined his behavior, but the dice. And what are the dice if not a stimulus? Stimulus *a* determined response *X* in the given situation and not the man himself. The operation with dice, more than the story with the Buridan ass, confirms that the same principle lies at the basis of human behavior as in animal behavior. Only the stimulation that determines human behavior is richer and more complex. That's all.

There is one thing we can agree with in the objection raised. What happened can actually be explained by the S–R pattern. Completely and with no remainder. From a certain point of view, specifically from the point of view of our opponent, the difference in behavior in the one case and in the other is wholly determined by the difference in stimuli. Our opponent's whole analysis from this point of view is absolutely correct. But the crux of the matter is that it is specifically this point of view that we consider insupportable in studying the operation with dice and specifically because in subsequent development, it results in a rejection of the basic difference between the two variants of behavior, that is, in other words, this point of view is incapable of detecting the new structural principle of behavior that the second variant discloses as compared to the first.

This means that the old point of view is inadequate for studying the new material, the new and higher forms of behavior. It detects that which they have in common with the lower—the old principle preserved in the new form of behavior—but does not detect that which is unique, which is in the new form and which distinguishes it from lower forms, does not detect the new principle that appears above the old. In this sense, the objection of our opponent shows yet again that the old point of view cannot adequately disclose the main difference between the behavior of man and animal, adequately disclose the structure of higher mental functions. Who will argue with the fact that it is possible not to notice the specific uniqueness of higher forms and pass them by? Even human speech can be considered among sonic responses of animals, and from a certain point of view, its principal differences may be bypassed. It is possible to limit oneself to detecting the presence of subordinate, auxiliary lower forms in higher forms of behavior. But the whole question is: what is the scientific-cognitive value of such a closing of the eyes to what is specific, unique, and higher in human behavior. Of course, one may close one eye, but one must know that in this case, the visual field unavoidably narrows.

Our opponent's analysis is also monocular analysis. He does not detect the dynamics of what occurred in our example, the transition from one situation into

another, the appearance of additional stimuli *a* and *b*, the functional significance of stimuli-devices (dice), the structure of the operation as a whole, and finally, the principle that lies at its base. He approaches the whole operation exclusively from the aspect of its composition, analytically dissolving it into components, and ascertaining that these components—each alone and all together—are subject to the stimulus–response principle. He breaks down both situations statistically and compares them in a petrified form, forgetting that the second part of the operation, the dice throwing, appeared on the basis of the first (the Buridan situation), that the one turned into the other and that specifically this conversion is the crux of the whole problem.

We might answer our opponent by saying that it is completely correct that response *X* in our example was determined by stimulus *a*, but this stimulus did not arise of itself and was not an organic part of the situation. Moreover, it has no relation to stimuli *A* and *B* which comprised the situation. It was introduced into the situation by the man himself and the connection of *a* with stimulus *A* was also established by the man. It is true that in the whole story, the behavior on the whole is to the end and completely determined by the group of stimuli, but the group itself, the stimulation itself is created by the man. You say that the situation in the second case changed since new stimuli *a* and *b* appeared. That is not true: it was changed and by the same man who, like the Buridan ass, was forcibly—by virtue of the situation—doomed to inaction or frustration.

In our analysis, if we might conclude our answer, you are overlooking the fact that behind the play of stimuli–responses what really occurred was active intervention of man in the situation, his active role, his behavior which consisted in introducing new stimuli. And this is exactly what comprises the new principle, the new unique relation between behavior and stimulation of which we spoke. In dissolving the operation into components, you lost its most important part: the unique activity of the man directed toward mastery of his own behavior. To say that in this case stimulus *a* determined the behavior is the same as saying that the stick got the fruit for the chimpanzee (in Köhler's experiments). But a hand guided the stick and a brain guided the hand. The stick was only a tool of the chimpanzee's activity. The same must be said of our situation also. Behind stimulus *a* stood the human hand and brain. The appearance itself of new stimuli was the result of the active participation of man. You have forgotten the man; that is where your error lies.

Finally, and lastly: you say that a second before, man himself did not know how he would act, what he would choose. Stimulus *a* (the incorporated die) compelled him to act in a certain way. But who gave stimulus *a* compelling force? The man's hand guided this stimulus. It was man who beforehand determined the role and function of the stimulus which in itself could not determine behavior just as the stick in itself could not knock down the fruit. In this case, stimulus *a* was the tool of the man's activity. That is the essence.

We will again postpone a more detailed consideration of the question not immediately connected with the problem of freedom of the human will to the end of our research. Then, when we have before us in a definitive form higher behavior in its principal forms, constructed on this principle, we will be able to evaluate the essence more fully and more profoundly and trace the perspective that opens behind it. Now we would like only to consolidate the basic conclusion that we can reach from our analysis: in the form of a general situation of an operation with thrown dice, a new and unique structure appears in comparison with the Buridan ass; the new consists of the fact that man himself creates stimuli that determine his response and uses these stimuli as devices for mastering processes of his own

behavior. Man himself determines his behavior with the help of artificially created stimuli-devices.

Let us pass to the analysis of the second rudimentary function which is as common and as widespread as throwing dice and just as inoperative. We agreed that analysis of such inactive functions has a great advantage. But now we have before us a rudimentary form of cultural memory which, like the throwing of dice, is a rudimentary form of cultural volition.

To the psychology of everyday life, tying a knot to remember something is just like throwing dice. A man needs to remember something, for example, that he must do some errand, make something, take something, etc. Not trusting his memory and not depending on it, he ties a knot, usually in his handkerchief, or uses some similar device such as placing a small piece of paper under the cover of his pocket watch, etc. The knot must later remind him of what he must do. And, as everyone knows, in certain conditions it may serve as a reliable means of remembering.

Here again we have an operation that is unthinkable and impossible for animals. Again we are ready to see in the very fact of introducing an artificial, auxiliary device for remembering, in the active creation and use of a stimulus as a tool of memory, an essentially new, specifically human behavioral trait.

The story of the knot-tying operation is exceptionally complex and instructive. In its time, its appearance heralded the approach of humanity to the boundaries that separated one epoch of its existence from another, barbarity from civilization. Thurnwald says that nature simply does not know hard boundaries. But if humanity is thought to have begun with the use of fire, then the appearance of the written word must be considered to be the boundary separating lower from higher forms of human existence. Tying a knot for remembering also was one of the very first forms of the written word. This form played an enormous role in the history of culture, in the history of the development of writing.

The beginning of the development of writing is based on similar auxiliary devices of memory, and it is not for nothing that many researchers call the first epoch in the development of writing mnemotechnical. The first knot tied for remembering signified the conception of the written word without which no civilization would have been possible. Widely developed knot records, the so-called quipu, have been used in ancient Peru for keeping chronicles, for keeping data of personal and government life. Similar knot records were widespread in various forms among many ancient peoples. In a living form, frequently in the state of developing, they can be observed in primitive peoples. As Thurnwald assumes, there is no need to see traces of magical origin in the use of these auxiliary memory devices. Observations sooner indicate that tying knots or introducing analogous stimuli to support memory appear first as a purely practical psychological operation and later become a magical ceremony. The same author tells of a primitive man who was in his service during an expedition. When he was sent on errands to the main camp, he always took a similar kind of device with him to remind him about all the errands.

V. K. Arsen'ev,[43] a well-known researcher of the Ussuriysk region, tells how in an Udeg village in which he stopped during a journey, the local inhabitants asked him, on his return to Vladivostok, to tell the Russian authorities that the merchant Li Tanku was oppressing them. The next day, the inhabitants came out to accompany the traveler to the outskirts. A gray-haired old man came from the crowd, says Arsen'ev, and gave him the claw of a lynx and told him to put it in his pocket so that he would not forget their petition about Li Tanku. The man himself introduced an artificial stimulus into the situation, actively affecting the processes of remembering. Affecting the memory of another person, we note in passing, is es-

sentially the same as affecting one's own memory. The lynx claw must determine memory and its fate in another. There is an endless number of such examples. But we can cite an equal number of examples in which man carries out the same operation with respect to himself. We will limit ourselves to one.

All researchers note the exceptionally high development of innate, natural memory in primitive man. L. Lévy-Bruhl believes that the basis for this remarkable trait of primitive thinking is the tendency to replace reflection with remembering. However, even in primitive man, we find two forms principally different in essence that are at completely different stages of development. With a superior, perhaps maximal development of natural memory are found only the most elementary and crude forms of cultural memory. But the more primitive and simpler the psychological form, the clearer is the principle of its structure, the easier its analysis. As an example, we cite the observation of Vangemann told by Lévy-Bruhl.

The missionary asked a Kaffir to tell him what he remembered of the sermon he heard the previous Sunday. The Kaffir at first hesitated, then reproduced the main ideas word for word. After several weeks, the missionary saw the same Kaffir during his sermon; this time, he sat, seemingly not paying attention to what was being said, but occupied with notching a piece of wood and later repeated one idea after another, guided by the notches he had made.

In contrast to Lévy-Bruhl, who sees here an instructive example of how primitive man whenever he can resort to memory in order to avoid reflection does so in any way he can, we are inclined to see exactly the opposite: an example of how human intellect leads to the formation of new forms of memory. How much thought is needed to record speech with notches on a piece of wood! But this is incidental. The basic thing that interests us is the difference between the two types of remembering. We are ready again to say that they are based on different principles. Here the situation is much clearer than in the case of the dice. In the first case, the Kaffir remembered only as much and only in the way that he happened to remember. In the second case, he participated in the process of remembering by creating artificial, auxiliary stimuli in the form of notches which he connected with the content of speech and which he placed at the service of his memory.

If in the first case, remembering was wholly determined by the principle of stimulus–response, then in the second case, the activity of the man hearing the speech and memorizing it by means of notches on wood is a unique activity consisting in creating artificial stimuli and in mastering his own processes by means of the notches; it is based on a completely different principle.

We have already spoken about the connection of this activity with writing. Here the connection is especially obvious. The Kaffir recorded the speech he heard. But the common knot tied to aid memory easily exhibits a functional relationship with writing. We have also already spoken about the genetic similarity of the one to the other. Thurnwald assumes that similar mnemotechnical devices primarily serve the person who introduces them. Subsequently, they begin to serve as a device for personal contact—written speech—owing to the fact that they are used within a single group in an identical way and are pre-arranged symbols. A number of considerations that will be developed subsequently compel us to assume that the actual sequence in development is more likely the reverse of that which Thurnwald outlines. In any case, we will note one thing now, specifically the social character of the new form of behavior, a means identical in principle with managing another's and one's own behavior.

To conclude the analysis of the knot-tying operation, which, by the way, we also transferred to an experiment on child behavior (the experiment makes it possible to see in pure form the structural principle on which the operation is based),

we will turn again to a generalized, schematic consideration of the example. A man has to remember a certain errand. The situation is again represented by two stimuli, *A* and *B*, between which an associative connection must be established. In one case, establishing the connection and its fate are determined by a number of natural factors (the strength of the stimuli, their biological significance, repetition of their combination in the same situation, the general constellation of other stimuli); in the other, the man himself determines the connections. He introduces a new artificial stimulus, *a*, which in itself has no relation to the situation and with the help of this auxiliary stimulus, he subjects to his own power the course of all processes of remembering and recalling. We are justified in repeating: the man himself determines his behavior with the help of artificially created stimuli-devices.

The third and last rudimentary operation in the series we have selected, which is preserved to the present, is found most often in the behavior of the child and forms a kind of necessary or at least very frequently observed initial stage in the development of arithmetical thinking. This is a rudimentary form of cultural arithmetic: counting on the fingers.

The quantitative characteristic of any group of objects is perceived initially as one of the qualitative characteristics. There is an immediate perception of numbers and it forms a real basis for natural arithmetic. A group of ten objects is perceived differently from a group of three. The immediate visual impression in both cases will be substantially different. Thus, the quantitative characteristic appears among a number of other characteristics as a special stimulus, but completely similar to all other stimuli. Since it is determined by stimuli of this type, man's behavior is completely determined by the stimulus–response law. Such, we repeat, is all of natural arithmetic.

The arithmetic of stimuli–responses frequently attains a high degree of development, particularly in the behavior of primitive man who can at a glance detect the finest quantitative differences in very large groups. Researchers report that primitive man, by direct perception of numbers, frequently notes if in a group consisting of several dozens or even hundreds of objects (a pack of dogs, a herd or flock of animals, etc.) one object is missing. Actually, regardless of the wonder such a reaction usually elicits among observers, it differs from what we have more by degree than by substance. We also determine numbers visually. Only in the fineness and precision of this reaction does the primitive man differ from us. His reaction is very well differentiated. He detects extremely fine differences and degrees of one and the same stimulus. But this is wholly and completely determined by the laws of development of conditioned response and differentiation of the stimulus.

The matter changes radically as soon as man, in reacting to the quantitative aspect of any situation, resorts to his fingers as a tool to aid in carrying out the counting operation. Turning again to a schematic, algebraic form, we might say that a man is affected by a number of stimuli: *A, B, C, D*. The man introduces auxiliary stimuli. With the aid of these stimuli-devices, he solves the problem that confronts him.

In its time, counting on the fingers was an important cultural achievement of humanity. It served as a bridge which man crossed from natural to cultural arithmetic, from immediate perception of numbers to counting. Counting on the fingers is the basis of many systems of counting. Even now it is widespread among primitive tribes. Primitive man, who often had no words for designating numbers higher than two or three, counts with the help of fingers and toes and other parts of the body sometimes to thirty or forty. Thus, the inhabitants of New Guinea, Papuans, and many primitive tribes of North America began to count from the little finger of the left hand, then the rest of the fingers, the fist, shoulder, etc., then, in reverse

order, began to drop down the right side of the body and ended with the little finger of the right hand. When there are not enough fingers, they frequently resort to the fingers of another person or to toes or to sticks, shells or other small movable objects. In studying primitive systems of counting, we can observe in a developed and active form the same thing that we find in a rudimentary form in the development of arithmetical thinking of the child and in certain cases of adult behavior.

But the essence of the form of behavior that we are interested in remains the same in all cases. The essence consists of a transition from immediate perception of numbers and immediate response to a quantitative stimulus to creating auxiliary stimuli and actively determining one's own behavior with their help. Artificial stimuli created by man which have no connection with the real situation and are brought in to serve active adaptation again appear as a distinguishing characteristic of higher forms of behavior.

We can conclude the analysis of concrete examples. Further consideration would lead us inevitably to repeating the basic characteristic that we have singled out in newer and newer forms and manifestations. In general, we are not at all interested in rudimentary, dead psychological forms in themselves, but in that most unique world of higher or cultural forms of behavior that is hidden behind them and into which we can penetrate with the help of a study of inactive functions. We are looking for the key to higher behavior.

We think that we have found it in the structural principle of the psychological forms that we are analyzing. This is where the heuristic significance of the study of rudimentary functions lies. As we have already said, the structure of the higher form comes through in psychological fossils, in living remnants of ancient epochs. Rudimentary functions disclose for us what all higher mental processes formerly were, to what type of organization they once belonged.

We again recall the methodological significance of our analysis. It seems to us to be the means for disclosing the structural principle that is the base for higher behavior in a pure abstract form. The task for further research will be to demonstrate the structure and development of the enormous variety of separate concrete forms of higher behavior in all the real complexity of these processes and to trace the real historical movement of the principle we find. We might refer to the remarkable example cited by Engels as evidence of the fact that, to the extent that inductive claims are solidly based, they may be the only or perhaps the basic form of scientific discoveries.

He says: "The steam engine was the most convincing evidence of the fact that mechanical movement can be obtained from heat. A hundred thousand steam engines did not prove this any more convincingly than did one engine..." (K. Marx and F. Engels, *Collected Works*, Vol. 20, p. 543). But analysis showed that in a steam engine, the basic process does not appear in a *pure* form, but is hidden by all kinds of peripheral processes. When circumstances peripheral to the main process were eliminated and an ideal steam engine was built, it brought the researcher face to face with the mechanical equivalent of heat. This is the strength of abstraction: it represents the process under consideration in a pure, independent, uncovered form.

If we wanted to present the process that interests us in a pure, independent, uncovered form, and in this way to present the results of our analysis of rudimentary functions, we could say that this process consists in the transition from one form of behavior—the lower—to another, which we arbitrarily call the higher, as being more complex in genetic and functional respects. The line dividing the two forms is the relation of stimulus–response. For one form, an essential characteristic shall be a full—in principle—determinacy of behavior by the stimulus. For the other,

the same essential characteristic is *autostimulation*, the creation and use of artificial stimuli-devices and determining one's own behavior with their help.

In all three cases that we considered, human behavior was determined not by the stimuli present, but by a new or changed psychological situation created by the man himself. Creating and using artificial stimuli as auxiliary devices for controlling one's own reactions also serves as a basis for the new form of determinacy of behavior that distinguishes higher behavior from elementary. The presence of *created* stimuli together with the *given* stimuli seems to us to be the distinguishing characteristic of human psychology.

We call artificial stimuli-devices introduced by man into a psychological situation where they fulfill the function of autostimulation "signs," giving this term a broader and at the same time a more precise sense than in common usage. According to our determination, every conditioned stimulus created artificially by man that is a means of mastering behavior—that of another or one's own—is a sign. Two points are therefore essential for the concept of a sign: its origin and its function. We will later consider both in all their details.

We know that, as Pavlov says, "the most general bases of higher nervous activity are ascribed to the large hemispheres, the same in both higher animals and in people, and for this reason even elementary phenomena of this activity must be identical in the one and in the other in both normal and pathological cases" (1951, p. 15). Actually, this can scarcely be disputed. But as soon as we go from the elementary phenomena of higher nervous activity to the complex, to the higher phenomena within this higher—in the physiological sense—activity, then two different methodological paths for studying the specific uniqueness of human higher behavior open before us.

One is the path to further study of complication, enrichment, and differentiation of the same phenomena that experimental study ascertains in animals. Here, on this path, the greatest restraint must be observed. In transferring information on higher nervous activity of animals to higher activity of man, we must constantly check the factual similarities in the function of organs in man and animals, but in general the principle itself of the research remains the same as it was in the study of animals. This is the path of physiological study.

True, this circumstance is of major significance and in the area of physiological study of behavior, in a comparative study of man and animals, we must not put the function of the heart, stomach, and other organs which are so similar to that of man on the same plane with higher nervous activity. In the words of I. P. Pavlov, "It is specifically this activity that so strikingly sets man apart from the rank of animals, that places man immeasurably above the whole animal world" (ibid. p. 414). And we might expect that along the path of physiological research we will find a specific qualitative difference in human activity. Let us recall the words of Pavlov cited above on the quantitative and qualitative incomparability of the word with conditioned stimuli of animals. Even in the plan of strict physiological consideration, "the grandiose signalistics of speech" stands outside the whole other mass of stimuli, the "multicapaciousness of the word" places it in a unique position.

The other path is the path of psychological research. From the very beginning, it proposes to seek the specific uniqueness of human behavior which does take us beyond the initial point. The specific uniqueness is considered not only in its subsequent complexity and development, quantitative and qualitative refinement of the cerebral hemispheres, but primarily in the social nature of man and in a new method of adaptation, as compared with animals, that sets man apart. The main difference between the behavior of man and of animals consists not only in that the human brain is immeasurably above the brain of the dog and that the higher

nervous activity "so strikingly sets man apart from the rank of animals," but most of all, because it is the brain of a social being and because the laws of higher nervous activity of man are manifested and act in the human personality.

But let us return again to the "most general bases of higher nervous activity, related to the cerebral hemispheres," and identical in higher animals and man. We think that it is in this point that we can disclose with definitive clarity the difference of which we speak. The most general basis of behavior, identical in man and animals, is *signalization.* Pavlov said, "So the basic and most general activity of the cerebral hemispheres is signaling with an infinite number of signals and with changeable signalization" (ibid., p. 30). As is known, this is the most general formulation of the whole idea of conditioned reflexes that lies at the base of the physiology of higher nervous activity.

But human behavior is distinguished exactly in that it creates artificial signaling stimuli, primarily the grandiose signalization of speech, and in this way masters the signaling activity of the cerebral hemispheres. If the basic and most general activity of the cerebral hemispheres in animals and in man is signalization, then the basic and most general activity of man that differentiates man from animals in the first place, from the aspect of psychology, is *signification*, that is, creation and use of signs. We are using this word in its most literal sense and precise meaning. Signification is the creation and use of signs, that is, artificial signals.

We will consider more closely this new principle of activity. It must not in any sense be contrasted with the principle of signalization. Changeable signalization that results in the formation of temporary, conditional, special connections between the organism and the environment is an indispensable, biological prerequisite of the higher activity that we arbitrarily call signification and is its base. The system of connections that is established in the brain of an animal is a copy or reflection of natural connections between "all kinds of agents of nature" that signal the arrival of immediately favorable or destructive phenomena.

It is very obvious that such signalization—a reflection of the natural connection of phenomena, wholly created by natural conditions—cannot be an adequate basis of human behavior. For human adaptation, an active *change in the nature of man* is essential. It is the basis of all human history. It necessarily presupposes an active change in man's behavior. "Affecting the environment by this movement and changing it, he changes his own nature at the same time," says Marx. "He develops forces asleep in it and subjects the play of these forces to his own will" (K. Marx and F. Engels, *Collected Works*, Vol. 23, pp. 188-189).

Each specific stage in mastering the forces of nature necessarily corresponds to a certain stage in mastering behavior, in subjecting mental processes to the will of man. Man's active adaptation to the environment, the change of nature by man, cannot be based on signalization, passively reflecting natural connections of all kinds of agents. It requires active closure of connections of the kind that are impossible under a purely natural type of behavior, that is, behavior based on a natural association of agents. Man introduces artificial stimuli, signifies behavior, and with signs, acting externally, creates new connections in the brain. Together with assuming this, we shall tentatively introduce into our research a new regulatory principle of behavior, a new concept of determinacy of human reaction which consists of the fact that man creates connections in the brain from outside, controls the brain and through it, his own body.

Naturally, this question arises: in general, how is the creation of external connections and regulation of behavior of the type of which we spoke possible? This is made possible by the coincidence of two points. Essentially, like the inference in the premise, the possibility of such a regulatory principle is contained in the

structure of the conditioned reflex. The basis for all teaching on conditioned reflexes is the concept that the main difference between the conditioned and unconditioned reflex is contained not in the mechanism, but in the development of the reflex mechanism. Pavlov said: "The difference is only that in one case, there is a ready transmission path and in the other, preliminary closure is required; in one case, the mechanism of connection is completely ready, and in the other case, the mechanism is augmented to complete readiness" (Vol. IV, p. 38). Consequently, the conditioned reflex is a mechanism newly created by the coincidence of two stimuli, that is, created externally.

The second point whose presence explains the possibility of the appearance of a new regulatory principle of behavior consists of the fact of social life and interaction of people. In the process of social life, man created and developed more complex systems of psychological connections without which work activity and all social life would be impossible. The devices of psychological connection in their very nature and in their essential function are signs, that is, stimuli artificially created to affect behavior by the development of new conditioned connections in the human brain.

Both points taken together lead us to understanding the possibility of the development of a new regulatory principle. Social life creates the need to subject the behavior of the individual to social requirements and together with this, creates complex signalization systems, means of communication that guide and regulate the development of conditioned connections in the brain of each person. The organization of higher nervous activity creates the necessary prerequisites, creates the possibility of external regulation of behavior.

The inadequacy of the principle of the conditioned reflex for explaining human behavior from the psychological aspect, as has been said, consists in the fact that with the help of this mechanism, we can understand only how innate, natural connections regulate the formation of connections in the brain and human behavior, that is, understand behavior in a purely naturalistic, but not a historical sense. Summarizing the principal significance of the regulatory principle of the conditioned reflex, Pavlov said that the infinite mass of natural phenomena is, by means of the apparatus of the cerebral hemispheres, constantly determining the development, sometimes positive, sometimes negative, of conditioned reflexes and by this means finely tuning all the activity of the animal, its everyday behavior. The idea that conditioned connections are determined by natural connections could not be expressed more clearly: nature determines behavior. This regulatory principle corresponds completely to the passive type of animal adaptation.

But active adaptation to nature, man's changing it, cannot be understood from any natural connections. This can be understood only from man's social nature. Otherwise we return to the naturalistic conviction that only nature affects man. Quoting Engels: "Both natural science and philosophy have till now completely disregarded research on the influence of man's activity on his thinking. On the one hand, they know only nature and on the other, thought. But a more substantial and closer base for human thinking is precisely *man changing nature* and not nature alone as such, and the mind of man developed according to how man learned to change nature" (K. Marx and F. Engels, *Collected Works*, Vol. 20, p. 545).

A new regulatory principle of behavior must of necessity correspond to a new type of behavior. We find it in the social determination of behavior carried out with the aid of signs. Of central significance among all systems of social intercourse is speech. Pavlov said: "Because of all the preceding life of an adult, speech is connected with all external and internal stimuli that enter the cerebral hemispheres,

it signalizes them all, changes them all and for this reason may elicit all the actions and reactions of the organism that these stimuli govern" (Vol. IV, p. 429).

In this way, man created a signalization apparatus, a system of artificial conditioned stimuli by means of which he creates any artificial connections and elicits the necessary reactions of the organism. If, following Pavlov, we compare the cortex of the cerebral hemispheres with an immense signal board, then we might say that man created the *key* to that board—the grandiose signalistics of speech. By means of this key, he controls the activity of the cortex externally and manages behavior. Not a single animal has anything similar. Moreover, it is not difficult to see that together with this, a whole, almost completely new regulatory principle of controlling behavior externally is created as is a new plan of mental development in comparison with animals—the evolution of signs, ways of behavior and, connected with them, the subjecting of behavior to the authority of man.

Continuing the preceding comparison, we might say that the mental development of man proceeded in phylogenesis and proceeds in ontogenesis not only along a line of development and complication of the very grandiose signal board, that is, the structure and functions of the nervous apparatus, but also along the line of developing and acquiring the corresponding grandiose signalistics of speech that is the key to this board.

Thus far, the discussion seems perfectly clear. There is an apparatus made for closure of temporary connections and there is a key to the apparatus that, together with these connections, which are formed in themselves by the action of natural agents, permits the production of new, artificial, closures that are subject to the power of man and his choice. The apparatus and the key to it are found in different hands. Man alone through speech affects another. But the whole complexity of the problem becomes obvious at once when we combine the apparatus and the key in one pair of hands, when we make the transition to understanding autostimulation and self-mastery. Here psychological connections of a new type appear within one and the same system of behavior.

We will place the transition from social action external to the personality to social action within the personality closer to the center of our research, and we will try to elucidate the most important points that constitute the process of such a transition. Now in the course of analysis, two situations are of interest to us. One consists in the fact that even in the first case, when the apparatus and the key are given to different individuals, that is, in social action on another by means of signs, the question is not as simple as it seemed initially, and actually it contains in a cryptic form the same problem that confronts us in an open form in considering autostimulation.

Actually, it is possible, of course, to assume that in the action of speech from one person to another, the whole process is fully contained in the pattern of a conditioned reflex which provides an exhaustive and adequate explanation for it. This is how reflexologists proceed who consider the role of a speech command in experimental research exactly as if it were any other. Pavlov said: "For man, the word is just as real a conditioned stimulus as all others common to him and to animals..." (ibid., pp. 428-429). Otherwise it could not be a sign, that is, a stimulus fulfilling a specific function. But if we agree with only this and do not pursue further the phrase we have cited which speaks of the incomparability of the word with other stimuli, we will find ourselves in a hopeless position with respect to explaining a number of fundamentally significant facts.

The passive formation of connections to sound signals, to which the process of speech activity is reduced in this kind of understanding, essentially elucidates only the "understanding" of human speech by animals and the analogous stage in

the speech development of a child, through which the child passes rapidly, that is characterized by the carrying out of certain actions according to a sound signal. But it is obvious that this process, which is usually called *understanding speech*, is something greater and something different from reacting to a sound signal. Actually only domestic animals are a true example of such *purely passive* formation of artificial connections.

As Thurnwald's beautiful expression puts it, man himself was the first domestic animal. The passive formation of connections genetically and functionally preceded the active, but does not to any degree explain or exhaust it. Even the Romans differentiated between a slave, a domestic and a tool according to the ability to speak, establishing not two, but three degrees with respect to mastering speech: *instrumentum mutum,* mute, an inanimate tool, *instrumentum semivocale*, with semi-speech as a tool (domestic animals), and *vocale*, having speech as a tool (the slave). The conception of speech that we have in mind now corresponds to *semi-speech*, a purely passive form of developing artificial connections proper to animals. For the ancients, the slave was a self-controlled tool, a mechanism with regulation of a special type.

Actually, even in external speech action, man uses not semi-speech, but full speech. Understanding speech, as further research shows, includes in itself its active use.

A second point that interests us in connection with active and passive speech being combined in a single personality consists simply of establishing the presence of this form of behavior, of emphasizing the moving to the first rank of that which we have already found in the analysis of rudimentary functions. Man tying a knot to aid memory or throwing dice is, in fact, an example of such a combination of the key and the apparatus in one pair of hands. His behavior is a real process of the type we were speaking about. It exists.

The problem is based on the personality and its relation to behavior. Higher mental functions are characterized by a special relation to the personality. They represent an active form in their manifestations. If we use the distinction introduced by E. Kretschmer, the personality's reactions that developed with intense and conscious participation of the whole personality are distinct from primitive reactions that do not include full participation of the whole personality but are formed immediately, reactively along a more elementary, secondary path according to the stimulus–response pattern. The latter, as Kretschmer first noted, we find mainly at early stages of development of people, in children and in animals. In the adult, cultured person, they appear in behavior primarily when the personality is not complete, not fully developed or is paralyzed by an extremely strong stimulus.

Cultured forms of behavior are specifically reactions of the personality. Studying them, we are dealing with separate processes taken *in abstracto* and rising from the personality, but from the personality as a whole, the higher personality, according to Kretschmer's expression. Tracing the cultural development of mental functions, we trace the path of development of the personality of the child. The trend toward developing human psychology which drives all our research appears here. Psychology is humanized.

The essence of the change that such a point of view introduces into psychology consists, according to a certain determination of G. Polizer,[44] in contrasting *man and processes*, in being able to see man who works, and not a muscle that contracts, in a transition from a natural state to a human state, in replacing "inhuman" (*inhumain)* concepts with "human" (*humain)*. The regulatory principle itself, which we always have in mind when speaking of the new form of man's determination of behavior, compels us to move from one level to another and to bring man for-

ward to the center. In a somewhat different sense, we might say with Polizer that the concept of determinism is *humanized.* Psychology looks for those specific human forms of determinism, regulation of behavior, that cannot in any way be simply identified with the determination of behavior in animals or reduced to it. Not nature, but society must, in the first place, be considered as a determining factor of human behavior. This is the whole idea of cultural development of the child.

In psychology time and again, the question has been raised as to how to speak of mental processes—in a personal or impersonal form. *"Es denkt sollte man sagen, so wie man sagt,"* wrote Lichtenberg.[45] "To say *cogito* is somewhat much, once this is translated as 'I think.'" Actually, would a philosopher agree with saying: I conduct excitation along a nerve. A. Bastian[46] expressed the same position: *"Nicht wir denken, es denkt in uns."* In this essentially syntactical controversy, K. Zigvart[47] sees a most important psychological problem: can we think of mental processes as the common notion understands a storm as a series of phenomena that we describe when we say: the storm rages, flashes, thunders, pours, etc.? Zigvart asks, must we, if we want to express ourselves completely, scientifically, speak in exactly the same way in impersonal sentences: it seems, it feels, it wants? In other words: is a psychology of only single processes according to the expression of Zigvart possible together with a personal and impersonal psychology?

We are not interested now in an analysis of direct data of consciousness relative to one form or another of expression, or even the logical question of which of the two forms is most applicable to scientific psychology. We are interested solely in a comparison of the two possible and actually existing points of view and in marking out a boundary between them. We also want to say that this difference agrees completely with the line that divides the passive and active forms of adaptation. It can be said about an animal that he is pulled toward food, but it cannot be said about a stick that it *"took"* the simian by the hand to get the fruit that lay beyond the railing. In precisely the same way, we must say about the man tying a knot for remembering that it "remembered" the given errand for him.

The development of personality and the development of reaction of the personality are essentially two aspects of one and the same process.

If we seriously consider the fact that with the knot tied for remembering, the man, in essence, constructs externally a process of remembering, an external object compels him to remember, that is, he reminds himself through an external object and, in this way, carries out a process of remembering as if externally, converting it to external activity, if we consider the essence of what occurs here, this one fact can disclose for us all the profound uniqueness of higher forms of behavior. In one case, something is remembered, in the other, man remembers something. In one case, the temporal connection is established due to a coincidence of two stimuli acting simultaneously on the organism; in the other, man himself creates the temporal connection in his brain using an artificial combination of stimuli.

The very essence of human memory consists of man actively remembering with the help of signs. In general, the following might be said about human behavior: in the first place, his individuality is due to the fact that man actively participates in his relations with the environment and through the environment he himself changes his behavior, subjecting it to his control. One of the psychologists says that the very essence of civilization consists in the fact that we purposely erect monuments and statues in order not to forget.[48] In the knot and in the monument, the most profound, the most characteristic, the most important appears which distinguishes the memory of man from the memory of the animal.

With this we can conclude our elucidation of the concept of signification as a new regulatory principle in human behavior. In establishing differences and simi-

larities between the unconditioned and conditioned reflexes as responses based on various regulatory principles, Pavlov cited the example of a telephone communication. One possible case—the telephone communication connects two points directly through a special conductor. This corresponds to the unconditioned reflex. In the second case, the telephone communication is carried out through a central station with the help of temporary, infinitely various connections that answer a temporary need. The cortex as the organ of closure for conditioned reflexes plays the role of such a central telephone station.

The most important thing that we can draw from our analysis and that lies at the base of signification may be expressed with the help of the same example if we broaden it somewhat. Let us take the case of the knot made to help memory or the throwing of dice. Undoubtedly, here in both cases a temporary conditioned connection is established, a connection of the second type, a typical conditioned reflex. But if we fully comprehend what actually occurs here and comprehend it from its most essential aspect, as is only fitting in scientific research, in our explanation of the connection that has arisen, we will be compelled to take into account not only the activity of the telephone apparatus, but also the work of the telephone operator who effected the required closure. In our example, man made the necessary closure by tying the knot. This is the principal uniqueness of the higher form in comparison with the lower. In this we have the basis of that specific activity that we call signification as distinct from and in conformity with signalization.

Since the principle of signification leads us into the area of artificial devices, the question arises as to its relation to other forms of artificial devices, of its place in the general system of man's adaptation. *In a certain specific relation,* the use of signs shows a certain analogy to the use of tools. Like all other analogies, this analogy cannot be carried to the bitter end, to a full or partial coincidence of the major essential characteristics of the concepts being compared. For this reason, we must not anticipate finding much similarity to working tools in these devices that we call signs. Moreover, together with similar and common characteristics in one activity or another, we must ascertain the essential characteristics of the difference in a certain relation—contrast.

The invention and use of signs as auxiliary devices for solving any psychological problem confronting man (to remember, to compare something, communicate, select, etc.) is, *from the psychological aspect, at one point* analogous to the invention and use of tools. As such an essential trait of the two concepts being compared, we consider the role of these devices in behavior to be analogous to the role of the tool in a work operation or, what is the same, *the instrumental function of the sign.* We have in mind the function of stimulus-device fulfilled by the sign with respect to any psychological operation, that it is a tool of human activity.

In this sense, based on the conventional, figurative meaning of the term, we usually speak of tools when we have in mind the mediating function of some object or means of some activity. True, such common expressions like "language is a tool of thinking," "auxiliary devices of memory" (*aides de memoire*), "internal technique," "technical auxiliary device" or simply auxiliary devices with respect to any psychological operation (*Geistestechnik*—"spiritual technique," "intellectual tools," and many others), are found in abundance among psychologists, are devoid of any specific content, and have scarcely any meaning beyond a simple metaphoric, picturesque expression of the fact that some objects or operations or others play an auxiliary role in the mental activity of man.

In addition, there is no shortage of attempts to ascribe a literal sense to similar signs, equating the sign and the tool, to erase the profound difference between the one and the other, to dissolve in general psychological determinations the specific

distinctive characteristics of each type of activity. Thus, J. Dewey,[49] one of the foremost representatives of pragmatism in developing the ideas of instrumental logic and the theory of cognition, defines language as a tool of tools, transferring Aristotle's definition[50] of the hand to speech.

E. Kapp goes still further in his well-known philosophy of technology; he indicates the fact that the concept of the tool is very commonly used in a graphic, figurative sense and in many cases hampers the real and serious understanding of its true meaning. Kapp continues: when Wundt defines language as a convenient instrument and an important tool of thinking and Whitney says that man invents language, this organ of mental activity, like the mechanical devices he uses to ease his manual labor, both understand the word, *tool*, in the literal sense. Kapp himself adheres fully to this understanding in considering speech to be a "moving material" like a tool.

With equal strictness, we separate the analogy we made from both the first and the second interpretation. The indeterminate, vague meaning that is usually connected with figurative use of the word *tool* actually does not lighten the task of the researcher interested in the real and not the picturesque aspect that exists between behavior and its auxiliary devices. Moreover, such designations obscure the road for research. Not a single researcher has yet deciphered the real meaning of such metaphors. Must we think of thinking or memory as analogous to external activity or do devices play a certain role as a fulcrum giving support and help to the mental process? What does this support consist of? What, in general, does it mean to be a means of thinking or memory? We find no answers to these questions among psychologists who willingly use these vague expressions.

Even more vague is the idea of those who understand such expressions in a literal sense. Phenomena that have their own psychological aspect, but in essence do not belong wholly to psychology, such as technology, are completely illegitimately psychologized. The basis for this identification is ignoring the essence of both forms of activity and the differences in their historical role and nature. Tools as devices of work, devices for mastering the processes of nature, and language as a device for social contact and communication, dissolve in the general concept of artifacts or artificial devices.

We intend to subject to precise, empirical research the role of signs and behavior in all its real uniqueness. For this reason, in continuing this whole presentation in greater detail than is practical here, we will on occasion consider how both functions are united and differentiated in the process of the cultural development of the child. But now as a point of departure, we can establish three points that seem to us to be both adequately elucidated by what has been said thus far and sufficiently important for the understanding of the research method we have chosen. The first point pertains to the analogy and points of contiguity between both types of activity, the second elucidates the basic points of divergence, and the third attempts to indicate the real psychological connection between the one and the other or at least to suggest it.

As has already been said, the basis for the analogy between the sign and the tool is the mediating function of the one and the other. From the psychological aspect, they may, for this reason, be classified in the same category. In Fig. 1, we present a diagram attempting to show the relation between the use of signs and the use of tools; from the logical aspect, both may be considered as coordinative concepts included in a more general concept—mediating activity.

With full justification, Hegel used the concept of mediation in its most general meaning, seeing in it the most characteristic property of the mind. He said that the mind is as resourceful as it is powerful. In general, resourcefulness consists in

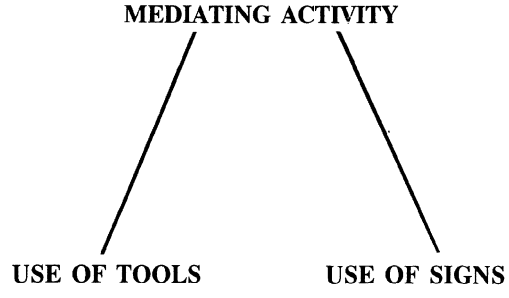

Fig. 1

mediating activity that, while it lets objects act on each other according to their nature and exhaust themselves in that activity, does not at the same time intervene in the process, but fulfills only *its own proper role*. Marx refers to this definition when he speaks of the tools of work and indicates that man "makes use of mechanical, physical, chemical properties of things in order to change them into tools to act on other things according to his purpose" (K. Marx and F. Engels, *Collected Works*, Vol. 23, p. 190).

It seems to us that on this basis, the use of signs should be classified as a mediating activity since the essence of this is that man acts on behavior through signs, that is, stimuli, letting them act according to their psychological nature. In both cases, the mediating function is of the first order. We shall not define the relation of these coordinative concepts to each other or to the common generic concept any more precisely. We should like only to note that neither can in any case be considered equivalent in meaning nor of equal value in fulfilling functions, nor, finally, in exhausting the *whole* range of the concept of mediating activity. Together with these, we might have enumerated quite a few mediating activities, since the activity of the mind is not exhausted by the use of tools and signs.

We must emphasize also that our diagram is intended to present the logical relation of the concepts, but not the genetic or functional (on the whole, real) relations of the phenomena. We would like to point to the relation of the concepts, but not in any way to their origin or real root. So conditionally, but at the same time in a purely logical scheme of relations of the concepts, our diagram presents both types of devices as *diverging* lines of mediating activity. The second point we have developed consists of this. A more substantial difference of the sign from the tool and the basis of the real divergence of the two lines is the different purpose of the one and the other. The tool serves for conveying man's activity to the object of his activity, it is directed outward, it must result in one change or another in the object, it is the means for man's external activity directed toward subjugating nature. The sign changes nothing in the object of the psychological operation, it is a means of psychological action on behavior, one's own or another's, a means of internal activity directed toward mastering man himself; the sign is directed inward. These activities are so different that even the nature of the devices used cannot be one and the same in both cases.

Finally, the third point, which like the first two, we will develop further, having in view the real connection of these activities and, of course, the real connection of their development in phylo- and ontogenesis. Mastery of nature and mastery of

behavior are mutually connected because when man changes nature he changes the nature of man himself. In phylogenesis, we can restore this connection according to separate, fragmentary, documentary traces that do not leave room for doubt; in ontogenesis, we can trace it experimentally.

Even now there is no doubt about one thing. As the first use of a tool instantly changes Jennings' formula with respect to an organically dependent system of a child's activity, so precisely does the first use of a sign signify going beyond the limits of the organic system of activity which exists for each mental function. The use of auxiliary devices, the transition to mediated activity radically reconstructs the whole mental operation just as the use of a tool modifies the natural activity of the organs, and it broadens immeasurably the system of activity of mental functions. We designate both taken together by the term *higher mental function*, or higher behavior.

After a long deviation from our path, we can again return to the direct road. We may consider as basically explained the principle required for all our research and can attempt to define the main formula of our method, which must be an analog of the structural principle of higher forms of behavior, which we have found.

Chapter 3
ANALYSIS OF HIGHER MENTAL FUNCTIONS

We have already said that the first and second form of our research is an analysis of higher forms of behavior; but the situation in modern psychology is such that before we can begin to analyze the problem, we have the problem of the analysis itself.

In modern psychology, as a result of the crisis that affects its very foundation, a change in its methodological bases is occurring right before our eyes. In this respect, a situation arose in psychology that more developed sciences do not experience. When we speak of chemical analysis, everyone clearly understands what we have in mind. But the situation is entirely different for psychological analysis. The concept itself of psychological analysis has an exceptional variety of meanings; it includes determinations that sometimes have nothing in common with each other and sometimes are diametrically opposed to each other. Thus, in the last ten years, the concept of psychological analysis as a basic movement in descriptive psychology has experienced extensive development. Descriptive psychology has sometimes been called analytical, and in this way its concept was contrasted with the concept of modern scientific psychology. Actually the analytical method was close to the phenomenological method and for this reason the problem of psychological research was reduced to dividing the complex structure of experiences or direct data of consciousness into their component elements. According to this understanding, analysis coincided with breaking down experiences and, in essence, opposing this concept to the concept of explanatory psychology.

In a somewhat different sense, analysis dominates traditional psychology, where it is usually called associative. Actually, it was based on an atomistic conception of what higher processes consist of and summarizing certain separate elements; the task of research was again reduced to presenting higher processes in a certain way as a sum of associated simpler elements. In fact, this was the psychology of elements and, although it dealt with somewhat different problems, including explanation of phenomena, nevertheless even here a close tie existed between this understanding of analysis and the dominance of the phenomenological point of view in psychology. K. Lewin[51] noted that, as a rule, the basis for such understanding is the opinion that higher mental processes are more complex or compounded and include a larger number of elements and their combinations than do the lower mental processes. Researchers attempted to break down complex processes into the independent processes comprising them and their associative ties. The dominance of the atomistic point of view led, in turn, to emphasizing the purely phenomenological problem which, as Lewin noted, in itself undoubtedly was of significant importance, but concealed a deeper causal-dynamic problem in the old psychology.

Thus, analysis in these two basic forms with which the old psychology was familiar was either opposed to explanation (in descriptive psychology) or actually led

exclusively to describing and breaking down experiences and was incapable of disclosing the causal-dynamic connection and relation of any complex processes.

The development of modern psychology changed even the meaning of analysis in a radical way. The trend toward studying processes as wholes, toward disclosing structures that are the basis of psychological phenomena is the opposite of the old analysis, which is based on an atomistic conception of the mind. We are justified in thinking that the great difference in structural psychology is the reaction to the psychology of elements and to the place that the analysis of elements occupied in theory. The new psychology itself is consciously opposed to the psychology of elements, and its most essential characteristic is that it is the psychology of whole processes.

On the one hand, the extensive development of behavioral psychology in all its forms is undoubtedly a reaction to the dominance of purely phenomenological trends in the old psychology. In some types of behavioral psychology, attempts were made to move from descriptive to explanatory analysis. Thus, if we wanted to summarize the course of the current state of this problem, we would have to say that the two positions that were represented in the old psychology, and from which the new is decisively distancing itself, resulted in a split between the two basic trends in the new psychology.

On the other hand, some psychological trends are developing before our eyes that are attempting to include explanatory analysis at the base of the psychological method. Such, for example, are certain trends in behavioral psychology that in essence preserved the atomistic character of the old psychology and consider all higher processes as sums or chains of more elementary processes or reactions. For example, Gestalt psychology,[52] which constitutes a substantial trend in contemporary psychology, emphasizing the significance of the whole and its unique properties, rejects analysis of this whole and in this way is forced to remain within the limits of descriptive psychology. In recent years, many psychological trends of a synthetic character are attempting to split the two types.

Also before our eyes, a new understanding of psychological analysis is developing. The first, most clear theory of this new form of analysis originated with M. Ya. Basov,[53] who tried to unite two lines of research in structural analysis — the line of analysis and the line of the holistic approach to the personality. The attempt to unite analysis and the holistic approach distinguishes Basov's method advantageously from the other two trends which usually follow one of the points of view indicated. We see this, on the one hand, following the example of extreme behaviorism, which from the correct premise "all depends on the reflex" reaches the erroneous conclusion "everything is reflex." On the other hand, we see the same thing in the example of contemporary holistic psychology which sees a universal property in structure, which accepts whole mental processes as the starting point, and in this way, taking the other extreme line, never finds a way to analysis and genetic study and therefore never finds a way to construct a scientific base for the development of behavior.

We believe it is necessary to consider somewhat more closely the new form of psychological analysis of which the method of research we use is a further development. Basov isolates the real, objective element of which this process consists and then differentiates them. He believes these phenomena to be independent, having an independent existence, but he looks for their component parts only to ascertain that each of the parts retains the properties of the whole. Thus, in an analysis of water, the molecule H_2O will be an objectively real element of water although it is infinitely small in size, but homogeneous in composition. For this

reason, particles of water must, according to this separation, be considered essential elements of the formation being considered.

Structural analysis has to do with such real, objectively essential elements and sees as its task not only to isolate these elements, but also to explain the connections and relations that exist between them and to determine the structure of the form and the type of activity that arise from the dynamic combination of these elements.

Recently, even holistic psychology is coming to the same conclusion. Thus, H. Volkelt notes that a very basic trait of contemporary psychological research is that it is directed toward the study of the whole. However, problems of analysis persist here to the same degree as formerly and, in general, must persist as long as psychology continues to exist. Volkelt distinguishes two lines of such analysis. The first may be called holistic analysis, which keeps in view the holistic character of the object being studied, and the second, elemental analysis, the essence of which consists of isolating and studying separate elements. Thus far in psychology, specifically the second form has been dominant. Many think that the new psychology rejects analysis in general. Actually, it only changes the significance and tasks of analysis; it has in mind analysis in its original sense.

Naturally, the very meaning of analysis must be radically changed. Its principal task is not to break down the psychological whole into parts or even into pieces, but to isolate certain traits and instances in each psychological whole that have retained the pre-eminent importance of the whole. We see here a completely clear expression of the idea of uniting the structural and analytical approaches in psychology. It is easy to see, however, that avoiding one of the errors of the old psychology, specifically atomism, the new analysis falls into another and actually has nothing in common with explaining, with disclosing the real connections and relations that form the given phenomenon. This analysis, as Volkelt says, is based on a descriptive isolation of holistic properties of a process since any description always isolates certain specific traits, places them in the forefront, and attempts to comprehend them.

We can see, therefore, that the elimination of the errors of the old psychology is actually still far from complete, and many theories, wanting to avoid the atomism of the old psychology, fall into a pattern of purely descriptive research. This is the fate of the structural theory.

There is another group of psychologists who, wanting to go beyond the limits of purely descriptive psychology, come to an atomistic conception of behavior. However, before our eyes, a base is being laid for the first foundations of a synthetic, uniting concept of the first and second theories. Before our eyes, analysis in psychology is changing its character. Actually, behind the various forms of interpretation and application of analysis are hidden various conceptions of the psychological factor. It is not difficult to see that the conception of analysis in descriptive psychology is directly linked to the basic principle of this psychology, specifically, to the teaching on the impossibility of a natural-science explanation for mental processes. In the same way, analysis in the psychology of elements is linked to a certain interpretation of psychological fact, specifically, with the teaching that all higher processes arise by way of associative combination of a series of elementary processes.

Psychological theory changes the conception of analysis depending on the general main approach to psychological problems. Behind one application of analysis or another lies a certain conception of the fact being analyzed. This is why, together with a change in the bases of the methodological approach to psychological research, of necessity, the very character of psychological analysis changes.

We note three specific points on which analysis of higher forms of behavior is based and which serves as the basis for our research. The first point leads us to distinguishing between analyzing things and analyzing process. Thus far, psychological analysis almost always treated the process being analyzed as if it were a specific thing. Mental formations were understood as a certain stable and solid fact, and the problem of analysis essentially was reduced to breaking it down into separate parts. This is why in this psychological analysis, the logic of solid bodies has been dominant thus far. The mental process was studied and analyzed, in the expression of K. Koffka,[54] primarily as a mosaic of hard and unchanging parts.

Analysis of things should be opposed to the analysis of process, which actually leads to a dynamic unfolding of the main points that form the historical course of a given process. In this sense, we are brought to a new understanding of analysis not by experimental, but by genetic psychology. Should we want to indicate the most important change that genetic psychology introduces into general psychology, we would have to admit, together with H. Werner, that this change leads to introducing the genetic point of view into experimental psychology. The mental process itself, whether we speak of the development of speech or volition, is a process that undergoes certain changes before our eyes. Development may be limited, as for example, in normal perceptions, to several seconds in all, or even to a part of a second. It may, as in complex processes of thinking, stretch over many days or weeks. It is possible to trace this development under certain conditions. Werner gives an example of how the genetic point of view can be applied to experimental research. Due to this, we are able experimentally, in the laboratory, to elicit a certain development that is a process that has long since been completed for modern man.

We said above that the method we use may be called an experimental-genetic method in the sense that it artificially elicits and creates a genetic process of mental development. Now we may say that the basic problem of the dynamic analysis that we have in mind is also contained in this. If we replace analysis of things with analysis of process, then the basic problem for consideration naturally becomes the genetic restoration of all the instances of development of the given process. Here, the principal task of analysis is restoring the process to its initial stage or, in other words, converting a thing into a process. This kind of experiment attempts to dissolve every congealed and petrified psychological form and to convert it into a moving, flowing flood of separate instances that replace one another. In short, the problem of such an analysis can be reduced to taking each higher form of behavior not as a thing, but as a process and putting it in motion so as to proceed not from a thing and its parts, but from a process to its separate instances.

The second point on which our understanding of analysis depends consists in opposing descriptive and explanatory problems of analysis. We have seen that the concept of analysis in the old psychology coincided essentially with the concept of describing as opposed to the problem of explaining phenomena. Moreover, the real task of analysis in any science is specifically to disclose the real causal-dynamic relations and connections that lie at the base of any phenomenon. Thus, in essence, analysis is a scientific explanation of the phenomenon being studied, and not just a description of it from the phenomenal aspect. In this respect, the separation of the two points of view of mental processes which Lewin is introducing into contemporary psychology seems extremely important to us. In its time, this kind of separation actually raised all the biological sciences to a higher level, or more precisely, this separation turned them from simple empirical description of phenomena into sciences in the true sense of the word, in other words, into an explanatory study of phenomena.

As Lewin correctly notes, in their time, all sciences made this transition from a descriptive to an explanatory approach, which is now the most basic characteristic of the crisis that psychology is experiencing. Historical study shows that an attempt to limit analysis to purely descriptive tasks is not a specific distinction of psychology. In old works on biology, statements were made that biology, in contrast to physics, can be, in the main, only a descriptive science. Today, everyone admits that this view was not justifiable.

Some ask, is not this transition from description to explanation a process of maturation typical for all sciences? Many sciences could see their unique features in the descriptive character of research. Dilthey defines the task of descriptive psychology in just this way. The transition from the descriptive to the explanatory concept is accomplished not by way of a simple replacement of some concepts by others. Extending the descriptive definition may also include transition to a certain genetic connection, and as development occurs, the science becomes explanatory. Lewin cites many basic biological concepts that made the transition from the category of description to explanation by extending and supplementing their content with genetic connections.

As we see it, this is the way science actually matures.

In essence, before Darwin, biology was a purely descriptive science that was based on a descriptive analysis of external properties of organisms without knowing their origin and, consequently, explaining their formation. The theory of botany, for example, placed plants into specific groups according to the form of leaves, flowers, according to their phenotypic properties. It developed, however, that one and the same plant may have a different external appearance depending on whether it grows at high or low altitudes. Thus, one and the same organism, depending on various external conditions, displays very important external differences and conversely: organisms very different in origin found in similar external conditions acquire a certain external resemblance, but in essence, remain different phenomena according to their nature.

For biology, overcoming the descriptive phenotypic point of view was connected with Darwin's discovery. The origin of species, which he discovered, laid the foundation for a completely new classification of organisms according to a completely new type of formation of scientific traits, which Lewin calls conditional-genetic in contrast to the phenomenological type based on external manifestations. A phenomenon is defined not on the basis of its external appearance, but on the basis of its real origin. The difference between these two points of view can be explained with any biological example. Thus, from the point of view of external traits, a *whale* is undoubtedly closer to fish than to *mammals*, but according to its biological nature, it is closer to the cow and to the deer than to the pike or the shark.

Phenomenological or descriptive analysis takes a given phenomenon as it is in its external manifestation and proceeds from the naive assumption that there is a coincidence between the external appearance or manifestation of matter and the real, actual, causal-dynamic connection that underlies it. Conditional-genetic analysis proceeds from disclosing real connections that are hidden behind the external manifestation of any process. The latter analysis asks about origination and disappearance, about reasons and conditions, and about all those real relations that are the basis of any phenomenon. In this sense, we could, following Lewin, move to a psychology of separating pheno- and genotypic points of view. Under genetic consideration of the problem, we will understand disclosure of its genesis, its causal-dynamic bases. Under phenotypic consideration, we will understand analysis that is based on directly presented traits and external manifestations of the object.

We could cite not a few examples in psychology that exhibit serious errors that are due to confusing these two points of view. In research on the development of speech, we will have the opportunity to consider two basic examples of this type. Thus, from the external, descriptive aspect, the first manifestation of speech similar to that of an adult appears in a child at the age of approximately one and a half years, and on the basis of this similarity, serious researchers such as W. Stern[55] reach the conclusion that even at this age, the child recognizes the relation between the sign and the meaning, that is, he closes in on phenomena that from the genetic point of view, as we shall see later, have nothing in common with each other.

A phenomenon such as egocentric speech, which is not similar externally to internal speech and differs from it in a most fundamental way, as our research shows, must be close to internal speech from the genetic aspect.

We are coming to the basic point that Lewin makes: two phenotypic single or complex processes may seem to be causally-dynamically extremely different and conversely—two processes that are extremely close from the causal-dynamic aspect may seem different from the phenotypic aspect. We can find such phenomena at every step, and we shall see that a whole series of positions and achievements established by the old psychology appears in a completely new light when we make the transition from phenotypic to genetic consideration.

Thus, the basis for the phenotypic point of view is a combining of processes that is based on external resemblance or similarities. Marx said the same thing in a most general form, confirming that "if the form of manifestation and the essence of things coincided directly, then all of science would be superfluous" (K. Marx and F. Engels, *Collected Works*, Vol. 25, Chap. II, p. 384). Actually, if the thing were the same phenotypically as it is genotypically, that is, if external manifestations of the thing as they are seen every day actually expressed the true relations of the thing, then science would be completely superfluous and simple observation, simple everyday experience, simple recording of facts would fully replace scientific analysis. Everything we might perceive directly would comprise the subject of our scientific knowledge.

Actually, psychology teaches us at every step that two actions may proceed similarly from the external aspect, but may differ profoundly from each other in genesis, in essence, and in their nature. In such cases, special means of scientific analysis are required to disclose the internal differences that lie behind external similarity. In such cases, scientific analysis is also required, that is, knowing how to disclose the internal essence that lies behind the external appearance of the process, its nature, its genesis. The whole difficulty of scientific analysis consists in that the essence of things, that is, their true, real relation, does not coincide directly with the form of their external manifestations; for this reason, processes must be analyzed, and through analysis, the true relation that lies at the base of these processes, behind the external form of their manifestation, must be disclosed.

Analysis also has the task of disclosing these relations. Genuine scientific psychological analysis differs in a radical way from subjective, introspective analysis, which by its nature cannot go beyond the limits of pure description. In our sense, analysis is possible only as objective analysis; for this reason, it seeks to disclose not what the observed fact seems to us, but what it actually is. We are interested, for example, not in the direct experience of free will, which introspective analysis shows us, but in that real connection and relation of the external and the internal that lie at the base of this higher form of behavior.

In this way, we see that psychological analysis as we understand it stands in direct opposition to the analytical method in the old sense of that word. If the old analysis saw itself as opposed to explanation, then the new is a basic means for

scientific explanation. If the old remained mainly within the limits of phenomenological study, then the new has as its task the disclosure of the real causal-dynamic relations. But in psychology, the explanation itself becomes possible to the extent that the new point of view does not ignore external manifestations of things, does not limit itself exclusively to genetic considerations, but of necessity includes both scientific explanation and external manifestations and the traits of the process being studied. It does this through the conditional-genetic approach.

In this way, analysis does not limit itself to only the genetic point of view, but of necessity considers the given process as a certain circle of possibilities that only with a certain complex of conditions or in a certain situation results in the formation of a certain phenotype. Thus, the new point of view does not eliminate, does not put aside the explanation of phenotypic features of the process, but places them in a subordinate position with respect to their actual genesis.

Finally, the third basic point consists of the fact that in psychology, we often are confronted with processes that have already become solidified, that is, passed through a very long historical development and were converted into a kind of fossil. Behavioral fossils most often are found in the so-called automatic or mechanical mental processes. These processes, which as a result of long functioning are perfected in the millionth repetition, become automatic and lose their initial appearance, and in their external form indicate nothing about their internal nature; they seemingly lose all traits of their genesis. Due to this kind of automatization, they create enormous difficulties for psychological analysis.

We will provide a very simple example that shows essentially how different processes acquire an external resemblance due to this kind of automatization. Let us take two processes that are called voluntary and involuntary attention in traditional psychology. Genetically, the indicated processes differ profoundly; moreover, in experimental psychology, the fact that is represented in the law of E. Titchener[56] can be considered an established fact: voluntary attention, once it is aroused, functions like involuntary attention. According to the author's expression, secondary attention continuously turns into primary. Because of this, a higher degree of complex relations develops which at first glance leads to occluding the basic genetic connections and relations that control the development of any mental process. Describing both forms of attention and contrasting one with the other with great sharpness, Titchener said that there is still, however, a third stage in the development of attention; it consists in nothing other than a return to the first stage.

Thus, the last, higher stage in the development of any process exhibits a purely phenotypic similarity to the first or lower stage, and in the phenotypic approach, we consequently lose the possibility of distinguishing the higher form from the lower. For this reason, the researcher is confronted with the same basic problem of which we spoke above—converting thing into movement, fossil into process. We have no other way of studying this higher, third stage in the development of attention and comprehending all of its profound uniqueness, in contrast to the first except by a dynamic unfolding of the process, except by indicating its genesis. Consequently, what must interest us is not the finished result, not the sum or product of development, but the very process of genesis or establishment of the higher form caught in a living aspect. For this, the researcher must very frequently transform the automatic, mechanical, fossilized character of the higher form and turn its historical development back, experimentally return the form that we are interested in to its initial moments in order to make it possible to trace the process of its genesis. But as we have already said, this is what the problem of dynamic analysis involves.

We can summarize what has been said above on problems of psychological analysis in this way and enumerate in a single sentence all three determining points

that form its base: analysis of process, not thing, analysis that discloses the real causal-dynamic connection and relation, but does not break up the external traits of the process and is, consequently, an explanatory, not a descriptive analysis, and, finally, genetic analysis, which turns to the initial point and reestablishes all processes of development of any form that is a psychological fossil in the given form. All three points taken together are based on the new understanding of the higher psychological form that is neither purely a mental formation, as descriptive psychology assumes, nor a simple sum of elementary processes as associative psychology believes, but a qualitatively unique form, a truly new form that appears in the developmental process.

Three points that make it possible to contrast with full clarity the new psychological analysis with the old may be found in a study of any complex or higher form of behavior. We will move on along the same path on which we started, specifically, the path of contrasting, since it is the easiest way to disclose the basic and essential trait of the new studies of the basic or radical changes in all of the genesis, origin, and structure of the higher form of behavior. For this reason, in order to move from a methodological consideration to concrete analysis that allows disclosure of the general form of the law that is the basis for the higher form of behavior, we will stop and consider experimental analysis of a complex mental reaction. This research is advantageous in many respects. First, it has a long history and consequently allows a very clear contrast to be made between the new forms of analysis and the old. Second, with respect to special conditions of the psychological experiment, such research permits a formulation in a very pure and abstract form of two basic points to which the analysis of all higher forms of behavior leads.

If we approach the analysis of a complex reaction in the way in which it was developed in the old psychology, we will easily find, in a most classical and finished form, the three distinguishing traits whose negation was the starting point of our research. First, the analysis is based on what N. Ach calls graphic schematism and which may actually be called analysis of the thing. Nowhere does the atomistic character of the psychology of elements, its logic of solid bodies, its attempt to consider mental processes as a mosaic of solid and unchanging things, its conception that what is higher is simply cumulative—nowhere does all this appear with such clarity, with such truly graphic schematism as in the most developed chapter of the old psychology, in experimental analysis of the complex reaction.

If we turn to the problem of how this psychology represents the genesis of a higher or complex form of reaction, we see that it represents the process that interests us in an elementary and simplified way at a higher level. According to that teaching, the higher reaction differs from the simple one most of all in the increased complexity of the stimuli presented. If we usually have one stimulus in a simple reaction, then in a complex reaction there are usually several stimuli. Most often, the complex reaction is characterized by the fact that instead of a single impression, the subject is affected by a series of stimuli. From these complicated stimuli, another point necessarily develops, specifically, a complication of mental processes that are the basis of the reaction. But most essential is the fact that complicating the internal aspect of the reaction is analogous to complicating the stimuli.

It is easy to be convinced of this if we turn to the usual formulas that are used for experimental analysis of a complex reaction. Thus, the reaction of making a distinction arises if the subject, before he reacts to the stimuli presented, has to make a distinction between two or more stimuli. In this case, we can compute the exact time of making the distinction according to the simple formula $P = p + P_1$, where P is the time of the complex reaction of making the distinction, P_1 is the time of the simple reaction, and p is the exact time of making the distinction.

In the same way, further complications bring us to constructing the reaction of selection. Where the subject is confronted with making a choice from among various movements, we have a further complication of the reaction that consists of the fact that the instant of making the distinction and the instant of selection is added and for that reason, the classical formula of the second reaction can be expressed in the form $P = P_1 + p + B$, where B is the exact time of selection, and P is the time of reaction or of making the distinction.

If we disclose the conception of a complex reaction that was the basis of these formulas, it is easy to note that, in essence, it may be formulated as follows: the reaction of making a distinction is a simple reaction plus making the distinction; the reaction of selection is a simple reaction plus making the distinction plus selection. Thus the higher is constructed as a sum of elementary processes that underlie the purely arithmetical summation. Actually, if we are justified in defining making a distinction and selection by simply subtracting the simple reaction from the complex reaction, then, by the same token, we maintain that the complex reaction is a simple reaction plus a new added element because all subtraction is nothing other than a conversion of addition, and if we would want to present the same formulas in their initial form, then we would have to replace them with a sum of the elements entering into them.

True, in experimental psychology, the problem of the almost complete inconsistency of the operation of subtracting higher forms from lower forms has been addressed a number of times. Thus, Titchener established that a complex reaction is not made up piecemeal from simple reactions, that differentiation and recognition reactions are not sensory reactions to which the time for differentiation and the time for recognition are added. The selection reaction is not a differentiation reaction to which the selection time is added. In other words, differentiation time must not be arrived at by subtracting sensory reaction time from differentiation reaction time. Selection time must not be obtained by subtracting the differentiation reaction time from the selection reaction time.

This is done frequently in textbooks: differentiation time, recognition time, and selection time are indicated, but actually, the position that forms their base cannot be considered correct, as if the reaction is a chain of separate processes to which one may arbitrarily add or from which one may arbitrarily subtract separate links. The reaction is a single process which, with a certain degree of habit, depends as a whole on the links of instruction. Perhaps it may develop that in an associative reaction one may resort to subtraction, that we may be able to determine, with a high degree of reliability, the time required for association by subtracting the time of simple sensory reaction from the time of simple association reaction, but facts indicate otherwise. Instruction which determines association controls the whole course of recognition, and for this reason the two reactions specified are not comparable.

The basic experimentally established fact that completely overturns the classical formulas given above for analysis of a complex reaction by simple arithmetical computation of separate elements is Titchener's establishment of the position that the time of carefully preparing the selection reaction may be equal to the time of the simple sensory reaction. We know that the basic law of a complex reaction established in classical psychology is an exactly opposite position. Specifically, the old experiments established that the time for a complex reaction exceeds the time for a simple reaction and the time for a complex reaction increases in direct proportion to the number of stimuli among which a differentiation must be made and the number of reactive movements from among which a choice must be made. New experiments demonstrate that these laws do not always hold, that an adequately

prepared selection reaction may occur at the same speed as a simple reaction and, consequently, when its concrete size is computed, the analytical formula given above must result in absurdity. This formula will show that the selection time is equal to zero and in this way will disclose the factual, basic inconsistency of this conception of a complex reaction.

The impossibility of this kind of analysis based on arithmetical subtraction was disclosed by many other researchers as well. Here we will not begin a consideration of all the objections that were raised against such an operation from various aspects; we will only indicate that Ach came to this conclusion in his research. With solid basis, he indicates that the inconsistency of this operation is evident, among other things, in the following: as a result of similar subtractions, some researchers obtained negative numbers. Like Ach, we think that the old psychology also made this same error when it applied the same understanding to higher processes. Thus, L. Quetlet[57] assumes that if we subtract the time required for explaining, translating to a different language, and naming the word, we obtain the exact time of translation. Thus, from this point of view, even the higher processes of understanding speech are combined with each other by simple summation and may be isolated and analyzed by simple subtraction. If understanding a word and naming it is subtracted from the translation of a given word to a foreign language, we will have in an exact form the process that is the basis of translating from one language to another. It is indeed difficult to imagine a more mechanistic understanding of complex and higher forms of behavior.

The second feature of the teaching on reactions as it was developed in the old psychology is ascribing primary importance to purely descriptive analysis. If the first, classical stage in the development of this teaching was characterized by analysis of things instead of analysis of process, then the new point of view, as represented by Titchener, Ach, and others who understood the inconsistency of earlier views, limits itself to purely descriptive, introspective analysis of reactions. The only difference is that a mechanistic analysis of stimuli is replaced by an introspective analysis of experience. Description of external relations is replaced by description of internal experiences, but in both cases, the phenotypic approach to the object itself is preserved.

E. Titchener notes[58] that all the instructions that refer to the first type of selection reaction can actually be quite different. And it is even doubtful, he continues, if even one of these instructions elicits an authentic process of selection. Unfortunately, in this area, researchers were more occupied with determining reaction time than with analyzing the reaction processes themselves. For this reason, the data from psychological analysis are often sparse. Introspective analysis had already shown that, practically speaking, the processes of selection actually have no place in the selection reaction. We may consider the fact as fully established that, from the psychological aspect, the selection reaction does not include processes of selection to any degree and for this reason it serves as a splendid example of how the external appearance of any process may fail completely to coincide with its actual psychological nature. Ach said that in this reaction we cannot speak of selection. All the processes from the psychological aspect occur in such a way that no place remains for selection. The same idea was formulated by Titchener: we must firmly keep in mind that the terms used for a complex reaction (simple reaction, differentiation reaction, selection reaction) are only conditional. Differentiation and selection refer to external conditions of an experiment and only to that. Titchener's assumption is that in the differentiation reaction, we do not differentiate, and in the selection reaction, we can originate operations, but we do not select reactions. The terms were assigned by way of a theoretical construct during the

period of development of psychology when experiments were little known and analysis was still a matter for the future. These terms and certain others have become obsolete together with their time. For this reason, observers must take these terms for reactions simply as indicators of certain historical forms of experiments and not as real discovered psychological facts.

Thus we see that in the mechanical analysis of classical psychology, real relations that are the basis for processes of complex reactions were replaced by the relations that existed between stimuli. This was the common manifestation of intellectualism in psychology that attempted to disclose the nature of the mental process by making the conditions of the experiment itself logical.

And so this process, which from the external aspect is selection, actually yields no basis for any talk of selection. In this sense, analysis of introspective psychology was a step forward in comparison with the old analysis, but it did not take us very far. It was, as has been said, a purely descriptive analysis of experience which, with scrupulous precision transmits the experiences of the subject during reacting, but inasmuch as experience is not in itself the whole process of reacting, or even its main basis, but comprises only one aspect of the process and itself requires explanation, then it is natural that self-observation is often in no condition to give even a correct description, let alone an explanation of the subjective aspect of the reaction. This is the reason for the substantial discrepancies in the descriptions of one and the same process by various authors. Even this analysis could not present a real causal-dynamic explanation of the process itself since it necessarily requires rejecting the phenotypic point of view and replacing it with the genetic point of view.

The third feature consists of the fact that the old psychology approached the study of the process of a complex reaction in its finished and dead form. Titchener said that the attention of researchers was directed toward the time of reaction and not toward the process of preparation and content of the reaction. Due to this, a historical precedent was set for considering reaction without its psychological preparation. We remember that a well-prepared selection reaction occurs as rapidly as a simple reaction. The whole attention of the old psychology was directed toward studying the process of the complex reaction in its automatized form, that is, when the process of development was already concluded. We might say that psychology began to study the complex reaction *post mortem*. It never could capture it in a living form; it set it up in test experiments and in this way, the interesting instance of setting up and establishing the connections of the reaction, the instant of its genesis was thrown away and the study began only after the reaction was established, its development concluded, and it was presented in its finished form, made automatic and completely identical under different conditions.

Many researchers usually rejected the first experiments, that is, that period in which the process of establishing the reaction itself actually occurred. Titchener recommended rejecting the first two experiments of each series during which the process of formation of the reaction occurs. Other researchers usually rejected the first experiment when it differed sharply in reaction time from subsequent experiments. Many researchers indicate that in complex experimental conditions, especially in selection reactions, they rejected all initial sittings in their studies.

It is not hard to see that the basic approach of the old psychology, which studied a complex reaction in a dead form, as a finished thing, after the process of its development was concluded, is evident in the technical practice of discarding the first stages of establishment of the selection reaction and then studying it. This is why understanding reaction as a certain developing process was foreign to these

psychologists; this is why they frequently were misled by the external similarity between complex and simple reactions.

Once again we call attention to the fact that a carefully prepared selection reaction may take the same time as a simple reaction. We will connect this fact with the circumstance that we noted earlier in a general form when we said that in the process of development, the higher forms often resemble the lower in external characteristics. We could enumerate a number of psychological differences of complex reactions beginning with the ordinary reflex, but we will point out only one: as we know, a complex reaction takes longer than a reflex. However, Wundt had already established that reaction time can be decreased as the reaction is repeated, and as a result of this the reaction time drops to the time of the ordinary reflex.

As a general rule, we might say that all principal differences between reaction and reflex are also most clearly evident specifically at the beginning of the process of reaction formation and, as the reaction is repeated, they recede more and more. Differences in the one form and the other of behavior must be sought in their genetic analysis, that is, in the way they are generated, in their real conditionality. As it is repeated, a reaction has a tendency toward minimizing its difference from a reflex and conversely toward effacing it. As it is repeated, a reaction has a tendency to be converted to a simpler reflex. Test experiments prescribed by experimental methodology, which sometimes took whole sittings which were then disregarded, led to a situation in which the beginning of the study of the developmental process was finished and the researchers were dealing with established, mechanical reactions that lost the genetic differences between them and a reflex and acquired a phenotypic similarity with it. In other words, reaction in the psychological experiment was studied after it went through some of the process of dying off and was converted into a congealed form.

By describing the basic points in traditional analysis of a complex reaction, we determined at the same time, from a negative aspect, it is true, the principal problems that confront us. Obviously, the problem of dynamic analysis is to capture the process of genesis of the reaction.

The center of gravity of our interest shifts and moves to a new place. Experiments during which there is an establishment of a reaction and which were rejected by the old researchers are of central interest for us, for dynamic analysis, since to explain any thing means to explain its real genesis, its causal-dynamic connection and relation to other processes that determine its development. Consequently, the problem of analysis consists of returning the reaction to the initial moment, to conditions of its closure and in this way, to grasp by objective research the whole process as a whole and not just its external or internal aspect. Conversely, the reaction that is already established, being repeated stereotypically, is of no interest to us except as a finished form, a means of establishing the end point toward which development of this process leads.

We are interested in the instants of genesis, establishment, and closure of the reaction and the dynamic unfolding of the whole process of its development. We need to see the complex reaction. For this, in the experiment, we must convert the automatic form of the reaction into a living process and again turn the thing from which it arose into movement. If this defines the problem that confronts us from the formal aspect, then from the aspect of content of our research a problem arises. As we have said above, previous studies carried out critical disruptive work on the old teaching about the mental reaction of selection. They demonstrated that in the selection reaction, there can be no mention of selection, that at the base of such a conception of a complex reaction, there is a purely intellectualistic conception

that replaces the psychological connection and relation between processes by logical relations between elements of the external condition of the problem. Moreover, this logical formula of the complex reaction was supplemented by analysis of experiences observed by the subject in the process of reaction. These researchers attempted to replace the logical relation of things with the phenomenological relations of experiences. But they did pose one problem in all its clarity: in the selection reaction, they said, we carry out the most various operations, but we do not select. The question then is, what does actually occur in the selection reaction? If we take even the best representation of the subject's experiences as Ach or Titchener present them in a systematic form, we see that they do not go beyond pure description, that they cannot explain for us the selection reaction from the causal-dynamic aspect. Consequently, we might have framed the basic question that confronts us as follows: what is the real causal-dynamic nature of a complex reaction?

If we turn to experiments with complex reactions, it is easy to see that they usually differ in one general trait among the various researchers. The general trait consists in the absurdity of the connections that occur in the process of the experiment between separate stimuli and the reactions. In the arbitrariness and absurdity of the connections that are at the base of the reactions, many researchers saw the most essential trait of the given experiment. The subject was presented with a series of stimuli to which he had to react with various movements; here, neither the connection itself between the stimuli and the movements nor the order of presentation of the stimuli and the movements made sense to the subject.

The subjects could react to any stimulus with any movement with equal success. The principally mechanical combination of any stimuli with any reactions places this experiment in the same order with classical studies of remembering by using meaningless syllables.

True, isolated attempts were made to move from meaningless connections to selection reactions with sensible connections. For example, in Münsterberg's experiments, the subject was asked to react with a certain finger of one hand to five various acoustic stimuli, and each time the signal of the reaction was a simple count from one to five and the order of the reactions on a keyboard of an electric key coincided with the natural order of the count. With the word *one*, the subject had to raise the thumb, with *two*, the index finger, etc. F. Merkel[59] studied the selection reaction with visual stimuli in a similar way.

So we see that there are two different processes through which the selection reaction is established. In one case, it is established simply by mechanical connection of the stimulus and the reaction, the major factor of which is repetition. Although none of the researchers considered the analysis of test experiments in detail, that is, the process itself of the formation of the selection reaction, nevertheless there is a firm basis for assuming that repetition of the instruction or presenting it in written form and repeated reading of it together with repeated experiments are the main means for establishing the required connections. The simplest way of putting this would be to say that the reaction is learned by the subject in the same way that he learns two meaningless syllables. In the second case, we are dealing with a process of a different order where the connection between the stimulus and the reaction of comprehension and, therefore, the difficulty of learning drops out at the outset. But in this case, we are dealing with the use of connections that are already established. In other words, this experiment in psychology may be considered an explanation or a mechanical method of adjusting connections or using connections that are already there, but in the course of our research, what interests us is the process of comprehending, the process itself of making adjustments and establishing connections that are the basis of the selection reaction.

From the very beginning, we set ourselves the problem of finding what distinguishes a complex form of reaction from a simple form, from a reflex. For this, we had to resort to two basic techniques which we ordinarily use. First, we faced the problem of impeding the reaction in order to prevent automatic suspension of closure of the connection, which would evade observation in this case. As we have already said, we saw the real task of the analysis to be the full dynamic unfolding of all the instances of the given process, but this always requires a certain slowing down of its progress and is best when the rate of the process is impeded. Second, in keeping with all of our methodology, we had to actually give the subject the external means with which he could solve the problem presented to him. Attempting to use an objectivizing method of research, in this case, we had to link the established connection to an external activity. Before doing this, we introduced the first complicating feature into the experiments on selection reaction before we placed the means for its mastery into the hands of the subject. The complication consisted of our eliminating trial experiments and proceeding directly to the basic research with the subject. The instruction provided for a reaction with different fingers to five or more various stimuli. We were interested only in seeing how the subject would conduct himself if he did not know how to deal with the problem. Without going into detail, in the most general form, we can say that the behavior of the subject always exhibited one and the same character. When the subject reacted mistakenly or found himself in difficulty, not knowing with which movement he should respond to the given stimulus, in each case, he looked for the required connection; this was expressed either in questions addressed to the experimenter as to how he should react or to remembering, either external or internal. We can say that in cases where the problem was beyond the powers of the subject, the difficulty lay in remembering and reproducing the instruction.

The second step of our experiment was the introduction into the situation of materials which the subject could use to create his own connection.

First of all, let us consider experiments with a two-and-a-half-year-old child since in these experiments both forms of the selection reaction were completely visible and occurred almost in parallel. Showing the child various stimuli, we told him to raise the right hand in one case and the left, in the other (for example, he was to raise his right hand when he was shown a pencil, and the left when he was shown a watch). This reaction was established immediately and usually proceeded normally, often with a long delay. In cases of error or not knowing which hand to raise, there was a seeking of the correct connection, which was evident in two basic forms. The child either asked the experimenter or reminded himself audibly or silently or, finally, made tentative movements expecting confirmation from the experimenter. This last is of most interest to us since in the very character of its progress it differs profoundly from reaction in the true meaning of that word. Frequently in these cases, the hand was not raised to the usual height, only initial movements were made, and the child's whole behavior had the character of cautious testing. If we leave aside the case of seeking a connection, we could say that in the child, the selection reaction with two stimuli very often proceeded along the completely usual type of establishing an ordinary connection.

With the same child, we set up a selection reaction in a different way. Instead of repeating the instruction or response to trials, we placed some objects at the child's right and left side; the child could easily connect these with a corresponding stimulus. In our example, on the right side, we placed a sheet of paper that was intended to remind the child that he must react to a pencil with his right hand; on the left, we placed a thermometer which was to remind the child that he must

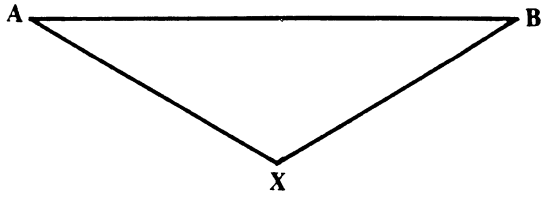

Fig. 2

react to a watch with his left hand. This kind of reaction proceeded without error, but the child's whole behavior changed substantially in this case.

It must be said that the connection between stimuli-objects and stimuli-means was extremely simple and accessible to the child; sometimes we alluded to the connection and sometimes we established it ourselves, and sometimes in the course of a series of experiments, we left the child to notice it himself. This latter was not successful, but in the first two cases, the child very easily used the connection. Our main interest was in comparing both components of the selection reaction. If the first corresponds to establishing a direct connection between the stimulus and the reaction, then the second has a mediating character. There is no direct connection between the stimulus and the reaction. The child must find this connection each time; he finds it with the help of the external stimulus-means that reminds him of the required connection.

In this case, the child's activity proceeds as if in two manifestations. The whole process of the selection reaction is clearly made up of two basic phases. Immediately after perceiving the stimulus, the required connection is set up and only after that is the corresponding reaction carried out. In looking at the pencil, the child now looks at the paper and only then does he react with his right hand.

From the experiment described, we moved on to an experiment with older children. We were interested in observing how both forms of the selection reaction develop and, the main thing, we were interested in finding the form with which the child himself creates the appropriate connection without the help of an adult. Experiments with older children were organized as follows. The child was presented with a series of stimuli and instruction requiring that he react by raising and lowering various fingers of the right and left hands. As a stimulus, we used words, drawings, colored figures, colored lights, etc. In no cases was there a sensible connection between the stimuli and the reaction.

During the experiment, the child's fingers were on the keyboard of a toy piano or a multiple electrical key. Together with each key in a special wooden apparatus, we placed various pictures or cards with words printed on them. Older preschool children and children in the early grades (younger pupils), convinced usually of the impossibility of carrying out the instruction by simply remembering it, turned to the auxiliary stimuli which they used as devices for remembering the instruction, placing them under the appropriate key and connecting them with the corresponding stimulus. In this way, a kind of reified outward extension of the instruction was created, external paths from the stimuli to the reactions were created, and the child was given the means to remember and reproduce the instruction. Here, the reaction again divided quite clearly into two phases: in the first, there was the seeking of a corresponding stimulus-device; in the second, the reaction directly followed the finding of the stimulus.

Without going into a detailed analysis of the experiment, we will turn at once to a generalized schematic consideration of what occurred in this case. In our diagram (Fig. 2) two arbitrary points, *A* and *B* are presented; a connection must be established between these points. The uniqueness of the experiment consists of the fact that there is no connection at present and we are investigating the nature of its formation. Stimulus *A* elicits a reaction that consists in finding stimulus *X*, which in turn acts on point *B*. Thus, the connection between points *A* and *B* is not direct, but mediated. This is what the uniqueness of the selection reaction and all higher forms of behavior consist of.

We will consider the triangle separately. If we compare the one method and the other for forming connections between the two points, then we will see that the relation between one form and the other may be visually expressed with our schematic triangle. With a neutral formation of a connection, a direct conditioned-reflex connection is established between the two points *A* and *B*. With a mediated establishment of the connection, instead of one, two other connections are established that lead to the same result, but in different ways. The triangle clarifies for us the relation that exists between the higher form of behavior and the elementary processes of which it is comprised. We formulate this relation in the most general aspect, saying that all higher forms of behavior can always be divided completely and without any remainder into the natural, elementary neuromental processes that make it up, just as the work of any machine can, in the last analysis, be reduced to a definite system of physicochemical processes. For this reason, the first task of scientific studies when they approach any cultural form of behavior is to give an analysis of the form and disclose its component parts. An analysis of behavior always leads to one and the same result, specifically, it demonstrates that there is no complex, higher apparatus of cultural behavior which would not consist in the final analysis of several primary elementary processes of behavior.

We have found that in the child, one associative connection is replaced by two others. Each of the connections taken separately is the same conditioned-reflex process of closure in the cerebral cortex as the direct associative connection. New is the fact that one connection is replaced by two others; new is the construction or combination of nerve connections; new is the direction of the specific process of closure of the connection with a sign; what is new are not the elements, but the structure of the whole process of the reaction.

The relations that exist between the higher and lower forms of behavior do not represent anything special, peculiar only to the given form. More likely, we are dealing with more general problems of relations of higher and lower forms that may be applied to all of psychology and are directly connected with more general methodological positions. The unconditional striving, so widespread at present, to cast out of the dictionary of psychology the very concept of elementary processes, including association, seems unjustified to us. Kretschmer said that the indispensability of the concept of association is demonstrated not only in the teaching about agnosia and apraxia, but also in treating many more complicated problems in psychology, for example, the psychology of children's thinking, incipient thinking, and the flow of ideas. The theory of a construction of higher mental life without an associative understructure is completely unthinkable according to Kretschmer.

In this sense, H. Høffding[60] admitted in his time the relation that exists between the process of thinking and the law of association. He said: in the true sense, thinking has no means and forms that are not already present during the involuntary course of a representation. The circumstance that association of the representation becomes the subject of special interest and of conscious selection cannot, however, change the laws of association of the representation. It is just as impossible to free

thinking, as understood in the true sense, from these laws as it is impossible for us to eliminate the laws of its internal nature from an artificial machine. But the psychological law, just like the physiological law, can be directed to serve our purposes.

In another place, Høffding returns to the idea in considering will. He says that involuntary activity forms the basis and content of voluntary activity. Will never creates, but always only changes and selects. The course of remembering and representation is subject to certain laws. When we deliberately recall or dismiss certain representations, we do this according to exactly the same laws, exactly in the same way as we can see them, change them, and make them serve our purposes according to laws of their external nature. According to Høffding, if we need to delay or dismiss a representation, we can do this indirectly according to the laws of forgetting. It seems to us that in the given case, the relation between higher and lower forms may be best expressed by admitting what in dialectics is usually termed removal. We can say that the lower, elementary processes and patterns that direct them represent a removed category. Hegel indicates that we must remember the dual meaning of the German expression "to remove." In this word, we understand, first, "removal," "rejection," and, according to this, we say that the laws are revoked, "cancelled," but the same word also means "preserved," and we say that we will "save" something. The dual meaning of the term "remove" is usually translated well into Russian by the word *skhoronit'* [to bury], which also has a positive and a negative sense—destruction and preservation.

Using this work, we could say that the elementary processes and the patterns that govern them are buried in the higher form of behavior, that is, they appear in it in a subordinate and cryptic form. Precisely this circumstance makes many researchers see analysis and breaking down higher forms into parts and reducing them completely to a series of elementary processes as the basic task of scientific research. Actually, this is only one aspect of scientific research that helps establish the connection and pattern of the appearance of any higher form from a lower form. In this sense, analysis contains a real relief from the metaphysical method of thinking that considers higher and lower forms as different fossilized essences not connected with each other and not being converted from the one to the other.

Analysis shows that the lower form is the basis and content of the higher form, that the higher form appears only at a certain stage of development and in turn itself continuously passes into the lower form. However, the problem is not limited to this, since if we should want to limit ourselves exclusively to analysis or reducing the higher form to the lower, we would never be able to develop an adequate representation of all the specific features of the higher form and those patterns to which they are subordinate. Here, psychology is no exception among the rest of the areas of scientific knowledge. Movement and use of matter—this is changing things. Engels objects to the attempts to reduce everything to mechanical movement, to reducing all other properties of matter to this and, in this way, blurring the specific character of other forms of movement.

This does not in the least imply rejection of the fact that each of the higher forms of movement is always connected in an essential way with real and mechanical, external or molecular movement just as the higher form of movement is actually impossible to produce without a change in temperature, or a change in organic life is impossible without mechanical, molecular, chemical, thermic, electrical, etc. changes. But the presence of secondary forms in each case does not exhaust the essence of the main form. Engels wrote: "Undoubtedly, in experimentation, we sometimes 'reduce' thinking to molecular and chemical movement in the brain, but

does this really exhaust the essence of thinking?" (K. Marx, F. Engels, *Collected Works*, Vol. 20, p. 563).

The need to study the main form together with the secondary forms, the claim that the essence of thinking cannot be exhausted by the lower forms that comprise its base, are nevertheless a basis for claiming the following. If we understand movement in the broadest sense as a change in things, we may say that thinking is movement. "Movement considered in the most general sense of the word, that is, understood as a method of existence of matter, as an attribute internally inherent in matter, includes in itself all changes and processes that occur in the universe beginning with simple displacement and ending with thinking. It is understood that a study of the nature of movement must be derived from its lower, simpler forms and we would have to learn to understand them before we could produce anything to explain its higher and more complex forms" (ibid., p. 391). We might transfer this general position pertaining in the same way to all areas of scientific knowledge, especially to the problem in which we are interested, and say that the relation between lower and higher processes in the selection reaction is similar also. No higher form of behavior is possible without lower forms, but the presence of lower or secondary forms does not exhaust the essence of the main form.

The task of our research also is to determine what the essence of the main form is. But the next chapter must provide the answer to this.

Chapter 4
THE STRUCTURE OF HIGHER MENTAL FUNCTIONS

The conception of psychological analysis that we tried to develop in the preceding chapter leads us to a new representation relative to the mental process as a whole and its nature. The most substantial change that occurred in psychology recently is that an analytical approach to the mental process was replaced by a holistic or structural approach. The most influential representatives of modern psychology advanced the holistic point of view and placed it at the base of all psychology. The essence of the new point of view is that the significance of the whole, which has its own specific properties and determines the properties and functions of the parts that constitute it, is foremost. In contrast to the old psychology, which represented the process of the formation of a complex form of behavior as a process of mechanical summation of separate elements, the new psychology places at its center the study of the whole and such of its properties as cannot be deduced from the sum of the parts. The new point of view has accumulated much experimental evidence that confirms its correctness.

For dialectical thinking, there is nothing new in the position that the whole does not arise mechanically by means of a sum of separate parts, but has specifically unique properties and qualities which cannot be deduced from a simple combining of the qualities of the parts.

In the history of the cultural development of the child, we find the concept of a twofold structure. First, this concept arose at the very beginning of the history of cultural development of the child and formed the initial moment of the point of origin of the whole process; second, the process of cultural development itself must be understood as a change in the basic original structure and the development of new structures on its base that are characterized by a new relation of the parts. We will term the first structures primitive; this is a natural psychological whole that depends mainly on the biological features of the mind. The second, arising in the process of cultural development, we will term higher structures since they represent a genetically more complex and higher form of behavior.

The main feature of primitive structures is that the reaction of a subject and all stimuli are at the same level and belong to one and the same dynamic complex which, as research demonstrates, has an extremely clear affective tinge. Many authors see the major capacity of the mind in the primacy of the whole over the parts, in the holistic character of primitive forms of child behavior, tinged affectively. The traditional representation that the whole is comprised of parts is disproved here, and researchers demonstrate experimentally that the whole, perception and action, not differentiating separate parts, is genetically primary, most elementary and simple. The whole and the parts develop in parallel and together with each other. Depending on this, many authors assume that the problems of psycho-

logical study changed radically, especially where explaining higher forms of behavior is concerned.

In contrast to Wundt, who seemed to believe that to explain higher forms, the existence of creative syntheses that unite separate elements into new qualitatively unique processes must be assumed, Werner advanced another point of view stating that not creative syntheses, but creative analysis is the real path to the formation of higher forms of behavior. New whole processes do not come from elements of a complex mind, but, on the contrary, they come from the breakdown of the dynamic whole, which from the very beginning exists as a whole, and the parts and connections and their interrelations that are developing among them on the basis of this whole must be brought forward and understood. Psychology must proceed from living unities and, through analysis, make a transition to lower unities.

However, primitive structures, for which such a merging into a single complex of the whole situation and reaction to it is characteristic, are only a point of departure. Moving on from it, a disruption and reconstruction of the primitive structure and a transition to a higher type begins. The attempt to apply the meaning of the new principle to ever newer areas of psychology begins to attach a universal significance to the concept of structure. This concept, metaphysical in essence, begins to signify something indivisible that comprises an eternal law of nature. Not in vain does Volkelt, speaking of their primary structures as the most important feature of the primitive mind of the child, call them "perpetually childlike." Actually, research shows that the "perpetual child" is as instantaneous, ephemeral, self-obliterating, and transitional to a higher form as all other forms of primitive behavior.

New structures that we contrast with lower or primitive structures differ mainly in that direct fusion of stimuli and reactions into a single complex seems to be disrupted. If we analyze thoroughly the unique forms of behavior that we had the opportunity to observe in the selection reaction, then we cannot help but note that in behavior, a seeming stratification of a primitive structure is occurring in this case. Between the stimulus to which behavior is directed and the person's reaction, a new intermediate member intervenes and the whole operation assumes the character of a mediated act. In connection with this, analysis develops a new point of view of the relation that exists between the behavioral act and external phenomena. We can distinguish clearly two orders of stimuli of which some are stimuli-objects and others, stimuli-means; each of these stimuli according to its relations uniquely determines and directs behavior. The uniqueness of the new structure is the presence in it of stimuli of both orders.

In our experiments, we were able to observe how the very structure of the whole process changes depending on a change in the position of the middle stimulus (sign)—the very structure of the whole process changes in behavior. Using words as a means of remembering was enough to make all the processes connected with remembering the instruction assume a single direction. But if only the words were replaced by meaningless geometrical figures, then the whole process took a different direction. Because of simpler experiments that were carried out, we believe it is possible to assume the following as a general rule: *in the higher structure, the sign and methods of its use are the functional, determining whole or focus of the whole process.*

Just as the use of one tool or another dictates the whole system of a work operation, the character of the sign used is the base on which the construction of the rest of the process depends. The same fundamental relation that lies at the base of the higher structure is the special form of organization of the whole process which consists of the process being constructed by involving certain artificial stimuli

in the situation as signs. Thus, the functionally different role of two stimuli and their connection with each other serves as a base of the connections and relations that form the process itself.

The process of involving secondary stimuli in a situation which then acquires a certain functional meaning may be observed most easily in experiments when the child first makes the transition from a direct operation to using a sign. In our experimental studies, we placed the child in a situation in which he was presented with a problem of remembering, comparing, or selecting something. If the problem did not exceed the natural capacity of the child, he dealt with it directly or with the primitive method. In these cases, the structure of his behavior resembled completely the diagram drawn by Volkelt. The essential characteristic of the diagram is that the reaction itself constitutes a part of the situation and is inescapably included in the structure of the situation itself as a whole. This dominant whole of which Volkelt speaks predetermines the direction of the child's grasping movement. But the situation in our experiments was almost never like that. The problem confronting the child usually exceeded his capacity and seemed too difficult to solve with this kind of primitive method. At the same time, beside the child, there usually was some object that was completely neutral in relation to the whole situation, and in this case, under certain conditions, when the child was confronted by a problem he could not solve, we could observe how the neutral stimuli stopped being neutral and were drawn into the behavioral process, acquiring the function of a sign.

We could place this process in parallel with the process described by Köhler. As we know, the simian that once had the sense to use a stick as a tool began later to use as tools any objects that were somewhat outwardly similar to a stick. Köhler said that if we assume that a stick that caught the eye acquired a certain functional significance for certain situations and that this significance was extended to all other objects, whatever kind they may be, then we come directly to the one and only view that coincides with the observed behavior of animals.

We could say that when an obstacle arises, the neutral stimulus acquires the function of a sign and from that time, the structure of the operation takes on an essentially different aspect.

In this way, we make a transition to the other side of the problem closely connected with it. As we know, in organic nature, structure and function are very closely connected. They are a unit and mutually explain each other. Morphological and physiological phenomena, form and function, depend on each other. In the most general form, we could define the direction in which structure is changed: it is changed in the direction of greater differentiation of parts. The higher structure differs from the lower most of all in that it is a differentiated whole in which the separate parts fulfill different functions and in which a combination of the parts into a whole process occurs on a base of functional double connections and interrelations between functions. Werner cites the words of Goethe,[61] who said that the difference between lower and higher organism consists in the greater differentiation in the higher. The more developed an organism is, the less similar are its parts to one another. In the one case, the whole and the parts are more or less similar to each other; in the other, the whole differs substantially from the parts. The more similar the parts are to each other, the less they are subordinate one to another. Subordination signifies a more complex relation of the parts of an organism. In this connection, Werner sees the very essence of the process of development in progressive differentiation and centralization connected with it.

As applied to structure, we could say that it is specifically differentiation of the primitive whole and clear separation of the two layers (stimulus-sign and stimulus-object) that are the mark of the higher structure. But differentiation has another

aspect that consists in the entire operation as a whole acquiring a new character and significance. We could not describe the new significance of the whole operation any better than to say that it represents *a mastery of the behavioral process itself.*

Actually, if we compare the diagram of the selection reaction as we drew it in the preceding chapter with the diagram that Volkelt provides, we can see that the most important difference of the one from the other lies in the character of the determination of the behavior as a whole. In the second case, the activity of the organism is determined by the total complex of the whole situation, the logic of the structure, and in the first case, man himself creates the connection and ways for his reacting; he reconstructs the natural structure; with the help of signs, he subordinates to his will processes of his own behavior.

The fact that traditional psychology did not at all note this phenomenon which we call mastery of one's own behavior seems surprising to us. In attempts to explain the fact of "will," psychology resorted to miracle, to intervention of a spiritual factor in the course of neural processes and, in this way, tried to explain the effect along the line of greatest resistance, as James had done, for example, in developing the teaching on the creative character of will.

But even in the psychology of recent times, which has begun gradually to introduce the concept of mastery of one's own behavior into the system of psychological concepts, there is still neither the necessary clarity in the concept itself nor an adequate evaluation of its true significance. Lewin is justified in noting that phenomena of mastery of one's own behavior have not yet appeared in all clarity in the psychology of the will. Conversely, in pedagogy, problems of mastery of one's own behavior have for a long time been considered as basic problems of education. In contemporary education, the will replaced the position of deliberate action. In place of external discipline, in place of compulsory training, independent mastery of behavior is promoted which does not propose suppressing the natural inclinations of the child, but has in mind his mastery of his own actions.

In this connection, obedience and good intentions are relegated to the background and the problem of mastery of oneself is moved to the forefront. This problem actually has much greater significance, since we have in mind the intention that controls the child's behavior. Moving the problem of intention to the background in relation to the problem of self mastery appears in the problem of obedience of the very small child. The child must learn obedience through self mastery. Self mastery is not constructed on obedience and intention, but, conversely, obedience and intention develop from self mastery. Analogous changes with which we are familiar from the pedagogy of the will are indispensable to the basic problem of the psychology of the will.

Together with an act of intention or decision, even more strongly must the problem of mastery of behavior be brought to the forefront in connection with the causal-dynamic problem of the will. However, regardless of ascribing such a central significance to the mastery of behavior, we do not find in Lewin any kind of clear determination or even a study of this process. Not once does Lewin return to it, and, as a result of research, arrives at distinguishing two basic forms of behavior. Since this distinction coincides closely with the distinction between the primitive and the higher structure which is where we begin, we will consider Lewin's remarks in somewhat greater detail.

With him, in the interests of a purer scientific formation of concepts, we agree to give up the term "will," and in its place to introduce the term "dependent actions and independent actions," or actions arising directly from forces within the situation itself. The latter seem to us to be especially important. According to Lewin, it is understood that controlled actions also are subject to determining forces of the

general situation, but with this type of action, man usually does not feel that he is involved with his whole personality in that situation; to a certain degree, he remains outside the situation and owing to this, he holds the action itself firmly in hand. Delimitation of the psychological systems in this case is different from what it is in a simple action due to the greater independence or greater dominance of the system "I."

Regardless of this confused formulation of the whole problem, Lewin still arrives at establishing the fact that the formation of such ties, made with the help of an auxiliary action, is a feature of adult cultured man or, as we could say in other words, it is the product of cultural development. Lewin indicates that the basic problem arises relative to whether "any intentions" can be formed. In itself, most remarkable is the fact that man has exceptional freedom in the sense of intentional implementation of any action, even senseless action. This freedom is characteristic for civilized man. It is present in the child and probably in primitive peoples to a much lesser degree and, in all probability, distinguishes man from animals closest to him much more than his superior intellect. The difference, consequently, is reduced to the possibility of man's mastery of his own behavior.

In contrast to Lewin, we attempt to provide for the concept of mastery of one's own behavior a completely clear and precisely determined content. We proceed from the fact that the processes of behavior represent the same kind of natural processes subject to the laws of nature as all other processes. Neither is man, subjecting processes of nature to his will and intervening in the course of these processes, an exception in his own behavior. But a basic and very important question arises: how should he represent the mastery of his own behavior to himself?

Two basic facts were known to the old psychology. On the one hand, it recognized a hierarchical relation of higher and lower centers by which some processes regulate the course of others; on the other hand, psychology, coming to a spiritualistic interpretation of the problem of will, advanced the idea that mental forces act on the brain and through it on the whole body.

The structure we have in mind differs substantially from both the first and the second case. The differences are that we bring forward the problem of means by which behavior is mastered. Just as mastery of one process or another in nature, mastery of one's own behavior assumes not a change in basic laws that control these phenomena, but subjection to them. We know that the basic law of behavior is the law of stimulus–response; for this reason, we cannot master our behavior in any other way except through appropriate stimulation. The key to mastery of behavior is mastery of stimuli. Thus, *mastery of behavior is a mediated process* that is always accomplished through certain auxiliary stimuli. We tried to disclose the role of stimuli-signs in our experiments on the selection reaction.

Recently in child psychology, the idea of studying specific features of human behavior has been advanced a number of times. Thus, M. Ya. Basov advanced the concept of man as an active agent in the environment, contrasting his behavior with the passive form of adaptation typical of animals. This author maintains that as a subject for psychology, we have before us an organism as an agent in his environment and the activity he exhibits in interaction with his environment in various forms and processes of behavior.

However, even Basov, who came closest to the problem of the specific in human behavior, did not delimit in his research any distinctly active and passive form of adaptation.

We might summarize what our comparative consideration of higher and lower forms of behavior leads to and say: the unity of all the processes that constitute the higher form is formed on the basis of two instances: first, the unity of the

problem confronting man, and second, as we have already said, the means that dictate the whole structure of the process of behavior.

As an example that will make it possible to distinguish clearly the features of the higher and lower forms and simultaneously disclose the major instances of this difference, we can use the primitive and cultured structure of children's speech.

As we know, the first word pronounced by the child is a whole sentence in meaning. And even more, it is sometimes complex speech. Thus, the external form of development of speech as it develops from the phenotypic aspect is deceptive. Actually, if we are to believe external consideration, we would have to conclude that the child is at first pronouncing separate sounds, then separate words, and later begins to unite the words in two's and three's and makes the transition to a simple sentence which later develops into a complex sentence and into a whole system of sentences.

This external picture, as we have already said, is deceptive. Research has shown definitively that the primary or original form of children's speech is a complex, affective and undifferentiated structure. When the child pronounces the first "Ma," Stern says, this word cannot be translated into the language of adults with the one word "Mama," but must be translated by a whole sentence such as "Mama, put me on the chair," etc. We will add that by no means is only the word "Ma" itself taken separately deserving of such an extended translation, but the entire situation as a whole: the child who wants to be placed on a chair, the toy which he wants to get by this operation, his unsuccessful attempt, the approaching proximity of the mother who is watching his behavior, and finally, his first exclamation—all of this, merged into a single whole complex could have been fully represented by Volkelt's diagram.

Let us compare this primitive undifferentiated structure with the structure of speech of this child at age three when he expresses the same desire in the developed form of a simple sentence. We ask, how is the new structure different from the earlier structure? We see that the new structure is differentiated. Here, the single word "Ma" is converted into four separate words of which each precisely indicates and signifies an object of action that constitutes the corresponding operation and grammatical relations that convey the relation between real objects.

Thus, the differentiation and subordination of separate members of the common whole distinguish the development of this speech structure from the primitive structure with which we compare it. But its most essential difference is that it does not represent action directed toward a situation. In contrast to the initial cry that is an integral part in the merged complex of the situation, the present speech of the child has lost the direct connection with action on objects. It is now only an influence on another person. And so these functions of influence on behavior which are divided here between two persons, between the child and the mother, are united in a single whole in the complex structure of behavior. The child begins to apply to himself those forms of behavior that adults usually apply to him, and this is the key to the fact of mastery of one's own behavior, the fact that interests us.

It still remains for us to elucidate the problem touched on earlier relative to what kind of distinguishing traits set the given structure apart from the more general type of structures that we, together with Köhler, could term detour structures. By this term, Köhler understands an operation that develops when attaining a goal by direct means is obstructed. Köhler has in mind two basic concrete forms in which such detour structures appear. The first are detours in the literal sense of the word when some physical barrier in the form of a road block stands between an animal and his goal and the animal moves toward the goal bypassing the obstacle in a roundabout way. The second concrete form consists in using tools, which, in a figu-

rative sense, may also be termed detours or roundabout ways: when the animal cannot master something directly, cannot get it with his hand, the animal moves it closer with a developed operation and, as if in a roundabout way, attains his goal.

Of course, the structure we are considering belongs to a number of similar detours. However, there is a substantial difference that compels us to consider it as a structure of a special kind. The difference is in the direction of the whole activity and in the character of the detours. While a tool or a real detour is directed toward a change of something in the external situation, the function of a sign consists most of all in changing something in the reaction or in the behavior of man himself. The sign changes nothing in the object itself, it only gives a new direction or reconstructs the mental operation.

Thus, a tool directed outward and a sign directed inward fulfill technically different mental functions. Depending on this, the very character of the detours differs in an essential way. In the first case, we have certain objective detours consisting of material bodies; in the second case, detours of mental operations. These circumstances simultaneously indicate similarities and differences between the structures we are considering and the structures of detours.

What has been said allows us to approach still another essential problem. At present, we may consider as completely elucidated the formerly debatable question of the need to isolate a third step in the development of behavior, that is, to place intellectual reactions in a separate class on the basis of genetic, functional, and structural traits that preclude considering these reactions simply as complex habits. If we assume, with Bühler, that the indicated acts retain the character of "trials," then the trials themselves acquire a completely different character. They no longer have to do directly with the object; they have to do with the internal aspect of the process, becoming exceptionally complex and in this case indicating a new step in the development of behavior. Of course, this new step cannot be considered as being cut off from the preceding second step.

The connection between the two steps is the same as it is over the whole extent of development. The lower forms are not destroyed, but are incorporated into the higher and continue to exist in it as a subordinate instance. For this reason we believe that relative to the three steps in the development of behavior proposed by Bühler, Koffka is justified in saying that areas of behavior must not be considered as fixed, congealed, separated from one another by an impassable wall. They must rather be understood as forms of behavior special in structural and functional relation that are found in an exceptionally complex dependence on each other and that are included in various relations in one and the same process of behavior.

In this case, we are interested in another question, opposite in a certain sense to the question we have just been considering. For us, speaking of three steps in the development of behavior is undoubtedly the very first requisite of the researcher. But we will take the question further: can we limit ourselves to the three steps indicated and do we not make the same mistake in this way that Bühler tried to avoid when he separated the second and third steps, does not this teaching contain a further simplification of higher forms of behavior, and does not the present state of our science oblige us to speak of still another, in this case, a fourth step in the development of behavior that characterizes the higher forms of behavior in man?

Introducing the concept of a third step, Bühler maintains that it is necessary to reduce to a common denominator both the higher forms of human thinking and the more primitive forms with which we became familiar in the child and in the chimpanzee, and that, theoretically, their bases are identical. The problem of science is completely legitimate: to understand what is common, what unites higher

and lower forms, since the seed of higher forms is contained in the lower. But it is exactly the reduction to a common denominator of higher and primitive forms of behavior that is the gross mistake based on an inadequate study of them, on the study only of the latter.

Actually, if we capture only what is identical in the higher and lower forms of behavior, we will do only half the job. In this case, we will never be able to describe adequately the higher forms with the whole specific quality that makes them what they in fact are. For this reason, the common denominator that Bühler sees in purposeful behavior accomplished with an object without repeated trials still does not disclose what is essential in higher forms, what they contain.

We will say outright: three steps in the development of behavior exhaust diagrammatically all the variety of forms of behavior in the animal world; in human behavior, they disclose what is identical with the behavior of animals; for this reason, the three-step diagram encompasses, more or less fully, only the common course of biological development of behavior. But it lacks what is the most essential, specifically, those unique forms of mental development that distinguish man. And if we want to be consistent in carrying out the trend that we termed the trend toward humanizing psychology, if we want separate out the human, and only the human, in the development of the child, we must go beyond the bounds of the diagram.

Actually, the common denominator assumes that all difference between the unique forms of human and animal behavior is removed. The fact that man builds new forms of action first mentally and on paper, stages battles on maps, works on mental models, in other words, everything that in human behavior is connected with the use of artificial means of thinking, with social development of behavior, and specifically, with the use of signs, is left beyond the bounds of the diagram. For this reason, together with the three-step diagram, we must isolate a special, new step in the development of behavior constructed above it, a step which may incorrectly be called a fourth step, since it stands in a somewhat different relation to the third than the third does to the second, but in any case, it would be more correct, moving from ordinal to cardinal numbers, to speak not of three, but of four steps in the development of behavior.

A fact of no small importance hides behind this position. We have only to recall how many arguments were caused by the discovery and recognition of the third step in the development of behavior to understand the enormous significance that adding a fourth step will have for all the prospects of genetic psychology.

As we know, recognizing intellectual reactions as a special class of reactions raised objections from two sides. Some found the introduction of a new concept to be superfluous and tried to demonstrate that intellectual reactions contain nothing basically new in comparison with habit, that they may be fully and completely adequately described in terms of the formation of conditioned reactions, that all behavior may be wholly exhausted with the two-step diagram that differentiated innate and acquired reactions.

Supporters of this view expressed misgivings that together with recognizing a third step which was still inadequately studied and insufficiently clear, the metaphysical and speculative concept would once again be introduced into psychology, that behind the new terms, once again the road would be paved for a purely spiritualistic interpretation, that an anthropomorphic transfer of human methods of behavior to animals might once again fatally pervert all of the genetic perspectives of psychology. We note incidentally that the misgivings were to a certain degree justified. However, this does not seem to us to be evidence to any degree that its

authors are right; from the position that any thing can serve as an object of abuse, it does not follow that the thing should not be used.

If adherents of the view under consideration assumed introducing a third step to be superfluous and criticized the new concept from below, from the aspect of biology, then it met with no less bitter attacks from the top, from the aspect of subjective psychology, which feared that with the introduction of the new concept the rights of the human intellect would be depreciated, that, as with Darwin, the divine nature of man would again be genetically linked to the chimpanzee. Psychologists of the Wurzburg school, being occupied with the study of thinking and considering it as a purely mental act, declared that contemporary psychology is again on the path to Platonic ideas. For this idealistic thinking, Köhler's discovery was a cruel blow showing as it did the root of human thinking in the primitive use of tools by the chimpanzee.

For us, this developing situation seems characteristic to a high degree since the discovery of the third step in the development of behavior evoked bitter attacks both from above and from below.

An analogous situation is also created when we attempt to introduce further complexity into psychology and speak not of three, but of four basic steps in the development of behavior. This is the basic and principal problem of all genetic psychology, and we must expect in advance that the new diagram will meet bitter opposition both from the aspect of biological psychology, which tries to reduce human thinking based on the use of signs and primitive thinking of the chimpanzee to a common denominator, as well as from the aspect of spiritualistic psychology, which must again see in the new diagram an attempt to expose higher forms of behavior and present them as natural and historical formations and in this way encroach again on Platonic ideas.

We can find comfort only in the fact that the criticism from above and the criticism from below cancel each other out, neutralize each other, in the fact that complication of the simple, initial diagram alone seems not to be justified, and in the fact that it will be accepted by others as an unnatural simplification.

Actually, we admit that in our new attempt, there is also more likely to be the danger of simplification and of extraordinary complication since only the first steps have been taken. Undoubtedly, consciously and unconsciously, we simplify the problem when we try to present it in a schematic form and again reduce to one denominator all that we conditionally designate as higher behavior. Undoubtedly, further research within human behavior will be able to distinguish the newer and newer epochs and steps when our attempts will also seem methodologically not final; they will actually seem a simplification of the problem and a reduction of heterogeneous things to one common denominator. But at present, we are speaking of gaining a new concept for science. We are speaking of moving psychology out of its biological captivity and into the area of historical human psychology.

Thus, our initial position is the recognition of the new, fourth step in the development of behavior. We have already said that it would be incorrect to call it a fourth step, and there is a basis for this. The new step is not built over the preceding three in exactly the same way that the preceding steps are built on one another. It signifies a change in the very type and direction in the development of behavior and it corresponds to the historical type of development of humanity. It is true that when we consider its relation to the first three steps, which we can call natural steps in the development of behavior, this relation seems similar to the one we have already mentioned. And here we note the unique geology in the development of genetically available layers in behavior. Similarly to the way in which instincts are not eliminated but merged with conditioned reflexes or in which habits

continue to exist in an intellectual reaction, natural functions continue to exist within the cultural.

As we have seen from our analysis, every higher form of behavior is disclosed directly as a certain aggregate of lower. elementary, natural processes. Culture creates nothing, it only uses what is given by nature, modifies it, and places it at the service of man. If we use the terminology of the old psychology, analogously to intellect, we could term the fourth step in the development of behavior the will because specifically in the chapter on will, the old psychology occupied itself most of all with the study of those real foundations of higher forms of behavior that are the subject of our research.

It would be a mistake to think that, together with spiritualistic representations of the will, those real unquestionable phenomena and forms of behavior that the old psychology interpreted erroneously and sometimes described must also be discarded. With this in mind, Høffding said that involuntary activity forms a basis and content of voluntary activity. Nowhere does the will create, but it always only changes and selects. He said that the will intervenes in the course of other mental processes only according to the same laws that are present in the processes themselves. Thus, the old psychology had every basis for also distinguishing not only voluntary and involuntary activity but also voluntary and involuntary memory and voluntary and involuntary flow of ideas; Høffding also maintained that the action of the will is not primary in evoking appropriate ideas. He said that the will provides the first push and bores through, but when the opening is made, then the stream of water must pass through under its own force and then it remains for us only to compare what we are seeking with what has been established.

Thinking in the true sense, formation of concepts, judgment and conclusions are based on the intervention of will in a representation. But just as these words carry so many meanings that they do not give a clear representation of the basic relation between the fourth step of behavior and other steps, we prefer to use a different term for this new area of development of which we continue to speak. Using Bühler's comparison, we could say that we have noted yet another area of development which, in contrast to the first three, is not subject to the biological laws of the formula of selection. In it, selection ceases to be the main law of social adaptation and in this area of behavior all neutral forms of behavior have already been socialized. Admitting a conditional comparison, we might say that the new area relates to the other three areas as the process of historical development of humanity on the whole relates to biological evolution.

In preceding chapters, we have already noted the uniqueness of this area of development. Now it remains for us to consider briefly the character itself of development.

We must say that in contemporary psychology the very concept of cultural development has not been assimilated. Even now many psychologists are inclined to consider facts of cultural changes in our behavior from their natural aspect and think of them as facts of habit formation or as intellectual reactions directed toward a cultural content. Psychology is deficient with respect to understanding the independence and specific pattern in the movement of forms of behavior. Moreover, studies show that the structure of higher forms of behavior does not remain unchanged; it has its internal history that includes it in the whole history of the development of behavior as a whole. Cultural devices of behavior do not appear simply as external habit; they comprise an inalienable part of the personality itself, rooted in its new relations and creating their completely new system.

Considering the changes to which the new mode of behavior is subjected, we can in every case disclose with precision all the traits of development in the true

sense of the word. This development, of course, is profoundly unique in comparison with organic development. Its uniqueness has thus far hindered psychologists from identifying these processes as a special type of development, seeing in them a completely new plan in the history of behavior. A. Binet discovered the fact that remembering based on signs leads to augmenting the function, that a mnemotechnique may attain better results than the most outstanding natural memory. This phenomenon Binet termed simulation of outstanding memory. As we know, by this he wished to express the idea that every mental operation may be simulated, that is, replaced by other operations that lead to the same results, but by a completely different path.

Binet's determination can scarcely be termed fortunate. It indicates correctly that in externally similar operations, some of them, in essence, simulated others. If Binet's designation had in view only the uniqueness of the second type of development of memory, one could not argue with him, but if it contains the idea that simulation, that is, deception, is occurring here, it leads to error. This practical point of view is prompted by the specific conditions of an appearance on a stage and for this reason is inclined toward illusion. It is, more likely, the point of view of a court investigator than of a psychologist. But, of course, as Binet also recognizes, such simulation is not illusion. Each of us has his own type of mnemotechnique, and mnemotechnique, in the author's opinion, should be taught in schools together with mental arithmetic. The author would not want to say that the art of simulation should be taught in schools.

Designating the type of development we are considering as fictive, that is, leading only to a fiction of organic development, seems to us just as inappropriate. Here again the negative aspect of the matter is correctly expressed, specifically, that in cultural development, the concept of function at a higher step, promoting its activity, is based not on organic, but on functional development, that is, on the development of the device itself.

However, the latter term hides the basic truth that in this case there is not a fictive, but a real development of a special type that governs special patterns. For this reason, we prefer to speak of cultural development of behavior as distinct from natural or biological development.

We now move to the problem of elucidating the genesis of cultural forms of behavior. We will present a short outline of this process as it was noted in our experimental studies. We shall try to show that cultural development of the child proceeds, if we can believe the artificial conditions of the experiment, through four basic stages or phases sequentially replacing each other and arising one from another. Taken as a whole, these stages describe the circle of cultural development of any mental function. Data obtained by nonexperimental means fully coincide with the pattern noted, beautifully fall in with it, expanding in it their own sense and their hypothetical elucidation.

We shall trace briefly the four stages of cultural development of the child since they sequentially replace each other in the process of a simple experiment. It is understood that the phases identified in the cultural development of the child are no more than an abstract outline that must be filled in with concrete content in subsequent chapters of the history of the cultural development of the child. Now, however, we believe it is necessary to dwell on one basic general problem; without this a transition from the abstract outline to a concrete history of separate mental functions would be impossible.

We would like to say that this outline, which we developed in the process of experimental study, cannot, of course, be considered as reflecting accurately the real process of development in all its complexity. In the best case, having unfolded

a certain form of behavior as a process, it helps to note, in a condensed form, the more important instances of cultural development and to find their relation to each other. But it would be a major mistake to consider our diagrammatic representation, developed on the basis of the artificial conditions of an experiment, as something more than only an outline. The greatest difficulty in genetic analysis consists precisely in using experimentally elicited and artificially organized processes of behavior to penetrate into how the real, natural process of development occurs.

In other words, the enormous problem of transferring the experimental outline to real life always opens up before genetic research. If the experiment discloses for us a sequence of patterns or any specific type, we can never be limited by this and must ask ourselves how the process being studied occurs under conditions of actual real life, what replaces the hand of the experimenter who deliberately evoked the process in the laboratory. One of the most important supports in transferring the experimental outline into reality are the data obtained nonexperimentally. We have already indicated that we see in these data a valid confirmation of the correctness of our outline.

However, this is not everything. In true research, it is still necessary to trace the path along which the cultural forms of behavior develop. Here again the basic difficulty consists in overcoming the traditional prejudice closely linked with intellectualism which still continues its cryptic dominance in child psychology. The basis of the intellectualistic view of the process of development is the assumption that development occurs like a logical operation. To the question as to how conscious use of speech develops in the child, the intellectualistic theory replies that the child discovers the meaning of speech. It attempts to substitute a simple logical operation for the complex process of development, not noting that such an approach involves an enormous difficulty because it assumes as given that which requires explanation.

We tried to show the insupportability of this point of view using the development of speech as an example. Actually, it would be impossible to find a more striking example of the fact that cultural development is not a simple logical operation.

We are not at all inclined to reject the fact that in the process of cultural development, intellect, thinking, invention, and discovery in the true sense of the word play an enormous role. But the problem in genetic research is not to explain the origin of new forms of behavior through discovery, but, on the contrary, to demonstrate genetically the rise of this development itself, of the role we must ascribe to it in the process of the child's behavior, and of other factors that promote its appearance and action.

The role of the intellect in development is most easily elucidated if we point out another prejudice that is just as firmly rooted in psychology as the first. If Stern tried to explain the development of a child's speech as discovery, then contemporary reflexology wants to present this process exclusively as a process of developing a habit without indicating that it is singling out speech from the remaining mass of habits. It stands to reason that the process of speech development includes the development of a motor habit and that all the patterns present in the formation of a simple conditioned reflex can undoubtedly be found in the development of speech also. But this only means that all the natural, innate functions are found in speech and that we are still far from an adequate description of the process itself.

Thus, we must overcome both the intellectualistic view that takes culture out of the activity of the human intellect and the mechanistic view that considers the higher form of behavior exclusively from the point of view of its functional mechanism. Overcoming the one error and the other leads us directly to the point where we can conditionally identify the *natural history of signs.* The natural history of signs

tells us that the cultural forms of behavior have natural roots in natural forms, that they are tied to them by a thousand threads, that they arise in no other way than on the base of the natural forms. Where researchers thus far saw either simple discovery or a simple process of the formation of a habit, a true study discloses a complex process of development.

We would like to promote to the first rank the significance of one of the basic paths of cultural development of the child, which we might call by the generally accepted word *imitation*. It may seem that in speaking of imitation as of one of the basic paths of cultural development of the child, we are returning again to the prejudices of which we have just spoken. A supporter of the habit theory may say that imitation is, of course, a mechanical transfer from one already developed form of behavior to another, that it is a process of habit formation, and we know it very well from animal development. Against such a view, we could point to the break that occurs in contemporary psychology of imitation.

Actually, psychology thus far has no intellectually clear idea of the process of imitation. As a matter of fact, it seems that processes of imitation are much more complex than it would seem at first glance. Thus, it would seem that the aptitude for imitation is strictly limited in different animals and people so that, summarizing the new position of psychology in this area, we might say: *the circle of available imitation coincides with the circle of the actual developmental possibilities of the animal.*

For example, it was pointed out long ago that the development of speech in the child cannot be explained by the fact that he imitates the adult. It is true that an animal hears the sounds of a human voice and with a certain structure of the vocal apparatus, it can imitate it, but we all know from experiments on domestic animals how limited is the circle of their imitation of man. A dog, the most domesticated animal with almost unlimited possibilities of training, does not in any way imitate motions of human behavior, and not one researcher has yet established that any but instinctive imitation was possible here.

We must again voice a reservation: we do not want to say that imitation does not play a decisive role in the development of a child's speech. We want to say quite the opposite: imitation is one of the basic paths in cultural development of the child in general. We would only like to note that imitation cannot explain the development of speech and that imitation itself requires explanation. Köhler, considering the reproaches that might be raised against ascribing intelligent behavior to a chimpanzee, dwells especially on the problem of imitation. The question arises: could not the chimpanzee in certain experiments see similar solutions reached by man and could he not simply imitate man's action? Köhler says that this objection might be a strong reproach if we assume the existence of simple imitation without any intelligent participation, a mechanical transfer of the behavior of one man to another. There is no doubt that such a purely reflex imitation exists; however, we must establish its true boundary.

If we assume that imitation of another kind is occurring here, not simple mechanical transferring from one to another, but connected with a certain understanding of the situation, then that in itself gives a new interpretation to the really intelligent behavior of animals. Actually no one has ever observed that complex actions could at once be reproduced by simple reflex imitation. The process of imitation itself assumes a certain understanding of the significance of the action of another. Actually, the child who can understand, cannot imitate a writing adult. Animal psychology confirms that the matter of imitation in animals is in the same situation. Studies by American authors showed, in contrast to the results of E. Thorndike,[62] that imitation, although with difficulty and limited in scope, does occur

in higher vertebrates. This discovery coincides with the assumption that imitation itself is a complex process that requires preliminary understanding.

To anyone who was engaged in animal research, Köhler could say in his own words: if an animal that sees a problem solved can actually by imitation arrive at the solution as he could not before, we would have to give that animal the highest mark. Unfortunately, we come across such cases very rarely in chimpanzees, and what is most important, only when a suitable situation and solution of it are within approximately the same boundaries that exist in the chimpanzee and are related to his spontaneous actions. Simple imitation is found in chimpanzees as it is in man, that is, when behavior produced by imitation is already common and understandable. Köhler assumes that the conditions are the same for imitation in higher animals and in man; man cannot simply imitate if he does not understand the process or the course of ideas well enough.

We would like to limit Köhler's position only to the area of natural imitation. As far as special or higher forms of imitation are concerned, we are inclined to say that they follow the same path of cultural development as all other functions. Specifically, Köhler says that under natural conditions, the chimpanzee is capable of imitating human behavior and he sees evidence in this for the intelligence of its behavior. Köhler stressed that, as a rule, the chimpanzee does not imitate human behavior. This is incorrect. There are cases in which even the greatest skeptic would have to admit that the chimpanzee imitates new methods of action not only similar to his own, but also those of man.

We could express this new evaluation of imitation another way by saying that imitation is possible only to the extent and in those forms in which it is accompanied by understanding. It is easy to see what enormous significance imitation acquires as a method of research that makes it possible to establish the limit and level of actions accessible to the intellect of the animal and the child. Roughly speaking, by testing the limits of possible imitation, we test the limits of the intellect of the given animal. For this reason, imitation is an exceptionally convenient methodological device for research, particularly in the genetic area. If we want to learn how much a given intellect has matured for one function or another, we can test this by means of imitation, and we consider an experiment with imitation that we developed to be one of the basic forms of the genetic experiment: a child is present when another solves a suitable problem, then he solves the same problem himself.

These considerations compel us to reject the opinion that reduces the essence of imitation to the simple formation of habits and to recognize imitation as a substantial factor in the development of higher forms of human behavior.

Chapter 5
GENESIS OF HIGHER MENTAL FUNCTIONS

The third level of our research is closest to the historical method of considering higher forms of behavior that we have adopted. The analysis and structure of higher mental processes lead us directly to disclosing the basic problem of the whole history of the cultural development of the child, to elucidating the genesis of higher forms of behavior, that is, the origin and development of the mental forms that are the subject of our study.

Using the expression of S. Hall,[63] psychology places genetic explanation above logical explanation. It is interested in the problem of from where and to where, that is, from what did this phenomenon come and into what is it trying to change.

The historical form of explanation seems to the psychologist-geneticist to be higher than any other possible forms. For him, to answer the question as to what a given form of behavior represents means to disclose its origin and the history of its development thus far. In this sense, as we have already said, in the words of P. P. Blonskii, behavior may be understood only as a history of behavior.

But before we move on to the genesis of higher forms of behavior, we must elucidate the concept of development itself just as we did in the chapters on analysis and structure of higher mental processes. The fact of the matter is that in psychology, because of its profound crisis, all concepts acquired multiple meanings and became confused; they changed depending on the basic point of view of the subject that the researcher chooses. In different systems of psychology oriented toward different methodological principles, all basic categories of research, including the category of genesis, acquire various meanings.

Another consideration that compels us to dwell on the problem of genesis is that the uniqueness of this process of development of higher forms of behavior that comprises the subject of our research is still inadequately recognized by contemporary psychology. The cultural development of the child, as we have attempted to establish above, represents a completely new level of child development which not only is still inadequately studied, but usually has not even been singled out in child psychology.

If we turn to the concept of development as it is represented in contemporary psychology, then we see that there are many things in it that contemporary research must overcome. The first thing, the sad survivor of pre-scientific thinking in psychology, is the cryptic residual pre-formism[64] in the theory of child development. The old representations and erroneous theories, disappearing from science, leave traces of themselves, residues in the form of habits of thought. Regardless of the fact that the view according to which the child differs from the adult only in proportions of the body, only in scale, only in dimensions has long been discarded in the general formulation in the teaching on the child, this representation continues to exist in a cryptic form in child psychology. Not one work on child psychology

can now openly repeat the disproved truths as if the child were an adult in miniature, but this view continues to be held even now in a cryptic form and is found in almost every psychological study.

It is enough to say that the most important chapters of child psychology (the teaching on memory, attention, thinking) are beginning only now to escape from this blind alley and to recognize the process of mental development in all its true complexity. But in most cases, scientific studies continue to hold in a cryptic form the view that explains development of the child as a purely quantitative phenomenon.

This view was held at one time in embryology. Theory based on this view is termed pre-formism or the theory of pre-formation. In essence, it is the teaching that in the embryo, there is an already completely finished and formed organism, but only smaller in size. The seed of the oak, according to this theory, for example, contains the whole future oak with its roots, trunk, and branches, but only in miniature. In the seed of man is already contained the formed human organism, but in extremely reduced size.

From this point of view, the whole process of development can be represented extremely simply: it consists in a purely quantitative increase in size of what was present from the very beginning in the embryo; the embryo gradually increases in size, grows, and in this way turns into a mature organism. This point of view has long been discarded in embryology and is of historical interest only. But in psychology, this point of view continues to exist in practice, although in theory it has also long been discarded.

Theoretically, psychology has long since rejected the idea that development of the child is a purely quantitative process. All agree that here we have a process that is much more complex, a process not exhausted by quantitative changes alone. But in practice, psychology is confronted with having to disclose this complex process of development in all its real completeness and to detect all those qualitative changes and transformations that refashion child behavior.

E. Claparède[65] in his introduction to the studies of J. Piaget[66] justifiably says that the problem of thinking of the child was usually posed in psychology as a purely quantitative problem and only new papers treat it as a problem of quality. Usually, says Claparède, what was seen in the development of intellect in the child was the result of a certain amount of addition and subtraction, an increment of new experience and liberation from certain errors. Contemporary studies disclose for us that the intellect of the child gradually changes its very character.

Should we want to characterize in a single general statement the basic requisite that the problem of development raises for contemporary research, we could say that this requisite consists in studying the positive uniqueness of child behavior. This requires some explanation.

All psychological methods used thus far for studying the behavior of the normal and the abnormal child, regardless of the great variety and differences that exist between them, have one common characteristic that links them in a certain respect. This characteristic is the negative description of the child that results from existing methods. All the methods speak of what the child does not have, what the child lacks in comparison with the adult, and what the abnormal child lacks as compared to the normal child. We have before us always a negative picture of the child personality. Such a picture tells us nothing about the positive uniqueness that distinguishes the child from the adult and the abnormal child from the normal child.

Now the problem that confronts psychology is to detect the true uniqueness of child behavior in all the fullness and richness of its actual expression and to present a positive picture of the child personality. But a positive picture is possible

only if we radically change our representation of child development and take into account that it is a complex dialectical process that is characterized by complex periodicity, disproportion in the development of separate functions, metamorphoses or qualitative transformation of certain forms into others, a complex merging of the process of evolution and involution, a complex crossing of external and internal factors, a complex process of overcoming difficulties and adapting.

Another thing that must be overcome to clear the road for contemporary genetic research is cryptic evolutionism, which thus far dominates child psychology. Evolution or development by gradual and slow accumulation of separate changes continues to be regarded as the only form of child development which exhausts all the processes we know that make up this general concept. In essence, in discussions of child development, an analogy to processes of plant growth shows through.

Child psychology wants to know nothing about the critical, spasmodic, and revolutionary changes with which the history of child development is replete and which are found so often in the history of cultural development. To the naive consciousness, revolution and evolution seem incompatible. For the naive, historical development continues only as long as it proceeds along a straight line. Where a turn, a break of the historical tissue, a jump occurs, the naive consciousness sees only catastrophe, a failure, a break. For the naive, history stops at this point for the whole period until it again enters on a direct and smooth road.

Scientific consciousness, on the other hand, considers revolution and evolution as two mutually connected and closely interrelated forms of development. Scientific consciousness considers the leap itself that is made in the development of the child during such changes as a certain point in the entire line of development as a whole.

This position has an especially important significance for the history of cultural development because, as we shall see, the history of cultural development consists to a great extent of these kinds of crucial and spasmodic changes that occur in the development of the child. The very essence of cultural development consists in a confrontation of developed cultural forms of behavior which confront the child and primitive forms that characterize his own behavior.

The most obvious consequence of what has been said is the change in the generally accepted point of view of the processes of mental development of the child and the representation of the nature of the structure and flow of these processes. Usually all processes of child development are presented as stereotypically occurring processes. The image of development, seemingly its model with which all other forms are compared, is considered as embryonal development. This type of development depends least on the environment, and the word "development" can be applied to it quite justifiably in the literal sense, that is, as an unfolding of possibilities that are contained in the embryo in a convoluted form. Also, embryonal development cannot be considered as a model of any process of development in the strict sense of the word. Rather, it can be represented as its result, its outcome. It is a process that has already stopped, that is concluded and proceeds more or less stereotypically.

We need only to compare the process of embryonal development with the process of the evolution of animal species, the true origin of species as disclosed by Darwin, in order to see the radical difference between the one type of development and the other. Species arose and died out, species changed and developed in the struggle for survival, in the process of adaptation to the environment. If we should want to draw an analogy between the process of child development and any other kind of process of development, we would have to select the evolution of animal species rather than embryonal development.

Least of all does child development resemble a stereotypic process protected from external influence; the development of the child occurs in an active adaptation to the environment. Ever newer forms arise in this process and not simply stereotypically produced links of a chain assembled earlier. Every new stage in the development of the embryo already present in a potential form in a preceding stage occurs due to the unfolding of internal potentials; it is not so much a process of development as a process of growth and maturation. This form, this type is also represented in the mental development of the child; but in the history of cultural development another form, another type has a much greater place; this consists in the new stage arising not out of unfolding potentials contained in the preceding stage, but out of an actual confrontation between the organism and the environment and an active adaptation to the environment.

In contemporary child psychology we have two basic points of view of the process of child development. One goes back to J.-B. Lamarck,[67] the other, to Darwin. Bühler correctly said that it is necessary to look at the book of K. Koffka[68] on the psychological development of the child in an attempt to give Lamarck's idea a contemporary psychological expression.

The essence of Koffka's point of view is that the principle that is usually used to explain higher forms of behavior, is used to explain lower forms of behavior while thus far, conversely, the principle that the psychologist used to explain primitive behavior was carried over to the higher form. But, according to Koffka, this method has nothing in common with anthropomorphism. One of the important methodological achievements of contemporary psychology is establishing the most important difference between naive and critical anthropomorphism.

While the naive theory is derived from recognizing the identity of functions at various stages of development, critical anthropomorphism is derived from higher forms that we know in man and traces the same psychological structure and its development dropping down the ladder of mental development. The works of Köhler and Koffka are close to this last theory. But, regardless of the important correction, we have before us theories that carry over the principle of elucidation found in studies of higher forms of behavior to the study of lower forms.

In contrast to this, Bühler regards his attempt to construct child psychology as an attempt to continue Darwin's idea. If Darwin knew only one area of development, then Bühler indicates two new areas in which, in his opinion, the principle of selection advanced by Darwin finds its confirmation and justification. True, Bühler tries to unite the points of view of Darwin and Lamarck using the words of E. Hering,[69] who said that a single, general picture of the history of the development of everything living could be generated from the two theories, Lamarck's and Darwin's, presented with a brilliant one-sidedness. What happened to him is what happens to a person looking through a stereoscope: at first he has two impressions crossing and fighting with each other until suddenly they unite into one clear picture established in a third dimension.

Continuing this comparison, Bühler says that neo-Darwinism without Lamarck is somewhat blind and stationary, but Lamarck without Darwin is not mature enough for the diverse richness of the forms of life. The theory of development will make a real step forward when in child psychology the relation of these two researchers with each other is elucidated more patently than it has been thus far.

Thus we see that the very concept of child development is not the same for the various researchers.

In Bühler's teachings, his ideas on the various areas of development seem to us to be exceptionally fruitful. In his words, Darwin knew essentially only one area while Bühler himself indicates three distinct areas. According to Bühler, develop-

ment of behavior passes through three basic stages and the process of development of behavior consists in that the site of the act of selection changes. Darwinian adaptation is accomplished by means of eliminating less favorably organized individuals; here we are speaking of life and death. Adaptation through training is accomplished within the individual; it sorts out the old and creates new methods of behavior. The site of its action is the area of bodily activity, and the price, not lives, but movements of the body produced in excess, lavished in the same manner as they are in nature.

K. Bühler indicates the further possibility of development. If movements of the body still cost too much or are for some reason insufficient, then the site of the act of selection must be transferred to the area of representation and thought.

Bühler says that it is necessary to reduce to a common denominator both the higher forms of human invention and discovery and the most primitive with which we became acquainted in the child and in the chimpanzee, and to understand theoretically what is identical in them. In this way, the concept of internal testing or trials in thought, which are the equivalent of trials with the object itself, allow Bühler to extend the formula of Darwinian selection to the whole area of human psychology. The origin of expediency in three different spheres (instinct, training, intellect), in three sites of action, of the principle of selection can be explained on the basis of a single principle. This idea, in the author's opinion, is a sequential continuation of the contemporary theory of development of the Darwinian thesis.

We would like to consider in somewhat greater detail the theory of the three stages in the development of behavior. The theory actually encompasses all the main forms of behavior, extending them over three stages of the evolutionary ladder. Instinct, or the innate, inherited resources of methods of behavior, forms the first stage. Above this rises the second stage, which might be called the stage of training, as Bühler calls it, or, in other words, the stage of habits or conditioned reflexes, that is, those learned and acquired through the personal experience of conditioned reactions. And, finally, the third stage rises still higher, the stage of the intellect or intellectual reactions that fulfill the function of adaptation to new conditions and represent, in the words of Thorndike, an organized hierarchy of habits directed toward solving new problems.

In outline, the third stage still remains debatable, least studied, and most complex. Many authors attempt to limit the outline of development to only two stages, believing that intellectual reactions should not be placed in a special class but should be considered as especially complex forms of habits. We think that contemporary experimental research provides a firm basis for considering this debate resolved in favor of accepting the third stage. Intellectual reaction, which differs in many essential characteristics of origin and function, cannot be placed in the same order as mechanical formation of habits that arise by trial and error even in the area of animal behavior, as Köhler's studies demonstrated.

True, we must not forget that the stage of intellectual reactions is very closely connected with the second stage in the development of behavior and is based on it. But this is a phenomenon of a common order equally applicable to the second stage in the development of behavior.

From the theoretical point of view, we believe one of the most fruitful ideas in genetic psychology is the idea that the structure of the development of behavior resembles the geological structure of the earth's crust in some respects. Research established the presence of genetically different strata in human behavior. In this sense, the "geology" of human behavior is undoubtedly a reflection of the "geological" origin and development of the brain.

If we turn to the history of the development of the brain, we will see what Kretschmer calls the law of stratification in the history of this development. With the development of higher centers, the lower centers, older in the history of development, do not simply move aside, but continue to work in a common union as levels subordinate to the direction of the higher centers in such a way that they cannot be defined separately in an undamaged nervous system.

The second pattern in the development of the brain consists in what might be called a transition of functions upward. Subordinate centers do not fully retain their initial type of functioning in the history of development, but surrender a substantial part of former functions upward, to the new centers that are formed above them. As Kretschmer assumes, only in cases of damage to the higher centers or their functional weakening does the subordinate level become independent and exhibit for us elements of the ancient type of functioning which remained in it.

Thus we see that with the development of the higher centers, the lower centers are preserved as subordinate levels and that the development of the brain proceeds according to laws of stratification and superstructure of new stories over the old. The old stage does not die when the new appears, but is displaced by the new, is dialectically negated by it, making a transition into it and existing in it. Precisely in this way, instinct is not abolished but is displaced into a conditioned reflex as a function of the ancient brain among the functions of the new. Precisely in this way, the conditioned reflex is displaced in an intellectual act simultaneously existing and not existing in it. Two completely equally tenable problems confront science: disclosing the lower in the higher and disclosing the development of the higher from the lower.

Recently, Werner expressed the idea that the behavior of a contemporary adult cultured person can be understood only "geologically" since in behavior different genetic strata have also been preserved that reflect all the stages through which man passed in his mental development. Werner maintains that the psychological structure is characterized by not one but many genetic strata superimposed on one another. For this reason even a separate individual considered genetically displays in his behavior certain phases of developmental processes that are already genetically concluded. Only the psychology of elements represents human behavior as a single closed sphere. In contrast to this, the new psychology establishes that man displays genetically different stages in his behavior. Werner sees the main problem of contemporary research to be disclosing the genetic multilayered quality of behavior.

Blonskii's entire book, *Psychological Essays,* is built around the genetic analysis of human behavior. The new idea it contains is that man's everyday behavior may be understood only if the four basic genetic stages through which the development of behavior always passed can be disclosed in it. Blonskii distinguishes sleeping life as a primitive state of life, primitive waking, a life of incomplete awakening, and a fully awakened life. This singular genetic pattern encompasses both everyday behavior of man and the many thousands of years of the history of his development or, more precisely, it considers everyday behavior of man from the point of view of his history of many thousands of years and presents a beautiful picture of how the historic point of view can be applied to general psychology and to the analysis of contemporary man.

The history of the development of signs, however, leads us to the general law that controls behavior. P. Janet[70] calls it the fundamental law of psychology. The essence of this law is that in the process of development, the child begins to apply the same forms of behavior to himself that others initially applied to him. The child himself assimilates the social forms of behavior and transfers them to himself. Ap-

plying this to the area of interest to us, we might say that nowhere is the correctness of this law more clear than in the use of the sign.

Initially, the sign is always a means of social connection, a means of affecting others, and only later does it become a means of affecting oneself. Many actual connections and dependences that are formed in this way have been explained in psychology. For example, we might point to the circumstance noted by J. Baldwin[71] that has at present been developed in Piaget's studies. Research has demonstrated that there undoubtedly is a genetic connection between the child's arguments and his reflections. The very logic of the child confirms the basis of this. Conclusions appear initially in arguments among children and only later are they internalized by the child himself, linked to how his personality is manifested.

Only with increasing socialization of the child's speech and all of the child's experience does development of the child's logic occur. It is interesting to note that in the development of the child's behavior, the genetic role of the group changes, higher functions of thinking are manifested in the beginning in the group life of children in the form of arguments and only later lead to the development of reflection in the behavior of the child himself.

Piaget established that it is specifically the break that occurs in the transition from preschool age to school age that results in a change in the form of group activity. On the basis of this, the child's thinking itself changes. Piaget said that reflection may be considered as internal argument. For the applicability of this law to the history of the cultural development of the child to be absolutely clear, we need only recall that speech is initially a means of socializing with those around the child and only later, in the form of internal speech, does it become a means of thinking.

But we would have said very little about the significance of the law that controls behavior if we were not able to demonstrate concrete forms in which it is manifested in the area of cultural development. Here we can connect the effect of this law with the four stages in the development of behavior that we noted above. If we take this law into account, it becomes absolutely clear why everything that is internal in higher mental functions was formerly external. If it is true that the sign is initially a means of socializing and only later becomes a means of behavior of the individual, then it is absolutely clear that cultural development is based on the use of signs and that including them in the whole system of behavior occurred initially in a social, external form.

In general, we could say that the relations between higher mental functions were at one time real relations between people. I relate to myself in the same way that people relate to me. As verbal thinking represents an internalization of speech, as reflection is an internalization of argument, precisely so the mental function of the word, according to Janet, cannot be explained in any other way unless we bring into the explanation a system broader than man himself. The original psychology of the function of the word is a social function, and if we want to trace how the word functions in the behavior of the individual, we must consider how it functioned formerly in the social behavior of people.

At this time, we will not solve beforehand the problem of how true in essence the theory of speech proposed by Janet is. We want only to say that the method of research that he proposes is completely self-evident from the point of view of the history of cultural development of the child. According to Janet, the word was initially a command for others, then it became a complex story consisting of imitation, changes in function, etc., and only gradually was separated from action. According to Janet, the word is always a command because it is a basic means of controlling behavior. For this reason, if we want to explain genetically from what

the volitional function of the word is derived, why the word subordinates motor reaction, what the origin of the power of the word over behavior is in both ontogenesis and phylogenesis, we unavoidably arrive at the real function of command. Janet says that the power of the word over mental functions is based on the real power of the superior over the subordinate; the relation of mental functions must be genetically attributed to real relations between people. Regulating another's behavior by means of the word leads gradually to the development of verbalized behavior of the individual himself.

But of course speech is a central function of social connection and cultural behavior of the individual. For this reason, the history of the individual is especially instructive in the transition from external to internal, from social to individual function and occurs here with particular clarity. Not in vain did Watson see a substantial difference between internal and external speech in the fact that the first serves individual, not social forms of adaptation.

If we turn to the means of social connection, we see that even relations between people have a dual nature. Direct and mediated relations between people are possible. The direct are based on instinctive forms of expressive movement and action. When Köhler describes a monkey that wants another monkey to go with it, how it looks into the other monkey's eyes, nudges it and begins the action that she wants to persuade the other monkey to do, we have before us a classical example of a direct connection with a social character. In descriptions of social behavior of the chimpanzee, many examples are given in which one animal affects another either by actions or by instinctive, automatic expressive movements. Contact is established through touching, through a cry, through a glance. The whole history of early forms of social contact of the child is full of examples of a similar kind, and here also we see contact established by crying, grasping a sleeve, glancing.

At a higher level of development, however, mediated relations between people appear; an essential characteristic of such relations is the sign by means of which social contact is established. It is understood that the higher form of socializing mediated by a sign grows out of natural forms of direct socializing; nevertheless the latter differs substantially from the higher form.

Thus, imitation and separation of functions among people is the basic mechanism of modification and transformation of the function of the individual himself. If we consider the initial forms of work activity, then we see that the function of fulfilling and the function of directing are separated there. An important step in the evolution of work is the following: what the supervisor does and what the underling does is united in one person. This, as we shall see below, is the basic mechanism of voluntary attention and work.

All cultural development of the child passes through three basic stages that can be described in the following way, using Hegel's analysis.

As an example, we will consider the history of the development of the pointing gesture; as we shall see, it plays an exceptionally important role in the development of speech in the child and is, to a significant degree, the ancient basis for all higher forms of behavior. Initially, the pointing gesture represents a simply unsuccessful grasping movement directed toward an object and denoting a future action. The child attempts to grasp an object that is somewhat too far away, his hands stretched toward the object are left hanging in the air, the fingers make pointing movements. This situation is the point of departure for further development. Here the pointing movement, which we may arbitrarily term a pointing gesture, appears for the first time. This is movement of the child objectively indicating an object and only an object.

When the mother comes to help the child and recognizes his movement as pointing, the situation changes substantially. The pointing gesture becomes a gesture for others. In response to the unsuccessful grasping movement of the child, there arises a reaction not on the part of the object, but on the part of another person. In this way, others carry out the initial idea of the unsuccessful grasping movement. And only subsequently, on the basis of the fact that the unsuccessful grasping movement is connected by the child with the whole objective situation, does he himself begin to regard this movement as a direction.

Here, the function of the movement itself changes: from a movement directed toward an object, it becomes a movement directed toward another person by means of a connection; grasping is converted into a direction. Because of this, movement itself is reduced, is contracted, and that form of the pointing gesture is developed which we may rightly call a gesture for oneself. But movement becomes a gesture for oneself in no other way than being, at first, direction for oneself, that is, objectively having all the necessary functions for direction and gesture for others, that is, being thought of and understood by the people nearby as a direction.

In this way, the child is the last one to recognize his gesture. Its significance and function are initially made up of an objective situation and then by the people around the child. The pointing gesture most likely begins to indicate by movement what is understood by others and only later becomes a direction for the child himself.

Thus we might say that through others we become ourselves, and this rule refers not only to the individual as a whole, but also to the history of each separate function. This also comprises the essence of the process of cultural development expressed in a purely logical form. The individual becomes for himself what he is in himself through what he manifests for others. This is also the process of forming the individual. In psychology, the problem of the relation of external and internal mental functions is posed here for the first time in all its significance. Here, as has been said, it becomes clear why everything internal in higher forms was of necessity external, that is, was for others what it is now for oneself. Every higher mental function necessarily passes through an external stage of development because function is primarily social. This is the center of the whole problem of internal and external behavior. Many authors have long since pointed to the problem of interiorization, internalizing behavior. Kretschmer sees in this a law of nervous activity. Bühler reduces the whole evolution of behavior to the fact that the field of selection of positive actions is transferred inward from outside.

But we have something else in mind when we speak of the external stage in the history of the cultural development of the child. For us to call a process "external" means to call it "social." Every higher mental function was external because it was social before it became an internal, strictly mental function; it was formerly a social relation of two people. The means of acting on oneself is initially a means of acting on others or a means of action of others on the individual.

The shift in the three basic forms of development in the functions of speech can be traced step by step in the child. More than anything, the word must have meaning, that is, it must relate to a thing, there must be an objective connection between the word and what it signifies. If there is not, further development of the word is impossible. Further, the objective connection between the word and the thing must be functionally used by adults as a means of socializing with the child. Only then will the word have meaning for the child also. Thus, the meaning of the word exists objectively first for others and only later begins to exist for the child himself. All basic forms of social intercourse between the adult and the child later become mental functions.

We can formulate the general genetic law of cultural development as follows: every function in the cultural development of the child appears on the stage twice, in two planes, first, the social, then the psychological, first between people as an intermental category, then within the child as a intramental category. This pertains equally to voluntary attention, to logical memory, to the formation of concepts, and to the development of will. We are justified in considering the thesis presented as a law, but it is understood that the transition from outside inward transforms the process itself, changes its structure and functions. Genetically, social relations, real relations of people, stand behind all the higher functions and their relations. From this, one of the basic principles of our will is the principle of division of functions among people, the division into two of what is now merged into one, the experimental unfolding of a higher mental process into the drama that occurs among people.

For this reason, we might term the basic result to which the history of the cultural development of the child leads us as sociogenesis of higher forms of behavior.

The word, "social," as applied to our subject, has a broad meaning. First of all, in the broadest sense, it means that everything cultural is social. Culture is both a product of social life and of the social activity of man and for this reason, the very formulation of the problem of cultural development of behavior already leads us directly to the social plane of development. Further, we could indicate the fact that the sign found outside the organism, like a tool, is separated from the individual and serves essentially as a social organ or social means.

Going further, we might say that all higher functions were formed not in biology, not in the history of pure phylogenesis, but that the mechanism itself that is the basis of higher mental functions is a copy from the social. All higher mental functions are the essence of internalized relations of a social order, a basis for the social structure of the individual. Their composition, genetic structure, method of action—in a word, their entire nature—is social; even in being transformed into mental processes, they remain quasisocial. Man as an individual maintains the functions of socializing.

Changing the well-known thesis of Marx, we could say that the mental nature of man represents the totality of social relations internalized and made into functions of the individual and forms of his structure. We do not want to say that this is specifically the meaning of the thesis of Marx, but we see in this thesis the most complete expression of everything to which our history of cultural development leads.

In connection with the ideas expressed here, which in a summarized form present the basic patterns we have observed in the history of cultural development and which are directly connected with the problem of children's groups, we have seen that higher mental functions, for example, the function of the word, were formerly separated and distributed among people and then became functions of the individual himself. In behavior, understood as individual behavior, it would have been impossible to expect anything similar. Formerly, psychologists attempted to derive social behavior from individual behavior. They studied individual reactions observed in a laboratory, and then, in a group, they studied how the reaction of the individual changes in a group situation.

Formulating the problem in this way is, of course, completely legitimate, but it involves a genetically secondary stratum in the development of behavior. The first task of analysis is to show how individual reaction develops from forms of group life. In contrast to Piaget, we believe that development proceeds not toward socialization, but toward converting social relations into mental functions. For this

reason, all of the psychology of the group in child development is presented in a completely new light. The usual question is how does one child or another behave in a group. We ask how does the group create higher mental functions in one child or another.

Formerly, it was assumed that the function exists in the individual in a ready, semi-ready, or rudimentary form and in the group it unfolds, becomes complex, advances, is enriched, or, conversely, is inhibited, suppressed, etc. At present, we have a basis for assuming that in relation to higher mental functions, the matter must be presented as being quite the opposite. Functions initially are formed in the group in the form of relations of the children, then they become mental functions of the individual. Specifically, formerly it was thought that every child was capable of reflection, reaching conclusions, proving, finding bases for whatever position. From the collision of such reflections, argument was generated. But the matter is actually something else. Studies show that reflection is generated from argument. The study of all other mental functions brings us to the same conclusion.

In considering the formulation of our problem and the development of the research method, we have already had the opportunity to elucidate the great significance of the comparative method of studying the normal and abnormal child for all of the history of cultural development. We have seen that this is a basic device of research which contemporary genetic psychology has available and which makes it possible to compare the convergence of the natural and cultural lines in the development of the normal child with the divergence of these same two lines in the development of the abnormal child. We will consider in somewhat greater detail the significance of the basic positions we have found relative to the analysis, structure, and genesis of cultural forms of behavior for the psychology of the abnormal child.

We will begin from the basic position that we have established in analyzing higher mental functions which consists of recognizing the natural basis for cultural forms of behavior. Culture creates nothing, it only modifies natural data to conform to the goals of man. For this reason, it is completely natural that the history of cultural development of the abnormal child would be permeated with influences of the child's basic defect or inadequacy. His natural resources, those possible elementary processes from which higher cultural devices of behavior must be constructed, are insignificant and poor, and for this reason the possibility itself of the rise and adequately complete development of higher forms of behavior frequently seems closed for this child specifically because of the poverty of the material which is the basis of other cultural forms of behavior.

The indicated feature is noted in children with general retardation in development, that is, in retarded children. As we recall, at the base of cultural forms of behavior, there is a certain detour that consists of simpler, elementary connections. This purely associative understory of higher forms of behavior, a foundation on which they arise, a background from which they are nourished, is weakened in a retarded child from the very beginning.

Another point that we found in analysis now introduces a substantial addition to what we have said, specifically: in the process of cultural development, there is a replacement of some functions in the child by others, a construction of detours, and this opens before us completely new possibilities in the development of the abnormal child. If such a child cannot attain something directly, then the development of detours becomes the basis for compensation. The child begins to attain in roundabout ways what he could not attain directly. Replacement of functions is actually the basis of all cultural development of the abnormal child, and therapeutic

pedagogics is full of examples of such detours and such compensating instances of cultural development.

A third position that we mentioned above states: the basis of the structure of cultural forms of behavior is made up of mediated activity, the use of external signs as a means for further development of behavior. Thus, isolating a function and using a sign have especially important significance in all of cultural development. Observations of the abnormal child show that where these functions are preserved in an undamaged form, we actually have more or less favorable compensatory development of the child; where they are inhibited or damaged, the cultural development of the child suffers also. On the basis of his experiments, W. Eliasberg developed the general idea that the use of auxiliary means may serve as a reliable criterion for differential diagnosis that makes it possible to differentiate between insanity and any forms of weakening, underdevelopment, disruption, and retardation of intellectual activity. The ability to use signs as auxiliary means of behavior is lost, evidently, only with the onset of insanity.

Finally, the fourth and final position we found discloses a new perspective in the history of cultural development of the abnormal child. We have in mind what we termed higher mastery of one's own behavior. As applied to the abnormal child, we can say that it is necessary to distinguish degrees of development of one function or another and the degree of development of mastery of this function. Everyone knows what a great disproportion there is in the development of higher and lower functions in the retarded child. For mild retardation, such a general, regular decrease of all functions is not as characteristic as underdevelopment of specifically higher functions with a relatively favorable development of the elementary functions. For this reason, we must study not only what memory the retarded child has, but also how and to what extent he is able to use his memory. Underdevelopment of the retarded child also consists primarily in underdevelopment of higher forms of behavior, in an inability to master his own processes of behavior, and in an inability to use them.

To a certain degree, we are returning from another direction to the idea advanced by E. Seguin[72] for whom the essence of idiocy appeared to be underdevelopment of the will. If we understand will in the sense of mastery of oneself, we would be inclined to share his opinion and maintain that specifically in the defect of mastery of one's own behavior lies the main source of all underdevelopment of the retarded child. J. Lindworsky expressed the same idea in a somewhat paradoxical form when he attempted to reduce the basis of intellectual activity to perception of relations and maintained that in this sense intellect as a function of perception of relations is as inherent in the idiot as it is in Goethe and that the enormous difference between the one and the other consists not in the act indicated, but in other, higher mental processes.

From this, we can form a basic conclusion, with which we will conclude our remarks on the uniqueness of cultural development of the abnormal child. We can say that a secondary complication of retardation is always, first, primitivism as general cultural underdevelopment that is based on organic underdevelopment of the brain, and, second, certain volitional underdevelopment, an arrest at an infantile stage of self mastery and of processes of one's own behavior. Finally, only in the third and last place we must list the basic complication of retardation, the general underdevelopment of the child's personality.

Now we shall consider certain concrete problems of development of higher mental functions, the consideration of which will enable us to approach more closely the basic data of child and pedagogical psychology.

Is the concept of development applicable in general to those changes of which we are speaking? As development, we of course have in mind a very complex process formed by a series of characteristics.

The first characteristic consists of the fact that with any change, the substrate underlying a developing phenomenon remains the same. The second immediate characteristic consists of the fact that any change here is of an internal character to a certain degree; we do not term as development any change that is not at all connected with any internal process occurring in the organism or in the form of activity that we are studying. Unity and constancy of the whole process of development, internal connection between the stage of development passed and the subsequent change—this is the second basic characteristic that enters into the concept of development.

It must be said that from this point of view, the cultural experience of the child as an act of development has been disregarded for a very long time in child psychology. It was usually said that what could be called development is what comes from within; what comes from outside is training and education because in nature, no child exists who would naturally mature in his arithmetical functions, but as soon as the child reaches, let us say, school age or somewhat earlier, he grasps externally from the people around him a whole series of arithmetical concepts and subsequent operations. Thus, we can scarcely say that acquiring addition and subtraction at eight years, and multiplication and division at nine years is the natural result of the child's development; these are only external changes that come from the environment and are by no means a process of internal development.

However, a deeper study of how a child's cultural experience accumulates showed that in this case we have at hand a series of most important prerequisite characteristics if the concept of development is to be applied to certain changes.

The first characteristic consists in that every new form of cultural experience is not simply external, regardless of the state of the organism at a given moment of development, but the organism, assimilating external influences, assimilates a whole series of forms of behavior, and assimilates them depending on the degree of his mental development. Something occurs that resembles what is called nourishment with respect to body growth, that is, assimilation of certain external substances, external material, that is processed and assimilated into the organism itself.

Let us imagine that the child not knowing the cultural forms of arithmetic finds himself in school and begins to study the four functions. The question is, is it possible to demonstrate that acquiring the four functions occurs as a process of development, that is, that it is determined by the presence of knowledge of arithmetic with which the child entered school? It proves to be that the matter is exactly so, and this forms a basis for teaching arithmetic to children of a certain age and not at certain stages of education. This can be explained by the fact that at age seven or eight, it becomes possible for the first time to assimilate this kind of operation because a development of knowledge about arithmetic has occurred in the child. Considering children of grades one to three, we find that in the course of two to three years, the children basically still exhibit traces of preschool, natural arithmetic with which they entered school.

In the same way, it would seem that when a child acquires other operations in school through purely external ways, the acquisition of any new operation is the result of the process of development. We will try to show this at the end of the chapter when we will analyze concepts of assimilation, invention, and imitation, that is, all methods that are used for acquiring new forms of behavior. We will try to show that even where the form of behavior is acquired through pure imitation,

the possibility is not excluded that it appeared as a result of development and not just by imitation.

In order to be convinced of this, it is enough to show experimentally that every new form of behavior, even one assimilated from outside, has different specific qualities. Naturally, it is built on what has gone before; it cannot be otherwise than on the basis of what has gone before. If someone could demonstrate experimentally the possibility of mastering some cultural operation immediately in its most developed form, then we would have proof that here we are speaking not of development but of external acquisition, that is, of some change due to purely external influences. But experiment teaches us the opposite, that every external action is the result of an internal genetic pattern. On the basis of experiments, we can say that a cultured child, even a wunderkind, cannot master at once the last stage in the development of an operation before he goes through the first and second stages. In other words, the very introduction of a new cultural operation is divided into a series of links, into a series of stages, internally connected with each other and succeeding each other.

Since experiment demonstrates this for us, we have every basis for applying the concept of development to the process of accumulation of internal experience, and this is the essence of the second characteristic of which we spoke.

But it is self-evident that the development we have been considering is of a type completely different from the development that is studied in the development of elementary functions of the child. This is a most substantial difference and it is very important to note it because in this case it is also one of the basic characteristics.

We know that in the basic forms of human adaptation, the struggle of man with nature, the zoological type of development differs substantially from the historical. In the first, there are anatomical changes in the organism and biological development occurs on the basis of organic changes in structure, while in human history, intensive development of forms of adaptation of man to nature occurs without such substantial organic changes.

Finally, we must point out that the connection between natural development, the behavior of the child based on maturing of his organic apparatus, and the kinds of development we are considering is a connection that is not evolutionary, but revolutionary: development does not occur by gradual, slow changes and accumulation of small changes that, as a totality, finally cause a substantial change. Here, in the very beginning, we observe development of a revolutionary type, in other words, sharp and basic changes in the type of development itself, the driving forces of the process themselves; it is well known that it is this kind of characteristic that would exclude the possibility of applying the concept of development to this process.

Now we will proceed directly to consideration of such instances of change in the type of development.

We know very well that in contemporary child psychology, two theories of genesis are more or less generally accepted: one differentiates two basic stages in the development of behavior; the other differentiates three. The first is inclined to indicate that all behavior in development goes through two basic stages: the stage of instinct or the stage that has been called the unconditioned reflex stage, a hereditary or innate function of behavior, and the stage of acquisition of reactions based on personal experience, or conditioned reflexes, the stage of dressage as applied to animals.

The other theory is inclined to divide the stage of reactions acquired by personal experience still further and differentiate between the stage of conditioned reflexes or habits and the stage of intellectual reactions.

How does the third stage differ from the second?

Very briefly we might say that the essential difference is, on the one hand, in the method by which the reactions arise, and on the other hand, in the character of the function, that is, the biological function of the reaction, in contrast to habit, that arises as a result of trial and error or as a result of stimuli acting in one direction. In intellectual reactions, a response arises as an expression of a certain image obtained, obviously, as a result of a kind of short circuit, that is, of a complex internal process formed on the basis of excitation of a series of cooperating centers, which creates a new path. Consequently, we are speaking of a reaction of an explosive type, exceptionally complex in the nature of its arising, the mechanisms of which are thus far unknown since our knowledge of brain processes is still at the beginning stage of development.

If the function of the instinctive reaction differs from the function of habit, then the latter differs from the intellectual function. Of course, if the biological function of habit is adaptation to individual conditions of existence that are more or less clear and simple, then the function of intellectual behavior is adaptation to changing conditions of the environment and to changing circumstances under new conditions. An argument has developed among psychologists specifically on this ground: authors who reject the consideration of intellect as a special level in nature say that it is only a special subclass within the same class as acquisition of habit. It seems to me that it is the responsibility of scientific caution that we speak here actually of only two classes of development in child behavior: inherited and acquired through experience, and within the latter—that acquired through experience—we will be able to establish not just two stages, but perhaps even more as our knowledge increases.

Consequently, it would be proper, it seems to us at the contemporary state of knowledge, to adopt the point of view of Thorndike, the American psychologist, who differentiates two stages: inherited and individual, or internal and acquired, and in behavior, he differentiates two stages or two groups of reaction: on the one hand, habits inherited for adaptation to more or less long-term conditions of individual existence, and on the other hand, a whole hierarchy of habits directed toward solving new problems that confront the organism, in other words, that order of reactions of which we have spoken.

In order to understand the connection between the levels of development that are of interest to us in child psychology, we must briefly take into account the kind of relation that exists among them. The relations are of a dialectical character.

Every subsequent stage in the development of behavior, on the one hand, negates the preceding stage, negates it in the sense that properties present in the first stage of behavior are removed, eliminated, and sometimes converted into an opposite, higher stage. For example, we will trace what occurs when a reflex is converted from an unconditioned reflex to a conditioned reflex. We see that a series of properties connected with its hereditary characteristics (stereotypical quality, etc.) is negated in the conditioned reflex because the conditioned reflex is a temporary, flexible formation exceptionally subject to extraneous stimuli and, in addition, inherent only in the given individual not by nature and not by heredity, but acquired due to conditions of the experiment. Thus, every subsequent stage affects the change or negation of properties of the preceding stage.

On the other hand, the preceding stage exists within the subsequent, which manifests, let us say, the stage of the conditioned reflex. Its properties are the same as those in the unconditioned reflex; it is the same instinct, but manifested and existing only in a different form and different expression.

Contemporary dynamic psychology strives to study the energy basis for various forms of behavior. For example, in a series of changes in forms of instinct, psychologists see the effect of development of child speech and its effect on behavior, which is, of course, of great interest to us with respect to the problem of will. We will return to this later. For us, the basic problem which psychologists pose is clear and understandable. For example, modern man goes to eat at a restaurant while an animal with the same innate instinct goes to hunt food needed for existence. The behavior of the animal is based wholly on an instinctive reaction, while in man, experiencing the same hunger, the method of behavior is based on completely different conditioned reactions. In the first case, we have a natural reflex where one reaction follows another, in the second case, a series of conditioned changes. However, if we look into the cultural behavior of the man, we see that the ultimate drive of this behavior, the energy basis, the stimulus, is the same instinct or the same material need of the organism that drives the animal, while instinct is not always needed in conditioned reflexes. In man, instinct exists in a cryptic form and behavior is of necessity connected with a changed series of properties of the instinct.

We have such a precisely dialectical relation of negation of a preceding stage while maintaining it in a cryptic form in the relation of the conditioned reflex and the intellectual reaction. In Thorndike's well-known example with arithmetic problems, it is essential that the child solving the problem uses no other reactions except those he acquired by habit or in a combination of habits directed toward solving a problem new to him. Thus, even here the intellectual reaction negates habits that are, as if, a cryptic reaction aimed at solving problems confronting the organism, and some properties of habits, are eliminated. However, at the same time, the intellectual reaction, it seems, is essentially reduced not to anything other than a system of habits, and this system or organization of systems is itself the proper matter for the intellect.

If we take into account this kind of sequence of stages in the natural development of behavior, then we must say something similar also with respect to the fourth stage of development of behavior in which we are presently interested. Perhaps we shall have to admit that the higher processes of behavior which we are about to discuss also belong to natural behavior in which every stage within this natural behavior has certain relations to the preceding stage: to a certain degree, it negates the stage of primitive behavior and contains natural behavior in a cryptic form as well.

As an example, we will use an operation such as remembering with the help of signs. We see that, on the one hand, remembering occurs here as it does not occur with ordinary remembering in the establishing of habits; remembering involving intellectual reaction has certain properties that are not present in the first case. But if we separate the process of remembering that depends on signs into component parts, we can easily see that in the final analysis this process contains in itself the same reactions that are also characteristic for natural remembering, but just in a new combination. The new combination is what comprises the basic subject of our studies in child psychology.

Of what do the basic changes consist? They consist in that at the higher stage of development, man begins to control his own behavior, subjects his own reactions to his own control. Just as he controls the actions of outside forces of nature, he also controls his own processes of behavior on the basis of the natural laws of behavior. Since the basis of natural laws of behavior are laws of stimuli–responses, a reaction cannot be controlled as long as the stimulus is not controlled. Consequently, a child controls his own behavior, but the key to this lies in controlling

the system of stimuli. The child controls arithmetic operations, having mastered the system of arithmetic stimuli.

Precisely in this way, the child masters all other forms of behavior, having mastered the stimuli, but the system of stimuli is a social force presented to the child from outside.

In order to make what has been said entirely clear, we will follow the stages that the child goes through in developing the operation of controlling his own behavior. We cite the experimental example which we used before in speaking of the selection reaction. It is appropriate to speak briefly here of how this reaction changes in the process of remembering and why we define the properties of development by these changes.

What does the development of the selection reaction consist of in the child? Let us say that five to eight stimuli are used in the study and the child is asked to respond to each stimulus with a different response, for example, to the color blue, he will respond with one finger, to red with another, to yellow, with a third. From data of the old experimental psychology, we know that the selection reaction in the child is established at the age of six. It has also been established that in an adult, the complex selection reaction is formed with significantly more difficulty, and special effort is required to select the responses corresponding to each stimulus from a large number of responses.

For example, if we ask the subject to react to red with his left hand and to blue with his right hand, the selection is established quickly and the reaction will be easier than if we present a selection of three or four or five or six colors. Analysis of old experiments, as we have noted before, leads psychologists to conclude that in the selection reaction, we do not actually select; a process of a different character occurs here which can be taken for selection only from external appearances. In reality, something else is occurring. A series of studies forms a basis for proposing that at the base of the selection reaction there is a very complex form of behavior, that we must differentiate between stimuli that appear without order and organized stimuli, that in these reactions there is a closure of conditioned connections, or, in the language of the old psychology, there is a fixing of the instruction. If we use mnemotechniques to remember the instruction, which is generally characteristic for memory, then we can facilitate establishing the correct selection of a reaction.

We proceed as follows: we give a six-year-old child, then a seven-year-old and an eight-year-old a number of stimuli, say, a number of pictures, and ask each child to react to each picture with a different movement, or to press a corresponding key or move a finger. We give the subject the chance to use external means to solve this internal operation and try to observe how the child behaves in such cases.

It is interesting that the child always does the proposed task and does not refuse to do it. He knows so little of his mental powers that the task does not seem impossible to him, in contrast to the adult who, as the experiment has demonstrated, always refuses and says, "No, I won't remember and I can't do this." And, actually, if the adult is given such instruction, he questions repeatedly, returns to a preceding color, seeks more precise information as to which color he should react and with which finger. A child, on the other hand, approaches the task, listens to the instruction, and tries at once to do it.

The experiment begins. Most often, children meet with difficulty almost immediately and 90% make mistakes. But even older children, having mastered one or two reactions with respect to the other stimuli, naively ask which finger they must use to press the key for which color. In the child, we take this early stage as an initial or primitive stage of development of the reaction.

It is clear to us why this is primitive, natural. It is common to all children, and in most cases, children behave exactly in this way in several reactions; it is primitive because the behavior of the child in this case is determined by his potential for direct imprinting, the natural state of his brain apparatus. And actually, if the child tries to master the selection reaction with ten stimuli, this can be explained by the fact that he does not yet know his limitations and operates with what is complex as he operates with what is simple. In other words, he tries to react to a complex structure with primitive means.

Subsequently, the experiment is set up as follows. Seeing that the child cannot cope with the task with primitive means, we modify the experiment to a certain degree, we introduce a second series of stimuli. This is a basic method that is usually used in studying cultural behavior of the child.

Besides the stimuli which were to elicit one selection reaction or another, we give the child a number of additional stimuli, for example, pictures pasted on the different keys, and suggest that the subject connect a given picture with a given key. For example, when the picture of a horse is presented, the key with the sleigh must be pressed. Having been instructed, the child sees that he must press the key with the "sleigh" when the "horse" picture is presented and the key with a drawing of a knife in response to "bread." Here the reaction goes well; it has already gone beyond the primitive stage because the child's reaction does not depend on just primitive conditions; suddenly the rule for solving the problem dawns on him and he makes a selection with the help of a generalized reaction. In selecting from ten stimuli, the properties of the reaction change correspondingly. Here the rule of increasing duration of study depending on the number of stimuli no longer holds; it is all the same whether four or eight, five or ten stimuli are presented, the quality of the reaction to the stimuli does not change.

But it would be a mistake to think that the child completely mastered the given form of behavior. One has only to take the same pictures and rearrange them and it is as if there were no such connection. If instead of the key marked "sleigh," there was a key marked "knife," and if the child were told to press the "knife" key in response to the "horse" picture, the child would at first not notice that the auxiliary pictures had been switched. If we ask if he can remember, the child without any doubt answers that he can.

He listens to the instruction, but when we actually change the position of the pictures, the child cannot produce the correct selection reaction. This stage occurs differently in different children, but basically, the behavior of all children consists of their dealing with the pictures without understanding how the picture works although they remember that somehow the "horse" helped find the "sleigh." Frequently, the child considers the internal complex connection purely externally; associatively he feels that it is evident that the picture must help him make a selection, although he cannot explain the internal connection that is the basis for this.

A simple example of this stage in the development of the child's operation is an experiment conducted with a small girl. The mother gives the child instruction similar to the instruction in a Binet test—to go to the next room and carry out three small operations. In giving the instruction, the mother repeats it several times or she says it only once. The girl notices that when the mother repeats it several times, the instruction is successful; the girl remembers and finally begins to understand that the mother must repeat the instruction several times. When the mother gives a new instruction, the girl says, "Say it once more," and not listening, runs off. The girl noted the connection between repetition and success in fulfilling the task, but she did not understand that the repetition alone did not help her, that

the repetition must be heard, clearly assimilated, and only then will it be easier to carry out the instruction.

Consequently, for this kind of operation, an external connection between the stimulus and the means, but not a psychological internal connection, is characteristic. It is interesting that similar phenomena observed in primitive man are frequently termed magical thinking. This arises on the basis of insufficient knowledge of the strict laws of nature and on the basis of the fact that primitive man assumes the connection between thoughts to be a connection between things.

The following is a typical sample of magic. In order to do serious harm to a person, primitive people practice witchcraft, try to get the person's hair or portrait and burn it, assuming that in this way the person will also be punished. Here the mechanistic connection between thoughts replaces the connection between objects. How do primitive people make it rain? They try to do this by magical ceremony. At first they begin to blow through their fingers in imitation of wind, then they arrange to have water fall on sand and if the sand gets wet, it signifies that such a ceremony will bring rain. The connection in thinking is converted into a material connection.

In a child in the stage of which we are speaking, an opposite phenomenon occurs—the connection between things is assumed to be a connection between thoughts, a connection between two pictures is assumed to be a mental connection. In other words, what occurs is not an authentic use of the given law, but its external, associative use. This stage can be termed the stage of naive psychology. The term "naive psychology" is used in analogy to the term "naive physics" introduced by O. Lipmann and H. Bogen, and by Köhler also. This term indicates that while some animals make a naive effort at practical use of tools, man makes an analogous naive effort relative to his mental operations. In both cases, the experience is naive because it is acquired through a direct, naive path. But since naive experience has limits, the naive physics of the monkey leads to a series of interesting phenomena. The monkey has somewhat little knowledge of the physical properties of his body, he constructs this naive physics on the basis of his optical experience and gets something like the well-known fact described by Köhler: if the monkey learned to get fruit using a stick and if he has no stick available, he grabs a straw and attempts to roll the fruit with the straw. How is such an error possible? Because optically, the straw resembles a stick and the monkey does not know the physical properties of a stick. The monkey deals with a shoe, with the brim of a straw hat, with a towel, with any object in precisely the same way.

Even more interesting are the inadequacies of naive physics that the monkey exhibits when he wants to get fruit that is high up: he tries to place a box on a corner or edgewise toward a wall and becomes furious when the box falls. Another monkey places the box on the wall at his own height and presses it in the hope that the box will stay there. The actions of the monkeys can be explained very simply from natural life in the forest where the animals acquire naive physical experience. The monkey can support itself on branches that extend from the trunk of the tree in exactly the same direction that he wants to attach the box to the wall. The erroneous attempts are the result of the monkey's inadequate knowledge of the physical properties of its own body and of other bodies.

This experiment transferred to children demonstrates that the young child's use of tools can also be explained by his naive physics, that is, by the fact that to the extent that the child acquires any experience, he is capable of using certain properties of things with which he has to deal and to work out a certain relation to them. Analogously, as a result of practical use of signs, experience with using them develops that is still naive psychological experience.

In order to understand that it is easier to remember after repetition, one must have certain experience in remembering. It has been observed in experiments how this remembering occurs, and it is understandable that it grows stronger with repetition. The child who understands the connections between repetition and remembering does not have enough psychological experience with respect to real conditions of how the real reaction occurs and uses this experience naively.

Can naive psychological experience be acquired? Undoubtedly it is acquired as naive physical experience is acquired owing to the fact that the child deals with objects, makes movements, masters some properties or others of objects, and learns how to deal with them. Precisely in this way, in the process of adaptation, the child remembers and carries out various instructions. Carrying them out, the child accumulates and acquires certain naive psychological experience and he begins to understand how one must remember, what remembering involves, and when he understands that, he begins to use one sign or another correctly.

In this way at the stage of magical use of signs, he uses them according to purely external similarity. But this stage lasts only a short time in the child. He is convinced that with the help of a certain distribution of the pictures, he will remember the selection reaction, but with a different distribution, he will not remember it. Thus, the child comes to the discovery of the unique character of his remembering and soon begins to say, "No, put that picture here." When he is told that for the "horse" picture, he must press the "bread" key, he says, "No, I'll press this key with the picture of the sleigh." So vaguely, but gradually, the child nevertheless begins to accumulate experience with respect to his own remembering.

Having naively mastered what the operation of remembering consists of, the child moves to the next stage. If we give him pictures in random order, he places them in the required order and establishes a certain connection; he no longer deals with signs externally, but knows that the presence of these signs will help him carry out a specific operation, that is, remembering by using the signs.

Very soon, the child, using the already prepared connection and having established the connection in previous experience (horse–sleigh or bread–knife), will begin to create a connection himself. Now the child no longer has difficulty in making and remembering similar connections. In other words, the next stage is characterized by the fact that the child, using a connection which we have given him, makes a transition to creating a new connection. This stage may be termed the stage of using external signs. It is characterized by the fact that in using signs in an internal operation, new connections begin to be formed in the child independently. And this is the most important thing that we wanted to say. The child organizes stimuli in order to carry out his reaction.

At this stage, we see clearly the manifestation of basic genetic laws according to which the child's behavior is organized. It consists of a reaction that the child wants to direct along a certain path. Here he organizes the stimuli that are external and uses them for carrying out the task given him. This stage lasts a short time before the child passes to the next form of organizing his activity.

After the subject goes through the same experiment several times, the researcher begins to observe a decrease in reaction time: if the reaction took 0.5 second or more before, it now takes only 0.2 second; this means that the reaction has accelerated by a factor of 2.5. The most important change is that in the internal operation of remembering, the child uses external means; wanting to master his reaction, he masters the stimuli; but then the child gradually eliminates the external stimuli that he has before him and no longer pays attention to them. Carrying out the selection reaction, the child operates as he operated earlier, but without the series of stimuli. The difference is that the external reaction turns into an internal

reaction; the reaction that was earlier impossible when a large number of stimuli were present now becomes possible.

Let us imagine what has happened: every external operation has, as they say, its internal representation. What does this mean? We make a certain movement, present certain stimuli, one stimulus here, another there. A certain internal brain process corresponds to this; as a result of a number of such experiences with the transition from an external to an internal operation, all intermediate stimuli become needed less and less and the operation begins to be carried out without mediating stimuli. In other words, what happens is what we conditionally call a process of revolution. If the external operation became internal, then it grew inward or made a transition from external to internal.

On the basis of these experiments, we are able to note three basic types of such revolution, that is, transition of an operation from outside inward. We shall list these types and try to show to what extent our results are typical for the cultured child in general and specifically for the arithmetical development of the child and for his speech and memory development.

The first type of revolution, or passage of an external operation inward, is what we conditionally term revolution of the seam type. We know that there is a revolution of living tissue. We take two ends of torn tissue and at first stitch it together with thread. Because of this, the two ends of tissue unite and they become spliced. Then the thread, preliminarily introduced, can be withdrawn and instead of an artificial connection, there is a union without a seam.

When the child combines his stimuli with a reaction, at first he combines a given stimulus with a reaction by means of a seam. In order to remember that the "horse" picture corresponds to the "sleigh" key, the child brings forward an intermediate member between the key and the picture, specifically, the "sleigh" picture; this is the seam that splices the given stimulus and the reaction. Gradually the seam disappears and a direct connection is formed between the stimulus and the reaction. If the seam is eliminated, then, of course, the reaction accelerates and an operation that required 0.5 second now requires only 0.15 second because the path from the stimulus to the reaction is shorter. The operation is converted from a mediated to a direct operation.

The second type of revolution is revolution of the whole. Let us imagine that the child reacts many times to one and the same picture with the help of pictures of identical things which he understands. If the child reacted 30 times in the same way, then, of course, we could say that the child will remember that for a given picture ("horse") he must press the "sleigh" key, in other words, he transfers the whole series of external stimuli inward as a whole. This is a transition inward of a whole series; here the transition of the operation inward consists in that the difference between external and internal stimuli is smoothed over.

Finally, the third and most important type of transition of an operation from external to internal is one in which the child assimilates the structure itself of the process, assimilates the rules for using external signs, and since he has more internal stimuli and can deal with them more easily than with external stimuli, then, as a result of assimilating the structure itself, the child soon makes the transition to using the structure as an internal operation. The child says: "I don't need the pictures anymore, I can do it myself," and in this way, he begins to use verbal stimuli.

Let us trace this stage using the example of the development of such an important area of knowledge of the child as the knowledge of arithmetic.

At the natural or primitive stage, the child solves a problem by direct means. After solving very simple problems, he moves on to the stage of using signs without

realizing the method of their action. Then comes the stage of using external signs and, finally, the stage of internal signs.

All arithmetical development of the child must first of all have a natural or primitive stage as a departure point. Can a three-year-old child tell by looking if a group of three apples or a group of seven apples is larger? He can. But, if asked about a more complex differentiation, can a child correctly tell which group contains 16 and which contains 19 apples? No, he cannot. In other words, at first we will see a natural stage defined by purely natural laws when he compares the numbers simply by sight. We know, however, that the child soon and completely unnoticeably, passes from this stage to another, and when he needs to recognize where there are more objects, then, like most children in cultured circumstances, he begins to count. Sometimes children do this even before they understand what counting is. They count: one, two, three, . . . , a whole series, although they do not yet know real counting.

Testing to see if many children begin to count before they understand what counting is, researchers (for example, Stern) observed children who knew how to count, but did not understand what counting was. If such a child is asked, "How many fingers does your hand have?" he counts them in order and says, "Five." And if he is told, "How many do I have? Count them!" the child answers, "No, I don't know how." This means that the child knows how to apply the series of numbers only to his own fingers but cannot count them on someone else's hand.

Another of Stern's examples. The child counts fingers: "One, two, three, four, five." When he is asked, "How many all together?" he answers, "Six." "Why six?" "Because this is the fifth, and in all, there are six." The child has no clear notion of a total. In other words, the child purely externally, "magically" assimilates a certain operation, not yet knowing its internal relations.

Finally, the child makes the transition to real counting; he begins to understand what it means to count his fingers; but nevertheless, he still counts using external signs. At this stage, the child counts mainly on his fingers and if he is presented with a problem such as "Here are seven apples. Take away two. How many will be left?" To solve the problem, he moves from the apples to his fingers. In this case, the fingers play the role of signs. He puts out seven fingers, then subtracts two, leaving five. In other words, the child solves the problem with the help of external signs. If the child is forbidden to move his hands, he cannot carry out the required operation.

But we know quite well that the child very quickly moves from counting on his fingers to counting in his head; an older child, if he is asked to subtract two from seven, no longer counts on his fingers, but in his head. Here, the child exhibits two basic types of revolution of which we spoke. In one case, counting in his head is a revolution of the whole, and the child turns a whole external series inward (for example, counting for himself: "One, two, three," etc.). In the other case, he manifests revolution of the seam type. This occurs if the child practices and then gives the answer. Finally, he will not need an intermediate operation, but will give the answer directly. This is what happens with any counting when all the intermediate operations are eliminated and the stimulus elicits the required result directly.

Another example involves the development of speech in the child. At first the child is at the stage of natural, primitive, or actually the prespeech stage: he cries, makes identical sounds in different situations; this is a purely external action. At this stage, when he needs something, he resorts to natural means, depending on direct or conditioned reflexes. Then follows the stage when the child discovers basic external rules or an external structure of speech; he notices that there is a word for every thing, that the given word is the conditional designation of the thing. For

a long time, the child considers the word as one of the properties of the thing. Research with older children showed that the relation toward words as toward natural features of things lasts a long time.

There is an interesting philological anecdote that demonstrates the relation toward language in people with little culture. There is a story in a book by Fedorchenko about a soldier talking with a German and discussing which language is best and most correct. The Russian argues that Russian is best: "Take, for example, *nozh*; in German it's *Messer*, in French, *couteau*, and in English, *knife*, but, you know, that it is actually a *nozh*; this means that our word is the most correct." In other words, it is assumed that the name of the thing is an expression of its true essence.

Another example presented by Stern involving a bilingual child reflects the same situation: when the child is asked which language is correct, he says that it will be correct in German because *Wasser* is specifically what one can drink, and not what the French call *l'eau*. Thus, we see that the child has made a connection between the name of a thing and the thing itself. Children consider a name as one of the properties of things together with its other properties. In other words, the external connection of stimuli or the connection of things is assumed to be the psychological connection.

We know that in primitive people, there is a magical attitude toward words. Thus, in peoples developing under the influence of religion, for example, the Jews, there are words that must not be said, and if one must speak of something, let us say, of a dead person, then one must add the words, "May this not spread to your house." One must not name the devil because if he is named, he will appear. The same thing applies to words defining "shameful" objects; the words acquire a nuance of these shameful objects, and it is shameful to say them. In other words, this is a remnant of transferring to conditional signs properties of the things that these signs signify.

The child passes very quickly from the stage of regarding words as qualitative properties of a thing to conditional signification of words, that is, he uses words as signs, particularly at the stage of egocentric speech of which we have already spoken. Here the child, in a discussion with himself, notes the most important operations that he must carry out. Finally, from the stage of egocentric speech, the child passes to the last stage, to the stage of internal speech in the true sense of the word.

Thus, in the development of speech in the child, we see the same stages: the natural, or magical, stage at which he relates to a word as if it were a property of a thing, then the external stage, and finally, internal speech. The last stage is authentic thinking.

Each of these examples could be discussed separately. However, after all that has been said, we may assume that the basic stages appear in forming memory, will, arithmetical knowledge, and speech—the same stages of which we spoke and through which all higher mental functions of the child pass in their development.

Chapter 6
THE DEVELOPMENT OF SPEECH

The development of speech is probably the most convenient phenomenon for tracing the mechanism of the formation of behavior and comparing the approach to this development, typical for studying conditioned reflexes, with the psychological approach to it. First of all, the development of speech presents a history of the formation of one of the most important functions of cultural behavior of the child which lies at the base of his accumulating cultural experience. Precisely because this subject has such a central, essential significance, we use it to begin a consideration of concrete aspects of the development of child behavior.

The first steps of the development of speech are accomplished exactly as the theory of the conditioned reflex indicates with respect to the development of any new form of behavior.

On the one hand, a basis for a child's speech is innate reaction, hereditary reflex, which we term unconditioned. It is the base for subsequent development of absolutely all conditioned reflexes. The reflex of a cry, a vocal reaction of the child, is this kind of unconditioned reflex, this kind of hereditary base from which the speech of the adult human develops. We know that it can be observed even in a newborn.

At the present state of our knowledge of unconditioned reflexes, it is difficult to say how many innate reactions there are besides the cry reflex, but recent work indicates that there is no doubt that the vocal reactions of the newborn involve not just one reflex, but perhaps a series of closely connected unconditioned reflexes. However, in the first weeks of life, a modification occurs that is proper to every conditioned reflex. Repeated in certain situations, combined in these situations with conditioned stimuli and entering into the composition of these situations, vocal reactions of the child very early, even in the first weeks of life, begin to be converted into conditioned vocal reflexes. They are elicited not only by various unconditioned internal stimuli, but also by conditioned stimuli that are linked to various innate reactions of the child.

C. Bühler,[73] having first set a goal of recording the development of speech monographically step by step, observed more than 40 children systematically and demonstrated all stages of the development of speech in its sequence. The researcher demonstrated specifically that, linked with the appearance of vocal reaction, reactions of social contact established with the help of speech are exhibited by the child.

If we were to specify in detail how a child's vocal reaction develops, we would see that he is inclined to repeat the way that has been experimentally established in laboratory studies of the formation of the conditioned reflex. Initially, the conditioned reaction is in a generalized stage that appears as a response not just to any specific signal, but also to a number of signals that are somewhat complex and

have something in common with the given signal. Later, the reaction begins to be differentiated. This happens if one of the signals occurs more frequently than another in the given situation. In due course, the reaction begins to occur only in response to the selected stimulus.

One example of such a generalized reaction is the appearance of a vocal reaction by a child at the sight of his mother or the wet-nurse. At first, the vocal reaction appears at the sight of any person, then it becomes differentiated and appears only at the sight of the mother or her outfit for feeding. For example, C. Bühler was able to observe the vocal reaction of a child if anyone else put on the dressing gown that the mother usually wore for the feeding.

Another very important point about the vocal reaction of the very young child is the following: this reaction does not develop in isolation, but always is an organic part of a whole group of reactions. A child never develops only a single vocal reaction, but always there is a series of movements within which the vocal reaction is only one part or one element. Even here the development proceeds along the path that is well known from studies of conditioned reflexes.

Since the vocal reaction is connected with certain external impressions, from the unorganized whole of which it is a part, an independent vocal reaction gradually develops. In the first years of the child's life, its development proceeds as follows: a differentiated vocal reaction is isolated from a multitude of unorganized movements of which the vocal reaction is a part. Specifically, this reaction begins to acquire a central significance. Some of the movements are eliminated and what remains is only the mimicry of the face, shoulders, and hands directly related to the vocal reaction. Finally, the vocal reaction begins to appear only against a background of the remaining reactions and is precisely isolated from a series of other reactions.

It is important to note the uniqueness of the role that the vocal reaction plays in the first six months of the child's life. Physiology and psychology, however, agree that we can ascribe two basic functions to the vocal reaction which have a clear physiological basis nevertheless. The first function consists of what the old psychologists called expressive movement. This is an unconditioned, instinctive reaction that arises as an external expression of emotional states of the organism. Thus, the child in pain gives a reflexive cry but with dissatisfaction he gives a different kind of cry. If we were to answer the question in the language of psychology as to what the expressive movement represents, we would have to say that the vocal reaction is a symptom of a general emotional reaction that expresses the presence or disturbance of the child's equilibrium with the environment. Who does not know from simple observation that a hungry child does not cry in the same way as a satisfied child? A change occurs of the whole state of the organism and this causes a change in the emotional reactions; the vocal reaction also changes in this case.

This indicates that the first function of the vocal reaction is emotional.

The second function, which appears only when the vocal reaction becomes a conditioned reflex, is the function of social contact. At one month, a special, that is, a trained vocal conditioned reflex appears as a response to vocal reaction originating from the people around the child. The trained vocal conditioned reflex together with the emotional reaction, or in place of it, begins to fill the same role with respect to expressing the organic state of the child as it does with respect to his social contact with the people around him. The child's voice becomes his speech or tool substituting for speech in its most elementary forms.

Thus, we see that in prehistory, that is, during the first year of life, children's speech is based wholly on a system of unconditioned reactions, predominantly instinctive and emotional, from which a more or less independent conditional vocal

reaction is developed by differentiation. Due to this, there is a change in the function itself of the reaction: if before, the function was a part of a general organic and emotional reaction exhibited by the child, now it begins to fulfill the function of social contact.

However, the vocal reactions of the child are still not speech in the full sense of the word. Here we approach the manifestation of articulated speech, the most difficult instance for correct understanding of the development of children's speech, that is, its cultural development. Let us remember that we spoke in the beginning of the difference between the physiological and psychological points of view of one and the same process.

In order to approach this instance in the development of speech, we must add one essential provision: we see that the vocal reaction of the child develops at the very beginning completely independently from thinking. Least of all can we ascribe to the 18-month-old child full-fledged, formed consciousness or thought. If the child cries, least of all can we assume that he already knows from experience what the connection is between the cry and subsequent actions of those around him and that his cry can be compared with our purposeful actions or communication when we speak to affect someone.

Thus, there is no doubt that the first phase in the development of children's speech is not related at all to the development of children's thinking; it is not connected with the development of the intellectual processes in the child. Actually, in observations of idiots and retarded children, we see that idiots also pass through this stage of development. Edinger succeeded in observing the vocal reactions of a child born without the cerebrum.[74]

As research has shown, speech is not alone in an initial development independent of thinking; thinking develops independently of speech as well. Köhler and other psychologists set up experiments with a monkey and with children. When the researchers placed the child in a situation in which the monkey used very simple tools and simple ways of getting an object, the child age 9-11 months exhibited simple reactions similar to those of the monkey. Like the monkey, children use a string or a stick, use various objects to move an object, and use indirect ways with their arms and with objects. In other words, at this age, the child exhibits simple reactions regardless of his speech capability.

As we have said, K. Bühler calls the age from 9 to 12 months the chimpanzee-like age, wanting to indicate that at this age, the child exhibits the first use of tools that can be observed with a chimpanzee.

In this way, we come to two points. On the one hand, speech development occurs at first independently of the development of thinking, and at the first stages, it occurs more or less similarly in both the severely retarded and in children with a normal brain. The character of speech development in the first period wholly confirms the picture we have of the formation of the conditioned reflex, passing through all the corresponding stages. This indicates that all the first forms of speech appear independently of thinking. On the other hand, at 9-12 months of age, the child exhibits simple use of tools which develops when speech has not yet taken shape. The impression is that thinking develops along its own path and speech along its own. This is a very important point that can be formulated relative to the development of speech at an early age.

At a certain point, these lines—the development of speech and the development of thinking—which proceeded along different paths, seem to cross or meet, and an intersection of the two lines of development occurs here. Speech becomes intellectual, connected with thinking, thinking becomes verbal and connected with

speech. An elucidation of this central instance on which all future fate of the cultural behavior of the child depends is the basic task of the next chapter.

But first, we will present certain cursory observations apropos to this. The first theory for explaining the features of the development of thinking and speech were proposed by W. Stern, who presented a valuable monograph on the development of children's speech. Stern maintains that at a certain age (presumably at the age of one and a half to two years), thinking and speech meet. In other words, there is a break after which the development of both begins to follow a completely new line. Stern calls this moment the greatest discovery that the child makes in the course of his whole life. In the words of Stern, the child discovers that every thing has a name, that for every object there is a corresponding word that signifies the given object.

How does Stern know that a child age one and a half to two years makes such a discovery? Stern establishes this on the basis of three basic objective symptoms.

The first symptom. The child in whom the break connected with an intersection of the lines of thinking and speech has occurred begins to enlarge his vocabulary by leaps. If the vocabulary of the first stages is limited to one or two dozen words, now it begins to grow and sometimes in the course of two or three months, increases eightfold. The first sign is the burgeoning increase in vocabulary.

The second symptom. The child exhibits the so-called period of first questions: the child in seeing some object asks in one form or another what it is called, or what it is. The child behaves as if he knows that the thing must have a name although adults have not called the object by name.

The third symptom is connected with the first two and is a radical change that is characteristic for human speech but is absent in animals. This change gave Stern a new reason to assume that a decisive transition takes place here from the conditioned reflex form in the development of speech to other forms. It is well known that animals are also capable of acquiring words of human speech, but there are definite limits to their acquisitions. Animals acquire as many words as people around them teach them. Never has any animal used any word except those that people taught them and never has an animal named an object that the people present did not name. Thus, the method that animals and small children use for acquiring words represents a passive extension of vocabulary. A child's use of a new word occurs as a conditioned reflex: when the child hears a word spoken by the people around him, he must connect it with an object and only then does he pronounce it. If one counts the number of words acquired by a small child, one can see that he acquires as many words as the people around him use. At one and a half to two years of age, a decisive break occurs: the child himself asks what an object is called and himself seeks words he does not know and begins actively to extend his vocabulary.

Thus we have three points: (1) a burgeoning increase in vocabulary; (2) the period of the child's questions (the appearance of the question, "What do you call this?"); and (3) the transition to an active extension of the child's vocabulary. The third point places a boundary between the stages of psychological development of the child; according to the third point, we might say that a break in the development of the given child occurred or it did not.

How can we interpret these three points? What is happening with speech here, what specifically is manifested in the third symptom?

W. Stern, who first established these points, develops the following theory: the child behaves as if he understands that every thing has its own name. With respect to his language, the child behaves as we behave with respect to a foreign language. Let us imagine that we find ourselves in a foreign country and know a few words.

Seeing a new object, without fail, we ask: "What is this called? What is it?" Stern assumes that the child actually makes a discovery or an invention and that this discovery in a retarded child occurs later and in idiots, it does not occur at all.

Thus, Stern classifies this discovery as a development of thinking in the child and hypothesizes that in this case, this is something other than a simple conditioned reflex. As he says, what is taking place is a consciousness of the connection and of the relation between the sign and its meaning. In his opinion, the child discovers the meaning of the sign. This interpretation is based on the external phenotypic similarity of the objects. The child behaves as if he had discovered the meaning of the object; the assumption that this is actually a discovery is based on this. But on the basis of a correct genotypic study we know that the phenotypic similarity of any processes or phenomena having the same appearance does not yet mean that they are the same. A whale is similar to a fish, but research has established that the whale is a mammal. Something of the same sort occurs with the child's so-called discovery.

Most of all, it is improbable that a child of one and a half to two years, when his thinking is at an extremely primitive stage, is capable of making a discovery that requires colossal intellectual effort. For this reason, it is doubtful that a small child would have the complex psychological experience that would enable him to understand the relation between the sign and its meaning. As experiments have shown, often even older children and adults over the course of all their lives never make this discovery; neither do they understand the conditioned meaning of words nor the relation between the sign and its meaning.

K. Bühler, who studied deaf-mute children, found that they make this discovery later, at the age of six. Subsequent research showed that in deaf-mute children who learn to speak, the discovery occurs less dramatically than Stern assumes. Here the matter is less that the child "discovers" something but is a matter of the question of what language really is. Something much more complex takes place here.

The French researcher, H. Wallon,[75] who studied the initial period of a child's development, also considered it improbable that a child should make such a "discovery," because subsequent development of children's words is completely of the conditioned reflex type.

A simple example: Darwin's grandson calls a duck, "quack"; he then extends "quack" to all birds. Later this word is extended to liquid since a duck swims in water; and the child even calls milk and medicine "quack." It develops that milk and the fowl have the same name while initially it belonged only to the duck swimming in the water. Further, the child sees a coin which bears the image of an eagle and the coin is also given the designation "quack."

Thus, we often have a long chain consisting of many changes in which words transfer from one conditioned stimulus to a conditioned stimulus of a completely different order. Such an extension of meaning factually refutes Stern's position. If a child had discovered that every object has a name and guessed that milk has its own name, and water, its own, then it would be impossible that a coin, a metallic button, and a fowl would be named with the same word since these objects play functionally different roles for the child.

These data show that Stern's hypothesis is improbable. We must not say that in his hypothesis, based on development of children's speech from the generally idealistic tradition, Stern wants to emphasize the more active role the inner source plays in the child's consciousness. According to Stern's expression, together with the material and social roots of speech, he also wants to confirm its inner aspect. This is the source of the hypothesis that the child "invents" something. But such explorations by a child beginning to make sounds seem improbable. All experiments

on memory connected with the first manifestations of language and conducted with children age one and a half to two years show how unlikely this kind of discovery is at such an early age.

So Stern's hypothesis collapses. Another hypothesis remains: the child does not discover the meaning of words, at a crucial moment he does not make those active explorations that Stern is inclined to see, but the child simply masters the external structure of the meaning of words, he masters the fact that each thing is named by its own word, he masters the structure that can unite the word and the thing in such a way that the word standing for the thing becomes as if the property of the thing itself.

If we move on to the history of the word, we see that speech in an adult develops in the same way. In order to trace how the natural formation of the sign, which is not at all an intellectual discovery, develops in the child, we must deal with how speech in general is formed.

Speech and the meaning of words develop naturally, and the history of how the meaning of a word developed psychologically helps to cast light to a certain degree on how signs develop, how the first sign appears naturally in a child, how mastery of the mechanism of signification occurs on the basis of a conditioned reflex, how from this mechanism a new phenomenon arises that extends as if beyond the boundaries of the conditioned reflex.

We know that our words are not invented. However, if we ask any person, as children ask, why a given object is called by a certain word, for example, why a window is called a window, a door, a door, then most of us cannot answer. Moreover, we are right in assuming that a window might have been called by the sound complex "door" and vice versa. The whole thing is arbitrary. We know, however, that language developed not from arbitrarily made up words and not because people agreed to call a window a window. Language developed naturally in such a way that psychologically it totally crossed the line of the development of the conditioned reflex which tolerated the word "quack" transferred from the duck to water to a coin.

Let us consider a simple example. Psychologists-linguists state that in contemporary language two groups of words can be identified, one of which can be distinguished visually. Let us consider the words used by A. A. Potebnya[76] (*petukh* [rooster], *voron* [raven], and *golub'* [pigeon]). It would seem that we can tell why a pigeon is called a pigeon and a raven, a raven. But could it not be the other way around? But if we take such words as *goluboi* [blue] or *voronoi* [black], *prigolubit'* [to caress], *provoronit'* [to yawn for a long time], or *petushit'sya* [to be cocky], we can see how the words differ psychologically and we can ascertain the presence of an exceptionally important characteristic in each of these words. We still may not understand why the words "raven" and "pigeon" refer to these birds, but with the words *voronoi* [black] and *goluboi* [blue] this is quite clear because *voronoi* means black and *goluboi* means light blue. Here we cannot let *voronoi* [black] be blue and *goluboi* [blue] be black.

If we say *provoronit'* [to yawn for a long time] or *prigolubit'* [to caress], then besides the common meaning, these words in themselves combine a certain group of sounds with a certain meaning. For this reason, in words such as *voron* [raven], psychologists distinguish two points: on the one hand, the *sound form* of the word (sounds v+o+r+o+n) and on the other, the *meaning* which names a certain bird.

If we take a word like *provoronit'*, we have three points: first, the complex of sounds; second, the meaning (*provoronit'* means to yawn for a long time); third, the word is linked to a certain *image* so that in the word, *provoronit'* there is a certain internal image (a raven does this when it opens its mouth). A certain in-

ternal comparison is made, an internal picture or pictogram of conditioned sounds connected with the internal image. When we say *petushit'sya*, then a certain image appears for which no word is adequate; we are comparing a person with a rooster; when we say *goluboe nebo* [blue sky], a comparison of the color of the sky with the wing of a pigeon is clear to all; when we say *voronoi kon'* [black horse], the word *voronoi* is linked to the wing of a raven [*voron*]. In all cases, a picture is generated that ties the meaning to the sign.

In modern language, we have two groups of words: words in one group form an image and in the other, they do not. Comparing the word "cabbage" with the word "snowdrop," Potebnya notes that these words seem to belong to two different classes because a definite image is linked with the word "snowdrop" (a flower that grows under the snow which opens up after a thaw), but the word "cabbage" seems arbitrary. But this holds only phenotypically; genetic studies have shown that every word has its image, but the image is frequently concealed although every word can be restored etymologically. The word "cabbage" is connected with the Latin word *caput*, which means head. A cabbage has an external similarity to a head, but we have forgotten or do not know about this connecting link. For psychologists, a connecting link is very important because without it, we could not understand why, specifically, the complex of sounds "c-a-b-b-a-g-e" signifies a plant. Actually, the history of almost every word shows that in its origin, it was connected with a certain image. Then, according to the laws of psychological development, other words were generated from these words. Thus, words are not invented and do not appear as a result of external conditions or arbitrary agreement, but come into being or are derived from other words. Sometimes new words appear as a result of transferring an old meaning to new objects.

Let us trace the history of some simple words. From the etymology of the Russian word *vrach* [doctor], we know that the Slavic words *vrati*, *vorchat* [to lie, to grumble] are related words, but the initial meaning of the word *vrach* is *vrushchi* [casting a spell], *zagovarivayushchii bolezn'* [casting a spell on an illness]. We see that here we can trace the graphic link between the sound and the meaning. At times the connecting link may be so distant that it is difficult for modern man to trace psychologically how this link led to a connection with the image of a given word.

Let us take the word *sutki* [twenty-four hours]. What does it mean? If we say that according to the interpretations of some dialectologists, it initially meant the front corner in a room, it would be very difficult without special analysis for us to see how this word began to mean "twenty-four hours" as we understand it. Twenty-four hours is a day and a night; comparative analysis of a number of words shows that it was formed from the word *stuknut'* [to knock]. If we take the prefix *su-* (or *so-*) [with] and *tknut'* [to poke or prod], we get *sotknut'* (*sotykat'*) [adjoin, i.e., day joined to night]. In some provinces, *sutki* means *sumerki*, the time when day and night meet. Then day and night together began to be called *sutki*.

In some words, it is very easy to find the root, but difficult to disclose the origin of the word. For example, who knows that *okun'* [perch] is derived from the word *oko* [eye], that is, "the fish with large eyes?"

The history of other words is even more complex. For example, who would have thought that the words *razluka* [separation] and *lukavyi* [crafty, cunning] are connected with the image of a bowstring? If a bowstring broke when pulled at the bow [Russian: *luk*], this was termed a separation [*razluka*]. Since *luk* is simply a curve, lines were distinguished as being straight [*pryamaya*] or curved [*lukavaya*].

Thus, almost every word has its history; at its base lies an initial representation or image, and a connecting link led to the formation of our word. This means that it is necessary to do a special analysis to disclose the history of this formation.

In Russian speech, nearly always there is a process of a reverse order. Potebnya elucidates this process.

Thus, certain literary words are perverted in colloquial speech: instead of *palisadnik* [front garden], people say, *polusadnik* [half garden]. The word acquires a certain image with this perversion. Instead of *trotuar* [pavement], people say, *plituar* [slab]. The perversion makes it possible to ascribe an image to the word which connects the sound with a meaning that is contained in the word. A. A. Shakhmatov[77] cites a more recent perversion: *semisezonnoe* [seven-seasonal] (instead of *demisezonnoe* [demiseasonal]) coat. *Demisezonnoe* is converted to *semisezonnoe* not because it is easier to pronounce, but because then the word becomes understood as a coat for all seasons.

The same explanation can be given for one of the first words of the revolution: people say *prizhim* [pressure] instead of *rezhim* [regime]. They say, "the old *prizhim*" because it is connected with a certain image. In the same way, the word, *spinzhak* [back jacket], published in the work of V. I. Dal',[78] arose because this piece of clothing is put on the back first. The word, having acquired the form *spinzhak*, acquires a sensible meaning.

Unfortunately, we can only produce a very limited number of examples of similar conversions in children's speech: the well-known children's words *mokress* [nonsense word; the root *mok-* means wet] (for *kompress*), *mazelin* [nonsense word, the root *maz* means "smear"] (for Vaseline). These perversions are understandable: compress is connected with a representation of something damp and Vaseline is rubbed on. With this kind of perversion, a connecting link is made between the sound composition and the meaning of the words.

A. A. Potebnya, analyzing a simple sentence that has logical sense, established what it means in the literal sense of the word. It developed that every sentence of this kind now has unperceived links. For example, using certain words in a figurative sense, we depend on a certain image. Thus, if we say, "We stand on the ground of 'facts,'" in the literal sense this means "to stand confidently" or "to be confident" because at the base of the confidence we have something positive in the form of determined facts. The sentence contains a seemingly senseless combination of words, but from the point of view of our direct speech, it has a figurative meaning. Of course, when we say that we are standing on the ground of facts, then we are least ready to see ourselves as standing on the earth and even less as standing on soil. We used the expression in a figurative sense. But when a man says that he stands on the ground of facts, we involuntarily compare the position of the man supported by facts with the position of a man standing on the ground, on the earth, standing firmly and not hanging in the air.

In this way all our sentences and all of our speech has a figurative sense. If we return now to the development of children's speech, we shall see that in clinical experiments we can establish the same thing that we have in the development of words. Precisely as in the development of our speech, words do not arise arbitrarily, but always arise in the form of a natural sign connected with some image or with some operation, and in children's speech, signs do not appear from what the child himself invents; the child obtains signs from those around him and only later realizes or discovers the functions of these signs.

Undoubtedly, the same thing occurred with humanity when man acquired any tools. In order for a tool to become a tool, it had to have some necessary physical

properties to be used in a given situation. Let us consider the stick as a tool. The stick had to have physical properties appropriate to the given situation.

In the same way, in order for a stimulus to become a psychological sign, it had to have certain psychological properties. In the most general form, we can say: a stimulus becomes a natural sign, a natural symbol for the child when the child perceives one and the same structure and all the elements with which it is connected.

We can ask, where in the child is the figurative speech of which we spoke? Where is that connection in the development of speech of the child that serves as a link between sign and meaning that might be seen in the process of extending meaning as a conditioned reflex or as a transfer of the reflex from one order to another? Of course, it is not present in the child. When the child acquires words, he acquires them in an external way. We have only to explain why we have forgotten certain meanings and why we must recall that the word *sutki* [twenty-four hours] represented *sumerki* [twilight], or even earlier, *styk dvukh sten* [the coming together of two walls]. Other words appear in exactly the same way, and their origin now seems incomprehensible. On the basis of the law of the conditioned reflex, the intermediate links are discarded. Let us recall that we spoke of the selection reaction. It occurs in the child in such a way that gradually the intermediate links are eliminated and a merging of the seam type occurs. Our speech represents an infinite number of merges of the seam type in which the intermediate links are eliminated since they become unnecessary for the meaning of the modern word.

Let us consider the word *chernila* [ink]. We know what this word signifies because the word *chernyi* [black] from which *chernila* is derived is fresh in our language. But does it mean that ink must always be black? Inks can be red and green. Evidently, naming according to the color and the image it generates contradicts some properties of the object. In this case, some of the old properties are rejected and a conflict develops between the old narrow meaning of the word and the differentiated new meaning, a conflict between the narrow and nonessential or partial meaning and a more essential and general meaning. What was the origin of the initial word *chernila*? Of course, the first thing that meets the eye, the first trait is that this is something black. A simple transfer of meaning occurs of the conditioned reflex type from *chernyi* to *chernila* [ink]. But the essential thing about ink is that it is a liquid. Is it essential that a liquid be black? Of course not. This means that the trait "black" is nonessential. Finally, the word *chernila* is connected with a certain reaction: it is something with which one can write; what is more, this means that it is not so important that ink be black as that one can write with ink. The whole history of the development of language shows that this is how it happens.

In all European languages, our word *korova* [cow] etymologically signifies *rogataya* [horned]. In Latin, this word meant goat, and in French, deer.

For the child, who gets every concrete word from us, a direct knot (or connection) is formed between a given word and the corresponding object. This connection, or conditioned reflex, appears in the child in a natural way since the child makes no discovery of a new sign and because he uses the word as a sign for the object. But if we try to observe clinically how the child acquires a sign independently or to formulate it experimentally, we see that in the experiment, the appearance of signs passes through the same stages through which language passed by way of connecting links.

In experiments, we place the child in this situation: in play, the child quite willingly names any object with the word for any other object. For example, for children playing, a plate or a clock can fulfill any function. So we can agree that, let us say, a knife is a doctor, an ink bottle cap is a cab, a clock is a pharmacy,

and any other object is medicine, etc. Then we carry out a series of simple actions with these objects and the child remembers very well their symbolic meaning. The child can easily tell an appropriate story, for example, about how a doctor got in a cab, rode to a patient, examined him, prescribed medicine, and then someone went to the pharmacy for the medicine. Sometimes the child tells even more complex stories. It is interesting to note that the child remembers very well that the clock is the pharmacy, etc.; what is essential is that a child does not make a mistake in his play.

After several experiments, a child of five begins to gradually identify primary traits that are the connecting link. Place a clock before a child and tell him that it is a pharmacy. No matter what we do with the clock subsequently, the child translates these actions to the word pharmacy. Thus, he begins to compare the numbers on the clock with medicines. "Pharmacy" is the first stimulus that is identified and serves as a connecting link between the sign and the meaning.

In other words, the child himself creates a sign in exactly the same way that the sign is created in general in the development of our speech. In an experiment, when a child unites two things directly, say the pharmacy with the clock, the child isolates one of the traits, say the face of the clock, and through this trait connects the pharmacy with the clock. In the same way, when a book that means "forest" is placed before a younger child, the child says that it is a forest because the book has a black binding. For a five-year-old child, the book can no longer be a forest; the child already isolates one stimulus from a number of stimuli, say the black color, and this trait begins to play the role of a connecting link between sign and meaning.

We will try to summarize what has been said. The prehistory of children's speech shows that speech develops in the same way as any conditioned reflex, that the development passes through all the stages known from laboratory studies of the conditioned reflex. Specifically, it is essential that the development of speech occurs independently of thinking and thinking develops independently of the development of children's speech, but at a certain instant, both meet. At approximately the age of two, the child experiences a burgeoning of his vocabulary, its active extension, after which there is a phase of questions: "What is this? What do you call this?"

On the basis of what we know, we must reject the hypothesis of Stern that at the moment of crossing of speech and thinking the child discovers the meaning of the word. Genetic analysis shows that it is difficult to speak of discovery. Evidently, the child at first masters not the internal relation between sign and meaning, but the external connection between the word and the object, and this occurs according to the laws of the development of the conditioned reflex due to simple contact between two stimuli. Specifically for this reason it is difficult to believe that discovery or recognition of the object occurs first and its function is recognized later. Actually, direct assimilation of function occurs and only on the basis of this assimilation does recognition of the object occur later. Thus, the instant of discovery of which Stern speaks is pushed ever farther away.

Chapter 7
PREHISTORY OF THE DEVELOPMENT OF WRITTEN LANGUAGE

In the practice of school training, writing still holds a somewhat limited place in comparison with the enormous role it plays in the process of the cultural development of the child. The teaching of writing is treated as if it were of little practical value. The child is taught to pick out letters and make words of them, but he is not taught written language. The mechanics of reading is put forward so much that it shades written language as such, and for this reason, teaching the mechanics of writing and reading is dominant over an intelligent use of this mechanism. Something similar took place in teaching oral speech to deaf-mutes when all the attention of the teachers was directed toward teaching the children correct articulation, the placement of individual sounds and pronunciation of them precisely. Beyond the technique of pronunciation the deaf-mute pupil did not note oral speech itself. What developed was guttural speech.

As opponents of this method noted, the children were taught not oral speech, but pronunciation of words. The same thing frequently happens in teaching writing. Pupils are taught not written language, but writing of words, and for this reason, to a significant degree, the teaching of written language has still not been raised above the level of traditional correct and neat writing. Historical reasons are the primary explanation for this situation: specifically, practical pedagogy, regardless of the existence of numerous methods of teaching reading and writing, has not adequately developed a rational, scientifically and practically based method of teaching children written language. And for this reason, the question of teaching this language remains open. In contrast to teaching oral speech which the child grows into by himself, all teaching of written language is based on artificial training, which requires enormous attention and effort on the part of the teacher and the pupil and, as a result of this, is converted into something self-sufficient in comparison with which living written language recedes to the background. We still do not base the teaching of writing on the naturally developing needs of the child and on his initiative, but present it to him from outside, from the hands of the teacher, and it resembles the development of any technical habit, for example, the habit of playing the piano. With this state of the matter, the pupil develops finger facility and learns how to read notes and strike the keys, but he is absolutely not introduced to the poetry of music.

The one-sided enthusiasm for the mechanics of writing affected not only practice, but also the theoretical formulation of the problem. Psychology also has thus far considered ordinary writing as a complex motor habit, as a problem of the development of the small musculature of the hands, as a problem of wide and narrow lines, etc. The problem of written language as such, that is, the special system of

symbols and signs the mastery of which signifies a critical turning point in the whole cultural development of the child, is not developed to any high degree in psychology.

Regardless of the number of studies we already have, we still cannot write any coherent and complete history of the development of written language in children. We can only note the more important points of this development and consider its main stages. For the child, mastery of written language represents a special and exceptionally complex symbolic system of signs.

As H. Delacroix[79] correctly says, the uniqueness of this system is that it represents symbolism of the second degree that gradually becomes direct symbolism. This means that written language consists of a system of signs arbitrarily forming sounds and words of oral speech that in turn are signs for real objects and relations. Gradually, the intermediate connection, specifically, oral speech, can fade away and written language is converted into a system of signs directly symbolizing the signified objects and the relations among them.

It is clear to us that mastery of this complex system of signs cannot occur exclusively mechanically from outside by means of simple pronunciation, by means of artificial training. It is clear to us that mastery of written language is not likely to have been formed at a key moment from outside by school training, but is actually a product of a long development of higher functions of the child's behavior. Only by approaching the teaching of writing from a historical point of view, that is, only by attempting to understand this moment in the whole history of the cultural development of the child, can we approach the correct solution to the whole psychology of writing.

The history of the development of written language of the child presents great difficulties for research. To the extent that this can be judged by extant materials, the development of written language does not proceed along a single line preserving a continuity of forms. The history of the development of written language of the child contains the most unexpected metamorphoses, that is, conversion of some forms of written language into other forms. In the beautiful expression of Baldwin, there is as much involution as there is evolution. This means that together with processes of development, movement forward and the birth of new forms, we must at each step detect processes of reduction, dying off, reverse development of the old forms.

Here, as in the history of the cultural development of the child, we frequently encounter characteristics of spasmodic changes and disruptions or breaks in the line of development. The line of development of written language in the child sometimes stops almost completely, then suddenly, as if completely out of nowhere, from outside, a new line begins and at first glance it seems that between the broken-off past and the beginning new, there is absolutely no continuous connection. But only a naive representation of development as a purely evolutionary process accomplished exclusively by gradual accumulation of separate small changes, an unnoticeable transition of one form into another, can conceal from our eyes the true essence of the processes that are occurring. Only someone who is inclined to imagine all processes of development as processes of germination will deny that the history of written language of the child is fully entitled to be represented by a single line of development regardless of the breaks, dying off, and metamorphoses of which we spoke above.

We already know that every process of cultural development of the child, like every other process of his mental development, is a model of revolutionary development. We have seen above that the type of cultural development of human behavior arising from a complex interaction between the organic maturing of the child

and the cultural environment must of necessity present for us at each step an example of this revolutionary development. In general, for science, the type of revolutionary development is nothing new; it is new only for child psychology, and for this reason, regardless of individual, sometimes boldly conceived studies, in child psychology we still have no coherent attempt to present the history of the development of written language as a historical process, as a single process of development.

The psychological aspect of mastering writing must be presented not as a purely external form of behavior, mechanical, provided from outside to the child, but as a certain moment in the development of behavior, appearing of necessity at a certain point, genetically connected with everything that prepared it and made it possible. The development of written language belongs to the first, most obvious line of cultural development because it is connected with the mastery of an external system of means developed and created in the process of cultural development of humanity. However, for the external system of means to become a mental function of the child himself, a special form of his behavior, for the written language of humanity to become the written language of the child, complex processes of development are required which we will try to investigate, but of course only in the form of a most general outline.

It is clear from what has been said that the development of written language has a long history, exceptionally complex and beginning long before the child in school begins to study writing. The first task of scientific research is to disclose the prehistory of children's written language, to show what induces the child to write, through what kind of important moments this prehistory passes and how it is related to school training. The prehistory of the child's written language often occurs in such forms in which it is difficult without special analysis to discover the stages preparatory to the development of writing. Frequently, under unfavorable external conditions, the stages pass subsurface, and are so confused and retarded that they cannot always be detected and established. For this reason, as we have seen before, experimental study is the most promising method of elucidating certain important moments that occur cryptically in the prehistory of written language. In order to study the phenomena that are of interest to us, we must first elicit them, develop them, and see how they occur and take shape. In other words, here we have the same principle of applying the experimental method in genetic research to elucidate cryptic links of this process that have retreated deeply inward, have been reduced or are sometimes inaccessible to simple observation.

The history of the development of writing begins with the appearance of the first visual signs in the child and is based on the same natural history of emergence of signs from which speech was derived. A gesture is specifically the initial visual sign in which the future writing of the child is contained as the future oak is contained in the seed. The gesture is a writing in the air and the written sign is very frequently simply a fixed gesture.

W. Wundt pointed out the connection between the picture and pictographic writing and the gesture. Wundt assumes that very often a graphic gesture simply signifies the reproduction of a graphic sign. Conversely, in other cases, the sign is a fixing and consolidation of the gesture. Thus, the picture writing of the Indians always replaces a line that joins points to which the movement of the hand or finger points. The pointing line converted into pictographic writing seemingly represents a fixed movement of the index finger. All of these symbolic designations in picture writing, Wundt says, may be explained only if we extract them from the language of gestures, even if the symbols separated from it will lead an independent existence as a result. We shall see below that even in the study of pictographic

writing experimentally elicited in the child, we note the same consolidation of the indicating gesture in the form of a line, but this was much later and most likely indicated a regression to a much earlier stage of development. But even there, displaced in time due to the experimenter, the genetic connection between the written sign and the gesture is expressed with the greatest clarity. We will speak about this separately.

Now we would like to note two points that genetically connect the gesture with the written sign. The first point is the scribbles that a child makes. As we have often observed during experiments, when the child draws, he very often makes a transition to dramatization, showing by a gesture what he wants to picture, and the line made by the pencil only supplements what has been depicted by the gesture. In psychological literature, we know of only a single indication of this. We think that the paucity of similar observations can be explained simply by the absence of attention to this phenomenon which is very important in the genetic respect.

Stern made a remarkable observation that pointed out the distant relationship between drawing and the gesture. A child of four sometimes added meaning to a picture by the movement of his hand. This was several months after his scribbles were replaced by ordinary, immature drawing. For example, once the sting of a mosquito was symbolized by a stinging motion of the hand and by the point of the pencil. Another time, the child wanted to show in a drawing how it gets dark when the curtains are closed and he made a forceful line down on the board as if he was drawing a window shade. The drawing movement did not signify a cord, but expressed specifically the movement of drawing a curtain.

We could cite a great number of such observations. The child who needs to represent running begins to use his fingers to show this movement and to make separate lines and dots on paper, which he believes represent running. When he wants to draw jumping, his hand begins to make movements that depict hopping, and on paper, he makes traces of this movement. We are inclined to consider the first drawings of children, their scribbles, to be more a gesture than drawing in the real sense of the word. We are also inclined to relate to the same phenomenon the fact, which we have tested experimentally, that in drawing complex objects, the child does not produce their parts, but the general qualities (impression of roundness, etc.). When the child uses his hands to represent a cylindrical jar by a circle, he uses the same gesture to represent something round. This phase in the development of the child coincides beautifully with the general movement expressions of the mind which characterize a child of this age and which, as the research of Bashushinskii showed, determine all the style and features of his first drawings. The child proceeds in the same way in depicting complex or abstract concepts. He does not draw, but only indicates and the pencil only fixes his indicating gesture. When the child is asked to draw fine weather, he points with a smooth horizontal movement of his hand to the bottom of the sheet and explains, "This is the ground," then making some confused dashed-line movements from the top he explains, "And this is good weather." In special observations, we had the opportunity to see the relationship between the images made with a gesture and a drawing and obtained a symbolic and graphic image made by gestures from a five-year-old child.

The second point that forms a genetic connection between the gesture and written language brings us to child's play. As we know, in play some objects can very easily represent others, replace them and become their signs. We also know that in this case the similarity that exists between the toy and the object that it represents is not important. Most important is its functional use, the possibility of using it to produce the representing gesture. In our opinion, this is the only key to explaining the whole symbolic function of child's play. In play, a lump of rag or

wood becomes a small child because the child makes gestures that imitate carrying a small child in his arms or feeding it. The child's own movement, his own gesture is what ascribes the function of a sign to a suitable object, and this imparts meaning to it. All symbolic graphic activity is full of such indicating gestures. Thus, a stick becomes a horse for the child because it can be placed between the legs, and a gesture can be applied to it that will indicate that the stick in this case represents a horse.

In this way, a child's symbolic play may, from this point of view, be understood as a very complex system of speech aided by gestures that supplement and indicate the meaning of individual toys. Only on the basis of indicating gestures does the toy gradually acquire its meaning precisely as drawing, supported at first by a gesture, becomes an independent sign.

Only from this point of view is it possible to explain scientifically the two facts that still lack the necessary theoretical explanation.

The first fact: for the child, in play any thing can be every thing. This can be explained by the fact that in itself, the object acquires the function and meaning of a sign only because of a gesture that gives it this meaning. From this it is clear that the meaning lies in the gesture and not in the object. This is why the child will deal with any specific object relatively indiscriminately in a given case. The object must be the focus for applying his own symbolic gesture.

The second fact: arbitrary verbal meaning occurs very early in the play of four- and five-year-old children. Children agree among themselves, "This will be a house, this will be a plate," etc. At about the same age, an exceptionally rich oral connection appears that interprets, explains, and imparts meaning to each separate movement, object, and act. The child not only gestures, but also discusses and explains the game to himself, organizes it into one whole and confirms graphically the idea that initial forms in the game actually represent nothing other than the initial gesture, than speech aided by signs. Even in play, we find the moment that leads to emancipation of an object as a sign and a gesture. Due to long use, the meaning of a gesture is transferred to objects that for the time of the game, even without corresponding gestures, begin to represent conditioned objects and relations.

We attempted experimentally to trace the independent origin of signs from objects and established (experimentally) the unique stage of object writing of the child. As we have pointed out, experiments were set up in the form of a game in which separate objects very familiar to the children arbitrarily, as a joke, began to represent objects and people participating in the game. For example, a book opened to a page represented a house; keys represented children; a pencil, a nursemaid; a clock, a pharmacy; a knife, a doctor; an ink bottle cap, a cab, etc. Then, by means of graphic gestures to these objects, the children were shown a simple story that the children being tested easily read.

For example, the doctor in the cab comes to a house, knocks, the nursemaid opens the door, he listens to and examines the children, writes a prescription, leaves, the nursemaid goes to the pharmacy, returns, and gives the children the medicine. Most three-year-old children read this kind of symbolic record very easily. Children age four to five read an even more complex record: a man walks in the forest, a wolf attacks him, the man saves himself by running away, the doctor helps him, the injured man goes to the pharmacy and then goes home. A hunter goes into the forest to kill the wolf . . . . Remarkably, the similarity of the objects does not play a marked role in understanding the symbolic object-reading. It is important only that these objects permit the corresponding gesture and serve as a point to

apply it. For this reason, the child rejects categorically things that are clearly not related to the given structure of gestures.

Thus, the child categorically refuses to participate in play that takes place when the child is seated at a table in which only small things are needed that lie on the desk. When we take his fingers, place them on the book and say, "And for fun, these will be children," he objects that there is no such game. Fingers are too closely connected to his body to serve as an object for the required indicating gesture. In the same way, very large objects standing in the room, such as a cabinet or someone present, cannot participate in this game.

In this way we see a completely clear experimentally obtained demarcation of the two functions of speech of which we spoke in dealing with the spoken language of the child. In itself, the object fulfills the function of replacement: the pencil replaces the nursemaid and the clock, the pharmacy; but only the gesture that refers to them imparts this sense to them, indicates this sense. In older children, the objects affected by the indicating gesture have the tendency not only to replace the objects they stand for, but also to denote them. The child's first very important "discovery" occurs here. When we put down a book with a dark cover and say that this will be a forest, the child himself adds, "Well, yes, this a forest because it is black, dark there."

In this way, he isolates one of the characteristics of the object that is for him an indication that the book must represent a forest. In precisely this way, when the metallic bottle cap represents a cab, the child points to it and says, "This is the seat." When the clock represents the pharmacy, one child points to the face and says, "Here is the medicine and the pharmacy," and another points to the ring and says, "This is the entry, it's the door to the pharmacy." Picking up the small bottle that plays the part of the wolf, the child points to the neck and says, "And this is his mouth." To the question of the experimenter pointing to the cork, "And what is this?" the child responds, "And this—he caught a cork and is holding it in his teeth."

In all the examples, we see one and the same thing—specifically, the usual structure of the things seems to change under the influence of the new meaning that it acquired. Because the clock represents the pharmacy, one of its characteristics is isolated and assumes the function of a new sign, an instruction as to how the clock represents the pharmacy. The ordinary structure of things (cork closing the bottle) begins to be represented in the new structure (the wolf holds the cork in his teeth). A change in structure is so strong that in some experiments we observed time and again that the child retains the symbolic meaning of the object. The clock represented the pharmacy in all the games while the other objects rapidly and frequently changed their meaning. In making a transition to a new game, we put in the same clock and according to a new plan of action announced, "This is a bakery." The child placed his hand on the clock as if to cut it in half and said, "All right, here is the pharmacy, and here is the bakery." In this way, the old meaning became independent and served as means for a new meaning. We could establish an independent meaning even outside a game: when the knife dropped, the child cried, "The doctor fell."

Thus, objects even without an indicating gesture retained the acquired meaning. Tracing the history of isolating and representing signs, we cannot help but remember the analogy to the development of speech and the meaning of words. As we have seen, in that case words were given a certain meaning through some graphic characteristic that indicated this meaning. The word "*chernila*" [ink] means a liquid for writing because of its old meaning and because of the characteristic "*chernoe*" [black]. In just the same way that the clock represented a pharmacy for

the child, the numbers represented medicine. Thus, the sign acquired an independent objective development that did not depend on the gesture of the child, and in this we see a second great epoch in the development of the written language of the child.

The matter is the same with drawing. Here we see that the written language of the child does not arise naturally. We have already said that the initial drawing develops from a gesture of the hand equipped with a pencil. In this case, it leads to the fact that the representation begins independently to stand for some object. This is expressed by the fact that the drawn lines are given an appropriate name.

C. Bühler called attention to the fact that the process of development of children's line drawing advances gradually: oral representation is transformed from subsequent into simultaneous. And finally the name precedes the drawing. This means that an intention to represent something abstract develops on the basis of the representation of a form that was drawn and named after the drawing was completed. Speech moving ahead [of action] serves as a means for important mental progress.

G. Gettser, wishing to study how mentally mature a school-age child must be to learn to write, was the first to develop a broad formulation of this problem. She tried to study how the child's function of symbolic representation of things, which is so important for learning to write, develops. To do this, Gettser had to elucidate experimentally the development of the symbolic function in children age three to six years. The experiments consisted of four basic series. The symbolic function in play was studied in the first series. The child in play had to represent the father or mother and do what they do during a day. In the process of play, arbitrary interpretation of the objects involved in playing occurred and the researcher could trace the symbolic function assigned to the objects in play. Construction material was used to represent the mother or father, which was then colored with colored pencils. In the second and third series, special attention was given to the moment the appropriate meaning was assigned. Finally in the fourth series, in a game of postman, the researcher was able to observe to what extent the child is able to perceive a purely arbitrary combining of signs since the blocks colored with different colors served as signs of different kinds of letters delivered by the postman: telegrams, newspapers, remittances, packages, letters, postcards, etc.

Thus, experimental study placed in one order the various kinds of activities united only by the fact that each of them was based on the symbolic function, and the study tried to establish a genetic connection between all of these types of activity and the development of written language.

In Gettser's experiments, we can see quite clearly how the symbolic meaning in play develops with the help of a graphic gesture and with the help of a word. Here the child's egocentric speech was very apparent. While in some children everything is represented with the help of movement and mimicking and speech is not involved as a symbolic means, in other children speech accompanies action: the child talks and acts. In a third group, purely verbal expression begins to dominate unsupported by any other kind of activity. Finally, the fourth group of children hardly played at all and speech was the only means of representation, while mimicking and gesture were relegated to the background.

The experiment demonstrated that with years, the percentage of purely play actions gradually diminishes and that speech begins to dominate. The most essential conclusion from this genetic study, as Gettser says, is the fact that the difference in play between three-year-old and six-year-old children is not in the perception of symbols, but in the method by which the various forms of representation are used. It seems to us that this is the most important conclusion showing that symbolic

representation in play and at a very early stage is, in essence, a unique form of speech that leads directly to written language.

As the child develops, naming moves gradually to the forefront of the process of representation and in this way, this process assumes the function of recording the word just named. Even the three-year-old understands the imaginative function of the construction; a four-year-old names his products before he begins to build them. The same thing happens in drawing. It seems that the three-year-old does not know the symbolic meaning of the picture ahead of time and children master this completely only by the age of seven. Prior analysis of children's drawing shows without a doubt that from the psychological point of view, we must consider it as unique speech of children.

As we know, at first the child draws from memory and if a suggestion is made that he draw his mother who is sitting opposite him or some object that is before him, he draws without once looking at the original, and as a result draws not what he sees, but what he knows. We see another indication of this in the fact that the child's picture not only does not take into account, but contradicts the real perception of the object. So what develops is what Bühler calls an x-ray picture. The child imagines a person in clothing, but while he does so, he draws his legs, stomach, and purse in his pocket and even money in the purse, that is, things about which he knows but which cannot be seen in the picture. Drawing a man in profile, the child gives him a second eye and draws both legs of a man on horseback portrayed in profile. Finally, in the child's drawing very important parts of an object are omitted while, for example, the child draws legs growing directly from the head, leaving out the neck and body. All of this shows that the child draws, in the words of C. Bühler, essentially just as he speaks.

This justifies our considering the drawing of the child as a preliminary stage of his written language. As far as psychological function is concerned, the child's drawing is a unique graphic speech, a graphic story about something. The technique of children's drawing shows without a doubt that the drawing is specifically a graphic story, that is, the child's unique written language. For this reason, the child's drawing itself, according to the correct observation of C. Bühler, is more speech than representation.

As J. Sully[80] showed, the child did not try for representation; he is much more a symbolist than a naturalist, he does not at all bother about a full and precise likeness, but wants only to produce a certain indication of the thing that he is drawing. The child tries rather to name and designate than to represent.

C. Bühler accurately points out that the child begins to draw when he has already had much success in verbal, oral speech and it has become habitual. Further, Bühler says that speech in general dominates and forms the greatest part of mental life according to its laws. Drawing also belong to this part; about drawing, we might say that in the end, it too is swallowed up by speech since all graphic ability for expression of the average modern cultured man flows out in writing. The child's memory at that time does not contain simple forms of representation, but for the most part consists of a predisposition to judgment enveloped in speech or capable of being enveloped in it.

When the child discloses new treasures of his memory in drawing, this is done by way of speech, as if by narration. The most important characteristic of this method is a certain abstraction to which all verbal description necessarily and naturally belongs. Thus, we see that drawing is graphic speech that develops on the basis of verbal speech. In this sense, the schematics that are characteristic of the initial drawings of children resemble verbal concepts that convey only the essential and constant characteristics of objects.

This stage of speech, in contrast to written speech, is still symbolism of the first degree. The child depicts not words, but objects and representations of these objects. But the child's development of drawing in itself is not anything understandable or developing purely mechanically. Its critical moment is in the transition from the simple making of marks on paper to using pencil marks as signs that represent or signify something. All psychologists agree that here, as C. Bühler says, the child must discover that the lines he makes can mean something. Sully explains this discovery using the example of when a child, in drawing without any idea or meaning, by chance produced a spiral line in which he suddenly saw a certain similarity and joyfully cried, "Smoke, smoke!"

Most psychologists assume that in drawing, the child discovers in the form he has drawn a similarity with some object, and from this his drawing acquires the function of a sign. We might suggest that what occurs, occurs somewhat differently: due to a number of circumstances, the child comes upon the fact that the drawing can represent something. Thus, children usually recognize things in the drawings of others before they themselves draw. But the process of recognizing what is drawn, although it is encountered in early childhood, is nevertheless, as observation has shown, not the initial discovery of symbolic function. Initially, the child, if he does see the similarity between the drawing and an object, takes the drawing to be a similar object, but not as a representation or symbol.

A girl who was shown a picture of her doll cried, "A doll! Just like this one!" It is possible that she regarded the picture as still another object that was the same as one she had. According to Gettser, none of the observations can compel us to assume that to understand an object is to understand as well what a drawing represents. For the girl, the drawing was not a representation of the doll, but another doll that was the same as hers. Evidence of this is the fact that the child treats the drawing as an object for quite a long time. K. Bühler observed how this girl tried to remove the lines and colors she had drawn on a green background from the paper, etc.

What caught my attention was that an older child who was already naming his drawings and correctly identifying the drawings of others still persisted for a long time in treating the drawing as a thing. For example, when a man was presented in a drawing with his back to the viewer, the child turned the paper over to see his face. Even in five-year-olds, we always observed that in response to the question: "Where is the face and where is the nose?" the child turned the paper over and only after he did that did he answer that they were not there, they were not drawn.

We believe that Gettser's opinion has the firmest foundation; it states that primary symbolic representation must be related specifically to speech, that all other symbolic meaning of signs is created on the basis of speech. In fact, going back to the beginning, the moment of naming during drawing very clearly indicates the strong pressure of speech under which children's drawing develops. This soon turns into the real written language which we had the opportunity to observe experimentally when we proposed to the children that they use signs to represent a more or less complex sentence. Here, as we have already said, we saw in the drawing the manifestation of gestures (stretched out arms, pointing fingers) or lines that replaced them and could in this way, like a filter, separate the figurative from the indicative function of the word.

In these experiments, most clearly apparent was the tendency in school-age children to move from purely pictographic to ideographic writing, that is, to representing the separate relations and meanings with abstract symbolic signs. We found the supremacy of speech over writing to be most distinct in the writing of one of the school children who did a separate drawing for each word of the sen-

tence. A sentence such as, "I don't see the sheep, but they are there," was written in the following way: a figure of a person ("I"), the same figure with a blindfold ("don't see"), two sheep ("sheep"), a pointing finger and several trees behind which the same sheep can be seen ("but they are there"). The sentence "I respect you," was rendered as follows: a head ("I"), another head ("you"), two human figures one of which is holding a hat in his hands ("respect").

Thus, we see how the drawing obediently follows the sentence and how oral language penetrates into a child's drawing. In doing the assignment, the children often had to make real discoveries and invent appropriate methods of representation, and we actually could confirm that the development of speech is decisive in the development of the child's writing and drawing.

Observing the spontaneous manifestations of children's writing, Stern gives a number of examples that show how this development occurs and how the whole process of writing proceeds. The child, learning to write independently, writes from the lower left edge of the paper to the right, every new line is added from the top, etc.

A. R. Luria,[81] in connection with our general research, aimed to elicit and track the moment of discovery of the symbolism of writing in order to study it systematically. The research showed that the history of writing begins in the child significantly earlier than when the teacher first places a pencil in his hand and shows him how to write letters. If we do not know the prehistory of children's writing, we will not understand how a child quickly learns written language, the most complex device of cultural behavior. We will begin to understand that this can occur only under the condition that during the first school years, the child mastered and developed a number of devices leading him directly to the process of writing, preparing him and facilitating incredibly the mastery of ideas and the technique of writing. In experiments, Luria placed the child who did not yet know how to write in a situation where he had to produce a certain primitive piece of writing. The child was told to remember a certain number of sentences, usually significantly exceeding the physical capability of the child to remember. When he was convinced that he could not remember, he was given a piece of paper and advised to note or write the proposed sentences.

Often the child met this proposal with perplexity and said that he doesn't know how to write, but he was firmly advised to somehow figure out how the pencil and paper could help him remember. In this way, the researcher gave the child a certain device and watched to what extent the child would prove capable of mastering it, to what extent the lines made with the pencil stopped being simple marks for the child and became signs for remembering the corresponding meanings. This device reminds us of the experiments of Köhler with monkeys when he did not wait for them to get the idea of picking up a stick, but placed them in situations where they had to use it as a tool; he placed a stick in their hands and waited to see what would happen.

Experiments have shown that three- to four-year-old children cannot relate to writing as a means: they write the given sentence mechanically over a series of scribbles and write before they hear. The child writes, imitating an adult, but this is still a stage of the child's writing in which he cannot use writing as a series of mnemotechnical signs; the writing does not help him at all to remember the given sentences; remembering, he does not look at his writing at all. But these experiments should be continued to determine whether the situation begins to change suddenly and essentially. Among our material, we sometimes found cases that were surprising at first glance, that deviated sharply from what has just been said. The child writes just as unthinkingly, in an undifferentiated way, makes scribbles and

marks that don't mean anything, but in reproducing sentences, he gives the impression that he is reading them, pointing to quite definite marks and showing without error many times in succession which marks mean what.

The child develops a completely new relation to his marks and they are the first to turn into mnemotechnical signs. For example, the child distributes the separate marks on the paper in such a way that he connects a certain sentence with each mark. A unique topography develops: one mark in the corner signifies a cow, another at the top, a chimney-sweep, etc. In this way, the marks are a primitive indicating sign for memory, a sign of something that must be reproduced. We have a solid basis for seeing in this mnemotechnical stage the first precursor of future writing. The child gradually converts the nondifferentiated marks into indicating signs; the symbolic lines and scribbles are replaced by figures and pictures and the latter yield to signs. Experiments made it possible to describe not only the moment itself of this discovery, but also to trace its course depending on certain factors. Insertions indicating number and form added to sentences first break the meaningless character of the writing that expresses nothing when different ideas and images are represented by completely similar marks and scribbles.

Inserting data on number into this material, we quite easily elicited differentiated writing in four- and five-year-olds that reflected the number inserted. The need to write number was perhaps the first thing that gave rise to writing. In precisely the same way, including color or form plays a leading role in the child's discovery of the mechanism of writing. Sentences such as, "Black, black smoke is coming out of the chimney"; "In the winter, there is snow"; "The mouse with the long tail"; "Lyala has two eyes and one nose," very quickly lead the child to making a transition from writing that fulfills the role of an indicating gesture to writing that contains a representation in embryonic form. From this, the child makes a direct transition to drawing and in this way, we witness his transition to pictographic writing. Pictographic writing develops very easily in the child because, as we have seen, the child's drawing is essentially a unique graphic speech. However, as experiments show, even here the child experiences conflict the whole time: the drawing as a means is still frequently replaced by a drawing as a self-sufficient direct process.

It is especially easy to observe this in retarded children who move to independent drawing from drawing the given sentences according to association. The child, instead of writing, begins to draw pictures. From pictographic writing the child makes a gradual transition to the ideogram if the drawing does not directly convey the content of the sentence. Experiments have demonstrated that the child proceeds along a detour and instead of the whole that is difficult to draw, he draws the parts that are easy to draw, a schematic, and sometimes, conversely, he produces the whole situation in which the meaning of the given sentence is contained.

We have already said that the transition to symbolic writing, as our experiments have shown, is signified by the appearance of a number of simply drawn gestures or lines that represent gestures. Studying how the child writes without knowing how to write, but already knowing his letters, we see that he goes through the same stages that we have just described. The development of writing consists not only of a constant improvement of some one device, but also in sharp leaps that mark the transition from one device to another. The child who knows how to write letters, but has not yet discovered for himself the mechanism of writing, still writes in the same nondifferentiated way, separating individual letters and their parts, but later cannot reproduce them.

Experiments have shown that the child who knows letters and can, with help, isolate their individual sounds in words does not at all immediately come to a full

mastery of the mechanism of writing. However, even here in what we have just discussed, we do not find the most important moment that characterizes the real transition to written language. It is easy to note that everywhere written signs represent symbols of the first order directly signifying objects or actions, and the child at the stage we are describing does not approach symbolism of the second order which consists of using written signs for oral symbols of words.

For this, the child must make a special discovery—specifically, not only things, but speech also can be drawn. Only this discovery brought humanity to the brilliant method of writing with words and letters; it also brings the child to literate writing and, from the psychological point of view, must be constructed like the transition from drawing things to drawing speech. However, it is difficult to trace how this transition is accomplished because the appropriate research has not yet resulted in definite results and the generally accepted methods of teaching writing do not allow a thorough observation of the transition process. One thing is not subject to doubt: in all probability, real written language of the child (not mastery of the habit of writing) develops in a similar way, the way the transition is made from drawing things to drawing words. Various methods of teaching writing confirm that in different ways. Many methods use auxiliary gestures as a means of uniting the written and the oral symbol; others use drawing depicting the corresponding object, and the whole secret in teaching written language consists in preparing and organizing this natural transition properly. As soon as this is done, the child masters the mechanics of written language and he only needs to perfect this method subsequently.

With the present state of psychological information, many will think the idea extremely forced that all the stages we have considered—play, drawing, and writing—may be presented as different moments of an essentially single process of developing written language. The breaks and jumps in the transition from one device to another are somewhat large for the connection between the separate moments to be sufficiently obvious and clear. But experiments and psychological analysis lead us specifically to this conclusion and show that no matter how complex the process of development of written language seems to us, no matter how zig-zag, broken, and confused its course it might seem at a superficial glance, actually we have before us a single line of the history of writing that leads to higher forms of written language. The higher form, which we touch in passing, consists in the fact that the written language of symbolism of the second order becomes again symbolism of the first order. The initial written symbols serve as a sign of verbal symbols. Understanding written language is done through oral speech, but gradually this path is shortened, the intermediate link in the form of oral speech drops away, and written language becomes a direct symbol just as understandable as oral speech. One has only to imagine what an enormous break occurs in the whole cultural development of the child due to the mastery of written language, due to the possibility of reading and consequently to being enriched by everything that human genius has created in the sphere of the written word in order to understand the decisive moment experienced by the child in the discovery of writing.

For us one problem in the development of higher forms of written language is now important: the problem of silent and oral reading.

Research into writing has shown that, in contrast to the old school which cultivated reading aloud, silent reading is socially the most important form of written language and has two important advantages in addition. From the first year of schooling, silent reading surpasses reading aloud in number of fixations of eye movements over the line. Therefore, the process of eye movement in itself and perception of letters is facilitated in silent reading, the character of movement becomes more rhythmical and reverse movement of the eyes occurs less often. Vo-

calization of visual symbols impedes reading and the speech reactions slow down perception, hamper it, and break up attention. Not only the process of reading itself, but as strange as it may seem, understanding is better with silent reading. Research has demonstrated a correlation between reading rate and understanding. Most think that understanding is greater with slower reading; however, actually with rapid reading, understanding is better or the different processes occur at different rates and the rate of understanding is more compatible with a rapid reading rate.

In reading aloud, there is a visual interval when the eyes move forward and are synchronized with the voice. If during reading we fix the place at which the eyes rest and the sound which at the given moment is being pronounced, we find the visual-sound interval. Research shows that the interval grows gradually, that good reading involves a large visual-sound interval and that the rate of reading and the interval increase together. Thus, we see that the visual symbol is more and more liberated from the oral. If we recall that school age is exactly the age of growth in the formation of internal speech, it becomes clear what a powerful means for perception of internal speech we have in silent or quiet reading.

Unfortunately, experimental research has thus far studied reading as a sensory-motor habit and not as a mental process of a very complex order. But even here, research showed that some mechanisms of reading depend on the type of material. To a certain degree, the work of the visual mechanism is subordinate to the processes of understanding. How can we imagine understanding in reading? We cannot now provide any very clear answer to this question, but everything we know thus far forces us to assume that, like every other process, at a given stage of development, using the law of written language, it becomes an internal process. That which we usually call understanding of what is read must be determined first of all from the genetic aspect as a given moment in the development of the mediated reaction to visual symbols.

It is clear to us that understanding does not mean that in reading each sentence we generate pictures of all the objects mentioned in it. Understanding cannot be reduced to a graphic resurrection of the object or even to naming the word; more likely, it consists in operating with the sign itself and referring it to meaning, to a rapid movement of attention, and isolating different points that are at the center of our attention.

An imbecile's reading gives a very clear example of reading without understanding. P. Ya. Troshin[82] describes an imbecile who in reading became delighted by every word: "A ladybird (ay, a bird, a bird!—Agitated pleasure) doesn't know (doesn't know!—What a revelation)" or "Count Vitte came (he came, he came!) to Petersburg (to Petersburg, Petersburg!)," etc.

Concentration of attention, attaching it to each separate sign, inability to control attention and transfer it so as to be oriented in the complex internal space that might be called a system of relations are the imbecile's basic traits of "understanding" the text. Conversely, normal understanding is the process of establishing relations, isolating the important, in a transition from separate elements to the meaning of the whole.

Characterizing briefly the history of the development of written language in the child, we come to four most important practical conclusions.

First: it would be natural to teach writing at a preschool age. Actually, if the discovery of the symbolic function of writing is possible in children of a very young age, as Gettser's experiments have shown, then teaching writing must be made a requirement in preschool education. We actually see a number of instances that indicate that teaching writing in our system comes too late from the psychological point of view.

Considering children from the point of view of teaching them writing, P. P. Blonskii indicates that a child learning to read and write at four and a half years of age must be considered a genius and a child learning it at four and a half to five years three months of age, as being highly intelligent. Moreover, we know that teaching reading and writing in most European and American countries begins at the age of six as a rule.

The research of Gettser showed that eighty percent of three-year-old children have learned arbitrary combining of sign and meaning, and at six years, they are fully capable in this operation. According to her observations, mental development between the ages of three and six consists not so much in the development of the operation itself of using arbitrary signs as in successes that produce the attention and memory of the child. Gettser assumes that even three-year-old children in most cases could be taught to read and write, since this is connected with mastery of symbolic writing. True, Gettser did not take into account that writing is symbolism of the second order while her data only cover symbolism of the first order. Wholly justifiably, she criticizes education in which a child of three to four years is taught reading and writing: she points to the system of M. Montessori[83] who teaches reading and writing in kindergarten and to many French schools that also do this. From the psychological aspect, says Gettser, this is not impossible, but it is difficult because of the child's insufficient memory and attention.

C. Burt[84] presents information relative to England where compulsory schooling begins at the age of five, but if there is space, three- to five-year-old children are admitted to school, where they are taught the alphabet. At four years, most children know how to read. Montessori speaks strongly for teaching reading and writing at an earlier age. She teaches reading and writing to four-year-olds. As a rule, in the process of play, by preliminary exercises, all children in her kindergartens in Italy begin to write at the age of four and at the age of five, they read as well as a six-year-old in first grade, which as compared with Germany represents a two-year advantage.

The uniqueness of the Montessori method consists of writing development as a natural instant in the process of the development of the hand; for children, the difficulty in writing is not in knowing the letters, but in insufficient development of the small musculature of the hand. With the aid of painstaking exercises, Montessori makes it possible for children to learn to write not by writing, but by drawing, making lines. They learn to write in order to approach writing, and for this reason, they begin to write at once, suddenly or spontaneously. The process of teaching writing takes very little time. Two of her four-year-olds took less than a month and a half to learn to write to the extent that they could write letters independently. From observations of child development in the family where books and pencils are used intensively and especially where there are older children who read and write, we know that at the age of four to five, the child spontaneously learns to read and write just as he learns the spoken language. The child independently begins to write individual numbers and letters, to read them in signs, to make words of them and does in a natural way what Montessori organizes in the kindergarten.

But Montessori's experience shows that the matter is much more complex than it seems at first glance. If, on the one hand, the teaching of writing in school lags since children as young as four to five years old can learn the mechanics from both the motor aspect and the aspect of symbolic function, then, on the other hand, how strange it is that teaching writing at the age of six or eight is premature,* that

*Editor's note: Modern research and practice of teaching have shown the possibility and expediency of teaching reading and writing at the age of six.

is, artificial in the sense that Wundt understands early development of spoken language by the child. This means that the technique is available to the child before his need for written language matures and before he needs written language. If writing, like muscular activity and like symbolic perception, develops very easily from play, then we must not forget that according to the psychological significance it has in behavior, it is far removed from play.

In this sense, Montessori's critics are right who point to the limitations of this understanding of development, which follows from Montessori's naturalistic anatomism and leads to mechanical passivity of the child. After a month and a half, says Gessen, four- and five-year-old children begin to write with calligraphy that amazes us. But for the time, we will leave the correctness and the elegance of the letters produced by the children and turn our attention to the content of what was written. What do Montessori's children write? "We wish Engineer Talani and Directress Montessori a good Easter"; "I wish the superior, the teacher, and Doctor Montessori well"; "Kindergarten, Campaign Street," etc.

We do not deny the possibility of teaching reading and writing to preschoolers, we even consider it desirable for the child going into school to know how to read and write, but teaching must be set up so that reading and writing satisfy the child's need. If the knowledge is used only to write formal greetings to the authorities and the first words are clearly dictated by the teacher, then obviously such a task will be a purely mechanical means that may soon bore the child; his activity will not appear in it, and his developing personality will not grow. Reading and writing must be needed by the child.

Here, as apparent as it can be, is the basic contradiction that characterizes not only the experiment of Montessori but teaching writing in school as well: writing is taught as a certain motor habit and not as a complex cultural activity. For this reason, together with the first question on transferring the teaching of writing to the preschool age, the requirement for lifelike writing which may be compared to the requirement for lifelike arithmetic is self-evident. This means that writing must make sense to the child, must be elicited by a natural want, a need, included in a lifelike task essential to the child. Only then will we be convinced that it will develop in the child not as habits of the hand and the fingers, but as a truly new and complex aspect of speech.

Many pedagogues like Gettser, not agreeing with the general spirit of teaching reading and writing as practiced by Montessori, speak for a transfer of the teaching of writing from the school to the kindergarten, but even here an erroneous approach to the problem and an underestimation of the significance of written language are apparent. Like speech, say the pedagogues, knowing how to read and write in the elementary sense of the word is more a habit of the mental order. Nothing could be more wrong than such an approach to writing. We have seen what a complex prehistory writing passes through before its definitive development, what leaps, metamorphoses, and discoveries are necessary for it to develop and be established. We know what a major change speech introduces into the behavior of the child. For this reason, we must not consider mastery of reading and writing as a simple mental habit. The indicated exactness even of the most perfect and liberated school methods of teaching reading and writing can be explained not by the fact that teaching reading and writing cannot become the subject of a school lesson, but by the fact that none of these methods takes into account the main thing and instead of written language, gives the child writing habits. Not for nothing does Gettser say that there is no basic difference between knowing how to read and write, knowing how to speak, dress and undress oneself, and knowing elementary drawing. Gettser

sees Montessori's merit in that she demonstrated that knowing how to write is to a significant degree a purely "muscular capability."

We see in this the weakest point in the Montessori method. For her, writing is purely muscular activity and for this reason her children write letters that have no content. Between knowing how to write and knowing how to dress, there is a major difference that we tried to emphasize throughout this whole chapter. The moving, muscular aspect of writing, which undoubtedly plays an enormous role, is a subordinate aspect, and it is specifically the failure to understand this that may explain the lack of success of Montessori.

What conclusion can be reached from this?

W. Stern disputes Montessori's opinion that it is necessary to teach a four-year-old child to read and considers it not by chance alone that such teaching begins at the beginning of the seventh year of life in all cultured countries. For confirmation, Stern cites the observation of M. Mukhov: it is specifically the paucity of play in the Montessori kindergartens that spurs the children to turn to reading and writing. In kindergartens set up according to the system of F. Fröbel,[85] where the child has many more activities, observations, work for developing fantasy and interests, and independence in play, children of this age rarely show an interest in reading and writing of themselves. The opinion of Mukhov has received indirect confirmation from observation of how a child himself arrives at a need to read and write without didactic influence. Here, as Stern says, maturation of this capability occurs along entirely different paths.

All of our observations presented above had the purpose of demonstrating to what degree knowing how to read and write differs in a major way from knowing how to dress and undress. We tried to disclose all the uniqueness and complexity of the path by which the child comes to being taught to write. The gross simplification of the tasks with which psychological consideration of the pedagogical process is usually confronted is most clearly apparent when even the best pedagogues are inclined to consider both habits—writing and dressing—as mainly one and the same thing. Genuine psychological analysis shows, and every pedagogue knows from experience, to what degree this is not one and the same thing, to what degree teaching writing must go through a complex path of development. Teaching writing as a habit leads specifically to the principle of writing that is not lifelike, to gymnastics of the fingers, and not to the cultural development of the child. When we read the letters of Montessori's children and admire their calligraphy, we cannot ignore the impression that we have children before us who learned how to hit the keys, but are deaf as far as the music their fingers are making is concerned.

The third point we wanted to make as a practical conclusion of our research is the requirement for natural teaching of writing. Here Montessori did a great deal. She showed that the motor aspect of this activity may be elicited in the natural process of the child's play, that writing must not be thrust on the children, but cultivated. She presented the natural path of the development of writing. Moving along this path, the child comes to writing as to a natural moment in his development and not as to external training. Montessori showed that the natural element for teaching reading and writing is the kindergarten, and this means that the best method for teaching is one in which the children do not learn to read and write, but in which both habits are the subject of play. For this, it is necessary that the letter become the same kind of element in the life of the child as, for example, speech is. In the same way that children teach themselves to speak, they must themselves learn to read and write.

The natural method of teaching reading and writing consists of appropriately affecting the situation in which the child finds himself. The child must need reading

and writing in his play. But what Montessori did with respect to the motor aspect of habit should be done with respect to the internal aspect of written language and its functional assimilation. It is also necessary to bring the child to an internal understanding of writing, necessary that writing should appear in the development of the child. For this, we can indicate only the most general path. Just as hand work and mastery of lines are preparatory exercises in the Montessori method for the development of the habit of writing, the activities we have indicated—drawing and play—must be preparatory stages in the development of children's written language. The pedagogue must organize the necessary actions of the child, the whole complex transition from one method of written language to another. The pedagogue must lead the child through the critical moments right up to the discovery that not just things can be drawn, but also speech. But this methodology of teaching writing is a matter for the future.

If we should want to summarize the practical requirements and express them in a single position, then we could say that consideration of the problem leads us to the requirement to teach a child written language and not writing the alphabet.

Montessori used her method to teach not only normal children, but also retarded children of the same mental age, correctly pointing out that she was developing Seguin's method first applied to retarded children. She succeeded in teaching several retarded children to write orthographically and calligraphically so well that she was able to have them participate in a general examination together with normal children. The retarded passed the examination quite well.

Thus, we have two exceptionally important instructions. First, that a retarded child of the same mental age can learn to read and write. However, apparent here with even greater clarity is the absence of a demand of lifelike writing and teaching of written language of which we have spoken. Specifically because of these methods, Gettser rejects Montessori's principle, indicating that at an early age, children do not yet come to understanding written words and that Montessori's results are a focus that has no pedagogical value. According to Gettser, teaching should begin before the child reaches the mental maturity that is needed for learning written language. As far as the method of teaching is concerned, Gettser also favors devices of preschool education so that the child would be prepared for reading and writing by drawing, and reading and writing would appear in the process of play and not as school subjects.

The importance of mastering written language as such and not just external reading and writing is so great that sometimes researchers directly divide the retarded into those who read and those who don't. Actually, if we divide the retarded according to degrees of mastering speech, then we must say that the idiot is a person who has not mastered speech at all; the imbecile learns only oral speech, but the retarded is capable of learning written language as well, and it is all the more important and more difficult to teach the retarded not only the mechanisms of reading and writing, but also true written language and knowing how to write and express his thought in writing. We already know that for the retarded child the same task is more creative than for the normal child. In order to master written language, the retarded child must exert more creative force; for him it is a more creative act than for the normal child. In experiments, we saw how retarded children work through the same crucial moments in developing written language that we observed in normal children, but with great effort and great expenditure of creative energy. In this sense, we might say that understanding what is written and being able to read is in itself the crown of all cultural development of which the retarded child is capable.

With blind children, we saw some experimental evidence that learning to read and write is, to some degree, not a simple motor habit, a simple muscle activity, because in the blind habit is something completely different, the content of muscle activity is very different compared to that in the sighted. Also, while the motor aspect of writing is completely different, in the blind child, the mental aspect of writing remains the same. The blind cannot master written language as a system of visual habits, and for this reason he experiences a great retardation in the development of the whole activity connected with signs as we have already ascertained with respect to development of speech. The absence of drawing greatly retards the development of written language in the blind child, but his play in which gesture also contributes meaning and sense to an object bring him by a direct path to writing. The blind read and write with raised points that represent our letters. The profound uniqueness of all motor habit when the blind child reads with two fingers can be explained by the fact that tactile perception is constructed in a completely different way from visual perception.

It would seem that here we have a completely different motor habit, but psychologically, as Delacroix says, the process of teaching a blind child coincides with the same process in the sighted; as it does there, attention gradually transfers from the signs themselves to what they signify, and the processes of understanding are developed and established in exactly the same way. In the development of writing in the blind, we see a clear example of how cultural development occurs in the abnormal child. Where he experiences a divergence between the system of signs developed in the process of historical development and his own development, we create a special cultural technique, a special system of signs that fulfills the same function psychologically.

The uniqueness of development of written language in the deaf-mute has not been appreciated sufficiently, and probably the fatal mistake in all teaching of speech to the deaf is that they are taught oral speech initially and then written language, while it should be the other way around. For the deaf-mute child, the basic type of speech, symbolism of the first order, must be written language. He must learn to read and write the way a child learns to speak, and oral speech must be developed in the deaf-mute as reading of what is written. Then the written language will become the basic means for verbal development of the deaf-mute child. If we teach the deaf-mute child written language and not just calligraphy, then we will be able to bring him to a higher degree of development, a degree which he will not reach by social interaction with other people, but may reach only through reading books.

Chapter 8
DEVELOPMENT OF ARITHMETIC OPERATIONS

We know that the principle of ordering, that is, giving a quantity a certain structure, making it possible to perceive a certain quantity by sight, remains a basic principle of the psychology of operations with great numbers. It is much easier for us to perceive the absence of a soldier from a company than the absence of a person in an unregimented crowd. If we hear a song or poetry and if one beat or one syllable is out of place, then, although we may not know the beat or these syllables, we feel the slip directly upon hearing it. The child proceeds in the same way. He takes an unordered pile of objects, places them in rows like a company of soldiers and sees at once that one is missing. Children understand the significance of ordering. This is expressed in the following example. Children who are accustomed to using cubes for building things begin very early to check the results of dividing the cubes or blocks according to what they are building, for example, a model of a tractor. All the children build it the same way and each sees whether he has enough blocks for a tractor. The children check the results of the division simply according to the tractors.

It is remarkable that the children relate to putting figures together not as to a goal in itself, but as an arithmetic game, and specifically, as a means and a demonstration. If all of them build a tractor and one child says, "I made a clock," then the children will demand that he break up his clock and make a tractor. One must build something that is comparable. This is a unit of counting. Children protest when they are building tractors and one builds a clock. They see that in this way they are deprived of the means of checking, that here they lack a common denominator.

Even more interesting are the experimental cases where we made the point of testing more difficult. The children had to divide a number of pencils of different colors, shapes, and sizes. These were not cubes or blocks that were completely alike from which it was easy to build tractors. From the point of view of arithmetic, the children proceeded completely correctly, but from our point of view, incorrectly. They began by distributing groups of pencils; they all seemed different. Then the children tried to make the groups equal. One pencil is longer, another, shorter.... And here the children began to make long wands of the pencils. All pencils were placed into wands and each child got one such wand. But one child had five short and another, two long pencils. From the point of view of arithmetic, this is an incorrect division, but from the formal point of view from which the child approaches the problem, it is correct.

Another most important point consists of the following: we cannot have a remainder greater than the divisor; the situation the children encounter is different. A child makes the distribution with the help of "tractors." The division consists of the following: the children make several "tractors" or "clocks" immediately. Six

blocks are needed for each tractor and there are participants in the game. One child has five blocks as a result. Can this be divided among four children? Yes, but a tractor cannot be built with five blocks; as a result, for the child, five blocks are a number that exceeds the divisor and is a remainder. This is a quantity that cannot be divided under the given method of division.

Here we see experimental evidence of the fact that such division is a mediated operation. It is possible to refuse to divide five blocks among four participants and consider them as a remainder. Here, the child divides not by eye, but he selects a certain figure, a tractor or a clock, which serves as a kind of measure, a unit. And if the unit consists of six blocks or cubes, then five blocks are a remainder, that is, a situation develops which is impossible with direct arithmetic.

The transition from direct arithmetic to mediated, from a reaction by sight to a reaction that resorts to the tractor, clock, or wands as an auxiliary means is the most important instant in the arithmetical development of the child.

The observations of Ranschburg and his students of severely retarded children showed that in these children it was difficult to elicit a transition from direct reactions to number to reactions that involved a figure that could serve as a unit, as a subsidiary means. It seems that our decimal system is difficult and almost incomprehensible for the severely retarded. Such a child does not go beyond the first ten. He cannot assimilate such a system. As Ranschburg says, there is an important symptom in the development of the child which can be used to predict how learning arithmetic will proceed. If the child does not resort to the devices of dividing of which I spoke, there is every basis to expect that he will be incapable of grasping cultural arithmetic. Basic culture in the development of counting consists of a transition from direct perception of number to mediated perception, to the child's beginning to compare numbers to certain signs and to operating with these signs.

To conclude with preschool arithmetic, we must indicate the final stage through which its development passes. Quite soon, the older child is confronted with the fact that the method of dividing with the help of "tractors" and "clocks" distracts energy, attention, and time from the nonmediated task before him. The child is confronted with arithmetical difficulties, one of which is that the remainder exceeds the divisor. Then the child makes a transition to another, simpler form of operation. He begins to use as a basic auxiliary means not such concrete forms as "tractors" or "clocks," but certain spatial, abstract forms that correspond to the number and may by divided according to units.

As far as we could trace this, it is evidently the last stage in the development of preschool arithmetic. We cannot say which paths further development would take if the child were left to himself, if he would not find himself in school and was not taught our system of counting, if he were to continue to develop along the natural, innate path. In practice, we cannot observe this. Almost always there are exceptionally crucial points in the development of the child, there is always a collision between his arithmetic and another form of arithmetic that adults teach him. The pedagogue and the psychologist should know that the child's learning cultural arithmetic produces a conflict.

In other words, development here consists of a certain break, a certain collision, in a collision between the forms of operating with numbers that the child developed himself and those that adults teach him. Up to this time, psychologists and mathematicians are divided into two camps. Some say that the process of learning arithmetic proceeds more or less along a straight line, that preschool arithmetic prepares one for school arithmetic completely naturally the way the prattling of a child prepares for his speaking. The school teacher only corrects the child and pushes him further in the same direction. Other methodologists say that the process

occurs in a completely different way. Between the preschool stage and the school stage, there is a certain break, a transition from one path to another. This displacement marks a turning point in the arithmetical development of the child.

The child makes a transition from direct perception of number to mediated perception by experience, that is, to mastery of signs and ciphers and their correct meaning, to those rules that we use which consist of replacing operation with objects by operation with number systems. If we want to divide a certain number of objects among a certain number of participants, then at the beginning we count the objects and the participants. Then we carry out the arithmetical operation of division. The point at which the child makes the transition from direct reaction to number to abstract operations with signs is the point of conflict. It creates a collision between the former line of development with that which begins with the learning of school signs.

We cannot imagine that development goes along a completely straight line. There are many leaps, breaks, and turns. It is interesting to select children for observation who, on the one hand, still do not know how to really count, but already have the rudiments of ordinary counting and, on the other hand, still have not completely abandoned "natural arithmetic." If we could do this, we would see that both methods of counting come into conflict, push each other away. Here we approach the basic, well-known methodological argument in arithmetic: how is counting to be taught—by way of number figures or by way of constructing a counting series.

We posed the problem of what is the relation between counting and perception in the child. We saw that at the first stage of development the form is an auxiliary means for counting. We gave a simple example where was it easier to note the absence of one person in a company of soldiers or in a crowd. The form, i.e., a certain ordering and correctness of the visual impression itself, is an important aid to correct perception of number. The first stage in the development of the child—using form and perceiving it—is most important; it is the stimulus for the development of perception of number. Take a simple domino game and you will see that the child, without knowing how to count, can play dominoes, matching the figures 2 and 2. It is completely clear that the ordered form stimulates to a high degree and assists the development of primitive, natural arithmetic. From this it follows that various objects can be used for various systems of counting. It is completely clear that it is not always possible to count with one and the same unit.

To master number perception by counting is a function different from perception of form. Thus, if the child counts cubes distributed in a cross, he gets one cube more: he counts the one that is in the middle twice because it occupies a formal place in two rows, the horizontal and the vertical. It does not occur to the child to skip this cube, that is, to deviate from the form. Our colleagues carried out such research recently. The data they collected showed that the older the children were and the higher in cultural development, the fewer such mistakes they made. If a more complex figure was presented (a square of cubes and another square that intersected the first) it resulted in a number of cubes being part of both squares. Counting in this case was even more involved. As a general rule we can make the following statement: the child who mastered form gave a correct count, but the child who got lost in the form, got lost in the count. But we only had to present squares of a different color, only had to relieve the conflict to see a decrease in the number of errors the children make.

In a child standing at the break between "natural" and "cultural" arithmetic, the relation between perceiving form and arithmetical operation changes radically. If form helped the arithmetical operation before, now it begins to hamper the op-

eration. We are approaching the basic methodological argument that divides teachers and psychologists into two camps. Some authors say that the child's arithmetic develops from direct perception of number figures and this means that it is necessary to study with number figures—wands, points, ones, twos. Others say that the child must be taught not with number figures where the numbers are always given in certain forms, but must rather be freed from them to pass more rapidly to mediated counting. W. Laj[86] and other adherents of the method of number figures showed with many experiments that the child who carries out counting operations with the help of number figures, visual samples, masters these operations much more quickly.

It would seem that the argument has been settled: experiments have shown that the visual method is easier and gives better results than other methods. Actually the argument only grew more intense after experimental evidence was presented. The problem has not yet been solved by the fact that the child learns more easily with one device than with another. He masters counting operations more easily because the whole course of prior development that was preparing the child also pertained to numbers. We say that all preschool arithmetic is, to a significant degree, arithmetic of direct perception of number, direct operation with numbers. But one may ask, does this device lead to the arithmetic that adults teach the child?

This can only be resolved depending on a number of conditions. If we start from the point of view that school development of arithmetic is a direct continuation of preschool development, then the adherents of number figures are right. They say that what the child did when he learned "natural" arithmetic, he will do here also, with a certain systematic, methodological approach. If we start from the other point of view and take into account that preschool arithmetic differs from school arithmetic, that the child passes from direct perception of numbers to mediated perception, then something else will be clear: although operating with number figures is easier for the child, this is not part of cultural arithmetic, but deviates from it; it consolidates the close tie between number and perception of form from which the child must free himself; it keeps the child at a lower stage of development.

Thus, the following is the main point: at a certain stage of development, the child comes to understand the limitations of his arithmetic and begins to make a transition to mediated arithmetic. "Tractors," "clocks," and other figures appear in the role of numbers. A conflict develops between our counting system and direct perception of figures. School arithmetic is the turning point. Although preschool arithmetic conflicts with school arithmetic, this does not mean that the school approaches the child purely mechanically. In the collision, a new, further stage of the development of counting appears.

Chapter 9
MASTERING ATTENTION

The history of the child's attention is the history of the development of the organization of his behavior. This history begins at the moment of birth. Initial attention occurs through hereditary nerve mechanisms that organize the reflex processes according to the principle of the dominant that is familiar in physiology. This principle establishes that in the operation of the nervous system, the organizing point is a dominant focus of excitation that inhibits the process of other reflexes and is augmented at their expense. The dominant nerve process is the organic base of the process of behavior that we call attention.

The first chapter in the development of the child's attention is traced through the genetic study of the child's reflexes. The study establishes how new dominants appear sequentially in the child's behavior and how the formation of complex conditioned reflexes in the cortex of the brain begins on this basis. It is extremely important to note that the formation of conditioned reflexes depends on the development of an appropriate dominant. For example, genetic studies have demonstrated a definite dependence of the formation of an associative reflex on the development of dominant processes in the central nervous system, since an associative reflex, in the words of V. M. Bekhterev, can be formed only from the receptive surface from which a dominant functional affect arises in the central nervous system.

The newborn has only two dominants: the feeding dominant and the position dominant that is manifested by a change in position. Bekhterev says that with these dominants, only an association between them can be formed: a conditioned reflex in the form of a feeding reaction that arises when the child is placed in a position customary for breast feeding. Before corresponding dominants develop, no other conditioned reflexes related to other perceived surfaces can be formed. Gradually, the child develops visual, aural, and other dominants, and only with their development is the formation of new conditioned reflexes related to the eyes and ears possible.

Thus, the dominant process stands at the very beginning of the formation of new connections in the cortex of the child's brain and determines the character and direction of these connections. We term this period in the development of the child, which encompasses the natural maturation of separate dominants, the period of natural or primitive development of attention. This term is based on the fact that development of attention at this time is a function of a general organic development of the child and primarily of the structural and functional development of the central nervous system.

Consequently, a purely organic process of growth, maturation, and development of the nervous apparatus and functions of the child form the base of the development of attention during this period. This process is analogous to the proc-

ess of evolutionary development of attention from lower to higher organisms where it can be observed with greatest clarity. We do not want to say that the organic development of attention in the child is parallel to the process of evolutionary development of attention or repeats it to any extent. However, we want to stress that these processes are similar with respect to type of development: in both cases, the base for development of attention as a specific function of behavior is the organic development or maturation of the corresponding nervous processes.

This process, which occupies a dominant place in the first year of the child's life, does not stop, does not end in later childhood or even in the subsequent life of the person. The relative equilibrium and stability that we observe in the adult in comparison with the child indicates essentially only an enormous retardation of the rate, and sometimes a change in direction of the processes, but not their cessation. These seemingly attenuated and retarded processes of organic change, however, affect the operation of our attention every day, and this dependency becomes especially perceptible and clear when these seemingly attenuated processes are revived when they change in morbidity.

The significance of the organic process that is the basis for development of attention moves to the background very early in comparison with the new processes of development of attention that are qualitatively different in type, specifically the processes of cultural development of attention. As cultural development of attention, we have in mind the evolution and change in the devices of control and the operation of attention, the mastery of these and their subjection to the will of the person, that is, processes analogous in type to the cultural development of other functions of behavior which we spoke of in preceding chapters.

Consequently, psychological study shows that in the development of attention we can also definitely see two basic lines with which we are already familiar. We can identify the line of natural development of attention and the line of cultural development of attention. We will not consider the relation that exists between the one line and the other in the development of attention because this problem has already been adequately elucidated in preceding chapters. Our task is to trace and graphically note the path of the second line, that is, the history of the cultural development of attention.

Strictly speaking, cultural development of attention also begins at a very early age, with the first social contact between the child and the adults around him. Like all cultural development, it is a social development.

The cultural development of any function, including attention, consists of a person's developing a series of artificial stimuli and signs in the process of mutual living and activity. The social behavior of the personality is directed by means of these and they form the basic means through which the personality masters its own processes of behavior.

In order to trace the history of the mechanisms of attention genetically, we proceeded in the same way as in the study of other processes described above. We tried to create a situation experimentally in which the child would be confronted with the task of mastering processes of his attention with the help of external stimuli-devices. Implementation of this can be found in the work of our colleague, A. N. Leont'ev,[87] who developed a method of double stimulation applicable to the study of mediated processes of attention. The essence of the experiments consists of the child's being confronted with a problem that requires a long, exerted attention, a concentration on the given process.

The experimenter plays a game with the child, "Questions and Answers," a game of the "Forfeit" type, with the following stipulation: "You must not say 'yes' or 'no,' or 'black' or 'white.'" The child is asked questions to some of which he

must respond by naming a certain color. For example: "Do you go to school? What color is the desk? Do you like to play? Were you ever in a village? What color is the grass? Were you ever in the hospital? Did you see a doctor? What color is his smock?" etc. The child must answer the questions as quickly as possible observing the instructions that he must not name the two forbidden colors, for example, black and white or red and blue, and not name the same color twice. The experiment is set up in such a way that meeting the requirements is quite possible but requires constant attentive effort on the part of the child. If the child breaks a rule and names a forbidden color or repeats the same color twice, he pays a forfeit or loses the game.

An experiment set up in this way demonstrated that the task is extremely difficult for a preschool child and quite difficult even for an eight- or nine-year-old who cannot carry it out without error. Actually, the situation requires concentration of attention to an internal process on the part of the child. It requires him to control his internal attention and is beyond his ability. The course of the experiment changes radically when the child is given colored cards as an aid: black, white, cream, red, green, blue, yellow, brown, gray. The child immediately has an external auxiliary device for solving the internal problem of concentrating and intensifying attention, and he makes a transition from direct to mediated attention. As we have already said, the child must master his internal attention, but he works with external stimuli. Thus, the internal operation is carried out or at least connected with the external operation and presents us with the possibility of studying it objectively. A double-stimulus type of experiment unfolds before us.

Two series of stimuli confront the child. The first is the question of the experimenter, the second, the colored cards. The second series of stimuli is the device that helps fix attention on the correct response. The result of introducing the auxiliary series of stimuli usually is very quickly apparent and the number of incorrect responses decreases rapidly, which indicates the increased stability of attention and the fact that the child masters these processes with the help of the auxiliary stimuli.

Let us consider the development with age of both forms of concentration and the establishment of attention in the double-stimulus experiment. In the preschool child, both forms of attention are usually close to each other. Their divergence increases markedly during the first and especially during the second school year and becomes insignificant again in adults. Tracing the development of attention from the preschool child to the adult, we reach a basic conclusion. The difference in activity of mediated and direct attention increases beginning with preschool age, reaches a maximum during the second year of schooling, and then exhibits a tendency toward leveling off. Subsequently, we can easily see in the two curves that show the basic genetic law of development of attention, a picture that is essentially similar to the parallelogram of the development of memory, which we shall try to elucidate in the next chapter.

In order to explain the sequence in the development of mediated attention, we must briefly trace the course of the experiment at various age levels. Here we will note mainly that in the preschool child, the difference between the number of errors with the one method and the other of directing attention is negligible and the introduction of a new device does not essentially change the course of the whole process. The preschool child does not use the stimulus-device that he is given to any significant degree. He frequently plays with the cards as if they had no connection to the task at hand and sometimes selects one randomly and is guided in his response by the suggestive influence of the card. The child who carries out the task most successfully begins to make partial use of the auxiliary device. He isolates the forbidden colors, say white and black, puts them aside and uses the colors of

the cards that he kept. But once the color has been named, the child does not remove that color from the cards that he has.

As a rule, it is only at school age that the child makes full use of the device he is given. The internal operation becomes external, and the child controls his attention with the help of the external stimuli-devices. The cards begin to be clearly differentiated into "possible" or "impossible" colors, as one of the subjects of the experiment put it; the used colors, those already named, are added to the forbidden colors. The school-age children clearly exhibit a dependence on the device by attempts to mechanize the whole operation, which frequently results in mindless responses since the children display a tendency toward being guided only by the color of the card but not by the sense of the question.

Thus, in the school-age child, resorting to the stimulus-device quickly increases efficiency of internal attention, but essentially reduces the quality of the response and moves in this way toward an inexpedient use of the device he is given. Older school children use external devices most fully and most adequately; they no longer exhibit complete dependence on the cards as do the younger children.

The number of errors decreases correspondingly. In the preschool child, mediated attention scarcely decreases the percentage of errors; in children in the lower grades, the percentage of errors drops by half, and in the older school children, by a factor of ten. Thus we have a seemingly sequential picture of the development of mediated attention: the processes are mastered gradually and attention is subjected to the will. Only in adults do we note again an extremely insignificant drop in number of errors when they resort to the cards.

To elucidate this fact, which plays a central role in the process of development of voluntary attention, we turn to experiments in a special series that show that in an individual child, the curves of development of both processes of developing attention are similar in form. If we continue these experiments with a preschool child for a long time, within the framework of this operation, the child generally follows the same course relatively quickly. The child's behavior during the experiment will pass through the following stages sequentially: (1) incomplete and inexpedient use of the cards; (2) transition to vigorous use of the cards and complete subjection to the external devices, (3) expedient use of the cards for solving the internal task with external devices, and finally, (4) transition to the type of behavior that adults exhibit.

As strange as this may seem at first glance, in our experiments, in the transition to using cards, the adult behaves very much like the preschool child if we are to judge by external appearance. The adult also makes little use of the cards; his operation has the character of using a semi-external device and he makes notes "in his mind" of the forbidden and already used colors, but does not touch the cards. Observing this behavior, which we saw in the long-term experiment with a child, we have a firm basis for assuming that this is due to a conversion of the processes, that is, to a transition from an externally to an internally mediated process.

In contrast to the preschool child, in the adult, the processes of voluntary attention are well developed and, in his mind, through words or through some other method, he can fix the forbidden or used colors; we can observe this same process in the child when the external auxiliary stimulus is replaced by an internal stimulus. In a corresponding experiment, together with a decrease and sometimes an extinction of the external operation, internal attention increases significantly in both the child and the adult, which is evident in objective results. On this basis, we conclude that the child experienced a reorganization of the internal processes as a result of the transition to the mediated form of attention and a conversion of the external device during which the external operation became an internal operation.

Data from analysis of the structure of the operation support this. They show that one and the same problem can be solved by different internal operations. In the expression of A. Binet, the child simulates attention when he isolates the forbidden colors from the field of vision and fixes his attention on the colors that remain before him. He replaces one operation with another that has the same effect but which essentially has nothing in common with the first. Again we see the deep difference between phenotypic and genotypic forms of the processes.

Sometimes the child solves the problem completely differently. He does not put the forbidden colors aside, but selects them and puts them before him and fixes his eyes on them. In these cases, the external device corresponds precisely to the internal operation, and we have before us the operation of mediated attention. With this operation the very process of searching for an answer is reorganized. The child must give a correct response, that is, a thoughtful response to the question posed and must observe the stated formal rules and not use certain colors. This unique purposefulness of attention transforms and reorganizes the process of seeking an answer; it directs thinking in a roundabout way. The child's responses become more and more qualitative. In place of a direct response to the question as to what color the grass is, the child who must not say "green" responds, "In the fall, the grass is yellow." To the question, "Are tomatoes red?" when red is a forbidden color, the child responds, "They're green when they're not ripe!" In this way, the subject resorts to new situations and makes a transition to a more difficult way of thinking.

In the most general outlines, such is the history of the development of attention. With T. Ribot,[88] who was the first to connect the problem of voluntary attention with the problem of the cultural development of man, we can say that its genesis is very complex, but it corresponds to reality.

It seems that Ribot was the first psychologist to consider voluntary attention as a product of human cultural historical development. He called involuntary attention natural, and voluntary attention, cultivated. He said, "The cultivated uses natural strengths to accomplish its tasks and in this sense, I term such a form of attention cultivated" (1897, p. 30).

To the question as to how voluntary attention arose, he responds that the same progress that forced man to make a transition from primitive savagery to a state of organized society forced him to make a transition from the dominance of involuntary attention to the dominance of voluntary attention. "The latter serves simultaneously as a consequence and a cause of civilization" (ibid., p. 33).

Digressing at present from considering to what extent Ribot is historically correct in linking the development of voluntary attention with the development of society, we cannot help but note that Ribot's formulation of the question itself involves a colossal revolution in the views of attention and lays out the first path toward its historical elucidation.

According to Ribot's views, voluntary attention is a historical form of natural attention that arose under specific conditions of adaptation of social man to nature. Ribot says that as soon as man left his wild state for one reason or another (inadequate supply of game, population density, soil infertility, nearness of tribes that were better armed) and was confronted by either death or adaptation to more complex conditions of life, that is, work, voluntary attention became in its turn a factor of primary importance in this new form of struggling to live.

As soon as man had the capability of devoting himself to work that was essentially not attractive but necessary for living, voluntary attention came to be. It is easy to say that before the appearance of civilization, attention did not exist or appeared for an instant as a fleeting flicker of lightning.

Ribot, who was the first to point to the social nature of voluntary attention, also demonstrated that this form of attention develops and that, in general, the development proceeds from the external to the internal. Voluntary attention gradually is converted into an internal operation and, finally, at a certain period of development, the developed attention becomes second nature—the task of the cultivated is accomplished. It is enough to find oneself in familiar circumstances, in a familiar environment, for all the rest to follow.

But it seems to us that Ribot's theory does not explain the mechanism itself of the activity of voluntary attention or give any precise picture of its ontogenesis. Ribot's mechanism can frequently be reduced to training. As we would now say, it shows the emergence of voluntary attention as the emergence of a simple conditioned reflex to remote stimuli that signal another stimulus that elicits natural attention. Undoubtedly this mechanism is the basis of the transition from involuntary to voluntary attention, but it is not most characteristic or most essential for it; it plays a subordinate role and elucidates, in general, any transition from an innate to an acquired form of behavior.

From this point of view, as Ribot establishes, an animal also has voluntary attention. So it is not evident why voluntary attention is a product of civilization. Ribot says that there is no need to prove that a transition from involuntary to voluntary attention also occurs in animals as a result of rearing and training. Binet stresses only the limitation of means by which we affect animals, evidently due to not knowing a wide range of conditioned stimuli that can, as knowledge of conditioned reflexes shows, elicit conditioned attention in an animal.

Ribot fails to note the basic fact that an animal's attention, even with training, is not voluntary, that man, not the animal, controls this attention. In animals, there is no transition from being controlled by others to self-control, from being managed to managing, a transition that is the most characteristic trait in the development of voluntary attention in man. Ribot's error is due to the fact that he did not know the mechanism for the formation of voluntary attention and did not consider the means by which historical development of both attention and behavior in general is accomplished. Only by establishing the mechanism in which we can see control of behavior through signs can we understand how a child makes the transition from external actions to internal voluntary attention.

We attempted to trace this transition with experimentally established data on the genesis of voluntary attention.

Recently, P. P. Blonskii adopted Ribot's ideas, indicating that active voluntary attention is undoubtedly a late product of development. Primitive attention, which appears at the very beginning of a child's life and which Ribot was inclined to identify with maximum wakefulness, differs from involuntary attention in that the latter, in his opinion, is determined mostly by thinking and is the most developed form of attention.

Thus, the genetic approach to the problem of voluntary attention is noted with all clarity. However, even here no very clear genesis of this form of attention is presented, and what is the main thing, neither is any analysis of how it develops. It seems to us that in light of the data we have accumulated, the more important laws of the development of attention established by researchers, which are now accorded their place in the whole process of development of voluntary attention, could be elucidated.

The most fully developed positions of the genetic theory of attention were worked out by E. Titchener[89] on the basis of the fact that the two forms of attention are distinguished in their popular meaning—specifically, passive or involuntary attention and active or voluntary attention are in reality characteristic for different

stages of mental development. They differ from each other only in complexity as earlier and later forms and exhibit one and the same type of consciousness, but at different periods of our mental growth. Titchener tries to explain the difference and character of each of them on the basis of the conditions under which they appear.

Analysis brings the author to the conclusion that involuntary and voluntary attention are essentially primary and secondary attention and that primary attention represents a certain stage of development, specifically the earliest stage of development of voluntary attention. Characteristic for secondary attention is that the relation between the subject and the object changes substantially. In themselves impressions not only do not attract and do not hold our attention, but on the contrary: it seems that we pay attention to some impressions or others with the help of internal effort.

A problem in geometry does not leave as strong an impression as a clap of thunder. However, it can attract our attention and such attention Titchener terms secondary attention. In his opinion, secondary attention is the inescapable result of the complexity of nervous organization and is secondary or active as long as it retains a trace of conflict.* We could scarcely bring more weighty evidence for the origin of secondary attention from the primary than the fact from everyday experience that secondary attention is continuously converted into primary. Titchener calls this voluntary primary attention and in this way arrives at three stages in the development of attention and attempts to reduce the difference between them to a mainly genetic difference.

He says that on the whole, in the human mind, attention is found at three stages of development. Secondary attention is a transitional stage, a conflict stage, a stage of dissipating nervous energy, although this attention is an indispensable preliminary condition for the stage of subordinate voluntary attention. From Titchener's point of view, there are three stages of attention, but only a single type of mental process of attention. The three stages exhibit a change in complexity, but not in the character of the experience itself.

Here we see Titchener's attempt to define attention genetically; Titchener tries to apply his theory to different ages. Considering life as a whole, he believes we can say that the period of learning and education is a period of secondary attention and the period of mature and independent activity that follows it is the period of voluntary primary attention. It seems to us that Titchener's theory comes closest to the data that we established in our genetic studies.

We cannot help but see that three of the four main stages that we noted in the development of all cultural behavior are repeated in Titchener's stages. His primary attention corresponds to our primitive or natural attention; his secondary attention, to the stage of externally mediated attention; finally, his third stage, to the fourth stage of turning.** Lacking is only the second, transitional, naive-psychological stage which we were not able to trace precisely in our experiments, but which nevertheless was observed in clinical observations especially in abnormal children.

Moreover, Titchener established without a doubt that voluntary attention differs from involuntary attention only in the way it is generated, not in its method of functioning. In other words, the development of attention is accomplished not according to type of organic maturation and change, but according to type of evo-

*Editor's note: Conflict between the task and the impression made by the clap of thunder.

**Editor's note: In the analysis of transitions from the primary to the secondary and then the tertiary stages of attention, Titchener proceeds from a different determination of attention and different conditions of transition.

lution of the form of behavior itself. It seems to us, however, that Titchener's theory, although it approaches the problem of attention genetically, is still based on a purely external phenotypic description of a separate stage and does not demonstrate the mechanism of development and the mechanism of action of these separate processes. Thus, Titchener dwells on experiences and not on objective function of the process and does not demonstrate the uniqueness of the structure of secondary attention in contrast to the preceding stage. On the basis of his point of view, why derived primary attention is raised to a higher state in comparison with the point of departure remains unclear. Completely correctly he states that secondary attention originates from conflicts of initial forms of attention, from features of perception and from the struggle of incompatible motor acts. But, of course, such struggle occurs even when the child is very young. If in explaining the appearance of voluntary attention we do not involve the fact that together with natural stimuli and their interrelations, social stimuli that control his attention are also significant for the child, it still remains unclear why and how our attention is initially subject to external impressions or direct interests and later begins to subject these impressions or interests to itself.

This inadequacy of a purely empirical description of the transition of voluntary attention to involuntary without noting the genesis and mechanism of this transition, like the qualitative features of the second stage, is also evident in the statement of E. Meumann,[90] who wrote that voluntary attention is gradually converted to involuntary. As we have already said, here we see experimental evidence that voluntary attention does not differ from involuntary in the mechanism of its organic basis, but in the structure of psychological behavior.

In his experiments, Meumann found an equally clearly expressed symptom for voluntary and involuntary attention—the slowing of the pulse, which probably can be explained by the following: in the subjects, voluntary attention consistently and very quickly turned into involuntary attention. But other researchers found the opposite symptoms for voluntary and involuntary attention: symptoms of involuntary attention are closer to the affects and coincide with the symptoms of amazement and fright, while voluntary attention is characterized by symptoms that are appropriate to willful acts.

We believe that this disagreement can be explained in the light of the genesis of attention that we noted. In the one case, we are speaking of the very moment of establishing attention which is the same voluntary process of controlling behavior as any other. In the other case, we are speaking of an already established and automatically working mechanism of attention. In other words, the difference in symptoms here is the difference in the stages of development of attention.

Now let us consider very briefly one complex phenomenon that is not clear in subjective analysis and which is termed the *experience of exertion.* Where does it originate in voluntary attention? It seems to us that it flows from the additional complex activity that we term *control of attention.* It is completely natural that this exertion is absent where the mechanism of attention begins to work automatically. Here we have additional processes, we have conflict and struggle, we have an attempt to direct the processes of attention along other lines, and it would be a miracle if all of this could be accomplished without exertion, without serious internal work on the part of the subject, work that can be measured by resistance met by voluntary attention.

The inadequacy of a purely subjective analysis also marks the work of Revault d'Allones; along the lines of Ribot, he was the first to propose differentiating attention according to structure as direct or indirect, i.e., mediated, and he perceived as an essential characteristic the fact that voluntary attention is directed toward

some object by means of some kind of auxiliary device or stimulus, which in this case is used as an instrument. From this point of view, Revault d'Allones defines attention as an intellectual operation that considers things through the mediation or with the help of one or several other things. Understood in this way, attention is converted into a direct instrumental or intellectual operation and it places an auxiliary device between the object of attention and the subject.

The author identifies various forms depending on which auxiliary devices are used, to what extent and how for mediating attention. But all the time, he has in mind only internal devices and predominantly configurations with which we direct our attention to one object or another. Revault d'Allones does not suspect that the devices may be internal and that they are consistently internal initially, and for this reason he sees in the "configurations" (continuing the ideas of H. Bergson[91]) a certain primary fact of a purely intellectual order. It seems to us that this theory may also be turned upside down and probably elucidated if we note that in this case we are undoubtedly speaking of the fourth stage or of voluntary primary attention, as Titchener puts it.

As a point of departure, Revo d'Allon takes the final stage of development and without tracing the processes as a whole, comes to a postulate of a purely idealistic character, but does not show the real process of formation of these configurations.

On the basis of the analysis of the experiments presented above and the positions that were developed in psychology on this problem, we reached the following understanding of the processes of voluntary attention. These processes must be considered as a certain stage in the development of instinctive attention; the general laws and character of their development coincide completely with what we were able to establish for other forms of cultural development of behavior. For this reason, we can say that voluntary attention is a process of the turning inward of mediated attention; the process itself is wholly subordinate to the general laws of cultural development and formation of higher forms of behavior. This means that voluntary attention in composition and in structure and function is not simply the result of natural organic development of attention, but is the result of its change and reconstruction under the influence of external stimuli-devices.

In place of the position that states that voluntary and involuntary attention are related to each other in the same way as will and instinct (the observation is quite correct, but somewhat general), we would like to say that voluntary and involuntary attention are related to each other as logical memory is related to mnemonic functions or as thinking in concepts is related to syncretic thinking.

In order to reinforce the conclusions we reached and to make certain theoretical generalizations, we still needed to elucidate experimentally an exceptionally important point in our research. We proceeded from the proposition that the path from natural to voluntary attention consists of a transition from direct to mediated operations. This is a path that is generally familiar to us on the whole in all other mental processes. But the question arises: how does mediation of the process of attention occur?

We know very well that all mediation is possible only on the basis of using natural laws for this operation, which is the subject of cultural development. For example, in memory, the mnemotechnical operation, that is, the relation between the stimulus-sign and the stimulus-object, was created on the basis of well-known natural laws of formation of structures. Now with respect to attention, we needed to elucidate what kind of natural-mental connection must exist between two stimuli in order that one might play the role of an instrumental stimulus that calls attention to the other. What, in general, are the natural conditions required for mediating

attention? What is the natural history of the laws of attention? The second and related question requires that research disclose how the actual transition from natural to instrumental occurs under certain natural conditions.

To answer these questions, which are of fundamental significance for the whole history of attention, we undertook quite complexly structured experimental studies. We shall now consider these in detail.

We proceeded from the fact that attention cannot be observed in its pure form. As we know, this caused some psychologists to use attention to explain all changes that occurred in processes of memory, thinking, perception, will, etc., and others, on the other hand, to deny completely the existence of attention as a separate mental function and to eliminate the word itself from the dictionary of psychology, as did Foucault, E. Rubin,[92] and others. Finally, a third group proposed speaking not of single attention, but of many attentions, having in mind the specificity of this function in each separate case. Actually psychology then took the path for dividing single attention into separate functions. We have a clear example of this in the work of German authors (N. Ach) and in the theory of attention of Revault d'Allones.

We know that the process of attention can occur in different ways and, as is clear from experiments cited above, we were dealing with different kinds of attention in different forms of activity. What remained was finding the most primitive and natural activity in which the role of attention could appear in the purest form and could facilitate the study of the culture of attention specifically. As such activity, we selected the reaction of selection of structural relations first used by W. Köhler in experiments with the domestic chicken, chimpanzee, and a child.

In Köhler's experiment, a chicken was presented with grain scattered on light gray and dark gray pieces of paper; the chicken was not allowed to peck at the light gray paper, but was shooed away, but it was allowed to peck freely at the dark gray paper. When this was repeated a great number of times, the chicken developed a positive reaction to the dark gray paper and a negative reaction to the light gray paper. Then in crucial experiments, the chicken was presented with a new pair of papers: one, white and the other, the light gray used in the first series. The chicken exhibited a positive reaction to the light gray paper, that is, to the same paper that elicited a negative reaction in the first pair. In the same way, when a new pair of papers was presented, the dark gray from the first series and black, the chicken exhibited a positive reaction to the black and a negative reaction to the dark gray, which elicited a positive reaction in previous experiments.

With certain changes, a similar experiment was carried out with a chimpanzee and a child. The results were even more significant. We were able to establish experimentally that under such circumstances, the animal and the child react to the structure, to the whole, to the relation between two colors and not to the absolute quality of the color. On this basis, a transfer of previous training to new conditions seems possible. In making the transfer, both the animal and the child exhibit very clearly the basic law of all psychological structure: psychological properties and functions of parts are determined by the properties of the whole. Thus, the light gray paper when included in a single whole elicited a negative reaction since in the given pair, it was the lighter of the two shades. Being included in a new pair, it elicited a positive reaction since it was the darker of the two. In the same way, the dark gray color changed from a positive to a negative reaction when it was included in a pair with black. Thus, the animal and the child reacted not to the absolute quality of the gray of one shade or another, but to the darker of the two shades.

Köhler indicates that for the experiments to be successful, very large colored surfaces with a significant difference in shades must be used and a set-up must be selected in which the relations of the colors are clearly evident. Köhler found that the difficulty with the selection reaction in previous experiments with monkeys was not in the formation of a connection between a familiar reaction and a familiar stimulus, but mainly with calling attention during the selection specifically to the given property of the visual field which must be used as a conditioned stimulus.

We must not forget that the researcher who wants to elicit and direct attention of the monkey is confronted with two completely different problems. One is calling the attention of the monkey to the experiment. If monkeys suddenly begin to relate to the conditions of the experiment apathetically, it is impossible to get the effect described. The first problem is solved fairly simply: in order to elicit the monkey's attention and direct it to the goal of the experiment, the goal selected must be obtaining food and everything startling, strong and attention-diverting must be removed from the set-up. Another more complex problem remains: directing the monkey's attention to the characteristic to which a connection must be formed. Köhler recommends selecting characteristics which in themselves attract the animal's attention, are fascinating to the animal or are eye-catching. Clearly obvious differences, large surfaces presented on a neutral background are required.

We introduced substantial changes into the experiment pertaining to attracting attention. Contrary to the advice of Köhler and using both normal and abnormal children, we presented the child with the following situation. The child was asked to select one of two cups standing before him, one of which contained a nut that he could not see and the other of which was empty. Both cups were covered with identical square lids of white cardboard to the top of which were fastened small light and dark gray squares taking up not more than one-quarter of the surface of the lid.

In this way, we purposely selected a trait that did not catch the eye in order to observe how attention is directed in this case. We made the change because the purpose of our experiment, comprising only the first link in a series, was the opposite of Köhler's purpose. Köhler was mainly interested in the formation of a connection and for this reason he wanted to create favorable conditions for creating this connection and especially for directing attention correspondingly. We already knew the process of formation of the connection from Köhler's experiments and we were interested only in the process in which we might trace the activity of attention.

We will present briefly a typical experiment with a three-year-old child. The whole attention of the child was directed toward the goal, and he did not at all understand the operation which he was asked to carry out. At the very beginning of the experiment and very frequently in its course, the child selected both cups and when he was asked to point to the one that he wanted to uncover, he stretched out both hands and had to be reminded that he must point to only one cup. Every time he was asked to indicate which of the two cups he wanted to uncover, he would repeatedly respond, "I want the one that has the nut," or he would point to both cups, saying, "I want the one that has the nut." When he won, he grabbed the nut greedily without paying attention to what the experimenter was doing; when he lost, he would say, "Wait, now I'll guess," or "Now I'll win." Soon after, when he selected the cup on the right three times in a row, he developed a reaction to place and when this rule was broken, he began to make random selections.

Because of alternation of success and failure, the most that could be elicited in a child of this age were certain vacillations before selection, but in the vacillations nothing indicated identification of a trait which the child might use in making his

selection. After 30 experiments, the child seemed to be establishing a positive reaction to the dark gray and this persisted for a certain time, but this was not confirmed in critical experiments and neither was it confirmed in a return to the original situation. To the question as to why one cup or the other was selected, the reason given seemed independent of whether the cup was covered or uncovered: "Because the nut was here," or "I didn't want to lose any more," etc.

In the experiment described, winning and losing alternated frequently enough so that the child was satisfied with the situation. His attention was fixed on the goal the whole time. It is possible that very long training would have led to the same result that Köhler got, but we lost interest in the experiment since our purpose, let us repeat, was not to verify, confirm, or develop Köhler's facts further. Usually the child's attention was not directed to the gray paper, and perhaps a greater number of experiments would be required for success.

In the same situation, a child of five, winning or losing, will give this answer to the question as to reasons for his selection: "I took this cup because I wanted it." But after a certain point in the experiment, it was apparent that the child was reacting mainly by trial and error. He chose the cup with which he had just lost. By the 23rd experiment, the child refused to forfeit the nut, saying, "I won't give the last one, I'll keep it," and in the 24th experiment, he considered for a long time. By the 49th, after three losses in a row, the child cried, "I won't play with you any more, so there." When the experimenter calmed him and asked for the reasons for his selection, he responded, "The nut moves from cup to cup, it seems to me."

We proceeded as follows. We placed the nut into the cup as the child watched, then we pointed to the dark gray paper attached to the lid. With another movement, we pointed out the light gray paper attached to the lid of the empty cup.

By the 51st experiment, the child won and as a reason, he explained, "There is gray paper here and there is gray paper here." In critical experiments, he immediately transferred his device and explained his selection: "Because the gray paper is here and the black, there." In experiments with white and gray paper, he again transferred the rule immediately and said, "Aha, this is dark gray, the nut is where it is darker. I didn't know before how to win, I didn't know that the nut was where the dark paper was." The next day and for several days, the child won at once without errors, maintaining and transferring his device reliably.

For us, the most essential point in the experiments is the instant of pointing out, the instant of paying attention, the gesture which is sufficient as a supplementary stimulus to call the child's attention to the trait with which he must connect his reaction. A very small additional nudge is sufficient for the whole process that leads the child to affective outburst to be immediately and properly solved not only with respect to the given pair of colors, but also with respect to the critical experiment. For this reason we are reminded of Köhler's beautiful statement about the chickens that in his experiments fell to the ground in a stupor, sometimes fell into a swoon, and sometimes exhibited an explosive reaction when presented with new shades of gray.

We will say at once that in the experimental moment as a gesture that calls the child's attention to something, we see—what is first and most basic—the natural conditions for the appearance of voluntary attention. In contrast to us, Köhler made every effort to eliminate difficulties, to facilitate getting the attention of the animal, and to show that in that case, a conditional connection is formed instantaneously; he said that in this respect the monkey is much more convenient than other animals. A stick is placed in the monkey's paws with which it can point to the container instead of picking it up. The process of teaching is shortened due to the fact, as

Köhler says, that he used all means to call the monkey's attention to the material that was the stimulus for selection, indicating that a banana had been put in exactly that place. We see an exceptionally important circumstance which, from Köhler's point of view, is yet another point of auxiliary significance. Köhler himself indicates that this kind of experimental set-up represents something on the order of a primitive explanation of his principle, not a literal explanation. We must note that this device led to a striking certainty on the part of the animal and to correctness of subsequent selections. In this circumstance, we see the primary function of language as a means of directing attention.

Bühler also believes that, in this case, pointing to both papers from the beginning vigorously directs the chimpanzee to the correct path: "Notice these objects. We only need to say to it: the food is in the cup with the lighter paper."

Consequently, in this experiment we see the natural roots of voluntary attention in the function of pointing, since Köhler had to create a kind of special mimic language for indicating to the monkey what it should pay attention to, and the monkey indicated to him which cup it was selecting.

We, on the other hand, had to lower the child to a primitive pointing out, having excluded verbal instructions from our experiment. Actually, we could have told the child at the very beginning that the nut was in the cup with the dark lid and he would have solved the problem sooner. But the entire purpose of our experiment was the following: we were able to trace in an articulated and analyzed form what is merged and indivisible in verbal instruction and in this way to disclose genotypically the two most important elements that are represented phenotypically in a merged form in verbal instruction.

Actually, it was very clear to us even in Köhler's experiments and from our subsequent experiments that in the process of forming the selection reaction on the basis of the darker of two shades, there are two psychological points that Köhler also tried to separate. First, we have the instant of paying attention, that is, identifying the appropriate traits and settling on the gray paper without which the process itself of forming a connection is impossible; second, we have the formation itself of the connection. Verbal instruction includes both instants simultaneously. It also turns the child's attention to appropriate traits, that is, it creates the settling of attention and creates the required connection as well. The task of genetic study was to separate these instants in the instruction. Köhler carried out the first part of the genetic analysis: specifically, wishing to show that the chimpanzee can form structural connections very easily even with one trial, he tried to study the effect of the settling of attention from the beginning by introducing traits that were eye-catching and then, with a direct attempt to evoke the settling, by instruction. And actually after the instant of settling was identified, Köhler was able to study in a pure form the laws of formation of the structural connection and the selection reaction.

We attempted to carry out the second part of the genetic analysis, trying to present both collaborating processes, the settling of attention and the formation of the connection, in a separated form and to demonstrate the role of the settling or paying attention. In our experiment, the child did not form a natural connection, partly because of not paying attention to the colors (remember that we purposely made them unobtrusive) and partly because of the spurious paying attention to the game of guessing and the paying attention to how the nut passed from cup to cup.

So there is no doubt that the difficulties that the child experienced were difficulties related specifically to settling his attention. These were most clearly expressed in the child's affective agitation, in crying and in refusing to continue the experiment. Here we saw the instant that may be involved only in directing atten-

tion, but not in establishing the connection itself, and we traced further how, depending on this nudge, the process, confused and confronting an affective dead-end, begins to develop in all intellectual clarity and transparency and in all its purity.

The connection is established by itself and, as critical experiments show, the transfer is made with the first try, that is, subsequently it develops according to natural laws, as Köhler explained. In this way, the critical experiments have for us the nature of control experiments that confirm that our instructive gesture, our pointing, was directed only to the attention of the child, and the connection developed on this basis by direct observation of the relation in the structure of the perceived field although verbal formulation of the connection developed only at the end, after the third transfer, when the child realized the situation and thought it through. After our instruction (50th experiment), the child won (51st and 52nd experiments), still giving an incorrect reason: "Here is gray paper and here is gray paper"; he gave correct responses in experiments 53 and 54, giving the following reason at first: "Because here the paper is gray and here it is black"; and only in the end did he move to the form: "Aha, here it is dark gray and where it is darker, that's where the nuts are. I didn't know how to win before." But our confidence in the results obtained would be incomplete if we did not conduct another parallel experiment in which the formation of the connection would be impeded regardless of the set-up and where, consequently, the turning of attention in itself would not lead to the formation of the required connection.

The child with whom we began the parallel experiments was present the whole time; therefore he not only paid attention, but also heard the verbal formulation of the task. In the critical experiments immediately following, the child won and answered the question as to why he chose the cup as follows: "Because that's where the nut is. Here is the gray paper and here is the nut." The child did not react to losing as to his own error, he said, "Now I'll win." In the ninth experiment, the experimenter again turned the child's attention to the color by pointing, then the child in most cases won till the 20th experiment; nevertheless, in the interval, he lost several times (the 13th and 14th trials), explaining his selection thus: "Because you told me," "Because you put the nut in this cup twice," etc.

In the critical series, the child won most of the time, but he did lose occasionally. As a reason, he sometimes said, "This one is gray and this is black." We note that where the process of forming the connection is impeded, the turning of attention and the experimenter's instruction in themselves still do not lead to success. The next morning, after repeating the experiment with the same instruction, the child won immediately, and we are right in concluding that we were successful in creating a seeming experimental instruction and obtaining the instant in pure form that creates the settling of attention in the instruction, the instant that functions regardless of subsequent processes of forming a connection.

We shall consider this instant and analyze it. We cannot now determine more precisely the reason for the success than to say that the key instant of the experiment is the instruction. But the question arises as to how we might understand the role of the instruction physiologically. Unfortunately, we still have nothing but a hypothesis with respect to the physiological processes that are the basis of attention. But no matter how we might imagine these processes, the most probable physiological explanation of the phenomena of attention consists of the principle of the dominant, and its mechanism rests in the principle of the general motor rule as established by Titchener.

G. Müller[93] develops the catalyzing theory of attention and Hering speaks of the sensitization of nerve paths, but it seems to us that the position established by A. A. Ukhtomskii[94] is most important; he indicates that the essential property of

the dominant is not its strength, but increased excitability and, what is the main thing, its capability for summarizing excitation. From this, Ukhtomskii concludes that the dominant reactions are analogous not to explosive reactions, as may seem at first glance, but to catalytic processes.

We must imagine in a general form that catalyzation of certain processes is achieved by way of instruction. The monkey or the child looking at the set-up of the experiment sees the gray color; but when we point to the gray color, we do not create new paths, but only sensitize or catalyze the appropriate nerve paths. In this way, with additional stimulation, we intrude on the intercentral relations being created in the cortex of the brain, in the relations that play a decisive role in the control of our behavior. Ukhtomskii says that the intercentral affects must be considered as most potent factors. Our intrusion causes a redistribution of energy in the nerve paths. We know, as Köhler established in his experiments, that in an affective state, both the monkey and man direct all their attention to the goal and do not divert it to auxiliary objects or tools.

I. P. Pavlov terms one of the innate reflexes the "What is it?" reflex. He says that the least change in the variation of the environment immediately evokes a disturbance of equilibrium in the state of the animal and immediately evokes the dominant reflex of alertness, expectation, and orientation toward change. Strictly speaking, we create the "What is it?" reflex with respect to the situation that the child looks at. It is as if we were putting an additional weight on the scale and disturbing the equilibrium that was being established and changing the intercentral relations that had developed.

Thus, we arrive at the following conclusion: the natural basis for the influence of signs on attention is not the creation of new paths as signs in memory, but a change in the intercentral relations that catalyze the respective processes and the evoking of additional "What is it?" reflexes. We assume that in the child, development of voluntary attention occurs in specifically this way. For the child, our initial words serve the function of instruction.

In addition, it seems to us that we approach the primary function of speech not developed by any researcher before us. The primary function of speech is not that words have meaning for the child, not that an appropriate new connection is created by the words, but that the initial word is an *instruction*. The word as instruction is the primary function in the development of speech from which all other functions are derived.

Thus, the development of attention in the child from the very first days of his life finds itself in a complex environment consisting of two kinds of stimuli. On the one hand, things, objects, and phenomena attract his attention in proportion to the strength of their properties; on the other hand, corresponding stimuli-catalyzers, specifically words, direct his attention. From the very beginning, the child's attention becomes directed attention. Initially, adults direct it, but together with gradual mastery of language, the child begins to direct his attention by the same means, first with respect to others and then with respect to himself. Using a comparison, we might say that the child's attention during the first period of life moves not like a ball that falls into the waves of the sea, depending on the strength of each separate wave that tosses it back and forth, but moves as if along separate, constructed canals, guided to the shore by their flow. From the very beginning, for the child, words are a kind of way out established along his path to be used for acquiring experience.

Whoever does not take into account this most important of the initial functions of speech will never understand how the whole higher psychological experience of the child is formed. But we already know the subsequent path. We know that the

general sequence of the cultural development of the child is as follows: at first other people act on the child, then the child begins to interact with those around him, next he begins to act on others, and finally, he acts on himself.

This is how the development of speech, thinking, and all other higher processes of behavior occurs. The situation is the same with voluntary attention. At first, the adult directs the attention of the child with words creating as if additional pointers—arrows—to the things around the child and creates from the words potent stimuli-instructions. Then the child begins to participate actively in the instructions and himself begins to use a word or a sound as a means of indicating, that is, turning the attention of the adults to an object that interests him.

The stage of development of the child's language, which Meumann termed the willful, affective stage and which he believed to include only the subjective state of the child, is, in our opinion, the stage of speech as instruction. For example, the child's phrase "ma-ma," which W. Stern translates into our language as, "Mama, put me on the chair," is actually an instruction to his mother; it is turning her attention to the chair. If we should want to give a more precise and primitive content of "mama," we would have to translate it initially by a gesture of grasping or the child's turning his mother's head with his hand to call her attention to himself and then with an indicating gesture pointing to the chair. Agreeing with this, Bühler says that the first and main position in comparative study is the function of pointing without which there is no perception of relations; further, there is only one path to knowledge of relations: through signs; no more direct perception of relations exists. For this reason, all attempts to find such a path have been unsuccessful thus far.

Let us proceed to describing our subsequent experiments. In some children, as we noted above, the selection reaction was established to the darker of two shades. Now we will turn to the second part of the basic experiments, which may seem to divert us from the basic line, and fix a goal of tracing, as far as possible in pure form, the manifestation of another natural process in the child: the action of abstraction. That attention plays a decisive role in abstraction when a part of the general situation is isolated can be disputed only if under the word "attention," the concept of formation is not understood from the very beginning.

It is very convenient for us to trace the activity of attention in the processes of abstraction in a young child. To do this, we used the methodology of experiments developed by Eliasberg, which we modified somewhat in connection with other problems that we had. We again used the experiments of others only as material, since the basic operation in them was studied with adequate clarity and we tried to set a different goal for ourselves. In contrast to Eliasberg, we were not interested in the natural process of abstraction in itself and how it occurs in the child, but in the role of attention in the course of this process.

We placed the child in the following situation. He had before him several completely identical cups standing either in a row or randomly placed. Some of the cups were covered by cardboard lids of one color, some, of another. There were nuts under one set of lids, for example, the blue; there were no nuts under the others, red, for example. How would the child behave in such a situation? Eliasberg's experiment had shown and our experiments confirmed that the child would uncover one or two cups at random at first and then suddenly confidently begin to uncover only the cups with lids of a certain color. In our experiments, a five-year-old was initially tested in critical experiments (described earlier) with positive success. To the question as to why he selected the black paper, he responded irritably, "You explained it to me yesterday and we don't need to talk about it any more."

Thus, the result of preceding experiments was preserved. Convinced by this, we moved on. Eleven cups were placed in an arc before the child; of these five were covered with blue lids and the nuts were in these and the rest were covered with red and empty. The child immediately asked, "How do I win?" wanting an explanation. He took the blue lid and guessed, then he took all the blue ("There is always a nut under the blue lids.") A three-year-old present added, "And there aren't any under the red lids." The child did not touch the red lids but said, "Only the red are left."

In the second experiment, the white was negative and the orange positive. The child quickly picked up a white lid, turned it over, took an orange one and then uncovered all the orange lids leaving the white and adding: "There is nothing in the white ones." In the third experiment, the black was negative and the blue, positive. The child picked up the blue and left the black. To the suggestion of the experimenter: "Do you want to try the black?" he responded: "There is nothing there." Thus we can attest that the experiment proceeded normally and smoothly from the first abstraction as Eliasberg's experiment did.

We worked with a three-year-old. The orange color was negative and the blue, positive. The child uncovered the orange immediately, paid the forfeit, then opened a blue cup, then opened all the blue and said, "There is nothing in the reddish ones." Next we started to distract the child with conversation and the child began to open all the cups in succession, both the red and the white. The child had no idea of abstraction of the required trait nor did he see the required relation. The child distracted himself by distributing the cards and from a correct solution of the problem, he made a transition to uncovering all the cups. With further distraction of attention, the child proceeded as follows: he uncovered all the cups, lost all the nuts, and cried. His attention was severely distracted, and in the fourth experiment he again uncovered all the cups in succession with a slight variation. Besides the statement "They're not in the red ones," as he stated earlier, he only said, "Not here; here it is, I won," etc. Thus, we were able to establish that both children, to a different degree, it's true, exhibited a natural process of primary abstraction; in the younger child, the process was disturbed when his attention was distracted to the extent that the child stopped paying attention to the color and began to uncover all the cups in succession.

A very interesting situation developed. The basic attention that the child directed toward the game was scarcely decreased and he looked for the nuts with the same attention, won or lost with the same emotions, and only the color no longer had any significance in his reactions regardless of the fact that the child saw what the other child did, made correct choices himself, and even gave a tolerable account of what was needed to win. Thus, a slight distraction of attention, mainly diverting him from the colored lids, resulted in a completely new form of behavior on his part. Obviously, here we proceeded differently from the way we proceeded in the previous experiment: there we *called the child's attention* to the required point; here we *distracted his attention* from the required abstraction. There we catalyzed a weak process; here we provided a kind of negative catalysis. If there we could demonstrate experimentally how the addition of our slight nudge led to liberating the whole intellectual process, then here in the same way, we could demonstrate experimentally how distracting attention immediately demotes the operation to a lower level.

We have already said that in pointing we see the primary form of mediating attention with which we begin to control with additional stimuli. Here we have opposite evidence for the same thing and we can establish how the process changes when we subtract from it the attention that is directed to color. From being me-

diated, directed toward the trait, attention becomes nonmediated, directed specifically toward the goal. If this can be called a subtraction of attention, then in the preceding experiment we had an addition, augmentation of attention. There, owing to concentration of attention on the basic point, we immediately obtained an error-free transition from nonmediated attention directed toward the nut and the cup that contained it, to mediated attention, to a selection not of the nut and not of the cup, but of the indicating traits, the shades of color. In this we see two main forms of natural mediation of attention and transition from direct to indirect attention.

Let us move to outlining the next experiment. A child of five is placed in the same situation as in the preceding experiment but with the difference that now the subject is allowed to uncover only one cup. If he guesses right, he can then uncover another, etc., but if he uncovers an empty cup, he loses the whole game, that is, the child is confronted with the problem of solving which of the two colors is the right one without trials and errors. However, since the colors change in significance each time, the child has no chance of a solution in good time. For this reason, we combined both parts of the experiment as they proceeded thus far, the method of Köhler and the method of Eliasberg. Onto cards of different colors we pasted a thin band of black or white paper and in this way gave the child some indication as to how he should act. These bands provided instruction for the child which he had to deduce from the experiment itself. In our experiment, the black bands were pasted on orange lids. The child discovered the principle and immediately took the orange card on which the black paper was pasted; he chose all the orange, then stopped: "There are no more." To a question as to his choice, he responded, "I knew where they were, I wanted the red and I took the red."

In the next experiment, the white were positive and the red, negative. Gray paper was pasted on the red and black on the white. After thinking for a while, the child removed the red lid and lost the game. The experiment was continued with additional gray and white bands. The child lost again, and asked why he lost, replied, "Because that's what happened." We see that the two operations the child mastered completely are independent of each other: specifically, the operation of choosing between two shades of gray and the operation of choosing between two colors are separate operations. As a result, the process returns again to the first stage of blind attempts, trials and errors.

What inhibited the whole operation? Obviously the fact that in following our method, we placed the gray signs at the center of attention, but made them smaller. The child saw them, he even began selection specifically with the lids that were marked with the gray bands, but he did not pay attention to them, was not guided by them. For him, they were not signs showing the way regardless of the fact that the connection set up with them remained.

Now we have two possibilities that lead in the same way to the same result. In some cases, we replaced the small papers with the former ones, the ones from the old experiment, and pasted them in exactly the same way. The problem was solved correctly immediately. The child explained, "Now I understand: the nut is where the dark paper is. That's how I guessed this time," and even when he solved the problem when there was a change, he exclaimed, "Aha, there is the dark paper." However, the child can reach the same result by a different path, not by the path of renewing the old connection, but by the path of simple turning of attention. Distributing the cups for a new experiment, we again used the earlier paper-indicators, but reduced them to one-third the size, making them less eye-catching. Again seeing the child hesitatingly looking at the cups, we called his attention to one of

the gray papers by pointing to it and again this slight nudge was enough for the child to solve the problem of choice that confronted him.

Because of our pointing, the child immediately perceived the instruction from experience and from the beginning, guided by the gray signs, made a choice between the two colors, the gray and the red, and then guided by the color, made a correct abstraction and selected all the proper cups.

Thus, the second operation of selection and abstraction occurred relatively smoothly due to the light and insignificant nudge to attract attention. In the last experiment, there are several very important points.

First, in this case the effect of attracting attention is absolutely equal to the act of direct regeneration of the old connection. When we used the same series of cards, regeneration of the old connection led to correct selection along the previously assimilated structural path. This same regeneration of the connection occurred with simply calling attention, which also led to reinforcement of the pertinent signal. The pointing finger guides the attention of the child, and guiding his attention, sets off and regenerates old conditioned connections and generates new processes of abstraction. We could have reminded the child with verbal instruction of the significance of the gray signs in the new set-up, but in this case, the child's experience and the instruction would have united two different operations, specifically, the operation of closure of the required connection and the operation of turning attention. We tried to separate the one from the other in two parallel experiments and to present both instances separately.

Second, the child finds the natural mediated processes to be very complex. His attention in this case is mediated twice. The basic direction of his attention remains the same throughout. The child seeks the nut according to a color trait he has abstracted and, consequently, turns his attention to the color. But in order to select the correct color of the two presented, he must be guided by two gray cards and in this way, all his attention becomes mediated. Here we have a natural, mediated process that, as we know, is found in studies of the development of memory. In this case, it is important for us to create this mediated operation for the child; we guide his initial attention and only later does the child himself begin to create the same thing for himself.

Finally, the third point, the gray cards acquired the functional meaning of signals for the child. In the first experiment, they were for him a trait according to which he chose a cup and now he is making a selection between colors. It would be a mistake to say that the gray shades play the role of words that mean "yes" and "no" or "+" and "–." However, they play the role of signs that turn the child's attention and guide him along a certain path, and at the same time acquire something like a common meaning. The combination of the two functions, the indicating sign and the memory sign, seems to us to be most characteristic in this experiment because we are inclined to understand the functions of the gray cards to be a model of the primary formation of meaning.

Let us recall that for a correct solution of the problem in the basic experiment, the child had to abstract correctly the trait of color, but the abstraction itself was made because of turning his attention with the help of indicating signs. Indicating which sets abstraction into motion is also, in our opinion, a psychological model of the first assigning of a certain meaning to a sign, in other words, it is a model of the first formation of a sign.

It seems that our experiments cast light on the processes of the formation of voluntary attention in this child and that the reaction is a process that results directly from directing attention correctly.

On this basis, Eliasberg defines attention as a function of pointing: he says that what is perceived becomes a pointer toward another perception, to the signal that did not previously appear as dominating or was not perceived. Signs and meanings can initially be completely independent of each other and in this case, pointing establishes their relation to each other. Eliasberg sees as the advantage of his experiments that they make it possible to observe the instant of attention without involving the hypothesis of nominative function. Comparing his experiments with the experiments of Ach, he indicates that in Ach's experiment the name was separated from other properties of the object, but by indicating the object with a word and pointing to it, we placed the word in a certain relation to the object.

Ach also stresses that the direction of attention leads to the formation of a concept. In the chapter on concepts, we shall see that the word that signifies the concept actually appears first in the role of an indicator that isolates some traits of an object, calls attention to these traits, and only then does the word become a sign that represents these objects. Ach says that words are the means of directing attention so that in a series of objects that have the same name, common properties are identified on the basis of the name which thus leads to the formation of a concept.

The name or the word is an indicator for attention and a nudge toward forming new ideas. If the verbal system is damaged, for example, in someone suffering brain damage, the whole function of using a word to call attention suffers.

Ach quite justifiably points out that, consequently, words are as if an outlet that forms the social experience of the child and directs his thought along already established paths. At a transitional age, as Ach believes, under the influence of speech, attention is directed more and more toward abstract relations and leads to the formation of abstract concepts. For this reason, the use of language as a means of directing attention and as a method of forming ideas is of very great significance for pedagogy. With complete validity, Ach indicates that with this understanding of directing attention with words, we move beyond the bounds of individual psychology and find ourselves in the area of social psychology.

From a different direction, we approached the statement of T. Ribot that voluntary attention is a social phenomenon. Thus, we see that the process of voluntary attention directed by language or speech is initially, as we have said, a process in which the child is more likely to be dependent on the adult than to manage his own perception. With language, adults direct the attention of the child and only on this basis does the child himself gradually begin to control his own attention. For this reason it seems to us that Ach is right when he understands the social moment of contact as being the functional action of the word.

Eliasberg correctly says that at this age, even in the youngest subjects that Ach studied, language had long since become the means of contact. It must be noted that only on the basis of the initial function of language, the function of contact, can its subsequent role, direction of attention, be formed.

On this basis, we can reach the conclusion that it is not apperceptive attention that determines mental processes, but that mental connections direct and distribute attention. The word "attention" in itself serves only to define the degree of clarity; the process itself of concentrating attention in thinking, Eliasberg proposes to explain by other volitional factors. In his work, the character of the primary factors that determine attention remain unknown. From our point of view, the primary condition that forms attention is not inner "volitional" function, but the cultural, historically developed operation that leads to the appearance of voluntary attention. Pointing lies at the beginning of directing attention, and it is remarkable that man created for himself a kind of special organ of voluntary attention in the pointing

finger, which in most languages got its name from this function. The first pointing was a kind of artificial indication with the fingers and, in the history of the development of speech, we have seen that the initial words play the role of similar indications that call attention. For this reason, the history of voluntary attention must begin with the history of the pointing finger.

The history of the development of voluntary attention can be beautifully traced in the abnormal child. We have already seen (in the chapter on speech) to what degree the speech of the deaf-mute child, depending on gestures, is evidence of the primacy of the function of pointing. The deaf-mute child speaking of people or things that are before him points to them and calls attention to them. Specifically, in the language of the deaf-mute child we see how the function of pointing acquires an independent meaning. For example, in the language of the deaf-mute, a tooth may have four different meanings: (1) tooth, (2) white or (3) hard, and finally, (4) stone. For this reason, when a deaf-mute, in the course of conversation, points to a tooth, which is a conditioned symbol for each of the four enumerated concepts, he must make at least one more pointing gesture to indicate to which of the qualities of the tooth we must pay attention. The deaf-mute must give direction to our abstraction: he calmly makes a pointing gesture when the tooth must signify a tooth; he strikes the tooth gently when he uses the sign in the sense of "hard"; he moves his finger across the tooth when he is indicating the color white; finally, he makes a throwing gesture when the tooth signifies a stone. In the language of deaf-mute children, we see very clearly the conditioned functions of pointing and the function of remembering that is typical of the word. The separation of the one from the other indicates the primitive nature of the language of deaf-mutes.

As we have seen, the pointing finger stands at the beginning of the development of voluntary attention. In other words, at first adults begin to direct the attention of the child and control it. In the deaf-mute, contact by means of gestures appears exceptionally early, but without words he loses all the instructions for directing attention that are linked to words and for this reason his voluntary attention develops extremely slowly. The common type of his attention may be described as predominantly primitive or externally mediated.

Experiments with abstractions, about which we have just spoken, were set up with deaf-mute children. The experiments showed that in the deaf-mute child there are primitive processes of paying attention that are required for processes of abstraction. Gifted deaf-mute children age six to seven conducted themselves in the experiment like three-year-old normal children, that is, they quickly found the required abstraction of both the positive and negative connections between the color and success. They also succeeded in making the transition to a new pair of colors, but hardly ever without special auxiliary devices.

Eliasberg sees in this fact a confirmation of his ideas on the effect of speech on thinking. Primitive processes of attention in the deaf-mute are not disrupted, but the development of complex forms of attention organized with the help of thought are strongly inhibited. True, Eliasberg says that we must not forget that a six-year-old deaf-mute child has a different system of language, gestures with a primitive syntax that frequently cannot be expressed logically; for this reason, the very question on forms of organization of behavior of the child remains an open question for him.

We conducted special experiments with deaf-mute children which showed the following: actually with very little difficulty, the deaf-mute child resorts to an external auxiliary device which facilitates directing attention. It developed that regardless of the lesser development of voluntary attention in deaf-mute children and of the very primitive resources of this function, directing their attention was very

much easier. The pointing gesture for a deaf-mute is all that he has at his disposal and in connection with this, his speech itself still remains at the primitive stage of pointing, and he always maintains a primitive mastery of operations. For this reason, for the deaf-mute child, an insignificant visual difference very soon becomes a directing sign that points to the path for his attention. However, it is difficult for the deaf-mute child to make any complex connection between the pointing function of the sign and its signifying function.

Thus at first glance, in the deaf-mute child we have a paradoxical, and for us a completely unexpected, combination of two symptoms. On the one hand, there is the lesser development of voluntary attention, its arrest at the stage of the external sign-indication resulting from absence of words and connecting the indicating gesture with its signifying function. This is responsible for the exceptional lack of significance of indicating with respect to objects not presented visually. This paucity of inner signs of attention is the most characteristic feature of the deaf-mute child. On the other hand, the direct opposite is characteristic for the deaf-mute child. Such a child exhibits a much greater tendency to use mediated attention than does the normal child. What for the normal child influenced by words became an automatic habit, for the deaf-mute child, was still a new process and for this reason, the child when faced with any difficulty very readily turns from the direct path of solving the problem toward mediated attention.

Eliasberg correctly notes as a general phenomenon, passing like a red thread through all his experiments with children, the use of auxiliary devices, that is, the transition from direct to mediated attention. As a rule, frequently this does not depend on speech. The child who does not say anything during the experiment, who generally speaks only of his needs with two-word sentences, immediately transfers his experience to any other pair of colors and, in the final analysis, experiments with him run the same course as if the child had formulated a rule: "Of two colors of any kind, only one is the trait." Conversely, the external verbal formulation appears only when the child is confronted by a difficult situation. Let us recall our experiments with the development of egocentric speech under difficult circumstances. In experiments with abstraction, we also see egocentric speech every time the child experiences difficulty. At the moment the difficulty arises, auxiliary devices enter—this is the general rule that we can deduce from all our experiments.

Whether the child resorts to mediated operations depends primarily on two factors: on the general mental development of the child and on mastery of such technical auxiliary devices as language, numbers, etc. It is very important that, in pathological cases, the extent to which a child applies auxiliary devices to compensate for the specific defect be considered as a criterion of intellect. As we have noted, children most retarded with respect to speech spontaneously resort to speech formulations when they encounter unavoidable difficulties. This is true even of three-year-olds. However, the significance of auxiliary devices becomes universal as soon as we move to pathological cases. Aphasics deprived of language, the most important organ of thinking, exhibit a tendency to using visual auxiliary stimuli and, specifically, the visual aspect of the stimuli may become devices for thinking. Thus, the difficulty consists not only in that thinking is deprived of most important devices, but also in that complex speech devices are replaced by other devices less expedient for establishing complex connections.

All aphasics, regardless of the fact that they have no direct intellectual defects, experience difficulty in separating the relation from its carriers. Comparing this characteristic with the behavior of children with poor speech development, Eliasberg reaches the conclusion that in itself the process of attention does not depend entirely on speech, but the complex development of thinking is seriously impeded

by absence of speech. Finally, the general rule derived from the study of all the subjects: the method of using devices is of decisive significance. Eliasberg says that, as a rule, devices are directed toward minimizing a given defect. If we did not know about the defect beforehand, all of this could help us reach a conclusion about the defect itself.

Thus we see that a defect has a double effect: this is the position we proceed from in considering the development of the behavior of the atypical child. Eliasberg says, and we have established this in our experiments, that as a rule, the defect acts as difficulty does in a normal child. On the one hand, the defect decreases the level of execution of the operation: for the deaf-mute child, an identical problem is impossible or extremely difficult. This is the negative effect of the defect. However, like all difficulty, it nudges the subject onto the path of higher development, onto the path of mediated attention, to which, as we have seen, aphasic and deaf-mute children resort much more frequently than normal children.

For psychology and pedagogy of deaf-mute children, the double effect of the defect is of decisive importance, the fact that the defect creates simultaneously a tendency toward compensation, toward adjustment, and this compensation, or adjustment, is accomplished mainly along the paths of the cultural development of the child. The tragedy of the deaf-mute child, and specifically, the tragedy in the development of his attention, consists not in the fact that the child has by nature poorer attention than the normal child, but in his divergence from cultural development. While cultural development in the normal child is attained in the process of his growing into the speech of those around him, in the deaf-mute child, it is retarded. His attention is, in a way, neglected and not cultivated, is not taken over and directed as speech in adults, as is the attention of the normal child. It is not cultivated and for this reason, it remains for a very long time at the stage of the pointing finger, that is, within the bounds of external, elementary operations. But deliverance from this tragedy lies in the fact that the deaf-mute child is capable of the same kind of attention as the normal child. In principle, the deaf-mute child arrives at the same point, but does not have the appropriate technical devices. We believe that it would not be possible to express the difficulty in the development of the deaf-mute child any more clearly than to turn to the fact that in the normal child, assimilation of speech precedes the formation of voluntary attention, and in the normal child, speech because of its natural properties is a device for calling attention. In the deaf-mute child, conversely, the development of voluntary attention must precede speech, and for this reason, in him both appear to be inadequately developed. A retarded child differs from the normal most of all in the weakness of voluntary attention when it is directed toward the organization of internal processes, and for this reason, the higher processes of thinking and formation of concepts are difficult for him.

The path to development of attention lies in the general development of speech. This is why the trend in developing speech of the deaf-mute child that places all the stress on articulation, on the external aspect, when there is general retardation in the development of higher functions of speech, results in neglecting attention, as we said above.

P. Sollier was the first to try to base the psychology of mentally retarded children on the inadequacy of their attention. Following Ribot and making a distinction for this reason between spontaneous and voluntary attention, he selected specifically the latter as a criterion for dividing mentally retarded children according to various degrees of retardation. In his opinion, in the idiot, attention is impeded and weak in general; this is the essence of idiocy. In absolute idiots there is no voluntary attention at all; in representatives of the three other degrees of mental retardation,

voluntary attention occurs rarely, periodically, or is easily but not stably elicited or acts only automatically.

According to Sollier, in imbeciles, the most characteristic trait is instability of attention. At present, Sollier's theory has lost its meaning and the criterion itself of reducing all symptoms of retardation to the dropping out of one function, specifically attention, is unsustainable, but undoubtedly, Sollier must be given credit for establishing how the inadequacy of voluntary attention creates a specific picture of the mentally retarded child. Regardless of the fact that Sollier argues with Seguin, whose position we are trying to establish, Sollier himself shares the point of view of Seguin since he always speaks of voluntary attention and for him, attention is, of course, a volitional act. For this reason, as Troshin correctly noted, Sollier's argument with Seguin seems a misunderstanding.

Binet, who disputed the point of view of Seguin and Sollier, called their work absurd, and rejected the idea that the retarded child's thinking was related to weakness of will, came to the same conclusions as a result of his own experiments. He actually used the same volitional acts, for example, a volitional glance, capability of expressing thought with gestures, etc., as a basis for dividing the severely mentally retarded into four levels. Binet can say that for him, these acts are not will alone, but an expression of will in the mind. But, of course, both Seguin and Sollier, in reducing the essence of development to the anomaly of will and attention, also understood the latter in a broad sense. Without a doubt, to reduce erroneously all underdevelopment to any one function, let alone a defect of the will as the most complex psychological phenomenon, may be the most characteristic aspect for mental underdevelopment. Not without reason did Seguin and Binet and Sollier essentially converge in this position regardless of their mutual contradiction. If we understand will in the genetic sense that we give this term, specifically as the stage of mastery of the processes of one's own behavior, then, of course, most characteristic in the mental underdevelopment of the atypical child, including the idiot, is, as we have already indicated, the divergence between his organic and his cultural development.

The same lines of development that coincide in the normal child diverge in the abnormal child. The means for cultural behavior have historically been devised in terms of normal psychophysiological organization of man. Specifically these means are not suitable for a child burdened with a defect. In the deaf-mute child, the divergence due to absence of hearing is consequently marked by a purely mechanical retardation along the path of speech development, but in the retarded child, the weakness is in the central apparatus: his hearing is preserved, but his intellect is so underdeveloped that the child does not have all the functions of speech and, consequently, the function of attention.

On the basis of the law of conformity between fixation and apperception, we can determine the capacity of the idiot to learn according to eye fixation on some object. On this basis, all idiots can be considered as being incapable of any education and completely not receptive to any therapeutic-pedagogical treatment. We have already seen that the capacity to pay attention requires a natural apparatus for catalyzing any perceived sign. If this process itself is absent, if visual dominants do not develop at all, then, as we have seen from the studies of V. M. Bekhterev, there can be no closure of any conditioned reflex from this organ. An imbecile who is capable of fixation on an object has passive attention and, consequently, is capable of training.

A further decisive step is the transition from passive to active attention; according to Heller, the difference between them is not in kind, but in degree. One differs from the other in that active apperception occurs in a field of attention

containing several perceptions that conflict with each other and the child chooses among them. The presence of choice defines the instant of transition from passive to active attention. Only at this higher stage are volitional actions connected with choice in the true sense of the word possible. In this connection, Heller recommends training retarded children to apply the method of selection by presenting them with a number of objects and requiring them to choose and indicate an object named by the instructor.

We also ascribe great psychological significance to this method because we see in it only a continuation and augmentation of the indicating function of the word, which in the normal child occurs quite naturally. We would like to note the general artificiality and the child's lack of interest in this task. This point is more a technical than a basic difficulty. The selection reaction put into play becomes a potent means through which we begin to direct the attention of the child.

A further development of this method when it is applied in practice may be that the child says the appropriate word to himself and then selects the required object, in other words, the child learns to stimulate his active attention himself. From the outset, the imbecile has spontaneous attention directed to various objects, but in him this function is, as a rule, extremely weak and unstable, and for this reason the usual state which we call inattention or absentmindedness in the normal child is a characteristic trait of imbeciles. Finally, mild retardation, the least serious form of retardation, is characterized by underdevelopment of thinking in concepts, which we use to deduce abstractions from a concrete perception of things.

This defect may be established with experimental precision in the slightly retarded and may, in this way, indicate not only the incapacity for direct attention, but also the inability to form concepts. Let us recall, however, our experiments demonstrating how essentially significant directed attention is for processes of abstraction, and it will become clear that the mildly retarded find it impossible to form concepts mainly because of an inability to follow the course of their own attention along the very complex paths indicated for them by words. The higher function of the word, connected with development of concepts, is inaccessible for them mainly because their higher forms of voluntary attention are underdeveloped.

Chapter 10
THE DEVELOPMENT OF MNEMONIC AND MNEMOTECHNICAL FUNCTIONS

In the area of memory, psychology has long ago learned to distinguish between two basic lines—the natural and the cultural—which we have tried to trace over the whole course of our research.

Very long ago, psychology began to consider memory as an organic function and came very early to formulating physiological bases for this function. As E. Meumann correctly points out, in traditional psychology, memory was studied mostly and specifically as a physiological function and psychologists began very early to relate to memory the more general properties of organic material.

As E. Hering claimed, memory represents a basic property of all organized matter. Actually, the plasticity of our nerve substance is expressed in its capacity to change under the influence of external actions and to preserve a predisposition toward their repetition. This was the basis for the graphic comparison between memorizing and establishing nerve pathways by a process similar to wheels making a rut in a road or to a crease formed in a sheet of paper when it is folded.

A. Semon introduced the special term "mnema" to indicate the organic bases of memory, but as frequently happens in comparing psychological and physiological concepts, he himself began to consider this concept as a certain mental function, that is, an ideational function. It seems to us, however, that the word "mnema" can best be used to indicate the totality of organic functions of memory that are manifested depending on certain properties of the brain and nervous tissue. In this sense, many psychologists now speak of mnema or the mnemonic functions, isolating natural or innate memory in this way.

At the same time, psychology recognizes what has for a long time been called technical memory or mnemotechnique, which is understood as the art of mastering the processes of remembering and controlling them through special technical means. Initially, mnemotechnique developed as a practical art that had the most various tasks and applications. But theoretical study of mnemotechnique was haphazard and most psychologists could not distinguish in mnemotechnique the real and true principle that is the basis of all cultural development of memory from the random and distorted form in which this principle appeared at the hands of learned scholastics and professional magicians. For this reason, we would like to propose that under the designation mnemotechnique, we understand all those devices for remembering that include the use of known external technical means and are directed toward the mastery of one's own memory.

Thus, we will subsequently use these two terms, mnema and mnemotechnique, long applied in psychology with a somewhat different meaning, to designate natural

or organic functions of memory, on the one hand, and cultural devices for remembering, on the other.

The inadequate separation of mnema and mnemotechnique had a most unfortunate effect on the working out of the problem of memory, and the inadequately studied function of mnemotechnical remembering led many psychologists and philosophers to a completely false formulation of the problem of double memory. Thus, psychologists who did experimental studies of the processes of thinking concluded that there two kinds of memory: concept memory, on the one hand, and thinking memory on the other, and that the two kinds of memory are subject to different laws.

H. Bergson,[95] in his well-known research on matter and memory, concluded that there are two memories: brain memory and mental memory and each of these has its own laws.

Finally, Freud also concluded that the activity of our memory may be explained only if we assume that it consists of two separate but interconnected constituent parts of the system.

We believe that only research carried out scientifically which separates mnema from mnemotechnique will succeed in turning this confused problem of the two kinds of memory right side up and will provide a scientific explanation for it.

We find this kind of stumbling block also in the genetic studies of memory where, regardless of much experimental work, the principal question remains unexplained: does memory develop at all significantly in childhood, does it stand still during all of childhood exhibiting insignificant fluctuations in one direction or another and, finally, as much data indicates, does it deteriorate, undergo involution and, in a certain sense, decline as the child grows and matures. It seems to us that this basic controversy can be resolved only if the two lines in the development of memory of which we have been speaking are isolated.

In our studies, we tried to compare directly the two types of memory, the two methods of remembering, and to elucidate by comparative analysis the elementary composition of both operations, their structures and genesis. In experiments, we asked a child to memorize a series of words (for the most part nouns, names of concrete objects). We used standard procedures such as are used in studies of memory in experimental psychology except that we tried to make it clear to the child that it would be impossible to remember the whole series in the given order. Then we introduced a new method of memorizing: we gave the child a number of cards from picture lotto or specially prepared cards either of separate pictures of the concrete objects or geometric figures, lines, dotted lines, etc. We added this auxiliary material in different series in various ways. Sometimes it was presented simply with the hint: "Perhaps these cards will help you remember?" but with no explanation as to how they would help. In other cases, we gave a short instruction (we explained to the child that he must try in some way to connect the words he was to memorize with corresponding cards) and we even gave a demonstration. The different methods were intended to show how the transition to a new method of memorizing occurs, to what extent it must be an independent device and to what extent imitation, what role understanding plays in this process, etc. We shall go into this later; now we will only say that the child did make a transition from natural, innate remembering to mediated or mnemotechnical remembering. The whole character of his operation changed instantly; every assigned word now elicited reference to a picture. The child established a connection between the word and the picture, then moved on to the next word, etc.

After we finished the whole series, the child, looking at the cards, reproduced all the words that he was asked to memorize and explained what connection he

made between the word and the picture. We used two different methods of presenting the material: (1) the pictures were presented to the child in a completely ordered form corresponding to the words so that each word matched the picture previously selected by the experimenter; (2) the pictures lay scattered before the child and the operation was complicated by the fact that the child had to select a picture that he thought was suitable for remembering a given word. Then, by varying the difficulty of the words, the degree of their similarity to the pictures and the pictures themselves, we had the opportunity to trace the course of the child's process of remembering.

The studies showed that even at preschool age, the child is capable of mastering the operation of using auxiliary pictures for memorizing and applying them correctly. Whoever observed the direct transition from the natural method of remembering to the mnemotechnical cannot help but have the impression that he has seen a seemingly experimentally elicited change from innate to cultural memory. The process of remembering was restructured instantly in such a way that remembering any given word was accomplished through the picture that played the role of a sign. The movement of the nervous processes in such remembering can be presented graphically in the form of a triangle (Fig. 2) showing that if in natural remembering a certain connection is made between two points, mnemotechnical remembering introduces a certain new, initially neutral stimulus-card that plays the role of a mnemotechnical sign and directs the course of nerve connections along a new path replacing one nerve connection with two new connections.

The whole advantage of identifying the nerve connection lies in that we master a new way of remembering and can subsequently recall the appropriate connection as we wish when we need it. However, as the experiment has shown, the graphic presentation does not correspond to the complexity of the process that was actually observed. We can easily see that the formation of a new connection is never limited to a simple associative approximation of the word the object and the sign, but assumes an active creation of a quite complex structure in which both stimuli are parts. Thus, when the child selects a picture of a camel for the word "death," he creates the following structure: "A camel in the desert is a wanderer and dies of thirst." From the point of view of associative psychology, it would be completely impossible to explain why such relatively complex structures are remembered much more easily and stably than simple associative connections between two elements.

If we assume that in this case there is a renewal of older connections and a support of the new remembering by old connections, then we might expect to find the same thing occurring in all other structures. But experiments indicate something else. They show that in a great majority of cases, the child begins to create completely new structures and does not renew the old. For example, when the child remembers the word "theater" with the aid of a picture of a crab at the shore, he creates a special auxiliary structure. "The crab is looking at the stones on the bottom, it is beautiful, for him it is a theater." If in the first example, we can also say that the child reproduces a story that he has heard many times, then in the second example, the child undoubtedly compares the "crab" and the "theater" for the first time. He created this structure exactly for remembering. From the associative point of view, it would be exceptionally difficult to explain how this complex image is remembered more easily than a simple associative connection.

The heuristic significance of all our experiments consists in the following: they support indirectly the correctness of the structural law of memory in contrast to the law of association, which says that a connection is created by a simple coincidence or juxtaposition of two stimuli. The law of structure says: a connection is formed only with the development of structure, that is, a new whole in which both

elements entering into a connection are functional parts; the better the structure is, the more easily and well it is remembered.

Both cases of remembering with the aid of pictures that we used made it possible to distinguish completely precisely the two instances to which we refer. In making a selection, the child usually finds and uses the old structure; he selects the picture that most resembles the word he is given. He depends on connections established in past experience since all the pictures call forth old structures and the best of these persist. From the psychological aspect, the process of selection itself is a recollection of an old structure. If we were not afraid of the paradoxical meaning of our idea, we might say that in this case, remembering is essentially recalling if by the latter we mean the renewal and restoration of an old structure. Thus, in selecting the picture of a camel for the word "death," the child recalls a story which contained both these elements. The situation is entirely different when the child must remember a given word with the help of a given picture, when he is not permitted to make a choice, and when recalling is actually impossible. Then the child begins to create new structures actively and this is the basis of the process of mastering memory. For this reason, from the psychological aspect, in such experiments it is not memory that is studied but the active creation of structures.

This is borne out also by reproduction errors. These are most frequent in free selection and, what is most important, in selection that leads to recalling. In the same experiments, for the word "to shoot," the child selected a picture of a lion, forming the structure "They shot the lion." From the same structure, in repeating, he referred to the word "gun." Such errors are very rare when a structure is created: here, as we see, new factors enter into action, specifically direction of the whole structure toward the word that the child must remember. We shall speak about this later.

Experiments provide an exceptionally important indication of the essence of the change that occurs in the process of cultural development of memory: some mental operations are replaced by others, replacement of functions so characteristic for all of the development of higher mental functions. The whole second operation of remembering externally retains the same form and results specifically in reproducing the given word. But the paths by which the child comes to the result are profoundly different. If in the first case, we dealt with the effect of the mnema, remembering in the organic sense of the word, then in the second case, the child replaces direct remembering with such operations as comparison, isolating the common factor, imagination, etc., which leads to the creation of the required structure. The child makes up little stories or imagines something new while looking at the picture. All of these new functions serve remembering, replace its simple forms, and a clear distinction can be drawn between the operation of direct remembering and other ancillary operations that replace it.

Ancillary operations may be reestablished more or less fully according to the structure that they generate, but the problem of remembering as such is not yet solved by this. It is not enough to reestablish the whole given structure—it is important that one know how to find the word in it that was to have been remembered. Isolating a given word in a structure and the ability to control the whole operation of remembering are also inherent functions of memory.

We can say that analysis of mnemotechnical remembering discloses three basic operations which combine to produce a complex mnemotechnical operation.

The first consists of what can conditionally be called an instrumental act: this is general control of the operation, using a sign as a means in the operation of remembering. Then there are various and alternating operations of creating a new structure or simple remembering and isolating a common trait or something else.

Finally, the third and most important operation: isolating within the new large structure the word that must be remembered and reproduced. Strictly speaking, this is already the function of indicating, or attention in the true sense of that word, since here the whole structure is reproduced in its entirety and finding the required word at both the moment of remembering it and the moment of reproducing it can only be done by turning one's attention to it. The required word is as if marked by an X, by an indicating sign that places it in the center of the field of attention.

We have the following evidence that all three parts enter into the make-up of the mnemotechnical operation: each of them can exist without the other two. Thus, very frequently, the full mastery of the first operation occurs without the subject's knowing how to form a structure in a given case. Generally, the child understands very well that he must remember with the help of a card and he has done this successfully many times. In this case, he also resorts to the picture first of all, but for the child the process itself of creating a structure is impossible at this point.

His capabilities for making combinations, his imagination, his abstraction, thinking, and other functions refuse to operate, as we have often observed, as soon as the relationship between the word and the corresponding picture becomes very complex. Frequently, the state of the problem and not knowing how to set up the appropriate connection are the point of departure for the formation of a structure. Specifically, the absence of a connection begins to serve the connection. What is completely incongruous, what has nothing in common is remembered specifically by this trait, and a structure of the absurdity type is formed. As one of the subjects said, "I remembered this like a fish at a funeral."

We noted that it was specifically the distinct turning of attention to the given word and not knowing how to turn away from it, to broaden its meaning or isolate some detail in it that are the impediments to the formation of the necessary ancillary structure. It is enough only to nudge the child's stuck attention that is fixed on the given word and move it to related words or to a part of the object itself and the necessary structure will be formed. In such cases, we elicit experimentally the dropping out of a link in mnemotechnical remembering.

We frequently observe the opposite. The child himself is capable of forming structures and forms them surprisingly easily especially when we question him, but he does not have the first point of the operation: he does not understand that such a formation of structures can be used for remembering and he does not know that two parts of the structure are interconnected in such a way that one can reestablish the other. For this reason, he does not guess that the picture may be used as a sign. This is particularly clear when the child, led to the idea of imagining structures, creates a story himself, but does not bring a picture into it and does not know how to use it as a sign. Here we have the first link experimentally isolated.

Finally, we can also isolate the third link experimentally: the function of indicating that plays a most important role in voluntary reproduction which consists of the fact that a selection must be made from among the mass of emerging images. We believe that here a special direction or sign indicating how the required selection must be made is helpful. Examples of absence of selection are the reproductions that miss the mark, about which we have already spoken. The child reproduces some word related to the given structure, he may even reproduce the structure as a whole, but not the word that was given.

In the problem of memory in child psychology, the basic path of development of this function has not yet been elucidated. Does memory develop during childhood at all significantly or not? Available results give no unequivocal answer. They led psychologists to the most contradictory conclusions.

Thus, A. Bain[96] believed that maximum efficiency of memory occurs at ages six to ten, after which memory no longer develops but regresses. Others maintained that a child's memory improves continuously. Finally, a third group of authors, such as Meumann, tried to separate the very concept of memory into various functions and to show that while one function, specifically the ability to memorize develops rapidly, another ability—for remembering directly—deteriorates. When the question is formulated in this way, the problem itself of the development of memory is divided into two separate channels, each of which takes its own course. The problem can be resolved scientifically only if it is broken down.

It seems that a child's memory evolves in certain respects and undergoes involution in other respects. The memory curve separates into two branches, one going up and other down; memory improves and deteriorates simultaneously. All the facts collected by researchers are a basis for the assumption that memory as such, its organic base, evidently does not develop in childhood at all noticeably; it is possible that it even contracts. However, the ability to memorize increases extremely rapidly and very remarkably in the child. The essence of the change, the rapid and vigorous rise in the development of memory, consists of the fact that memory becomes active, voluntary, that the child masters his memory, that he moves from instinctive, mechanical memory to memory based on intellectual functions and develops voluntary memory.

Thus, psychology has for a long time been indicating the two basic directions in which memory development proceeds during childhood. The first—the intellectualization of the mnema—and the second—the active or voluntary character of remembering. However, no psychologist was able to determine more precisely that either the one process or the other is taking place in memory. All studies bring us to the conclusion that the key to the development of memory in childhood must be found in the change in methods of remembering. Our task will be to trace the evolution of these methods and to show that they occur through the four basic stages that we noted above.

In our studies, we tried to trace the comparative development of the three methods of remembering in childhood. As has been said, we presented a series of words of comparable difficulty to be remembered. These had to be remembered by three different methods: the simple, natural method of retention and the mnemotechnical method with mandatory and with voluntary selection of a picture. The data collected showed that all three methods of remembering exhibit a very characteristic and unique evolution at different ages. If we agree to call the coefficient of natural memory the average percentage of retained words in direct remembering and the coefficient of mnemotechnical memory, the average percentage of words retained with the second method and try to trace the relations of the coefficients in the process of the development of the child, we will establish the following basic fact that is obtained consistently under various research conditions: the relation between both coefficients is not a constant value but varies during the course of the child's development and changes strictly according to pattern.

During preschool age, both coefficients are close to each other; the difference between them in methods of remembering is insignificant and the transition to mnemotechnical remembering does not noticeably increase the efficiency of memory. The child using a sign remembers approximately as much without the sign. At an earlier age, there is even the opposite interrelation of coefficients; the transition to remembering with the help of pictures only confuses the child, diverts him, since it presents a problem of considerably greater complexity. The child's attention is divided and the pictures confuse him. In this case, behavior is often observed that is characteristic for an earlier age. The picture is included passively in the associative

series and the child sometimes finds a connection between the word and the picture, but looking at the picture, he does not produce the given word, but the name of the picture itself or some other word associatively connected with it. We can trace how the improperly used sign diverts the child from correctly recalling the word and makes it more difficult or inhibits his work. The mnemotechnical coefficient is lower than the mnemonic coefficient.

However, if we trace subsequent relations of the coefficients, we see that the curves begin to diverge as the child grows. While direct remembering (as was established by previous research) increases very slowly and displays a tendency toward almost horizontal movement forward, mnemotechnical remembering evolves rapidly, and the curves that represent the height of both coefficients diverge sharply. Their clearest opposition is apparent usually in the preschool years; later both curves again change direction. The lower curve that represents processes of direct remembering begins to rise quite rapidly and sharply toward the upper and to grow, while the upper curve, conversely, rises more slowly and gradually levels off.

The relation of the curves changes radically after the transitional point. Instead of the ever increasing divergence that we observed earlier, we now again see a trend toward convergence of the curves due to a retardation of the upper curve and a sharp rise in the lower curve. We can again speak of the tendency toward convergence of the curves toward a single point. In this way, both curves, exhibiting a development of natural and cultural remembering, form an exceptionally unique relation. It is this: the two convex curves are turned toward each other with their concave sides and approach each other at their lower and upper points. This arbitrary graphic representation, which we call the parallelogram of the development of memory, establishes to a high degree what we believe to be an important basic genetic law of memory.

This phenomenon was first noted by A. N. Leont'ev in the processing of experimental data and he was the first to formulate it as a law. Since the data was collected on a very large number of children and adults, we are justified in concluding that it represents the genetic curve in the development of memory and specifically, of its two basic methods.[97]

We are justified in assuming that each specific child or each specific group of children will, in subsequent growth, exhibit the same characteristics in the evolution of both methods of remembering that was exhibited in the general mass of older children. In other words, we are justified in seeing in these curves the path that the development of a child's memory takes in the process of his developing into an adult.

The parallelogram of the development of memory remains to be explained at least hypothetically. An explanation in the light of what we know about the development of higher mental functions of the child consists of the following: mnemotechnical memory must be considered as a process of mastering memory with the aid of external stimuli-signs. This operation becomes possible for the child only over the years, only gradually, only with the increase in his cultural development; the divergence of both curves in the left half of our diagram* can be explained by the fact that increase in cultural memory with a more or less unchanged size of natural memory consists in ever greater mastery of these processes. The child's memory grows rapidly and this means that the child quickly learns to master the processes of remembering, to improve them and control them. Both forms of

*Editor's note: Concrete data and corresponding diagrams of the discussed parallelogram of development are presented in A. N. Leont'ev: *Problems of Mental Development,* Moscow, 1959, pp. 346, 347, 348 (Figs. 39, 40, 41).

remembering reach maximum divergence when the child is of school age, when he has advanced significantly in cultural development, but has remained at an earlier stage with respect to direct retention.

Subsequent movement of the curves must be explained in part by specific conditions under which the experiments were done.

The total amount of material produced by remembering was so sparse that a school-age child came close to reaching the maximum. To a significant degree, this explains the fact that the curve of mnemotechnical memory exhibits a continuous deceleration in rate of increase. However, if we were to present more material for memorizing consisting of several dozen or even hundreds of words, we would easily see, as our subsequent experiments will show, that the curve would again exhibit a sharp upward trend.

Most interesting and remarkable at first glance is the rise of the curve of direct remembering at an age when we might least expect it. We are inclined to explain this phenomenon preliminarily by the fact that the rapid rise in direct remembering is evidence of profound internal changes that occur in direct remembering affected by mediated remembering. We are inclined to think that there is a kind of revolution of mnemotechnical devices for remembering, that the child turned from external to an internal use of a sign and that in this way, direct remembering actually became mnemotechnical remembering, but based only on internal signs.

A threefold reason convinces us of this. First, there are the experimental data that confirm our hypothesis indirectly from various aspects. This pertains particularly to the observation we have made many times: in direct remembering, the child, and especially the adult, resorts to mnemotechnical remembering using objects in his environment as well as internal connections and interpretation. Everything that in previous experimental studies of memory was represented as a broad use of auxiliary means pertains to this also. G. Müller correctly indicated that natural auxiliary means are based on the same principle as mnemotechnique and may be termed natural mnemotechnique or internal mnemotechnique arising on the basis of external mnemotechnique.

The next reason suggested by experiment is that the youth, and especially the adult, does not resort to remembering with the aid of external stimuli but uses internal means, actively makes connections between the memorized words and the content of a preceding experiment and organizes the word into one pattern or another, etc. Finally, data from experiments with the selection reaction and other experiments, mentioned in part above and cited in part below, show that in the process of the experiment itself, the child makes a transition from using external means to using internal means.

Finally, a whole series of experimental ideas completes the special study that had as its goal tracing the process of such a turning inward, for example, training internal mediated remembering in a given concrete situation. The results of the study showed that in a specially organized series, the child actually moves in a quite short time from external mnemotechnical remembering to internal remembering. The curves of these experiments are very much like the curve of the genetic parallelogram of memory.

Based on the data obtained, we can assume the following: what occurs in the child in the process of trained turning inward with respect to the special task also occurs with respect to the development of memory in general in an infinitely expanded form. Now, of course, we can speak only of a hypothetical elucidation of the development and we cannot yet say how this process, symbolically represented in our diagrams, actually takes place.

Does something occur that is actually somewhat similar to what we see in the specially organized experiment, that is, does the child make a transition in each separate situation in solving each specific problem from the external to the internal sign, and does his memory develop through an accumulation of separate turning inward of signs and by accumulating and combining separate points? There is much to support such a hypothesis, since observation shows that, on the one hand, in various situations the child solves different problems in different ways. In other words, from the genetic aspect, the child's memory is not at a single level everywhere but represents a kind of complex geological layering of various epochs of development. On the other hand, however, we can scarcely assume that the child is limited in the development of memory to the processes indicated and that these processes specifically play the decisive role.

It is most probable that such points very likely prepare the process of memory development rather than complete it, that the development itself probably is completed by vigorous steps and that a turning in of a structural type occurs here while the device itself, the operation itself, is developing and the prolifically developing internal experience presents an already prepared and diverse system of so-called representations or trace stimuli that may be used as signs.

In this way, we might present the development of memory according to a genetic diagram that we noted above for the development of higher mental functions in general. According to this diagram we might be able to sequence the change in method of remembering indicated by the actual data. We might say that at the beginning of the development of memory there is a purely mechanical remembering corresponding in our diagram to the primitive stage in the development of any function. It is precisely primitive memory that can explain the productive memory of children markedly apparent in initial motor habits, the easy assimilation of speech, retaining of a great number of objects, that is achieved in the first years of life and in comparison with which all subsequent accumulation of memory seems attenuated at best.

This is followed by a stage of naive psychology in the application of memory, a stage which can be traced experimentally with greatest clarity and which consists in that the child, once he is convinced that the picture helps him remember, tries subsequently to resort to the picture again, but still does not know how to do it. An example of this may be cases from our experiments cited below, but we were not completely successful in observing how development of memory actually occurs in the second stage.

Next follows the stage of internal mnemotechnical remembering that alternates with the stage of turning inward or logical memory. Here, as the experiment shows, the line of memory separates into two: from the external mnemotechnical sign there are two paths leading to further development of memory. The first consists in the transition from the external to the internal process of remembering, that is, in the development of so-called voluntary memory. In our experiments we were able to observe that a child creates yet another path for the development of memory. He begins to develop systematic devices of "recording" or writing. Psychological studies have shown that writing developed as an auxiliary means for memory. The initial incisions made on trees, the knots that were tied for remembering were also the forebears of our modern writing.

The same thing happens in the child. We ask the child to memorize a series of numbers using the natural method at first, the method of direct retention, and when he cannot do this, we give him an abacus for remembering. The child makes a transition from direct remembering to recording the numbers on the abacus and instantly the whole system of his internal operation changes.

Experiments showed that natural remembering, of a series of five or six numbers is impossible for young children. But by using abacuses, every number mentioned is placed in a separate row and then is reproduced according to the number of beads. With a little difficulty, the zero is noted by one bead and the child distinguishes it from one by its place in the series. Two-digit numbers are placed in two rows and the child does not divide the number into tens and units but in reproducing them, takes into account both numbers in corresponding groups. We note here a very interesting relation between natural and cultural remembering, since one bead on the abacus can represent a unit, a zero, or a part of a two-digit number. The child differentiates either according to the location of the bead in the row or according to natural memory that is combined with the cultural memory, and the child, already quite competent in various methods of remembering, says: "I remembered it this way." Also, the order on the abacus does not always correspond to the order of counting, but in reproducing it, the child reestablishes the required order with the help of natural memory.

Thus, making use of notation on an abacus for fixing the series of numbers leads to combining natural and cultural devices for remembering. Natural memory participates in differentiation of units, zero and eleven, in reproducing order, and in reading two-digit numbers, and cultural memory, in notations for recording zero and in recording numbers greater than ten. Here the general basic law that we are inclined to extend to all cases of memory that uses recording is apparent: natural processes are a function determined by cultural devices. Natural processes are applied where there are no cultural devices and are directed toward promoting the use of the latter.

The use of cultural devices lightens the load for natural activity, eliciting in the child a positive reaction, and drastically changes his relation to the work. With further complication of the number series, the system of recording becomes more and more complex and requires special effort of natural memory for distinguishing the different signs. We observed these kinds of natural processes for inception of writing from tasks of memory in other experiments. For example, if we give a child a number series, we can observe how the child, guided by our suggestion or independently, involves completely peripheral, neutral material in the operation of remembering and begins to make special notes or a special record that helps him remember.

In the experiment, the child creates tallies, that is, numerical records such as are widely used by people, without knowing how to count. Cards, chips, strings, and cubes lie before him and he discovers the required functional meaning of these objects. The child guesses, makes marks, and usually moves to "recording" knots, to removing or adding cards, to making tallies, etc. Most essential is the fact that the child carries out a series of operations externally in order to solve the internal problem of remembering. This result, which seems banal at first glance, which we all seem to know, which consists of remembering with the aid of writing, is disclosed in the experiment as a genetic fact. We are now able for the first time to pinpoint the moment of transition itself, the moment of inventing writing, and second, to explain at once the profound change that takes place in the child in the transition from direct to mediated remembering.

Therefore, we can consider as established the two basic lines in the subsequent development of cultural memory. One leads to logical remembering and the other, to writing. We will try to trace the latter line in detail in the chapter on writing. The middle ground between the one line and the other in the development of memory is occupied by so-called verbal memory, that is, remembering with the aid of words.

Psychology noted long ago that language, according to the expression of G. Kompeire, is a mnemotechnical tool that introduces substantial changes into the process of remembering, and for this reason verbal memory is essentially mediated memory or memory aided by signs. When we remember not the things or experiences, but their verbal record, we abbreviate, order, and abstract and, using the word, profoundly change the form of the material that is to be remembered.

We tried to compare experimentally the description of an eidetic image and a verbal description of the same picture with exactly the same kind of reproduction. It is quite difficult to detect the difference between the two methods of remembering because the description of an eidetic image also consists of words, that is, it is given in essentially the same kind of record, but it is possible, nevertheless, to see what the degree of difference is in remembering in words and direct remembering.

The presence of verbal memory indicates that each person, in the expression of Binet, is his own mnemotechnician. In experiments on remembering with pictures, we very frequently came upon cases where the child remembered not the picture, but its name, its verbal record. We had only to change the name of the picture during the reproduction and the given word was not recalled. One and the same picture that was initially termed "tiger," which the child then called "lioness," prevented reproduction of the required word. But if the child were reminded of the initial term for the picture, then he succeeded in the operation.

By deliberately presenting a picture with two possible names or arbitrarily changing the name of one and the same picture during the experiment, we were convinced repeatedly that in addition to the two stimuli—the picture and the word—a third stimulus, the name of the picture, developed. We tried to isolate the role of the name of the picture experimentally, asking for it during training and reproduction, giving a false name, changing it, presenting pictures with a double name, etc. For example, the child was given the word "fight." He selected a picture of two oxen; then the child recalled the words "to work," pointing to the picture and explaining: "This is a plowed field." Previously, the picture was described as "two cows walking," which was linked to the word "work." Now the new name for the picture, "plowed field," was linked with the new word "work."

Bergson worked out this thesis in his important study of matter and memory, showing that two memories theoretically independent of each other must be differentiated: mechanical, motor memory that results in the formation of a habit and mental memory linked to voluntary activity that takes the form of independent or spontaneous memory. Bergson gives an example that makes it possible to integrate the one with the other: Imagine that we are studying some lesson and must repeat something many times. As a result of multiple repetitions, we form the ability to recall the lesson as if by motor habit in which the other repetitions are erased, are summarized, are submerged in the total result. This is the first type of memory. But in addition to this result of remembering, I have another memory of the lesson. I can recall how I studied it the first time, the sixth time, or the last time. I can specifically remember a given single episode of learning, and this remembering represents the second type of memory.

Bergson considers the first memory a function of the brain, and the second, a function of the mind. What is most remarkable here is that with respect to the difference between one type of memory and the other, Bergson points directly to the coincidence between the second device for remembering and mnemotechnical devices. He suggests that an analysis of the devices devised by mnemotechnology would show that these devices are especially useful in spontaneous remembering, which is cryptic, and put it under our control as active memory.

Which device does mnemotechnology recommend? Each of us selects these devices more or less unconsciously. The talent of the mnemonist consists in capturing in a segment of prose the outstanding ideas, short phrases, or simple words that call forth whole pages. Here we approach a most important point from which a whole philosophical perspective opens. In the present research we will not attempt to delineate it completely. In passing we will say that another great philosopher, Spinoza,[98] saw evidence for constraint of our spirit specifically in memory. He said that we can do nothing with respect to spirit if we do not remember it. Actually, the decisive role of memory in the study of intention shows to what degree all of our intentions are linked to the recognized apparatus of memory which must subsequently realize them. Not in vain did Meumann, in analyzing a voluntary action, come to the conclusion that it very often resembles a mnemotechnical operation.

H. Høffding, citing the words of Spinoza, indicates that each intention is distinct because memory participates in it. "Intention is only a slave of memory," writes Høffding, citing Shakespeare. But we shall discuss this question in greater detail in the chapter on will.

In conclusion, we will touch upon the question of the development of memory in the abnormal child. The experiments we discussed above were also carried out with the abnormal (retarded) child and showed that in such a child, mechanical, primitive memory is dominant over mediated memory.

For this reason, he experiences greater difficulty in making the transition to higher forms of remembering, but in principle, his remembering does not differ from the remembering of the normal child. Thus these studies show complete agreement with what we know in general about memory of retarded children.

The material collected establishes three basic positions. First, among retarded and primitive children, eidetic memory is more widespread than among normal children. Second, the function of active remembering in retarded children in general is inferior to that of normal children. Third, thus far the fact that very frequently retarded children have exceptional ability for mnemotechnical remembering has hardly been explained. There are outstanding artists with respect to memory whose memory is limited to some narrowly specialized area. Every institution in which many such children gather will, without fail, point to a child gifted with exceptional mechanical memory. These situations can be scientifically explained if we are able to distinguish the two lines in the development of the retarded child: the natural and the cultural, the separation of which is the basic idea of this entire chapter.

Chapter 11
DEVELOPMENT OF SPEECH AND THINKING

The subject of this chapter—the development of speech and thinking, especially development of higher forms of thinking during childhood—is difficult and complicated. For this reason I will allow myself to begin with what is simplest: with the best known concrete facts, so elementary that I am afraid I will be reproached for extreme simplification of a great problem. But I see no other way to approach the enormous and complex problem immediately from the theoretical aspect.

I would like to begin with a well-known experiment—with the attempt to determine the main stages in the development of a child's thinking according to the story he tells about a picture. We know that the device that Binet proposed, which was widely used by W. Stern, is extremely simple and clear. A simple picture, for example, of a city or country family, or prisoners in a jail, is presented to a child of 3, 7, or 12 years, and an explanation is given of how each of them describes the same subject. The researchers say: since all the children were given the same subject to think about, it seems that thinking develops at early very important stages since it is evident in the story of the child.

We also know what conclusions have been drawn from such an experiment. These are the conclusions on which much in the psychology of thinking has been based. What happens is that children of early preschool age name the individual objects and from this the conclusion is drawn that the preschool child thinks of the world as a system of separate things. The school-age child establishes some simple actions carried out by the people or functions of the objects in the picture and from this the conclusion is drawn that the school-age child thinks of the world as a system of acting objects and people. Finally, we know that the older school-age child makes a transition to the stage of signs and later to the stage of relationships and that he understands complex relations between separate objects. From this, the conclusion is drawn that the older school-age child perceives the world as a system of complex relations in which people and things interact.

The central fact that is of the essence for the psychology of thinking is a review of the positions which we have just indicated. Doubts concerning the significance of the data obtained in the experiment with the stories about pictures arose a long time ago, and it was necessary to raise these doubts in people who approached the problem very simply. What does the experiment actually say? At first the child perceives objects, then actions, later, relations, that is, the connection between things. Is this really similar to what we know about the development of the child in general? Let us try to extend this series further back and we will see how the child perceives the picture or the world at an even earlier age. Obviously, he must perceive not only objects or things, but the smallest properties and qualities of things because a thing itself is quite a complex connection of separate traits and relations.

We might say directly that everything that we know about the child contradicts this notion. Everything that we know about the child says that the child of early and preschool age perceives things as a segment of reality with an extremely concrete connectedness of these things. The initial perception of separate objects that we ascribed to the child on the basis of the experiment with the picture is actually a much later stage that appears in the child's subsequent development, and everything that we know about the development of thinking in the very young child favors the idea that this experiment as it continues leads by some miracle to a wrong notion, that is, exactly to an opposite process of development of thinking in the child.

The child thinks rather in whole connected clusters. This is termed syncretism. Syncretism is the feature of the child's thinking that makes it possible for him to think in whole clusters without breaking them up or without separating one object from another. The syncretic nature of the child's thinking, that is, thinking in whole situations, whole connected parts, is so strong that it persists even in the area of verbal thinking in the school child and is a reorganizing form of thinking in the school-age child. Specifically the inability to isolate the individual thing, to name it, is very clearly apparent in two examples that I borrow from Piaget.

The child is asked, "Why is the sun hot?" He answers, "Because it is yellow, because it is high up and stays high up." For such a child, "explaining" means bringing in a series of other facts and properties, impressions and observations that are directly connected with a single impression, a single image. That the sun stays up and does not fall, that it is yellow and hot, that there are clouds around it, all of this is what the child sees, what is linked together; he does not separate one thing from another.

In the older child, syncretism results in a shifting, that is, a combining of everything with everything that only seems superficially united. This persists in the school-age child in speech: the child operates with such syncretic wholes. Blonskii correctly calls this property unconnected connectedness of thinking. "Unconnected"—this is understandable: of course the child thinks, pointing out that the sun does not fall because it is hot. In this, much seems unconnected. Also, this is correctly called "connectedness," because the child connects what we, the adults, never fail to separate. For him, the facts that the sun is yellow and that it does not fall are merged into one impression that we divide.

Thus, syncretism consists of an unconnected connectedness of thinking, that is, in a dominance of a subjective connection, a connection that arises from a direct impression, over an objective connectedness. Unconnectedness and subjective general connectedness are derived from this. The child perceives in such a way that for him everything is connected with everything. From the objective aspect, this means that the child assumes the connection of impressions to be a connection of things. What is for the child a connection of impressions, he perceives as a connection of things. What happens in this case in the brain of the child is relatively well known from the physiological aspect: this is very well reflected in Pavlov's interesting point on irradiation, that is, an initially dispersed, diffuse stage of excitation which accompanies a first impression that gives rise to a whole complex connected with this impression.

How did psychologists of previous times, psychologists-subjectivists, imagine the development of thinking to be? They indicated that the state of a newborn child could be represented as chaos of some kind of sensations, primarily a chaos of unconnected things, for where would a connection arise when there is no experience? The child never saw objects, let us say, a bed, a person, a table, chair. If only organs of sensation function, then naturally the child must experience chaos

of what he sees, a mixture of hot and sweet, black and yellow, various unconnected sensations and properties of objects. Gradually sensations accumulate and groups are formed from separate sensations. From this, things develop, then things are organized into groups and finally, the child makes the transition to perceiving the world.

However, experimental studies show that things go quite the opposite way. The very young child perceives the world as syncretic—whole large groups or situations. Still another physiological consideration speaks in favor of this.

Pavlov studied the properties of the so-called complex of stimuli and demonstrated that a complex of certain stimuli elicits a different reaction than does each stimulus taken by itself, separate stimuli or taken together. In Pavlov's laboratory, initially work was done with separate stimuli and then with a complex of stimuli. Thus, in laboratory practice, an experiment with separate stimuli is set up first, then an experiment with a complex of stimuli. And what happens in the child's life? I think that at first the child deals with a complex of impressions and objects, with the situation as a whole. The mother feeds the child; this means that the mother is the stimulus, her clothing, face, voice; then the child is picked up and placed in a certain position; there is satisfaction with feeding and the child is put to bed. This is the whole situation that unfolds before the child. For this reason, Pavlov says that while in the laboratory we arrived at a complex of stimuli later, in life, genetically for the child, the complex of stimuli comes first, and the child initially thinks in terms of a complex and later in terms of separate objects.

It is easy to see, however, that the experiment with perception of pictures says the opposite.

Still another factual consideration.

The experiment with the pictures indicates that a child of three sees separate objects and an older child thinks of the world as a system of effects. It develops that if one and the same picture (let us say, the prisoner in jail) is shown to a three-year-old, he will say, "a man, another man, a window, a mug, a bench," but for a preschool child it would be: "A man is sitting, another is looking out the window and a mug is on the bench," We know that the opposite is true: both the three-year-old and the very young child resolve all the separate objects according to their functions, that is, they determine them through actions. For the child, it is actions that are primary. When we try to find the first, primary word, then we find that this is the name of an action and not an object; the child names a word that signifies an action, then a word that signifies an object.

Summarizing the data, we come to this conclusion: a fatal contradiction has arisen between the development of thinking as presented by the story with the picture and everything that we know about the development of thinking from life. In both cases, the relations seem to be inverted. It is curious that all of these notions can be confirmed by experiments and facts. We can take a thousand children and show yet again that this is the case with the picture. It is an incontrovertible fact, but it must be interpreted differently.

We will make one of the simplest observations that we can explain, and this will indicate the path to a new interpretation. If everything that we know about the thinking of a child contradicts what the story with the picture presents, then everything that we know about the child's *speech* is confirmed by it.

We know that the child uses single words at first, then phrases; later the child accumulates a series of word fragments and facts. A five-year-old establishes a connection between words in a single sentence, and an eight-year-old uses complex, additional sentences. A theoretical assumption arises: can the story about the picture describe the child's thinking? Can we believe that the child thinks the way he

speaks, in naive expressions? Can the matter be different genetically perhaps: the picture establishes only the fact that the child creates phrases from isolated words, then connects the words more and more into sentences and, finally, makes a transition to a connected story? Perhaps the child does not think of the world initially as separate things, then actions, and later traits and relations? Perhaps the child speaks initially in separate words, then simple sentences, and later combines these sentences?

Let us conduct an experiment because only experiments can give a definitive answer. There are several simple ways to do this that seem to me to be extremely clever. We will try to exclude the child's speech and we will try to get responses to the picture by some other means and not through words. If the proposition is true that the child does not think of the world as separate things but can say only separate words and cannot form their connections, then we will try to get along without words. We will ask two children not to tell a story, but to perform what the picture shows. It develops that the children's play about the picture sometimes lasts 20 or 30 minutes, and primarily and most of all in the play, those relations are captured that are in the picture. To put it more simply, if the child is asked to dramatize the picture and not to tell its story, then, according to the experiments of Stern, the four- or five-year-old child dramatizes the prison picture the way a twelve-year-old tells it. The child understands very well that the people are in jail: here the complex narration about how the people were caught, how they were taken, that one looks out the window, and that he wants to be free is added. Here a very complex narration is added about how the nanny was fined for not having a ticket on the trolley. In a word, we get a typical portrayal of what we see in the story of the twelve-year-old.

At this point the psychologist's eyes are opened to the process of the child's thinking, to the history of the development of the child's thinking as the story about the picture shows and as he displays it in dramatization. Let us move on to another aspect of this experiment.

We will try to do what other experimenters have done before us. We will try to show whether it is true that a three-year-old does not perceive relations, but perceives separate things or objects and that the connection between them is established later. If this is so, then we would expect that if in the experiment we let the child operate with things which are only slightly connected, then the child will not see the connection and will use the objects as separate, unconnected objects. Eliasberg worked on this and developed a method for substantiating the special experiment. This is its essence. A number of bright pieces of paper are placed on the table and the child is brought to the table and given no instruction, but sometimes his attention is called to the papers lying before him. The papers are of two colors: bright red and blue. The child reaches for the papers and turns them over. A cigarette is pasted under one of the papers (under the blue). The child turns his attention to it and tries to pull the cigarette away. What is he going to do next? If the child is at the stage which was evident in the test—with the story about the picture—then we might expect that next the child will work with the separate papers or at least with several papers and will not establish any connection or relation between the objects.

The experiment shows the opposite. The child, beginning at the age of one and a half, two, and, as a rule, three, always forms a very ordinary connection between the blue paper and the finding of the cigarette. When the papers are placed randomly, the child opens only the blue and leaves the red. If the color of the papers is changed after the first trial and the red and blue are replaced by orange and brown, the child proceeds in the same way. He opens the orange and opens

the brown in which he finds the cigarette and again establishes a connection between the color and the cigarette. It is very interesting that he establishes the connection much more quickly than the older school child for whom the experiment and the whole situation are much more divided into separate things that have nothing in common with each other. An adult establishes the connection even less successfully than the older school child. For this reason, Eliasberg believes it improbable that the child who easily establishes the relation between the things would, in the simpler experiment, think of the world as consisting of separate objects and would not be able to imagine the connection—a man standing at the window—and would see only a man and a window.

For Eliasberg, the experiments with nonverbal children, with mute and deaf-mute children, were of decisive significance. Many experiments with analysis of nonverbal behavior lead us to conclude that the very young child may be thought to have a tendency to connect everything with everything else; as the experiment has demonstrated, for him the extraordinary difficulty lies in breaking the connection, in being able to isolate separate instances. For this reason, the common notion that the child does not connect actions with each other is dispelled.

The correctness of the genetic curve in the development of thinking produced by the story based on a picture has been in doubt for a long time. Stern called attention to the fact that if the task of thinking is difficult for the child, he drops to a lower level. If the child sees a very complicated picture, the twelve-year-old will begin a narration like that of a seven-year-old and the seven-year-old, like that of a three-year-old. To demonstrate this, Stern asked a child to write a story about the picture he was looking at. Again all the children forced to use written language to tell the story dropped down to a lower level still.

This experiment was a triumph for Stern. The experiment demonstrated that when the task became more complicated (if we study reconstructing the picture from memory), the quality of the narration declined. Consequently, from the superficial impression that formed about the process of thinking, it might be assumed that initially there was thinking about separate things, then about the actions of these things, next about traits and, finally, about connections between the things. But there is still another group of experiments that overturn all of Stern's constructs, and one can only wonder how it was that these experiments did not lead to a review of the problem from this aspect.

The first experiment consists of the following. Among children from different social strata—peasants and cultured city children, retarded and normal—we find that in telling a story from a picture, the peasant child living in Germany drops back in development at the transition from stage to stage in comparison with children from other social strata. When Stern compared the thinking of children from cultured and noncultured strata, he found that in everyday thinking, there was almost no difference between the children of the two different strata, and in many cases there was almost no difference in the content of their thinking. Conversely, the experiment analyzing speech of children from various social strata showed complete agreement with data on the development of speech; for example, observations of development of verbal speech and syntax of peasant children show that the child describes the picture in the same way that he ordinarily speaks. A simple conclusion might follow from this, and if psychologists could be convinced of it then no further experiments would be necessary. But psychologists adhere to a different view, believing that the story about the picture is not an indication of how the child speaks in everyday life, but how he speaks under specific experimental conditions.

Another experiment, to which Blonskii called attention and which also led to a review of all experiments with stories about a picture, shows that if we ask a

child to write a story rather than tell it, then we see immediately that a twelve-year-old tells the story like a three-year-old. The written story of a twelve-year-old resembles the verbal story of a three-year-old. Can we really believe that it was only that we gave the child a pencil that made the task of thinking more difficult? If the child writes poorly, does that mean that in thinking he immediately drops from the stage of relations to the stage of objects? This is not true. But that a child at twelve writes like a child of three speaks is a fact. To put it more simply, this means that the story based on a picture yields an inverted picture of the child's development of thinking. Actually the story reflects the stage at which one form or another of the child's speech is; if we move to written language, then the experiment reflects specifics of the child's written language.

The confusion in child psychology arose because psychologists could not distinguish the development of speech from the development of thinking—this is the most important conclusion from which a theoretical consideration of this problem begins.

In an analysis of the test using a picture, we showed that if the test is not used sufficiently critically, it can lead us into error, that is, it may falsely show a path of development of the child's perception of the world and the child's thinking about the world. Moreover, experimental confirmation of a very young child's perception, excluding his speech, shows that the child does not perceive the world as a number or sum of separate things, that his perception is syncretic in character, that is, is integral, more or less combined in groups, that his perception and representation of the world is situational.

If we approach these facts from the point of view of the development of the child's speech, we see that at an early age, the child really does use separate words, then a connection between two words develops, and later sentences with a subject and predicate. This is followed by a stage of development in which the child speaks in complicated sentences and finally makes a connection between the separate elements of a main and a subordinate clause.

Analysis of the experiment with a picture mainly makes it possible therefore to separate the development of thinking and speech in the child and to show that the development of thinking and the development of speech do not coincide but proceed along different paths.

We shall try to correct the misunderstandings that might arise in the interpretation of the facts obtained.

The first misunderstanding may be as follows. We confirmed that a child of three describes a picture in the same way that he speaks, but perceives and thinks of the picture differently. Consequently, if we should want to represent symbolically the curve of development of speech and thinking, then the separate points of these curves would not coincide. But does this mean that development of speech and thinking are completely independent of each other? Does this mean that in his speech the child does not exhibit a certain degree of development of his thinking? This misunderstanding must be clarified. We must show that although the child's development of thinking and speech do not coincide, they depend closely on each other.

The task of this chapter is to show that the development of speech in the child affects his thinking and restructures it.

We will begin with the second, the simpler task. In order to analyze it, we must first establish that the child's thinking and a number of other functions begin to develop before speech develops. In the first years of life, development of thinking proceeds more or less independently, but in certain areas, it coincides with the

curve of development of speech; even in adults the function of thinking may remain independent to a certain degree and not connected with speech.

We know about certain experiments, for example, the experiments of Köhler in animal psychology. These experiments established the pre-speech roots of thinking. There are studies by other authors in the area of child development, for example, the experiments of Tudor-Hart and G. Gettser with a six-month-old child. These authors observed the child's turning toward objects and could see the preliminary stage or rudiments of thinking with which the child operates in a concrete situation manipulating objects and using them as tools. Rudiments of thinking are more definitely evident in a child of 10 months. In addition to instinctive, innate reactions and conditioned reflexes, a child of nine to twelve months already exhibits habits that are developed at an early age. He has a quite complex apparatus of adaptation to new situations. For example, in using tools, the child picks up the basic relations between objects mainly in their simpler forms.

All 42 ten-month-old children observed by Tudor-Hart and Gettser proceeded as follows: when a rattle with a string attached fell, they perceived the connection between the rattle and the string and after vain attempts to get the rattle with their hands, pulled the string and tried to get it that way.

Also, observations showed that a child of this age is not only capable of picking up simple relations between objects, is not only capable of using an object as a tool, but in order to push another object toward himself, he creates a connection and complex relation between objects. The child tries to use one object as a tool for controlling another object much more frequently than the objective situation warrants. The youngster tries to move one ball with another ball not just when the ball is nearby and reachable with his hand, but also when the ball is several meters away and when there is no contact between the tool and the object. Germans call this *Werkzeugdenken* in the sense that thinking is revealed in the process of using simple tools. In a twelve-month-old child, thinking is revealed much more fully and precedes the formation of speech. Therefore, these are the pre-speech roots of the child's intellect in the true sense of the word.

Recently we got hold of extremely valuable experiments with so-called conceptions. We know what a conception is in the old psychology: it is the traces of stimulation which originates in the environment that, from the subjective aspect, consists of all the objects acting on us and which, closing our eyes, we frequently, more or less actively, reproduce as an internal image. From the objective aspect, we still do not precisely know the mechanism of representation; evidently we are speaking of regenerating trace stimuli.

Experiments with so-called eidetics made it possible to experiment with representations. Eidetic representation is the degree of memory development that in genetic relation occupies the midposition between perception on the one hand and representation, in the proper sense of the word, on the other. Since on the one hand, representations are memory in the sense that a person sees an image when the object is not before him, we are dealing with representation as with the material of thinking. On the other hand, since a person localizes images seen previously on the screen and these images are subject to the principal laws of perception, we can experiment with these images as with a perception; we can move the screen closer or farther away, illuminate it differently, introduce various stimuli and look at the results.

During the last few years, E. Jaensch[99] did experiments of this kind: he took 14 eidetics and conducted an experiment with them in the following situation. He showed each of the subjects a real fruit, then after a certain interval, he showed them a cane and a hook. When the objects were removed, the eidetics saw images

on a screen: the fruit and the cane and the hook. When the subjects were asked to think about how good it would be to eat the fruit, 10 of the 14 responded in the same way: if the cane and the hook were isolated in the field of vision, then after the instruction, the cane and the hook moved toward each other in the field of vision and assumed a position that would actually make it possible to get the fruit with the cane. Any distraction of attention from the cane disrupted the connection being formed and the cane moved away from the hook.

We know that in our perceptions, separate objects appear to be mobile and change very easily in size and location depending on the attention paid them. In observations of eidetics, mobility of images is extreme. Thus, Jaensch succeeded in showing that in both conceptions and trace stimuli, direct visual merging of separate objects occurs. These experiments were the basis for assuming that Jaensch obtained a model of how not only animals in Köhler's experiments, but also children who cannot speak, solve problems by thinking. This occurs in the following way. If no objects are close to each other in the field of eidetic vision, then in the conceptual field, in the field of trace stimuli, there is a special combining of the objects that corresponds to the task, the situation in which the child finds himself at that certain time.

This form of thinking is called "natural" because it is innate, primary. This thinking is based on certain primary properties of the nervous apparatus. The natural form of thinking differs first in the concreteness of what is before the child, in the connection in more or less ready situations and, second, in the dynamics, that is, eidetics create combinations and transpositions of certain images and forms. In other words, they create in a sensory field the same changes that hands make in the motor field when a person takes a cane and moves it in the required direction. The connection that is made in the motor field is also made in the sensory field.

I think that this experiment, whose physiological implications we do not yet know, does not contradict what we know about the working of the brain. We know that it does not have two centers that work independently of each other; on the contrary, as a rule, any two centers that are simultaneously excited in the brain have a tendency to form a connection with each other. This means that all the excited centers establish some connection with each other. Consequently, when there are two impressions and two conditioned reflexes, we may assume that these two impressions result in a third center connected with the task itself (with the desire to get the fruit). The third center is connected with the first two impressions and consequently there is a transposition of stimuli in the cortex of the brain. We see to what extent experiments with eidetics caused a shift in preceding conceptions; we see that from the experiments we can draw completely unexpected conclusions compared with what we knew before about the effect of nerve centers on each other.

Now let us imagine to what extent the whole development of the child's thinking changes depending on the work of the sensory apparatus: when the child's eyes are directed toward two objects, a closure occurs, a connection is formed between the two objects and the child makes a transition from the natural form of thinking to the cultural form which humanity has developed in the course of social relations. This occurs when the child makes the transition to thinking with the help of speech, when he begins to talk, when his thinking stops being only a movement of excitation from trace to trace, when the child moves to speech activity, which is nothing other than a system of very fine, differentiated elements, a system of combinations of the results of past experience. We know that not a single spoken expression is repeated exactly as another expression but is always a combination of expressions. We know

that words are not simply individual reactions but part of a complex mechanism, that is, a mechanism of the connection and combination with other elements.

Let us take our cases, changes in sound with declension according to cases: lampa [a lamp], lampy [lamps], lampe [lamp, prepositional case]. One change in the terminal sound changes the character of the connection of that word with other words. In other words, those elements emerge before us that have a special connection so that a shift can occur, so that they might be combined; the relations shifted and a new whole was then created by the combination.

We get something like a box with a mosaic with an extremely large number of different elements where many different connections can be made by combining the elements to create ever newer wholes. We get a seemingly special system of habits that are by nature material for thinking, that is, for creating new combinations, in other words, means for developing a reaction which in direct experience has never been developed.

Let us return to the experiments. They show that decisive changes in a child's behavior occur when, in an experiment with eidetic use of tools, the child introduces words—speech. Jaensch has demonstrated that this whole operation, simple from the eidetic point of view—a system of "tool and fruit"—now becomes unbalanced as soon as the child tries to formulate in words what he must do and what is happening before him; in this case, the child immediately makes a transition to new forms of solving the problem.

These facts can be found in the well-known experiments of Lipmann. He took the subject into a room and asked him to carry out a more or less complicated operation, let us say, getting a ball from a cabinet in which the ball lay at the very top of the cabinet and was quite inaccessible without the use of a tool. The first time, Lipmann said to the subject, "Please get the ball from the cabinet," and watched how the subject responded to the request. The second time, he said, "Please get the ball from the cabinet," and as soon as the subject started to do so, he gave a signal, "Stop!" and said, "First tell me how you will do this," and again he observed how the subject carried out the task. The researcher compared how the task was done with preliminary verbal solution and actually without words. It developed that the character of solving the problem was completely different; we solve one and the same task differently depending on whether we take aim at the ball with our eyes or solve the problem with words. In the first case, the reaction proceeds from action in which I want to manually measure the distance to the objects lying before me and in the second case, I solve the problem with words, I analyze the whole situation with words. It is understood that many combinations can be made with words that cannot be made manually. Words can convey any image that corresponds to the size or color of the ball. With words, one can ascribe additional properties to the object, including even those that are not required for carrying out the task in the first case.

It will be clear if I repeat after Lipmann that I can use words to extract the very essence of the situation and leave the effects of the properties of the situation that are not essential from the point of view of the task outside the field. Words aid, first, in extracting the essence and, second, in combining any images. In addition to climbing on the cabinet or using a stick to get the ball, by using words, I can in a minute draw up two or three plans of action and decide on one of them. In this way, in solving a problem with words or by action, we have completely different principles of approach to carrying out the task.

I had the opportunity to observe an experiment with children who were given the task connected with the use of tools. The situation was similar to Köhler's situation. The child was placed in a bed with a net; there was a fruit in his field of

vision and there were several sticks. The child had to get the fruit, but a net intervened. The task consisted in moving the fruit closer. When the child tried to get the fruit with his hand, he ran into the net. As Köhler's experiment demonstrated, a monkey almost never thinks immediately to roll the fruit in the opposite direction, but first resorts to direct reaction, pulling the fruit toward itself. Only when the fruit fell did the monkey use an alternate way to move it closer to itself.

The very young child solves the problem with much greater effort, with more delay, and exhibits very interesting behavior. Usually the child is extremely agitated and engages in egocentric speech, that is, he not only pants and changes sticks, but he also talks continuously. In talking, he fulfills two functions: on the one hand, he acts on and pays attention to what is present, but on the other, and what is most important, the child plans in words the separate parts of the operation. For example, the experimenter removes the stick and the child cannot see it, but the task consists of getting the fruit that lies beyond the net and this cannot be done without a stick. The child cannot put his hand through the net. He must move the fruit from the side, then go around the net and plan two stages of the operation: to guide the fruit that he must get, catch it, and pick it up. Here, this instant is of special interest: if there is no stick, then the child tries to get the fruit with his hand, moves about the bed, looks about in perplexity, but as soon as his attention is directed to the stick, the situation changes radically, as if the child realizes what he has to do, and the problem is solved instantly.

With an older child, the operation proceeds differently. At first the child turns to the adult, asking for a stick with which to move the fruit: the child resorts to words as a means for thinking, as a means which would make it possible to get out of a difficult situation with help from adults. Then the child begins to reason himself, and his reasoning frequently develops into a new form: the child states first what he must do, then he does it. He says, "Now I need a stick" or "Now I'll get a stick." A completely new phenomenon develops. Before if there was a stick, the operation was successful; if there was no stick, the operation was not successful. Now the child looks for the stick himself and if it is not there, then he himself, judging by what he says, looks for the required item.

However, the most interesting thing happens in the experiment with imitation.

While the older child solves the problem, the younger observes. When the older child has solved the problem, the younger child begins and we see to what extent the younger child can imitate and produce a ready solution. It develops that if the operation is at all complicated, the situation changes: the process of imitation consists in one child carrying out the operation and the other reproducing it verbally. If he succeeds in formulating the solution in words, then he gets the result that Lipmann got when he asked the subject to explain the process first and then to begin the process itself of imitation. Naturally, when the task is more or less complicated, the process of imitation depends on the extent to which the child separated the essential from the nonessential in the operation.

Here is an example. In the simplest case, the older child, whom the younger is imitating, tries to get through the net and get the fruit with his hand first. After the futile attempt, he gets a stick and in this way finds the solution to the problem. The younger child, picking up the whole situation and imitating the older child, begins where the older child left off: he lies down, stretches out his hand, but knows beforehand that it is impossible to get the fruit with his hand. Then he follows step by step the whole operation that the older child carried out. The situation changes substantially as soon as the younger child understands what the crux of the matter is. Then he reproduces only that part of the situation that he has formulated in words. He says, "I have to get it from that side"; "I have to stand on a chair." But

here the child reproduces not the whole visual situation, but only the part he solved with words.

In observing the two forms of the child's thinking—assisted by the visual situation and assisted by words—we note the same transformation that we noted before in the development of speech. As a rule, the child acts first, then he speaks and his words are as if the result of the practical solution of a problem; at this stage the child cannot separate verbally what came first and what came later. In the experiment, when the child must select one object or another, he first selects and then explains why he chose as he did. If of two cups, the child selected the one with the nut, he actually selected it without knowing that the nut was there, but putting it in words, the child says that he selected it because there was a nut in the cup. In other words, the words are only the concluding part of the practical situation.

Gradually, at four or five years of age approximately, the child makes a transition to simultaneity of speech and thinking; the operation to which the child reacts is extended in time and lasts several seconds. Speech appears in the form of egocentric speech, and thinking emerges during action; later we can observe their complete unification. The child says, "I will get a stick," and he goes and gets it. At first these relations still fluctuate. Finally, at approximately school age, the child begins to plan the necessary action in words and only after this does he carry out the operation.

In all areas of the child's activity we find the same sequence. The same thing happens also in drawing. The small child usually draws first, then speaks; at the next stage, the child talks about what he is drawing, at first about parts of the drawing; finally the last stage is formed: the child first says what he will draw, then he draws it.

We shall try to present briefly the colossal revolution that occurs in the child when he makes the transition to thinking with the aid of speech. An analogy can be drawn here to the revolution that occurs when man first makes the transition to using tools. The proposals of Jennings relative to animal psychology are very interesting: an inventory of potentials can be determined for each animal strictly according to its organs. Thus, a fish cannot fly under any circumstances, but it can make swimming movements that are determined by its organs.

Before nine months of age, the human infant is entirely subject to this law; an inventory of potentials can be constructed for the child on the basis of the structure of his organs. But at nine months, a break occurs and from that moment, the human infant goes beyond Jennings' scheme. As soon as the child first pulls on the string tied to the rattle or pushes one toy with another in order to move it closer to himself, organology loses its former strength and the child begins to differ in his potentials from the animal; the nature of the child's adaptation to the environment changes decisively. Something similar occurs in the realm of thinking when the child makes the transition to thinking with the aid of speech. Specifically owing to this kind of thinking, thought acquires a stable and more or less constant character.

We know the properties of any simple stimulus acting on the eye: the least turning of the eye is enough to change the image itself. Let us recall the experiment with the so-called afterimage: we look at a blue square; when it is removed, we see a yellow spot on a gray screen. This form of the simplest memory is the inertia of simulation. When we try to move our eyes upward, the square moves upward, when we move our eyes to the side, the square moves to the side. When we remove the screen, the square is removed and when we bring it back, the square reappears. A most unstable reflection of the world develops depending on the distance at

which the stimuli act, at what angle, and on how they act on us. Jaensch suggests that we try to imagine what would happen with a small child if he found himself at the mercy of eidetic images: his mother standing ten steps from him and his mother coming closer would have to grow ten times bigger in the eyes of the child. The size of every object would have to change significantly. At a distance of a hundred steps, to the child an animal, large and bellowing, would appear to be the size of a fly. This means that if there were no correcting adjustment for space in relation to each object, we would have a picture of a world unstable to the highest degree.

Another inadequacy of the graphic, concrete form of thinking from the biological point of view is that solving a concrete, single problem relates only to the given, present situation; we cannot generalize in this case: the problem once solved is not an equation that would allow us to transfer the solution to a problem with other objects.

The development of speech reorganizes thinking and translates it into new forms. The child who names separate objects in describing a picture has not yet reorganized his thinking; however, the most essential fact is that a method has been created here that forms a basis for the construction of verbal thinking. What the child names as separate objects has a greater significance from the point of view of the biological function of his organs. The child begins to separate the unconnected mass of impressions that were merged into a single cluster; he separates and isolates clumps of syncretic impressions that must be separated in order to establish some kind of objective connection between the separate parts. Not thinking in words, the child sees the whole picture, and we have a basis for suggesting that he sees his life situation globally, as syncretic. Let us remember how syncretically connected all of the impressions of the child are; let us remember how this fact was reflected in the causal thinking of the child. A word which separates one object from another is the only means for isolating and breaking down a syncretic connection.

We can imagine the kind of complicated upheaval there would be in the thinking of a child who cannot speak, especially in the deaf-mute child, if from a quite complicated combination of things that he thinks of as a whole large picture, he would have to isolate some parts or isolate individual characteristics of objects from a given situation. This would be an operation that would take years to resolve.

Now let us imagine a person who can speak or, better still, a child for whom an adult points to an object: instantly from the whole mass, from the whole situation, one object or characteristic is isolated and becomes the center of the child's attention; then the whole situation assumes a new aspect. The separate object is isolated from the whole cluster of impressions, the stimulus is concentrated on the dominant, and in this way the child first makes a transition to breaking down the cluster of impressions into separate parts.

How does this most important change in the development of the child's thinking under the influence of his speech occur and of what does it consist? We know that the word isolates separate objects, breaks down the syncretic connection, the word analyzes the world, the word is the first means of analysis; for the child to name an object with a word means to isolate one object from the whole mass of affective objects. We know how initial conceptions arise in children. We say to the child, "There's a rabbit." The child turns and sees an object. One might ask how this affects the development of the child's thinking. In this act, the child makes the transition from an eidetic, syncretic visual image, from a specific situation, to finding a concept.

As research has shown, the development of concepts in a child is influenced by the word, but it would be a mistake to think that this is the only way. We had thought so until recently, but experimentation with eidetics showed that concepts may be formed by another "natural" path as well.

There are two lines of development in the formation of concepts, and in the area of natural functions there is something that corresponds to the cultural, complex function of behavior that is called a verbal concept.

Jaensch gave a subject this problem: he showed the subject a leaf with smooth edges, then he showed him a number of leaves with toothed edges. In other words, he showed the subject eight to ten objects that had much in common in their structure but there were also objects with individual differences: thus, one leaf had one tooth, another two or three teeth. After the subject had seen a number of these objects, a gray screen was placed before him and a determination was made of the kind of picture that the subject then saw. It developed that sometimes he saw a mixed image like a group photograph (at one time, psychologists compared the process of concept formation to the process of group photography).

Initially the child had no general concept; he saw one dog, then another, then a third, a fourth and it was like a group photograph; what was different about the dogs was eliminated and what they had in common remained. What was most characteristic remained, for example, barking, the shape of the body. Consequently, one might think that the child forms a concept simply owing to repetition of one and the same group of images and that some part of the characteristics that are repeated frequently remain and others fall away.

This was not confirmed by experimental studies. Observations of children show that they have absolutely no need to see, let us say, 20 dogs to form an initial concept of a dog. Conversely, the child may see 100 varieties of an object, but will not form the required representation from all that he has seen. Obviously, a concept is formed by some other means. In Jaensch we see an attempt to test experimentally what is taking place if we show a series of connected objects, for example, leaves with different teeth. Does a collective photograph or collective image develop here? It seems that it does not. In this experiment, there are three basic forms of natural formation of concepts.

In the first form, we have a so-called moving image. The child initially sees one leaf, then the leaf becomes toothed, forming one tooth, then another, a third and this image returns to the first impression. A dynamic pattern emerges and actual stimuli are transformed one into another, and a leaf in motion forms that unites everything that was stable before. Jaensch refers to another form of unifying the image as an intelligent composition: from two or three images that we looked at, some new image is formed; it is not a simple sum of two or three impressions, but an intelligent selection of parts; some parts are selected, others are left out, and in this way new images are formed and the whole is the result of intelligent composition.

Jaensch presented a picture of a dachshund to eidetics and then projected an image of a donkey on the same screen; as a result of the two pictures of two different animals, the subjects had an image of a tall hunting dog. Some traits coincided and others taken from one picture and the other provided new traits and this was converted into a new picture.

We will not discuss in detail the third way in which a natural concept is formed.

Experiments have shown that, in the first place, concepts are not formed purely mechanically and that our brain does not make a group photograph in order that an image of a dog, for example, placed on another image of a dog, results in a

certain sum in the shape of a "collective dog," that the child himself forms a concept by a processing of images.

Thus, even in the natural form of thinking, a concept is not formed from a simple shifting of separate traits, most frequently repeating traits; a concept is formed through a complex modification of what occurs in the transformation of an image at the instant of movement or at the instant of intelligent composition, that is, selection of certain significant traits; all this occurs not by means of a simple shift of elements of separate images.

If concepts were formed by mechanical placement of one stimulus on another, then every animal would have concepts because a concept would be a Galton plate. However, even a mentally retarded child differs from animals in the formation of concepts. But all studies show that mentally retarded children form concepts differently; specifically, a common concept develops with greatest difficulty in mentally retarded children. The clearest characteristic by which the thinking of a mentally retarded child differs from the thinking of a normal child is precisely that the mentally retarded child has not firmly mastered thinking with the aid of forming complex concepts.

A simple example: the mentally retarded child with whom I dealt solved an arithmetic problem. Like many retarded children, he works reasonably well with simple counting: he carries out the more simple operations within the limits from one to ten, he knows how to add, subtract, and give verbal answers. He remembers that he left the city where he lives on Thursday, the 13th; he remembers what time that was. This phenomenon is frequently found in mentally retarded children: their mechanical memory connected with certain circumstances is very well developed.

With this child, we moved on to solving problems. He knew that subtracting six from ten leaves four. He repeated this as long as the situation remained the same. Then I changed the situation. If he were asked, let us say, "There were ten rubles in a bag, mother lost six rubles, how many were left?" the child could not solve the problem. If we put out the coins and asked him to take six away from the ten, he readily understood what was going on and determined that four coins remain; when we gave the child this kind of a problem with my bag, he solved it. But when the same child was given a problem with bottles, "The bottle contained ten glasses, six were drunk, how many were left?" he could not solve it. When we brought the bottle to demonstrate and poured into glasses, carrying out the whole operation, the child was again able to solve the problem and then could solve a similar problem with a tub and with any kind of liquid. But if we were to ask him, "If we subtract six yards of fabric from a ten-yard piece, how much is left?" he would again be unable to solve the problem.

This means that we have here almost the same stage that certain animals also exhibit with developed so-called arithmetical pseudoconcepts but with no abstract concepts, that is, concepts not depending on a concrete situation (bottles, coins), and because concepts are abstract they become general concepts applicable to all cases in life, to any problem.

Now we see to what degree adaptation is diminished in the mentally retarded child—slave of the concrete situation. He has no apparatus for developing a general concept and for this reason, he can adapt only within the limits of a narrow situation. We see how difficult it is for him to adapt while the normal child, once assimilating that $10 - 6 = 4$, will always solve the problem regardless of the concrete situation.

Now a final example with a mentally retarded child who is taught to traverse a quite complicated distance in Berlin with the aid of a map. The child gradually masters the map and moves correctly along the learned path. Suddenly the child

gets lost. It developed that the house at the corner where he was to turn to another street and which was marked with a cross on the map was covered with scaffolding for renovation. The whole situation changed. The child was lost, he was not used to returning alone, and so he began to wander and met with chance stimuli that diverted him.

From this example, it is eminently clear to what degree it is true and incontrovertible that if the mentally retarded child does not have the apparatus for developing abstract concepts, he will be greatly limited also in adaptation. He is severely limited in this respect since his apparatus for developing concepts is subject to concrete thinking and a concrete situation.

Chapter 12
SELF-CONTROL

If we were to try to synthesize the separate forms of development of higher mental functions described in the preceding chapters, it would be easy to see that all of them have a common psychological characteristic which we touched upon indirectly thus far, but which is the characteristic that distinguishes them from all other mental processes. All of these processes are processes of mastering our own reactions by different means. We face the problem of considering what the process of controlling our own reactions consists of and how it develops in the child. Most typical for controlling our own behavior is *selection*, and it is not for nothing that in studying voluntary processes, the old psychology saw the very essence of the voluntary act in selection. In continuing our analysis, we also often came across the phenomena of selection.

For example, in the experiments on attention, we had occasion to study the selection reaction since it is determined by the structure of external stimuli. In the selection reaction with mnemotechnical remembering of instruction, we tried to trace the course of this complex form of behavior when it is determined preliminarily in such a way that certain stimuli must correspond to certain reactions.

If in experiments of the first type, selection depended mainly on externals and all activity of the child was reduced to isolating these external traits and to picking up the objective relation between them, then in the subsequent reaction, the question was about stimuli that had no external relation with each other, and the child's problem was reduced to fixing or establishing the required brain connections reliably. Correspondingly, the first problem of selection was resolved with the help of attention, the second, with the help of memory. There the pointing finger, here a mnemotechnical device were the keys to mastering this reaction.

However, there is still selection of a third type that we tried to trace in special experiments which would cast light on the problem itself of mastering our reactions. This is free choice between two possibilities determined not externally, but from within by the child himself.

In experimental psychology, a method of studying free choice in which the subject is told to select and carry out one of two actions has long been established. We will complicate this device somewhat by asking the child to make a choice between two series of actions which include both something that the subject finds pleasant and something he finds unpleasant. In this case, the increase in number of actions from which a selection is to be made not only introduced quantitative complication in the system of conflicting motives that determine choice in one direction or another, not only complicated the conflict of motives, but also greatly affected the quality of the very process of selection. The qualitative changes were evident in that the unequivocal motive was replaced by ambiguous motives and this resulted in a complex adjustment with respect to the given series of actions. As

has been said, the series included something attractive and something repellent, something pleasant and something unpleasant, and this applied as well to the new series from which a selection had to be made. In this way, we obtained experimentally a model of the complex behavior that is usually termed conflict of motives in a complex selection.

From the aspect of method, the substantial change introduced by this device consists in our being able to create motive experimentally since the series which we use are flexible and can be increased, decreased, replaced in part, and finally moved from series to series; in other words, we are able experimentally to change the basic conditions of selection and study how the process changes depending on this.

Experiment shows that from the very beginning such conditions of selection become quite complicated and impede the process; the subject experiences indecisiveness, vacillation, suspension of motives, and effort to balance them. Sometimes selection is arrested and becomes extremely difficult. In these cases, we introduce a new, additional factor that is the very center of our experiments: we suggest to the child that he make a choice by lot. The suggestion is made through various devices beginning with having a die on the table or letting the child play with a die before the experiment and ending with a direct question as to whether he would like to use the die or a direct suggestion when the child sees how another person solves the same problem.

Sometimes we were able to observe how the subject uses the die or some other device of this type completely independently, but since our main task was not to study inventiveness of the child but the process of selection using a die, for the most part we proceeded as indicated above. We resorted to the device we used repeatedly: direct proposal that the child use the appropriate device. As Köhler would say, we placed a stick in the hands of the monkey and watched what would happen. We proceeded in this way in studying writing when we gave the child a pencil and induced him to write.

Our experiments show the depth of the changes in all of the child's behavior when the use of a die is introduced. In order to study under which circumstances the child resorts to using a die, we subsequently left this decision to the free choice of the child. Varying external conditions, we were able purely empirically to observe the circumstances under which the child voluntarily turned to using a die. Thus, if we abbreviated the time of selection and so did not allow conflict of motives and resolution of this conflict time to develop, as a rule the child almost always resorted to using the die. This also happened in cases when the child was not aware of some of the motives, let us say, one or two of the actions in a series were given to the child in a sealed envelope that he could open only after making a choice. Frequently, he resorted to using the die even when the motives were not different, that is, if both series between which he had to choose did not involve actions that would at all forcefully affect the child in a positive or negative way. The relative balance of motives had the same effect in cases where both series between which a choice had to be made included attractive and repellent elements in a more or less equal form.

It developed that the complexity of motives and difficulty of choice, but particularly the presence of sharp emotional pleasant or repelling elements, resulted in a more frequent use of the die and, finally, when both series included extremely various motives which were difficult to compare, the emotional evaluation of which lay in seemingly different planes, that is, when the motives were addressed toward different aspects of the child's personality, the natural selection was impeded and the child readily let the play of the die decide his fate.

This is a short list of cases in which the child usually resorted to the die. We ask what do all of these cases have in common? We can make only a qualitative determination of the situation in which dice are used. To a certain degree, this situation exhibits a similarity to the well-known philosophical anecdote that is erroneously attributed to Buridan and which is usually used to illustrate that our will is determined by motives and when the motives are equal, selection becomes impossible and will is paralyzed.

Among others, Spinoza also touches on this example indicating not the freedom of our will, but its dependence on external motives. He says that the donkey experiencing only hunger and thirst and placed between food and drink at equal distances from him, will die of hunger and thirst since he has no basis for making a choice between moving to the right toward the food or to the left toward the water. The anecdote says that the human, like the sheet of paper that remains in place if we pull at it with equal force on opposite sides, will be paralyzed if motives acting on it are in balance. The anecdote contains the deep and true idea that the illusion of free will collapses as soon as we try to trace the determinacy of will and its dependence on motives.

It is understood that in this example we have taken the ideal case of balanced motives (which we never actually see) and correspondingly extremely simplified conditions of the effect of motives. But at every step in life and in laboratory experiments, we encounter situations that approximate to a certain degree the situation of Buridan's donkey and involve motives approximately balanced in strength that result in a temporary refusal to make a choice, in vacillation, in more or less long inactivity and seem to paralyze the will. Inactivity resulting from vacillation of motives has served many times as a theme in tragic and comic works and Spinoza, in giving this example, says directly that man placed in such a situation, experiencing nothing but hunger and thirst and seeing food and drink at equal distances from himself, will always die of hunger and thirst.

But Spinoza himself, touching on this question elsewhere, gives an answer that is directly opposite. What would happen if a man found himself in the situation of Buridan's donkey? Spinoza answers: if we imagine a man in the situation of the donkey, we would have to consider him as an unthinking thing, but more shameful than the donkey if he were to die of hunger and thirst. And actually, here we touch upon the most important elements that distinguish the will of man from the will of an animal.

Human freedom consists specifically of man's ability to think, that is, that man is cognizant of the developing situation. To the question posed by Spinoza, we can give an empirical response on the basis of both observations from life and our experiments. Man placed in the situation of Buridan's donkey throws dice and in this way escapes the difficulty that confronts him. This is an operation that is impossible for animals, an operation in which the whole problem of freedom of the will appears with experimental distinctness. In experiments in which the child is confronted by a similar situation and finds a way out by using a die, we see the deep philosophical sense of the phenomenon that interests us. We have already cited the opinion of one of Ach's subjects that a psychological experiment of this kind is transformed into experimental philosophy.

Actually, in experiments with the die, we are inclined to see experimental philosophy. Two kinds of activities are presented for the child's selection; he must select one and reject the other. By complicating the child's selection, balancing the motives, shortening the time, creating a serious emotional impediment, we create a Buridan situation for the child. Selection is made more difficult. The child resorts to a die and introduces into the situation new stimuli that are completely neutral

in comparison with the whole situation and ascribes to them the force of motives. He decides in advance that if the die turns black side up, he will choose one series and if it turns white side up, the other series. In this way, the choice is made in advance.

The child ascribed the force of motives to neutral stimuli by introducing an auxiliary motive into the situation and leaving selection to the die. Then the child throws the die, it falls black side up, he selects the first series and the choice is made. How different it is from the selection the child had just made between similar series without the help of the die! We can compare the two processes experimentally and observe something very instructive.

First we will analyze the selection using the die. What shall we call the action chosen by the child—free or not free? On the one hand, it was not at all free, but strictly determined; the child carried out the action not because he wanted to, not because he preferred it to the alternative, not even because he was simply drawn to it, but exclusively because the die fell black side up. The child carried out the action as a reaction to a stimulus, as a response to instruction; a second earlier he could not have said which of the two actions he would take. Thus, we have the most determined, least free selection. But, on the other hand, in themselves, the black and white sides of the die do not to any degree compel the child to take one action or the other. The child himself ascribed to it the force of a motive in advance and he himself linked one action to the white side and the other to the black side of the die. He did this solely in order to determine his selection through these stimuli. Thus, we have maximum freedom and a completely voluntary act. Dialectical contradiction consisting of freedom of the will appears here in an experimentally separated form accessible to analysis.

The experiment tells us that freedom of will is not freedom from motives; it consists in that the child recognizes a situation, recognizes the need to make a choice based on motive and, as the philosophical definition states, in the given case, his freedom is the recognition of necessity. The child controls his selection reaction, but not in such a way as to change the laws that govern it, but in such a way as to make it subject to Bacon's[100] law, that is, as subject to laws.

As we know, the basic law of our behavior states that behavior is determined by situations and reaction is elicited by stimuli; for this reason the key to controlling behavior lies in controlling stimuli. We cannot master our own behavior except through appropriate stimuli. In cases of selection with the die of which we just spoke, the child controls his behavior, directs his behavior through the auxiliary stimuli. In this sense, human behavior is no exception to the laws of nature. As we know, we are subject to nature, comply with its laws. Our behavior is one of the natural processes, the basic law of which is also the law of stimulus–response, and for this reason the basic law of mastering natural processes is mastering them through stimuli. We must not bring forth any process of behavior and control it other than by creating an appropriate stimulus.

Only spiritualistic psychology[101] could admit that the spirit directly affects the body, that our thoughts are a purely mental process and can elicit any change in human behavior. Thus, S. Ramon y Cajal[102] explains the influence of will on the process of conceptions by the contraction of neuroglial cells affected by will; he explains the activity of attention in the same way.

His opponent is completely justified in asking: how can will, from which Ramon y Cajal diverts such a major role, be effective? Is not this the property of the neuroglial cell? Is it possible to understand the word "will" as a nervous current? Actually, if we assume that the mental process can shift a brain atom by even a millionth part—the law of conservation of energy will be disrupted, that is, we must instantly

reject the basic principle of natural science on which all of contemporary science is based. It remains for us to assume that our control over our own processes of behavior are constructed in essentially the same way as control over natural processes. Of course, man living in society is always affected by other people. Speech, for example, is one of the powerful means of affecting the behavior of others, and naturally, in the process of development, man himself masters the means by which others controlled his behavior.

O. Neurath[103] developed a position on the use of auxiliary means in the study of so-called auxiliary motives; dice are a simple form of such means when they function to affect one's decision, that is, the choice one makes, through some neutral stimuli that acquire the force of motives because of this significance.

We can cite many examples of auxiliary motives.

William James, in analyzing the voluntary act, turns to the daily act of getting up. Upon waking, a person knows, on the one hand, that he must get up and, on the other hand, that he would like to sleep a little longer. A conflict of motives develops. The two motives alternate, appear in consciousness, and replace each other. James believed that it is most characteristic that at the instant of vacillation, for the person, the moment of transition to action, the moment of decision, passes unnoticed. It is as if it had not happened at all. Suddenly, one of the motives, as if nudged, squeezes out the competitor and almost automatically results in a selection. Suddenly I find myself getting up—this is one way of putting it.

The elusiveness of this most important moment in the voluntary act can be explained by the fact that its mechanism is internal. The auxiliary motive in this case is not sufficiently distinct and clear. A typical, developed voluntary act in the same situation exhibits the following three instants: (1) I must get up (motive), (2) I don't want to get up (motive), (3) counting to oneself: one, two, three (auxiliary motive) and (4) at the count of three, rising. This is the introduction of an auxiliary motive, creating a situation from within that makes me get up. This is completely similar to saying to a child, "Now, one, two, three—drink your medicine." This is will in the true sense of the word. In the example of getting up, I got up at the signal "three" (conditioned reflex), but I, myself, through a signal and a connection with it, got up, that is, I controlled my behavior through an auxiliary stimulus or an auxiliary motive. We find the mechanism itself, that is, controlling oneself through auxiliary stimuli, in experimental and clinical studies of the will.

K. Lewin did experimental studies on the formation and execution of so-called intentional acts. He came to this conclusion: intention itself is a volitional act that creates situations that make it possible for a man to subject himself subsequently to the action of external stimuli so that carrying out the intended act is not at all voluntary, but is an act purely of the conditioned-reflex order. I decide to drop a letter in the mailbox and for this reason I remember an appropriate connection between the mailbox and my action. This and only this is the essence of intention. I created a certain connection that will subsequently act automatically in the manner of a natural need. Lewin calls this a quasineed. Now I must go out into the street—and the first mailbox will automatically make me carry out the whole operation of mailing the letter.

Thus, a study of intention compels a conclusion that seems paradoxical at first glance—specifically, intention is a typical process of controlling one's own behavior by creating appropriate situations and connections, but executing it is a process that is completely independent of will and takes place automatically. In this way, the paradox of the will consists in that the will creates involuntary acts. However, even here there is a great difference between executing an intended action that is seemingly dictated by the newly created need and a simple habit.

Lewin explains voluntary action with the same example of the mailbox. Of course, if in the given case the conditioned connection simply recalled a habit or a conditioned reflex, we would have to expect that the second, third, etc., mailbox would be an even stronger reminder of mailing the letter. Moreover, the created apparatus stops acting as soon as the need for which it was created is satisfied. Here the process of the voluntary action is reminiscent of the course of the ordinary instinctive reaction. Lewin does not fully appreciate the essential difference between voluntary and involuntary actions evident in his experiment.

As his experiments have shown, human behavior that does not have a specific intention is subject to the power of the situation. Every thing requires some kind of action, elicits, excites, actualizes some kind of reaction. The typical behavior of a person waiting in an empty room with nothing to do is characterized mainly by the fact that he is at the mercy of the environment. Intention is also based on creating an action in response to a direct need of things or, as Lewin says, coming out of the surrounding field. The intention to mail the letter creates a situation in which the first mailbox acquires the capability of determining our behavior, but in addition, with intention, an essential change in the person's behavior occurs. The person, using the power of things or stimuli, controls his own behavior through them, grouping them, putting them together, sorting them. In other words, the great uniqueness of the will consists of man having no power over his own behavior other than the power that things have over his behavior. But man subjects to himself the power of things over behavior, makes them serve his own purposes and controls that power as he wants. He changes the environment with his external activity and in this way affects his own behavior, subjecting it to his own authority.

That in Lewin's experiments we are actually speaking of such control of oneself through stimuli is easy to see from his example. The subject is asked to wait for a long time and to no purpose in an empty room. She vacillates—to leave or to continue waiting, a conflict of motives occurs. She looks at her watch; this only reinforces one of the motives, specifically, it is time to go, it is already late. Until now the subject was exclusively at the mercy of the motives, but now she begins to control her own behavior. The watch instantly constituted a stimulus that acquires the significance of an auxiliary motive. The subject decides "When the hands of the watch reach a certain position, I will get up and leave." Consequently, she closes a conditioned connection between the position of the hands and her leaving; she decides to leave through the hands of the watch and she acts in response to external stimuli, in other words, she introduces an auxiliary motive similar to the dice or the count "one, two, three" for getting up. In this example, it is very easy to see how a change in the functional role of the stimulus, its conversion to an auxiliary motive, occurs.

Clinical studies of hysteria also make it possible to detect this kind of separation.

E. Bleuler[104] established long ago the relative independence of the almost automatic actuating mechanism separate from will and from decision. Bleuler calls this the apparatus of chance and cites the same example as Lewin: "I wrote a letter, put it in my pocket with the intention of dropping it into the nearest mailbox. I don't have to think about it any more. The first mailbox I see after I leave home will remind me to mail the letter." When a person makes a choice, he seemingly establishes in his brain an apparatus, for example, that green will cause him to react with his right hand and red, with his left.

In isolated reactions, the conscious "I" participates very little or not at all. The reaction proceeds automatically. The opposite also happens when consciousness interferes and prevents reaction. In the examples cited above, using a simple primary

situation, we constructed a certain cerebral apparatus for determining the case at hand. The apparatus makes the decision in exactly the same way as habit creates automatic apparatus or as phylogenesis constructs appropriate apparatus.

In the words of Kretschmer, every decision, every wish to undertake something, creates this kind of functional apparatus, beginning from the simplest automatism resembling reflexes and responding to certain stimuli with reaction, as in a simple psychological experiment, and ending with a continuing real-life problem that ends only at death and whose resolution may be interrupted thousands of times. The question of whether to sleep after the alarm or not to sleep after the alarm is an example of this; a similar apparatus may also develop as a result of combining the centrifugal part of one reflex with some new stimulus (the Pavlovian conditioned reflex).

We can draw these two conclusions. First, we see that in voluntary action, we must differentiate two apparatus that are relatively independent of each other. The first corresponds to the instant of decision and consists in the formation of a certain functional apparatus, in establishing a reflex connection and in forming a new nerve path. This is the closure part of the voluntary process. It is formed exactly as habit is formed, that is, it consists of constructing a conditioned reflex curve. In brief, we might say that this is an artificially created reflex. In our experiments it corresponds to the instant that is presented very satisfactorily in isolated form, the instant of decision to act in a certain way depending on the fall of the die. Here we see most clearly the moment of decision because at this very moment, the subject still does not know how he will act. Here we see clearly that the decision itself that determines the subsequent choice is completely analogous to the formation of a double connection in the selection reaction. The subject as if gives himself the instruction: "If the die falls black side up, I will react in one way, if white side up, I will react in another."

Second, we must distinguish the actuating apparatus, that is, the functioning of the cerebral connection already formed in this way. In the examples of Lewin and Bleuler, this would correspond to the moment of carrying out a voluntary action when the mailbox reminds me to mail the letter. In our example, this would be the implementing of one action or another after throwing the die. The second, relatively independent part of the voluntary process acts exactly as the selection reaction usually acts. Here we have the Pavlovian conditioned reflex.

If the first instance consists in creating a conditioned reflex that might be compared to the instant in the laboratory when a dog develops a conditioned reflex, then the second instance consists in the functioning of an already developed reflex; an analogy to this can be found in the action of a developed conditioned stimulus.

Thus, the paradox of the will consists in that we create with its help an involuntarily acting mechanism.

The question of the relation of the second, or actuating mechanism, to the first, or closure mechanism, can be answered in different ways.

Experiments lead Lewin to the conviction that there is a closer dependence between the first and second instance, that in this case, a quasi-need is formed that itself automatically turns off the corresponding apparatus after the quasineed is extinguished. Thus, in Lewin's opinion, the need arises first and the conditioned connection in itself is not the true cause of purposeful action, for, says Lewin, if an intended action were subject to the law of association, then, due to the law of repetition, the second, third, and fourth mailbox would arouse a stronger memory about the letter than the first. If this does not actually happen, it is only because a purposeful action is similar not to habit, but to need. When the need expires, the apparatus created to serve it disappears of itself.

Clinical data lead Kretschmer, on the other hand, to the position that this is an erroneous representation, that apparently every movement, every function of the central nervous system ends by itself. In his opinion, every closure that develops must be opened again in order for it to stop functioning. Kretschmer says that there are as few self-originated changes in physiology as there are in physics. He cites examples of the fact that once a set-up is created, it continues to function automatically. In his opinion, even at the very beginning an action frequently becomes relatively independent of the will so that the will only creates a prepared set-up that now begins to work of itself. And this set-up produced for a specific purpose, this functional apparatus, does not stop working of itself. For this a special directed impulse of the will is required that would inactivate the closure established for a given purpose, would switch it off; otherwise it would continue to work endlessly. In Kretschmer's opinion, it is specifically this that occurs in hysteria. A functional apparatus appropriate for a given case is formed that becomes liberated from the will and acquires an existence independent of it and continues to work despite it and even against it.

Observation leads us to the conclusion that in this case, the truth is on Lewin's side and not on Kretschmer's. Kretschmer's data indicate that only in those cases produced by decision does the apparatus continue to lead an independent existence, when there are special motives that support it. When this is not so, it switches off automatically and, as experiments demonstrate, it switches off because at the moment of decision, that is, at the moment of the creation of this apparatus, all differentiated conditions for its existence and activity are determined. If it continues to function (and this happens in cases of anomaly), the apparatus created begins to feed on other sources of energy and results in the formation of hysteria.

Thus, we came to separating the voluntary act into two separate processes of which the first, corresponding to decision, consists in the closure of a new brain connection, in wearing through a path, or in creating a special functional apparatus. The second, or actuating process, consists of the work of the apparatus created, in action according to instruction, in implementing a decision, and it exhibits all the marks of the selection reaction that we studied. In connection with such a separation of the voluntary act into two separate processes, we must also distinguish the different methods of action of stimuli on both processes and in connection with this, the special kind of auxiliary stimulus or motive for each process. Thus we arrive at distinguishing the concepts of stimulus and motive.

If as stimulus, we understand the more or less simple stimulation acting directly on an already established reflex curve, no matter how it was established, and as motive, we understand a complex system of stimuli connected with the construction, formation, or selection of one of the reflex curves, then differentiating between a motive and a stimulus can be quite precise. We can say that the stimulus becomes a motive under certain conditions, it activates a complex reactive formation intruding into a certain system formed to evaluate the set-up and habits. This complex, reactive formation crystallized around the stimulus is a motive. Thus, in voluntary selection it is not stimuli that are in conflict, but reactive formations, whole systems of assemblies. The motive is, in a certain sense, a reaction to a stimulus. Stimuli seemingly activate associates and involve them in the conflict, they fight as if they were armed. In a concrete collision of two stimuli a conflict of assemblies may occur. If we imagine a simple case in which I decide not to greet a person, having lost my respect for him, then the direct stimulus would be meeting him and remembering my decision. The conflict is actually not between two stimuli: this was resolved earlier when the apparatus itself was formed, at the moment of decision,

and comes into being as a result of the conflict of motives in the sense of that word, as we have just said.

We can take a further step in understanding the processes of voluntary selection if we admit not only the fact that in voluntary selection, it is not stimuli, but motives that are in conflict but if we also admit that the conflict itself is not what stimuli in general are in conflict over. In voluntary selection with a conflict of motives there is also a conflict over the common motive field, generally not for the actuating mechanism, but for the closure mechanism. This distinction has a deep psychological and neurological significance. We shall start with the latter.

As established by C. Sherrington,[105] the conflict over the common motive field and how it is most clearly apparent in the collision of two reflexes in a dog, for example, an itch that requires scratching the back and a protective drawing back that requires bending over, is in essence a conflict of two nervous currents proceeding from sensory paths to the efferent neuron. This conflict over a motor path depends to a significant degree on purely mechanical conditions.

The conflict of motives that occurs when a decision is made is not over the actuating mechanism, not over the efferent neuron, and not over the motor path for the already developed nervous excitation—it is over the choice of closure path. For this reason, we are speaking not of whether one and the same implementing organ was defeated in the conflict by a stimulation present in another, but of which path to select, what kind of uniting pathway in the brain cortex to establish, what kind of closure or cerebral apparatus to create. Because of this, from the neurological point of view, transferring the conflict to a different territory, to another instance, and changing the very object of the conflict is of greatest importance.

Of itself it is understood that these changes are not without consequences for the conflict process itself since its outcome can be determined by quite different factors under these completely new conditions in which the conflict is occurring. Specifically, we think that making a decision in favor of a motive that is weaker in the biological sense may be truly explained only in connection with transferring the whole process to new instances. Here we immediately come to the psychological significance of the distinction we made. If it is true that the conflict is not over the actuating mechanism, but over closure, then we can determine selection itself as construction of this kind of cerebral apparatus. Selection is an act of the closure mechanism, that is, closure of the connection between the given stimulus and the reaction. Everything that follows occurs exactly as it does in selection following instruction.

The psychological significance of this may be reduced to three basic points.

The first is that the conflict of motives shifts in time—is transferred to an earlier moment. The conflict between motives frequently occurs a long time before the actual situation develops in which it becomes necessary to act. As a rule, the conflict of motives and the decision coupled with it are, in general, possible only if they precede in time the conflict of stimuli; otherwise the conflict of motives is converted simply into a conflict over a common motive field. In this way, the conflict is moved along and is played out and decided upon to its very end; it is a seemingly anticipated regimental leader for the strategic plan of the competition. Psychologically, it is very understandable that developing the plan may be completely different from its execution. A decision is made and the conflict ends often long before the real or actual conflict begins.

Another substantial psychological change in the process of selection is that here we have an explanation of the basic problem of voluntary action which was left essentially unresolved on the basis of empirical psychology. We have in mind the well-known illusion that always arises with a voluntary act and consists in that

the voluntary act is directed as if along a line of greatest resistance. We select what is more difficult and call only such a choice voluntary.

William James recognized this problem as being unsolvable on the basis of a scientific deterministic view of the will and had to admit the intrusion of spiritual force, the voluntary "yes, let it be!" "Yes, let it be" ("*fiat*"—the word with which God created the world). Selection of the word itself is very indicative. If we conceal the philosophy of this term, we can easily see that, in essence, hidden behind it is the following idea. To explain the voluntary act, for example, the fact that a person on the operating table represses cries of pain and stretches out to the surgeon the affected member despite a direct impulse that would make him pull his arm away and scream, science cannot say anything else except that here we have a repetition of an act like the creation of the world, but of course on a microscopic scale. This means that explaining a voluntary act led the scientist standing on empirical ground to a purely biblical teaching on the creation of the world.

A number of observations, particularly experimental studies, have shown that this illusion of action along the line of greatest resistance arises regularly every time a voluntary selection is made.

Recently, Claparède came to the same conclusion on the basis of his experiments. But most important is the fact that the illusion is elicited by something that is undoubtedly objective. To disclose the objective moment embedded in the process of voluntary selection that leads to the development of this illusion, we can formulate the state of the matter thus: in voluntary selection, both the subject and the experimenter following the line of greatest resistance give the impression that the outcome of the conflict would be different if it had occurred at different instances. If it had actually been a conflict over motive fields, the patient on the operating table would undoubtedly scream and would pull his hurt arm away since the relative force of the stimulation and all the other points indicated by Sherrington affecting the result of this conflict certainly favor such an outcome.

However, the illusion arises not only in the subject, but also in psychologists. They do not take into account the simple fact that the line of greatest resistance in some instances may be the line of least resistance in others. Transferring the conflict from the stimulus to the motive, transferring it to a new plan and changing the object itself of the conflict profoundly transforms both the relative strength of the initial stimuli and the conditions and outcome of the conflict between them. The stronger stimulus may become the weaker motive and conversely, the stronger stimulation that automatically would have dominated the motor efferent path at the decisive moment would be breached in the same way that a strong stream of water tears through a dike. This stimulation can only affect the selection of the closure path tangentially, that is, only one-sidedly.

It seems to us that without such distinction, psychology would not be able at all to find a way to study the higher forms of human behavior and establish the main difference between the behavior of man and animals.

Let us consider a simple example. In Pavlov's experiments, a positive reaction was developed to painful, damaging stimulation. The dog reacted to an injection, to burns, to pain just as it normally reacts to feeding. Pavlov indicates that such deviation of reaction from the initial path might have arisen only as a result of a very long conflict between two reflex curves, a conflict that sometimes ended in conquest of one opponent or the other. Significantly, Pavlov's opinion, based on experiments, is that the one-sided connection existing between these reactions is determined by the nature of the beast. This means that the food center being biologically stronger can draw to itself the stimulation that usually goes to the pain center, but not the other way around.

Moreover, a person says he is hungry and continues to be hungry. It seems to us that from the common view of a person who experiences hunger and does not eat the food given him regardless of terrible hunger, we can say that his behavior is directed along the line of greatest resistance. The fact of suicide among people, the fact that it is not found in the animal kingdom, has long been considered paradoxical for all teaching on freedom of the will, and not without reason did many philosophers consider it a sign of human freedom. But, of course, as in the case with hunger and in James' example of the patient on the operating table, here too freedom is, of course, not freedom from necessity, but freedom understood as recognizing necessity. In this plan, the expression "to take oneself in hand" may have a certain literal sense like the expression "to stand the pain, clenching his teeth." This means that the basis of such freedom, like the basis of freedom with respect to the external world, is recognition of necessity.

The third psychological point resulting from our distinguishing between stimuli and motives is that the character of the auxiliary stimulus used changes depending on whether this stimulus is an auxiliary means in the conflict over the closure mechanism or in the conflict over the actuating mechanism. Dice as a voluntary sign and mnemotechnical signs in the selection reaction with instruction fulfill completely different functions psychologically. We can say that the difference between predetermined selection and free selection is that in one case, the subject carries out the instruction and in the other, he creates the instruction. In psychological terms, this would correspond to the fact that in one case an established actuating mechanism functions and in the other, we are speaking of creating the apparatus itself.

From what has been said, we can reach a most important psychological conclusion: this is how we can explain the old teaching of the intellectualists who point out that laws of will are, in essence, laws of memory, that in the true sense, ways and means of thought controlling action belong to will, that the will mechanism essentially is not anything other than association that is under our control, and that in connection with this, the technique of desire in action, as Meumann noted, is, to a significant degree, mnemotechnique. All of this indicates that voluntary action may be trained, that in themselves, voluntary factors, like Ach's determining tendencies, are most likely contrary to will and as will, we can understand only those means by which we control action. In this sense, will means control over action carried out in itself; we only create artificial conditions in order to carry out the action; for this reason, will is never a direct, unmediated process.

In the chapter on memory, we cited the valid opinion of psychologists, going back to Spinoza, that the soul cannot carry out any kind of intention if it does not remember it. However, these psychologists, it seems to us, erroneously assumed the actuating mechanism to be the essence of the voluntary process and paid no attention to the process itself of the formation of this mechanism. This is absolutely correct: implementing an intended action is very much like a mnemotechnical operation, that is, an artificial conditioned-associative connection between a stimulus and response. But the process itself of establishing this connection proceeds quite differently.

Kretschmer, as we have seen above, distinguishing two wills and explaining all features of behavior of the hysteric by conflict of the two wills, comes directly to the conclusion that we are dealing not only with two different directions of reaction of the hysterical patient, who, in contrast to the patient in James' example, coming to the doctor, wants the doctor to cure him, on the one hand, and, on the other hand, like all hysterical patients, is opposed to this. Here, as Kretschmer's brilliant clinical analysis shows, this is not a situation like the conflict between two stimuli

or two motives. He says that the situation pertains not only to two different observations, but also to different aspects of will and in this lies the main part of the problem. The view of the will in which the patient is opposed to his cure exhibits a completely different structure psychologically than the view in which the patient strives for recovery. Kretschmer calls the first type of will hypobulia, and the second, will in the true sense of the word.

In clinical observations, we can distinguish the effect of stimuli on one voluntary apparatus and the effect of motives on another. The will of the patient-hysteric is affected by reasonable arguments and evidence, consideration, appreciation of one's situation and, in general, everything that leads him to a decision. Another view of will that makes the patient oppose cure is characterized mainly by this will being blind, not appreciating the situation, and not connected with the intellectual mechanisms. As Kretschmer says, this will is like a foreign body with respect to the integral personality; it is blind, without memory of the past or thought of the future. It concentrates on the present moment, and the character of its reaction is determined exclusively by the impression of that moment. This will is not affected by conviction or reasonable arguments; they do not reach it and it does not hear them, for it they are an empty place; it can be affected only in other ways, for example, by a loud shout, a sharp or unexpected blow, pain, or a jolt. Thus, in brief, the first will flows from motives, the second reacts to stimulation.

We might say that in the second case what is acting is an isolated cerebral apparatus. Most important is the following. What we note in the hysteric as a kind of sick foreign body, be it a demon or a counterpart of purposeful will, we find in higher animals and in small children. For them it is will in general, it is a step in development and is a normal, perhaps the only, existing method of desire.

The hypobulic type of will is an ontogenetic and phylogenetic lower step of the purposeful apparatus. In addition to this, we see the genetic point of view injected into the teaching on will. The two apparatus of the will of which we spoke from the very beginning are actually two stages in the genesis of will.

Perhaps the most remarkable thing that the psychologist can now say about will is the following: will develops and is the product of the cultural development of the child. Self-control and the principles and means of this control do not differ basically from control over the environment. Man is part of nature, his behavior is a natural process, and controlling it forms like all control of nature, according to Bacon's principle that "nature is overcome by subjection." Not in vain does Bacon place control of nature and control of intellect in one order; he says that the bare hand and the mind taken in themselves do not mean much—the deed is done with tools and auxiliary means.

But no one expressed with such clarity the general idea that freedom of will is derived from and develops in the process of the historical development of humanity as did Engels. He says: "Not in the imaginary independence of laws of nature does freedom lie, but in recognizing these laws and, based on this, knowing the possibilities of systematically making the laws of nature work toward certain goals. This refers both to laws of external nature and to laws that govern the bodily and mental existence of man himself—that there are two classes of laws that can be separated from each other is the most important thing in our concept which is by no means far from reality. Consequently, freedom of will means nothing other than the ability to make a decision with knowledge of the matter" (Marx and Engels, *Collected Works*, Vol. 20, p. 116). In other words, Engels places in one order the control of nature and control of self. Freedom of will with respect to one and the other is, for him as for Hegel, understanding necessity.

Engels says: "Consequently, freedom is based on recognizing the needs of nature (*Naturnotwendigheiten*), control of ourselves and of external nature; for this reason, it is an indispensable product of historical development. The first humans coming out of the animal kingdom were in all essentials as lacking in freedom as the animals; but each step forward on the path of culture was a step toward freedom" (ibid.).

Therefore, the psychologist-geneticist is confronted with the most important task of finding in the development of the child the lines along which maturation of freedom of the will occurs. We are confronted with the task of presenting the gradual growth of this freedom, of disclosing its mechanisms and showing it as a product of development.

We have seen that for the clinician, the genetic significance of the will of the hysteric is clear. In the words of Janet, in studying the hysteric, we are dealing with a large child. Kretschmer says of the hysteric that he cannot be convinced or simply forced, he must be constrained.

The method with which we affect the will in difficult cases of hysteria is similar to the concept of training. It does not differ in principle from will in the higher sense of the word. The latter does not create new mechanisms. This is apparent from the fact that people of whom we speak as having a strong will base this trait on a well-conserved hypobulia.

The philosophical perspective opens before us at this point of our study. For the first time in the process of psychological studies we can resolve essentially purely philosophical problems by means of a psychological experiment and demonstrate empirically the origin of the freedom of human will. We cannot trace in all its completeness the philosophical perspective opening before us here. We expect to do this in another work devoted specifically to philosophy.* Now we shall try only to note this perspective in order to see most clearly the place we have reached. We cannot help but note that we have come to the same understanding of freedom and self-control that Spinoza developed in his "Ethics."

*Editor's note: We have in mind L. S. Vygotsky's "The Teaching on the Emotions (Teaching of Descartes and Spinoza on the Passions)," included in Vol. 6 of the present *Collected Works*.

Chapter 13
CULTIVATION OF HIGHER FORMS OF BEHAVIOR

The history of the cultural development of the child leads us right to the problems of rearing.

As we have seen in preceding chapters, the cultural development of the child's behavior does not proceed smoothly along a rising curve. It actually has little resemblance to the established stereotypic forms of development or to the regular pattern of transition from one form to another as occurs in the child's development in the womb. As we have already said, psychology has for a long time ascribed too great a significance to just such established stereotypic forms of development that were themselves the result of already developed and fixed processes of development, that is, processes that are concluded and are only repeated and reproduced.

For a long time, vegetative processes of development with their very elementary relations between the organism and the environment were accepted as a basis for development. On this basis, the processes of bringing the child into the culture were generally not considered as processes of development. They were most often regarded as a process of simple mechanical assimilation of a number of habits or a process of learning a number of things. For example, introducing the child to cultural arithmetic was considered as simple training essentially the same as acquiring certain factual data, let us say, addresses, streets, etc.

This point of view held as long as development itself was understood in a narrow and limited way. But we have only to extend the concept of development to its legitimate limits, we have only to assimilate the idea that the concept of development certainly includes not just evolutionary but also revolutionary changes, regression, gaps, zigzags, and conflicts, in order to see that introducing the child into the culture is development in the true sense of that word, although it is development of a type different from development of the human fetus within the womb.

The history of the cultural development of the child must be considered as analogous to the living process of biological evolution, to how new species of animals developed gradually, how in the process of the struggle for existence, the old species became extinct, how catastrophically adaptation of the living organisms to nature proceeded. The development of the child can be understood only as a living process of development, a coming into being, a struggle, and only in this form can it serve as a subject of truly scientific study. Introduced into the history of child development at the same time is the concept of conflict, that is, contradiction or clash between the natural and the historical, the primitive and the cultural, the organic and the social.

All cultural behavior of the child develops on a base of its primitive forms, but this growth often involves conflict; the old form is forced out, is sometimes completely disrupted, and sometimes there is a "geological" superimposition of vari-

ous genetic epochs that make the behavior of a cultured person resemble the earth's crust. We note that our brain is constructed with such "geological superimposition." We have seen many examples of this kind of development.

When Wundt called development of speech in the one-year-old precocious development, he had in mind specifically the great contradiction and genetic lack of correspondence between the organically primitive apparatus of the youngster, on the one hand, and the complex apparatus of cultural behavior on the other. He understood that what is unfolding is, in the words of Bühler, the greatest drama of development—a collision of the innate and the social-historical. Previously, when we spoke of the development of speech and thinking and tried to disclose the errors of the naive psychological theory that tried to draw a curve of the development of the child's thinking on the basis of a test with pictures, we saw what a great distance there is at that age between the curves of development of thinking and speech, what serious dialectical contradiction there is between the method the child uses for thinking and those with which he speaks.

We have seen that this type of thinking, which is a matter of habit for the cultured adult, is created and developed only as a result of a long struggle and adaptation of natural forms of thinking to the basic higher forms; psychologists considered this type of thinking to be a finished product of development and believed it to be primordially given and natural, but genetic studies present it as a result of the complex process of development. As examples, we have such processes as the replacement of natural arithmetic by school arithmetic when new forms of adaptation to numbers displace the old, or transition from primitive to cultural arithmetic which occurs in the form of a major collision between them. We can observe step by step the same kind of transformation of innate or natural forms of behavior into cultural or social-historical in all the other chapters of our study.

We can say that all chapters lead us to establishing the basic points that have deep significance for the problem of cultural rearing of the child.

The first consists of a change in the concept of type of development: in place of the stereotypic, established development of natural forms that resembled the automatic replacement of forms characteristic for the child in the womb, a living process of formation and development occurs that goes forward in a continuous contradiction between primitive and cultural forms. This living process of adaptation, as we have said, can be considered analogous to the living process of evolution of organisms or to the history of humanity.

In this sense, Bühler rightly calls the process of child development a drama, since its basis is a collision, a struggle, a contradiction of two basic instances. Through this, into the concept of rearing, the concept of the dialectical character of the cultural development of the child is introduced, the concept of the actual adaptation of the child growing into a social-historical environment that is completely new to him, a concept of historically higher forms and functions of the child's behavior.

If earlier we were able to assume with a certain naiveté that the child's thinking develops from the stage of the object to the stage of action and then to the stage of quality and relations just as a petal emerges from a bud, now the processes of the development of the child's thinking appear to us as an authentic drama of development, as a living process of development of social-historical forms of behavior.

It is natural that together with the change in the basic theoretical point of view, the concept of cultural rearing changes radically. This change affects two basic points.

Previously, psychologists studied the process of cultural development of the child and the process of his rearing in a one-sided way. Psychologists posed the

problem of what kind of natural given conditions promote the child's development, on what kind of natural functions of the child should the teacher depend to introduce the child into one cultural sphere or another. For example, a study was made of how the development of speech in the child or teaching him arithmetic depends on his natural functions, how it is primed in the process of the child's natural growth, but the opposite was not studied: how acquisition of speech or arithmetic transforms the natural functions of the child, how it profoundly reorganizes the whole course of natural thinking, how it interrupts and displaces old lines and trends of development. Now the teacher begins to understand that when the child enters into culture, he not only takes something from culture, assimilates something, takes in something from outside, but culture itself profoundly refines the natural state of behavior of the child and alters completely anew the whole course of his development. Differentiating the two plans of development in behavior—the natural and the cultural—is the point of departure for the new theory of rearing.

The second point is even more important, more essential. It introduces the dialectical approach to child development into the problem of rearing for the first time. If previously, in differentiating the two plans of development, it was possible to naively present the cultural development of the child as a direct continuation and result of his natural development, now such a concept is impossible. Former researchers did not see the profound conflict in the transition, for example, from babbling to the first words or from perceiving numerical figures to the decimal system. They believed that the one is more or less a continuation of the other. New studies have shown, and this is their inestimable contribution, that where formerly a smooth path was taken for granted, there was actually a discontinuity; where there seemed to be a successful movement along a smooth surface, there were discontinuities instead. Speaking more simply, new studies noted turning points in development where the old assumed straightforward movement; in this way, the new studies illuminated the important nodal points of the child's development for rearing. Naturally, together with this, the old concept of the nature of rearing itself also disappears. Where the old theory could speak of cooperation, the new speaks of conflict.

Actually, of course, for rearing, it is not an indifferent matter whether the child is brought from babbling to the word or from perceiving a number to the decimal system along a straight line or with breaks, discontinuities, and reversals that the child must make. The first theory taught the child to take slow, smooth steps; the new theory must teach him to skip. The radical change in the view of rearing that arises from a review of the basic problems of the cultural development of the child can be illustrated decisively for each methodological problem with every chapter of our research.

Let us take a simple but, from our point of view, eloquent example that we borrow from Thorndike's psychology of arithmetic. Thorndike gives a picture of a first lesson in arithmetic. The child must master the number one and its shape. How would the old textbook present this? It would have a picture of one object, one mug, as Laj does, or one figure of a child, an animal, a bird, and alongside would be the number one and he would try to unite the natural concept of a single object with the cultural concept of one. This is how the methodology of teaching proceeded when teachers believed that the cultural development of the child could be nurtured simply by continuing directly from the natural perception of numbers. This was the basis for the serious mistake of Laj and his school. They thought that in order to understand one, it is necessary to see one since they assumed that the arithmetical concept of one arises on the basis of perceiving a single object.

Thorndike proceeds differently. He goes over one with a picture of many objects, a whole landscape that in perception has nothing in common with one. Visual perception must be overcome, must be refined, broken up in order to make the transition to the arithmetical sign. The picture contains two girls, two dogs and a tree. Questions are posed that divide the visual perception separating the girl on the swings from the one standing on the ground. Thorndike brings the child to a real understanding of one. In this somewhat simplified example, the methodological change of which we spoke is clearly apparent.

In contrast to Laj, Thorndike leads the child from perceiving numbers to a number series not along a direct path, but over a seeming barrier that forces the pupil to jump over the barrier. This contains and graphically expresses the basic problem of methods of teaching. What is the transition from perceiving one object, that is, the transition from natural arithmetic to Arabic numerals, that is, to the cultural sign? Is it a step or a leap? Laj believed it was a step, Thorndike showed that it is a leap. If we were to express the change in a general form, we could say that the new understanding involves a radical change in the concept of the relation between rearing and development.

The old point of view had only one very important watchword: adapting rearing to development and that alone. It assumed that it was necessary to adapt rearing to development (in the sense of time, rate, forms of thinking and perception proper to the child, etc.). It did not pose the question dynamically. For example, from the correct rule that memory in the pupil is still concrete and his interests are emotional, it reached the correct conclusion that work in the lower classes must be emotionally saturated and presented in concrete, graphic form. It knew that teaching is strong only when it is based on natural laws of child development. This was the wisdom of that theory.

The new point of view teaches that there must be opposition to be overcome. It takes the child in the dynamics of his development and growth and asks where must the teaching bring the child, but it answers the question differently. It says that in lessons with pupils, it would be folly not to consider the concrete and graphic nature of their memory, which must be relied on; but it would also be folly to cultivate this type of memory. That would be to keep the child at a lower step of development and to fail to see that the concrete type of memory is only a transitional step to a higher type, that concrete memory must be overcome in the process of teaching.

In the chapters on written language, memory, arithmetic, and voluntary attention, everywhere we established the same principle which, if we think it through and work it out to the end, must bring us to a profound reorganization of all pedagogical and methodological study in the area of the cultural rearing of the child.

We recall as an example the well-known and still unresolved methodological argument about arithmetic: how must a child be brought to acquiring the ability to count—through counting or through number notation? We remember why it was that the problem could not be solved. On the one hand, Laj's position that perception of written numbers is easier, more natural, more proper to the child and leads to a better and more rapid result in his training could be considered as being experimentally proven. On the other hand, it ostensibly adds nothing to the teaching of arithmetic in the true sense of the word.

In our view, which we tried to present in the chapter on arithmetic, this paradoxical position is resolved simply and clearly. We cannot but admit that written numbers, with which Laj worked, actually corresponded to the development of arithmetical operations at preschool age and for this reason were easiest and most accessible for children entering school. For this reason, undoubtedly true is Laj's

conclusion that school training that takes into account the special quality of child development cannot help but consider this circumstance. For the child, the path to mastery of numbers lies through the perception of numerical images. And no matter how much Laj's opponents might maintain that a chasm lies between school arithmetic and the perception of a numerical image, that they are separated by essential traits and that the numerical image in itself even if developed to its maximum is not capable of bringing the child to the perception of the elementary, arithmetical unit itself, all of these claims, regardless their validity, cannot shake Laj's basic position: the child approaches arithmetic through perception of the numerical image and school training cannot bypass this path.

The crux of the matter is that the break, the chasm, the principal difference between the perception of a numerical image and a number series lies in the development itself of the child. The child must cross over it in order to find himself on the other side; consequently, he must come directly to the chasm and somehow get beyond it. A more important mistake that Laj made was to affirm that the path through the numerical image could lead the child to understanding numbers and modern arithmetic. To do this, Laj had to develop a purely a priori understanding of the number and operations with it. His second mistake was that he ignored the main difference between the one arithmetic and the other and in constructing cultural arithmetic along the pattern of the primitive, he depicted it as being a priori.

Here all the legitimacy of his opponents comes forward. They recognized this difference, they understood that as long as one goes further along the path of perceiving numerical images, no matter what, one will never get to cultural arithmetic but, on the contrary, will move away and aside from it. Their mistake was in a one-sided rejection of the partial truth that Laj's position contained. Finally, the eclectic point of view of Meumann and others who tried to unite both methods is actually the right one, but theoretically is completely insupportable because it provides no basis for the way in which the two methods must be united. The problem is solved purely eclectically, and the internal contradiction of both paths for growing into arithmetic not only is not surmounted, but appears with even greater force.

Meumann tries to unite the two contradictory elements: without indicating a theoretical basis for uniting the two contradictory methodological devices, he indicates that it must conform to the dialectical contradiction in the development of the child himself.

Thorndike notes correctly: Laj and his followers have a reached a wrong conclusion that numerical forms are the best method of teaching arithmetic since they help the children most to perceive numbers. This is supported by the fact that certain numerical images are easily evaluated quantitatively but this does not at all mean that they are the best means of teaching; they may be easier because they are more customary. Laj's conclusion would be correct only if his way resulted in better results in teaching arithmetic in general under other equal conditions. With Laj's method, it is necessary to measure all results, not just time and ease.

From our point of view, the problem that is actually resolved genetically can be formulated as follows. As we have seen in the development of arithmetical operations, when the child enters school, he undergoes a break, a transition from primitive to cultural arithmetic. There is no straight line in the child's development, there is a discontinuity, a replacement of one function by another, a displacement and conflict of two systems. How can the child be carried through what is a dangerous point for him? Genetic research indicates that for this, both teaching and genetic devices adapted to the nature and the features of the given stage of development are necessary. This means that in no case can we ignore all the features of primitive arithmetic of the preschool child. They are the point of support from

which the leap forward must be made. But neither can we ignore the fact that the child must decisively give up this support and select the new point of support contained in the number series. For this reason, it is impossible to reject the method of numerical images in teaching arithmetic and to replace it immediately with the method of mastering the number series. We must depend on the numerical figure specifically for the child to master the number series. It is necessary to depend on the numerical image in order to overcome it. As we have seen, this is the methodological device in the training of the child in cultural behavior: to depend on the primitive function in order to overcome it and lead the child further.

In a more general form the same situation arises every time we speak of the cultural rearing of the child. The element of contradiction, an internal overcoming, must always be included in every methodological device, and rearing can never ignore the fact that the transition from primitive to cultural forms of behavior is a change in type of the child's development itself.

From this point of view, the principle of convergence in child development established by Stern can be seen in a new light. As part of this principle, Stern understands the basic position that the line of natural organic development of the child coincides, crosses over, meets with the line of the effect of external conditions that affect the child and only from the convergence or coincidence of these lines can the real process of his development as a whole and each of its stages be elucidated. The principle was formulated somewhat generally and does not essentially give us any means for explaining it, does not disclose further what the process of convergence or coincidence specifically consists of, what kind of meeting occurs between the two lines and what occurs at the meeting site itself. This principle is essentially unreliable and says nothing. It becomes unreliable if it is used, as Stern uses it, as an explanatory principle. Actually even the child's development in the womb, his nutrition, teaching him to read, and inculcating ideals—all of this appears as a result of convergence of internal and external conditions. But the problem of scientific research is to know specifically how to answer the question of what kind of meeting is occurring in each case, what the processes that develop here are, what the role of each of the factors is and what the result of their combined effect is. The task of scientific theory is to review the main types of relations that exist between the environment and the organism.

However, in the area that interests us, Stern's position expresses the factually true idea that the development of the child in every cultural epoch more or less coincides at certain points with the line of his natural development. Thus, if we consider matters phenotypically, it actually seems that at a given stage of development of the brain and accumulation of experience, the child acquires human speech, at another stage, he masters the number system, and still later, under favorable conditions, he enters the world of algebra. Here apparently there actually exists a complete coincidence, a complete agreement of the lines of development. But this is a deceptive point of view. It conceals a serious discrepancy, a complex conflict in which these conditions never coincide since the line of natural development of the child is actually subjected to its own logic and never makes the transition to the line of cultural development.

The conversion of innate material into the historical form is never a process of a simple organic transition, but is a process of complex change in the type of development itself. The basic conclusion that can be drawn from the history of the cultural development of the child with respect to his rearing is that rearing must exert itself every time whenever it had been following a smooth road before, that it must take a leap where before it seemed that it could limit itself to a step. The

primary merit of the new research is specifically that it disclosed a complex picture where formerly we saw a simple one.

The new point of view introduces a real revolution into the principles of rearing when we approach the rearing of the abnormal child.

Here the matter is something essentially different from rearing the normal child. The whole apparatus of culture, both external and with respect to forms of behavior, conforms to the normal psychophysiological organization of man. All of our culture is meant for a person who has certain organs, the hand, the eye, the ear, and certain functions of the brain. All of our tools, all our technology, all signs and symbols—all are meant for the normal person. From this arises the illusion of convergence of a natural transition from natural to cultural forms which cannot actually exist in the nature of things and which we have just attempted to disclose in its true scope.

As soon as a child appears who is different from the normal human type, weighed down by a defect in psychophysiological organization, then even in the eyes of a casual observer convergence is replaced by serious divergence, that is, by deviation or a noncorrespondence in the lines of natural and cultural development.

Left to himself and his own natural development, the deaf-mute child will never learn to speak and the blind will never learn to write. Here training helps by providing an artificial cultural technique, a special system of cultural signs or symbols adapted to the features of psychophysiological organization of the abnormal child.

Thus, in the blind, visual writing is replaced by tactile; Braille makes it possible to produce a whole alphabet from various combinations of six dots and for the blind child to read by feeling the raised dots on the page and to write by using a stylus to pierce the paper to make convex dots.

In just this way, for the deaf-mute, dactylology or the hand alphabet replaced the sounds of speech with optical signs and various positions of the hand and produced a special writing in the air that the deaf-mute child reads visually. Training goes even further and teaches the deaf-mute child to speak since his speech apparatus is usually not defective. A child who is only deaf from birth is mute because he is deprived of aural perception. Training teaches this child to understand speech by reading lips, that is, replacing speech sounds with visual images, the movement of the mouth and lips. The deaf-mute learns to speak using touch, a visually perceptible sign, or kinesthetic perception.

Specially constructed indirect ways of cultural development of the blind and deaf-mute child and specially created written and oral language are very important in the history of the cultural development of such a child in two respects. The indirect ways are a kind of natural experiment of nature that shows that cultural development of behavior is not necessarily linked with one organic function or another. Speech is optionally linked with the sound apparatus; it can be translated into another system of signs just as writing can be diverted from the visual path to the tactile path.

These cases permit us to observe most clearly the divergence of cultural and natural development that occurs in the normal child as well, but which, in this case, is manifested most markedly specifically because it is here that we note the most striking divergence between the cultural forms of behavior meant for normal psychophysiological organization of man and the psychophysiology of a child burdened by one defect or another. But most important is the fact that these cases indicate the only true method for rearing the abnormal child. Creating indirect ways of development where no direct ways are possible is the method. Written speech for the blind and writing in the air for the deaf-mute are indirect psychophysiological ways

for cultural development in the most literal and materially precise sense of the word.

We have become accustomed to the fact that man reads with his eyes and speaks with his mouth. Only a great cultural experiment which showed that it is possible to read with the fingers and speak with the hand discloses the whole conventionality and mobility of cultural forms of behavior. Psychologically these forms of rearing can do what is most important: specifically, they can accustom the deaf-mute and the blind child to speaking and writing.

It is important that the blind child reads just as we do, but this cultural function is facilitated by a completely different psychophysiological apparatus than we use. In the same way, for the deaf-mute child, most important from the point of view of cultural development is the fact that universal human speech is facilitated for him through a completely different psychophysiological apparatus.

Thus, the first thing these examples teach us is the independence of a cultural form of behavior from one psychophysiological apparatus or another.

Another conclusion we must reach from these examples pertains to deaf-mute children and the independent development of cultural forms of behavior. As we have seen in the chapter on the development of speech, deaf-mute children left to themselves develop a complex mimetic language, a complex peculiar speech that they master with no training from those around them. A peculiar form of speech is created not for the deaf-mutes, but created by the deaf-mutes themselves. A unique language is created that differs more profoundly from all modern human languages than do these languages from one another.

Thus, left to himself even with no training, the child begins his cultural development; in other words, the child's natural psychological development and his environment contain all the necessary factors for self-starting of cultural development, for the child's independent transition from natural to cultural development.

Taken together, these points bring us to a radical reevaluation of the current view of rearing the abnormal child. The traditional view was based on the idea that the defect represents a minus, a gap in the child's development. A negative view of this developed, that is, a position that his development was characterized primarily from the aspect of the lack of some functions. For this reason, the whole psychology of the abnormal child was usually constructed by subtracting the missing functions from the psychology of the normal child.

This conception is replaced by another conception that considers the whole dynamic of the development of the child with an organic defect; this new conception is based on the key position that the defect has a double effect on the child's development. On the one hand, the defect is an inadequacy and acts directly as such, causing disruption, gaps, and difficulties in the child's adaptation. On the other hand, specifically because the defect presents an impediment, causes difficulties in development, and disrupts normal equilibrium and adaptation, it serves as a stimulus for the development of indirect, alternate ways of adaptation, of replacement functions or additions to functions which serve to compensate for the defect and bring the whole system of disturbed equilibrium into a new order.

In this way, the new point of view prescribes consideration not only of the negative characteristics of the child, not only his minuses and deficiencies, but also strives for a positive analysis of his personality which mainly presents a picture of complex indirect ways of development. From this, it is clear that organic overcoming of the defect and direct organic compensation is, to a high degree, a narrow and limited path. The development of higher mental functions of the child is possible only along paths of the functions' cultural development and it doesn't matter if the cultural development proceeds along a line of mastering external means of culture

such as speech, writing, and arithmetic or along the line of internal refinement of mental functions themselves, that is, developing voluntary attention, logical memory, abstract thinking, formation of concepts, free will, etc. Research shows that the abnormal child is usually retarded specifically in this respect. But this development is not directly related to the organic defect of the child.

This is why the history of the cultural development of the child is a basis for the following thesis: cultural development is the main sphere in which compensation for defects is possible. Where further organic development is impossible, an immense path of cultural development opens.

In the chapter on giftedness,* we shall consider especially how culture levels the differences in giftedness and erases, or, more properly, makes it historically possible to overcome organic underdevelopment.

It remains for us only to add that with respect to cultural development of internal means of such types of behavior as voluntary attention and abstract thinking, the same kind of technique of particular indirect ways must be created as exists with respect to the development of external means of cultural behavior. For the development of higher mental functions of attention and thinking in the mentally retarded child, something like Braille for the blind or dactylology for the deaf-mute must be developed, that is, a system of indirect ways of cultural development where direct ways are cut off for the child as a result of his natural limitation.

*Editor's note: The manuscript does not contain material on giftedness.

Chapter 14
THE PROBLEM OF CULTURAL AGE

At this point, we approach a problem which can be called the problem of cultural age. We know the conventional concept of intellectual age that is sometimes introduced in psychology in other countries together with chronological age. Neither intellectual nor cultural age are chronological concepts. When we speak of physiological age or of intellectual age, we assume that the process of development consists of certain stages that in a certain regular pattern of change follow one after another; the beginning of these stages never agrees completely precisely with the chronological passage of time. For this reason, we know that a child of a certain chronological age may be either ahead or behind that point with respect to both his physiological and his intellectual age. In this connection, we have come immediately to the problem that might be called the problem of cultural age.

We will proceed from the hypothesis that was being developed in the preceding chapters: cultural development of the child represents a special type of development, in other words, the process of the child's growing into a culture cannot be equated, on the one hand, with the process of organic maturation and on the other, it cannot be reduced to a simple mechanical assimilation of certain external habits. If we take the point of view that cultural development, like all other development, is subject to its own patterns, its own stages, then the problem of cultural age of the child seems completely natural.

This means that with respect to every child, we are justified in asking not only what his chronological age is, what his intellectual age is, but also at what stage of cultural development he is. It is easy to see that just as two adults, so two children of the same chronological and intellectual age may belong to different types of cultural age. Conversely, two persons with comparable cultural age may differ in intellectual and chronological age. One circumstance has for a very long time interfered and interferes even now with elucidating the problem of cultural age: cultural development, as they say, levels giftedness to a great extent.

Experiments were recently done on animal giftedness. Unexpectedly, the experiments showed that intellectual giftedness in animals varies to a much greater extent than in man. Specifically, the experiment of Köhler, Jaensch, and Katz[106] with domestic chickens showed that intellectual giftedness in solving certain problems varies more than giftedness in solving the same problems varies in very young children. Köhler's experiments with chimpanzees showed that variations in giftedness among chimpanzees in the area of solving intellectual problems was greater than variation in solving similar problems in very young children.

In other words, there is some tentative basis for assuming that there would be a difference, while not completely established, in giftedness with respect to higher mental functions; sometimes even basic functions in some animals exhibit greater variation than in the very young child. From this, psychologists reached the con-

clusion that differences in organic functions must be more significant than differences in giftedness in cultured man. Other observations show that cultural development to a certain degree levels the difference in giftedness in the same sphere; however, talent results in much rarer forms of development than leveling.

Let us imagine primitive arithmetic and cultured arithmetic. If we compare all of us with respect to arithmetic culture, then we would find that everyone who went through school, who has more or less mastered useful habits in the area of solving problems, is equipped with these habits in an equal measure and for this reason there will be no great difference in functions in the area of cultural arithmetic. But if we test each of us for development in primitive arithmetic, then we will find that both our actual potential and the dynamics of our development vary much more than common cultural forms of behavior that we have assimilated. This can be explained by the fact that each form of cultural behavior is in a certain sense already the product of historical development of humanity, an adequate form of adaptation in the given area of behavior. And to the extent that each of us grows into the specific forms, to that extent, there is naturally a leveling of giftedness as an index of the common cultural level that we attain. On the one hand, this is the case.

On the other hand, cultural development in some cases affects giftedness, that is, it is a process critical for the state of giftedness of the child. We know from pedagogical observations of mentally retarded children that they are not ready to master writing although the path for mastering writing is within the range of school age that is systematically subject to teaching and cultural development. This is completely clear and understandable.

Let us imagine the course of cultural development. As we know, it greatly extends natural potentials. Differences in giftedness that are insignificant in natural, practical behavior are converted into very different forms of adaptation by the powerful aid that cultural development gives to mental functions. I would say that cultural development can increase the scale of divergence in the differences of natural giftedness.

Let us assume that we test musical giftedness in a number of people. We will find significant variation, but it will be within a relatively limited range. But let us assume that each of the people tested that ranked the same at the moment of testing had modern musical training, let us say, played complex musical compositions on some instrument. How greatly potential varies, how greatly the divergence in results increases in which giftedness is apparent!

Thus, the relation between cultural development and giftedness is very complex and double-edged; on the one hand, cultural development has the tendency to level individual differences in natural giftedness, and on the other, it tends to increase the scale and range of various degrees of giftedness. Specifically because the relation between cultural development and development of general giftedness is so complex, scientific investigation is faced with the problem of isolating, as far as possible, the process of cultural development and considering it more precisely.

Thus, as cultural age, we will take that stage of cultural development of the child that he has reached approximately and will correlate cultural age on the one hand with chronological age and, on the other, with intellectual age.

The question arises of means for determining cultural age. Modern devices for measurement in the area of child development and current state of diagnostics of child development illuminate this problem only in rough approximation. We must get to know the first attempts to measure cultural age of the child in order to show that this measurement, like every new measuring device, does not at all change or contradict the basic forms of study of mental development of the child that are

available to science. But this approach makes it possible to look at the process of child development from yet another point of view, to see the side that is of great significance for the development of both the normal and the abnormal child. The basic measurement of cultural development is closely tied to the scientific approach to special giftedness.

We know in general what constitutes the problem of special giftedness. The very concept of general giftedness is to a certain degree a misunderstanding that arises from an incorrect translation of a foreign word. Traditionally, we translate the word "giftedness" incorrectly, since this term in French, English, and Latin and in the international psychology lexicon means "intellectuality" and those using it usually have in mind intellectual giftedness. For this reason, when we ask the question about special giftedness in general, it does not mean the same thing in Russian: here, we must have in mind intellectual giftedness, since general giftedness distributed over all aspects of the personality equally does not exist. This we know very well.

With respect to mental, intellectual giftedness, the simplest observations, particularly observations of outstanding geniuses, leave the impression that human giftedness as a system of a person's intellectual functions is something singular, fundamentally simple. We know, however, that even the least complicated apparatus of metabolism is not at all a simple, homogeneous mass of tissue that carries out its task with respect to the organism as a whole through completely homogeneous functions. The same can be said also of observations of apparent giftedness, of geniuses or talented people. Here we are always surprised by the following. For example, if L. N. Tolstoy, the genius novelist, might want to work on mathematics, might want to take up medicine or even chess, there would probably be an enormous discrepancy between his abilities as a novelist and his potential for mathematics or chess. If we were to take an outstanding chess player or master of classical dance, then we would probably get an increase in the coefficient with respect to chess or classical dance and a significant decrease in the coefficient in all other respects.

Experimental observations of normal and mentally retarded children teach us the same truth at each step: the human organism, the human personality, and the human intellect is a single whole, but not a simple whole, that is, not a homogeneous whole, but a complex whole comprised of a number of functions or elements in a complex structure and in complex relation to each other. Regardless of the high correlation of various forms of giftedness, we know not only from facts from life, but also from facts established experimentally that different curves in the development of the child almost never coincide of themselves. We know, for example, that intellectual giftedness and motor giftedness do not coincide with each other, and we know that retardation is possible in each area so that the curves for these areas do not coincide completely and even if retardation coincides in ordinary forms, each curve will still have its own unique dynamics.

This situation creates a most important and most substantial turning point in the technique of modern psychological measurement, and the turning point inevitably leads to a transition from the group of superficial measurements to measuring giftedness and to special research on specific features of separate functions.

There are attempts, however, to unite the functions through a complex functional-structural connection. Recently, Thorndike, having carried out a great number of separate psychological and physiological studies, proposed a new project for reforming measurement of mental development of the child. He indicated the need for reviewing and evaluating the traditional methods of measurement if only according to the system of Binet, of which Thorndike justifiably says that in this sys-

tem, we never know what we are measuring and how we are measuring or whether the measurements we have are reliable. Most of all, we do not know what we are measuring because we must add and subtract various operations of the child in a five-part form. One child did a test of three assignments, another made a map of city streets and houses of the town where he lives; the one and the other were scored according to 1/5 of their age. But it is clear that the product of these operations is not homogeneous and we cannot compare them and say that both indicate identical increase in intellect by 1/5. It is often necessary in such a case to add and combine different qualities, to add miles and pounds. As a result, we do not know what we are measuring and it is impossible to discern either the identity of the operation or the parity of the products obtained as a result of these operations.

Most important, says Thorndike, is that we do not even know how we are measuring. Measurement is a basic arithmetical principle; measurement is counting with equal units so that between 1 and 2, 7 and 8, and 15 and 16 there is the same arithmetical unit; consequently, for measuring, we need a scale of equal units.

What is the situation with Binet's measurement? Of course, there is no such single scale. If a child at 7 does not pass a certain test and passes it when he is 12, do we know that here too the advance is equal to a unit? Speaking generally, in a ranking of children, we can get the following. I studied five children and found their rank: A, B, C, D, E; but it may be that the difference between the first and the second child will not be the same, that for one, the coefficient will be 200 and for the other, 10 or 20 times lower. How can the meaning of the rank be understood if the differences are not identical?

Finally, because of this, we are measuring things that are not the same with units that are not the same, and we reach the point where we do not know whether we are measuring reliably, whether we are actually getting a coefficient that corresponds to the state we are measuring. This happens because we are working with a scale that has no zero. In order to set up any scale, we must have a zero at the beginning, but here we do not know what to relate our unit to and from which point we began to count. Let us say that we began to count from zero and that Binet's scale is based on the year as a unit. This is one thing. Then the rank of the child who solves problems of a 12-year-old according to Binet is automatically raised and the increase will be evaluated as the ratio 3/2. Let us imagine that we did not begin from zero and that one year of development was equal to a score of 1000.* Then this would be an entirely different ratio, approximately 1012/1018, which yields an entirely different coefficient of the child's advancement.

In order for us to know whether this ratio that we obtained with two measurements is reliable and whether we can compare these two measurements, we must take only the last two numbers, or all numbers as a whole, or the two last digits from a six-digit number.

Thorndike says that to obtain a zero, we would have to grade intellectual giftedness from an earthworm to an American student, that is, we would have to take the whole range of development in order to present a ratio that we are measuring. Thorndike advances a solid position, and all methodology of measuring intellectual giftedness for children and all of his research point to the need for a transition to special measurements. First of all, we must know what we are measuring. For this, we need to know and measure the number of the same kind of units; to do this, we need to measure not intellectuality in general, but only a series of intellectual features of children and as far as possible experimentally analyze certain functions

*Editor's note: arbitrary unit.

that would give us, under identical conditions of measurement, a product that could be compared. Thorndike proposes a system of tests for this that would measure intellect, specifically, a test of vocabulary, a test of arithmetic, etc. Moreover, he speaks of the inadmissibility of adding or subtracting the products of different tests. Thorndike concludes that we must carefully approach establishing methods that determine the unit of measurement for special functions, that is, a number of nonuniform processes.

The second position. We must measure with equal units, therefore we must organize the apparatus for measurement adequately. For this, we must find in behavior qualitatively identical units or quantities; without these we cannot construct any measurement.

On the basis of the indicated points the following necessity arises: we must not only get the facts, but also determine their proper interpretation.

Binet's operation consists of the following. He takes a number of facts: the child solved this, he did not solve that, the protocol discloses the data, they are added, the arithmetical average is computed and a mechanical result is obtained. Actually, says Thorndike, it is naive to assume that between the intellectual functions at all ages of development there is this kind of arithmetical relation. If the matter were so simple, then we could take as an indicator a simple derivative from all theoretically taken five parts that we obtained in the preceding several years of development of the child. For this reason Thorndike believes that in similar cases science is obliged to divide strictly the two methodological operations—obtaining facts and interpreting them.

How does a doctor proceed? He listens, measures temperature, takes an x-ray, and does not simply add up all these data; no, he interprets them on the basis of the whole system of medical knowledge and only then does he make a diagnosis. Here scientific processing consists of developing a solid basis for facts that can be interpreted by separating the two different things. In order to establish a proper position, we must establish a fact with maximal precision, and then each precise fact can be subjected to further interpretation. This is done in order to disclose the relation between separate facts since one and the same fact in a given grouping (the same temperature, the same cough or chill) do not mean the same thing as they would in a different combination: they have a different significance in a different combination.

The psychologist must proceed in the same way. Instead of naively assuming that the relation between intellectual functions is simpler than between stages of tuberculosis, he must separate the facts from their interpretation and he must have a theoretically correct plan. Only then can he disclose the relation between these facts.

Thorndike proposed a most interesting experiment that established precisely the plan for differentiating three plans or three studies of intellect: measuring by height of intellect, measuring by breadth of the intellectual area, and measuring by scope of intellect. We will not consider this in detail at this point. We shall return to the problem of measuring the cultural behavior of the child.

First of all, it is necessary to indicate that in this area we have what is lacking in other areas of research—we have a zero established empirically although it is not ideal arithmetically. The zero had to be derived. Because of this, we can compare the different measurements. In some cases, the problem is solved without changing the cultural means and in others, by applying appropriate cultural devices. In this way we can compare two types of solving, and this comparison will give us a completely objective scientific criterion for measuring development. This convenient situation is due to the concept itself of cultural development, of what differs

in cultural development from organic development. We can study a number of external transformations of organic development that are derived from adaptation of the growing child to the corresponding cultural environment. The same device of comparison or relation, as Thorndike correctly points out, allows us to approach closer to the scale of equal units and to make the transition to measuring relative indicators and then operating with correlations of coefficients.

Having this kind of coefficient, we gain another advantage: we obtain actually equal, although abstract units. We will now confirm this. When we add data according to the system of Binet and identically consider as 1/5 the solving of a test from the three tests assigned for naming place, number, and year, we proceed in an unjustified way because we compare two qualitatively different things. But if we compare two identical relations consisting of identical units, then we get something uniform. Here we will not make a mistake. It is easier to count abstract units than concrete units and in this way, we overcome the difficulty.

Finally, based on general knowledge of cultural development and its relation to organic development, we also obtain the reliable possibility of interpreting facts of which Thorndike speaks. We obtain a collection of data of a comparable character, with the same function in cultural and organic development. We have the possibility of disclosing the relation of symptoms, and this makes it possible to interpret fact scientifically and approach the measurement of cultural development just as a doctor approaches observation of symptoms.

Using the examples, we will try to elucidate our situation. We will take the development of arithmetic in the child. How can we present and measure an operation with numbers in relation to its cultural development? There are many examples of measuring arithmetical development in the child, such as tests that pose the problem of taking into account the presence or absence of certain habits. For this, the subject is asked to solve special variants of a test in subtraction, for example, to subtract not only the lower number from the upper, but also the upper number from the lower. What can we expect in this experiment?

Imagine that a given class solves the test in subtraction in a certain way and the pupils are distributed according to its solution also in a certain way. Imagine that we propose to do the same subtraction, but in reverse so that the subtrahend is written above and the minuend below. It would seem that if we introduced the same change for all children, then we might expect that the rank distribution of the pupils would remain the same as it was earlier; perhaps the amount of total time needed for solving the problem might change. But studies show that this is not the case. We introduced the same change for everyone, but the difference between the children in solving the new problem was very great.

Thus, we are confronted by a fact that we must explain.

Why do we get one distribution in the groups when we subtract in the normal order and a different distribution when the order is inverted? As always, in every concrete fact there is an interweaving of a great number of very complex reasons. In this case, a number of factors play a role: the moment of adapting to the new circumstances (different in different children), the moment when stability of complete mastery of the habit is attained, and the point in time that must be passed. But the basic point that has now been proven experimentally is that children that solve the test identically, that is, children that exhibit the same ability to use some habit, are genetically at different stages of development with respect to cultural arithmetic.

One child has mastered a purely external mechanical device which he uses effectively. As soon as conditions for carrying out the operation change, he is no longer able to perform the operation and begins to make mistakes and for this

reason, the whole operation is disrupted. Sometimes the subtraction is not carried to completion, the principle of subtraction is violated, and the whole decimal system and the whole system of arithmetical operations is disrupted. All of this is broken down because of a simple change: the lower number is placed above and the upper number, below. Under the changed circumstances, the whole system seems improper. With another child, the operation is slowed, the number of errors changes, but the solution itself remains absolutely reliable. This means that the child assimilated the required structure of subtraction, that is, in cultural development, he not only acquired the external habit with which subtraction is usually done, but he actually developed an adequate method of behavior with respect to the given structure, and for this reason even in changed circumstances, his habit is more stable.

Finally, between the two extreme cases where a child could not solve the problem at all and where a child was able to solve it but more slowly, there is the greater majority of the class and this is the pattern of the cultural development of this class. Let us imagine that 40 people who solve test problems in subtraction according to external signs are a homogeneous group, but as soon as we change the conditions, the same 40 people exhibit great differences. Here we have a device for research that can arbitrarily be called the *method of shifts*, or displacement of commonly accepted means, commonly accepted systems of measurement. In this way, we can test to what degree the child reacts mechanically to a given situation and to what degree he has assimilated the essence of the given operation, that is, to what degree he has assimilated the structure of the cultural operation regardless of the different changes.

We will give one more device which Thorndike also adopted. Together with using a test in elementary arithmetical operations, he constructed a study using algebraic devices which allows taking into account the productivity of the pupil who has mastered one habit or another. In addition, says Thorndike, it is also possible to study more general psychological conditions that underlie the process of calculation. Thorndike's research is extremely simple. Let's say that we replace the ordinary arithmetic signs with letters. We will try to introduce a new arbitrary representation for writing division and multiplication signs, to introduce an unusual form instead of the usual form, and we will observe how this affects the behavior of those solving the problem.

Or even more simply. In order to learn how a child operates with symbols in general, specifically algebraic signs, Thorndike introduces a series of arbitrary signs. Preliminarily, instructions are given that one sign means one thing, another, something else, and a third, something else again and that one of four signs stands for a certain concrete thing. Then a system of signs is presented that the child must interpret. In this way, Thorndike tries to study to what extent in general a child mastered the structure of dealing with symbols and to what extent he can replace one symbol with another to solve an arithmetic problem.

What does the research show?

It would seem that there would be no difference if in an algebra problem the x were replaced by another sign. The principle does not change; a bar could replace the x. The meaning of the sign used remains unchanged. But such a change is not without consequences for any of the pupils. As a rule, the general character of solving the problem changes. Thorndike is correct in saying that the habit of using the unknown x has a substantial significance and changing the meaning slows the resolution of the corresponding operation; the new system of signs seems more difficult and, what is most essential, the rank order of pupils in the class with respect to solving the problem changes, that is, in other words, carrying out the task expressed in different signs yields a different distribution of the pupils in the class

from the distribution that resulted when the problem was solved with the ordinary signs. As a result of the experiment, we get a picture different from the one we got before. Thorndike says that by this means of research, we disclose the discrepancy between arithmetical and algebraic knowledge and we obtain a general form of behavior which conceals the solution of every purely arithmetical problem in a general form. Consequently, the method of shifts makes it possible to gain access to genetic study of one habit or another, to disclose how stably a habit has been assimilated.

This method opens the genetic approach to the system of schooling. Schooling and its effect on the pupil's development has until now been measured in two basic directions, which remain, of course, and which are most essential, but which do not solve the whole problem of schooling: on the one hand, we considered the system of school skills, habits, and knowledge, and on the other, giftedness of the pupil. However, a third important task remains—showing the reciprocal effect of the habits acquired by the pupil and the schooling on the form of cultural behavior and development of this behavior.

Thus far, mainly the first two indicators have been studied in pedagogical practice. Moreover, we know that there is also a reciprocal, extremely strong influence of the acquired devices of behavior on the general development of the child. We know that without certain intellectual data, the child cannot master the required habits; a child-idiot cannot even master speech. But the other side is also significant for us: it is important for us to know not only to what degree thinking reorganizes the devices of behavior, but also to what extent the devices of behavior reorganize thinking and why specifically these two processes must be at the center of attention for the study of the cultural age of the child.

Put more simply, the moment of mastering speech depends on the intellect of the children, and all studies lead to the conclusion that the study of speech is a very convenient indicator of mental potential. Consequently, one degree or another of giftedness is undoubtedly reflected in the nature of mastering speech. But, of course, the reverse is also true. If in the process of development, the child masters some language, it is interesting to see to what degree and how this reorganizes the whole natural process of his thinking. Let us recall the divergence of curves, that is, the mutual effect of natural and cultural development. Let us recall the example with the picture. If we try to draw the curve of development of the child's thinking taking into account its quality from stage to stage, we see that this curve does not coincide with the curve of development of thinking as a whole but coincides with the curve of the development of his speech.

Two very important questions arise from this. First: to what degree is mastery of speech facilitated by intellectual potentials of the child? For example, why does a child who is at the stage of, let us say, a three- or four-year-old describe the picture with separate words although he thinks of it in whole images? Obviously, in order to master speech, one must know how to carry out intellectual operations of a more complex order than those that a three-year-old can carry out. Consequently, we can disclose the dependence of separate stages of development of speech on the degree of development of the child.

Something else that is more important remains: the child thinks in whole images, but tells about the picture in isolated words, and in school the child experiences a conflict between the development of thinking and speech. Speech leads to the end of the formation of thinking, transfers it to a new track, converts direct, natural thinking into cultural thinking, verbal thinking, and in this way makes it more abstract.

The second question arises here: how does development of speech in the child change and transform the development of thinking? What kind of new forms of thinking arise in the child that depend on his using appropriate forms of speech? We tried to elucidate this question in preceding chapters. We tried to present certain points of view, certain theoretical data, a kind of genetic plan or methodological devices that have a common task: on the one hand to separate what in studies on child psychology was considered until now to be inseparable, that is, to separate the process of organic development from the process of cultural development, and on the other hand, to determine methodological ways to study the problems.

On the basis of our results, we can take yet another step in research. Our work helped us see still another side of the process of child development, which until now was considered somewhat simplistically by many. If we will stop being satisfied with a somewhat one-sided approach to child development, then the task of the present work has been accomplished. In our research, we wanted to develop a more complex view of the process of child development, to present two lines of child development and as far as possible to enrich the methodological approaches to the study of the child. This was our basic purpose in the present work.

Chapter 15
CONCLUSION; FURTHER RESEARCH; DEVELOPMENT OF PERSONALITY AND WORLD VIEW IN THE CHILD

Our studies were always conducted along an analytical path. We tried to isolate and trace the line of cultural development of separate mental functions, separate forms of behavior connected, on the one hand, with mastery of external means (speech, arithmetic, writing) and on the other, with internal changes in memory, attention, abstract thinking, formation of concepts.

The chapter on will disclosed the general root from which all other forms of behavior spring. But synthesis must necessarily follow analysis. Since the course of exposition never coincides directly with the course of research, we first presented the general theoretical positions to which the study of separate functions led us, which we considered in three chapters. Their purpose was to explain the analysis, structures, and genesis of cultural behavior.

In the synthesizing section, we attempted to gather general conclusions that the history of cultural development supported with respect to rearing and the methodology of school training. Then we tried to elucidate the problem of cultural age connected with the range of cultural development and with a method of measuring it.

Finally, we come to the last task, the subject of this chapter, which consists of an attempt to present a plan or picture of the whole cultural development of the child, to review the cultural development of the child as a whole in its changes with age. We must note that at the present state of our knowledge and our research, the synthesizing chapter can be written only in draft form. In presenting the cultural development of each separate function, we used factual material and separate studies and observations. Now we come to projecting the further course of research. Only a detailed accumulation of primary factual material, followed by empirical and theoretical generalizations that show partial patterns and place them within ever broader laws, can lead to a complete resolution of our problem.

As we have said, at present our studies do not give an adequate basis for this. However, even now we can try to draw a schematic of cultural development as a whole and illuminate in an age cross-section the more important points of the perspective that is opening up in connection with the facts presented earlier. We do this, first, because only facts taken in perspective can be finally understood and evaluated in all their significance. Second, because without a conclusive synthesis, even in a schematic form, many facts would be deprived of unity, would be disconnected and would lose much scientific significance.

An attempt to cover cultural development synthetically must be based on the following basic positions.

First: in content, the process of cultural development may be characterized as development of the personality and world view of the child. These concepts are insufficiently determined and precise scientific terms. They are being introduced into child studies almost for the first time. Perhaps in the course of further studies, they may be rejected entirely or replaced by other concepts, but even if they remain with the approximate meaning which we are now trying to ascribe to them, their content must be made more precise, determined and rigorously separated from similar concepts. At present, we are introducing them for preliminary orientation as general concepts that encompass two very important aspects of the cultural development of the child.

Personality as understood here has a narrower sense than in the usual sense of the word. We will not include here all the traits of individuality that distinguish it from a number of other individualities, that make up its uniqueness or relate it to one specific type or another. We are inclined to put an equals sign between the child's personality and his cultural development. Thus, the personality is a social concept; it encompasses what is supernatural and historical in humanity. It is not innate, but arises as a result of cultural development because "personality" is a historical concept. It encompasses unity of behavior that is marked by the trait of *mastery* (see the chapter on will). In this sense, the correlate of personality will be the relation of primitive and higher reactions, and in this plan, the concept we introduced coincides with the concept that Kretschmer is establishing in the area of psychopathology.

As world view, we are also not inclined to understand any logical, well-thought-out views of the world and its more important parts, developed in a deliberate system. We are inclined to use this word also in a synthesizing sense corresponding to personality in a subjective plan. World view is that which characterizes a person's behavior as a whole, the cultural relation of the child to the external world. In this sense, an animal does not have a world view, and in the same sense, a child does not have a world view at the moment of birth. During the first years of life, sometimes right up to the time of sexual maturity, the child does not have a world view in the real sense of the word. Frequently this is more likely to be world action rather than world view. Thus, we imbue the term "world view" with a purely objective meaning of a method of relating to the world that the child has.

We must make two more stipulations: first, the course of our research differs from a study of the course of natural development. Natural development goes forward not as development and change in separate parts that results in the formation of a total change of the whole. More likely, conversely, not one function of those considered above, whether it be speech or memory, develops at all independently and separately from others; in the process of close interaction, all aspects of mental life develop, advancing and supporting each other in every way. Personality develops as a whole, and only arbitrarily, only for purposes of scientific analysis can we abstract one aspect or another of its development. This is clear from what has been said above. The very character of cultural development, in contrast to natural development, brings about what neither memory nor attention can turn into processes of general cultural behavior if taken as such and left to themselves at any level of natural development at which they might be. Only when the personality masters one form of behavior or another does it bring them to a higher level.

Thus, as in the area of organic development, the whole, in the expression of Aristotle, preceded its parts, the parts themselves and their action, that is, organs and functions, change depending on a change in the whole. In precisely the same way, the smallest step in the area of cultural development of any function assumes development of the personality if only in the most embryonic forms. The essence

of cultural development, as we have seen, consists of man mastering processes of his own behavior, but an indispensable prerequisite for mastery is the formation of personality and for this reason, development of one function or another is always a derivative of development of the personality as a whole and is determined by it.

From this point of view, we see that in our research on the development of personality and a world view, we accumulated significant material that must be collected and presented as a whole. If it is true, as we have said above, that the development of each separate function is a derivative of the development of personality as a whole, then it must follow that in tracing the development of each separate function, we will trace the development of personality. Personality was present as if invisibly and participated in the process of mastering one's own reactions; we touched on this above.

Second and most important: we wrote not a single chapter that does not extend multiple threads into subsequent chapters. If we looked at the work as a whole, as they say from the height of a bird's flight, there would appear before us the very complex and confused threads that connect and interweave all the chapters together. Thus, speech, that principal means for developing personality, leads us to the basic form of mnemotechnical memory; it becomes clear only in the light of the pointing function of signs of attention. The word is a direct tool for the formation of concepts. Speech appears as the basic means of thinking and is connected with the development of the gesture, the picture, play, and writing. Attention also provides a real basis without which the development of concepts would be obscure, and we would never take up writing the history of personality and world view of the child if these intricately interwoven threads were not already noted in the whole preceding presentation.

Third: with the current state of our knowledge we have a serious lack of important points for resolving the problem posed. Thus, we could say nothing about the very important connecting link between organic life and life of the personality, a link that lies in the cultural development of human emotions and desires. We could trace the development of social and cultural needs only conditionally and briefly in studying the development of motives.

Let us move on to an ontogenetic consideration of cultural development as a whole.

The *newborn* is probably the most primitive being that a person can be. Neither people at a low level of development, nor idiots who have almost no cultural development, nor deaf-mute children, nor an older child, let alone an adult, ever reach in their organic functions the stage of pure naturalness that characterizes the newborn. The newborn is a natural being in the full and precise sense of that word. For this reason, in the first period of the child's life it is easier than ever to observe natural forms of reactions. If certain primary forms of cultured behavior are apparent here, then they still have a semi-organic character and are coupled with an elementary reaction of the child to the human voice, to the appearance of an adult or other small children.

In this period, most significant from the point of view of cultural development, the most important turning point, is the instant when the child uses his first tools. As systematic observations and experiments have shown, this aspect of natural thinking, independent of words, of which we spoke above, is observed in children at nine months. Specifically then the first complex mechanical and sensory-motor connections are formed.

Preliminary intentions to do something with the aid of some object have been observed in a child as young as six months. At nine months, complex connections appear more definitely. When, after several attempts, the child cannot use his hand

to get a toy that has fallen, he throws another toy after the first. We note that Köhler's monkeys and older children acted the same way when they failed in their attempts to get a ball lying beyond a net.

But a child of ten months very often picks up a rattle that has fallen by its attached string, an operation that is impossible for an adult dog, as Köhler's experiments have shown. The child already comprehends certain mechanical connections. This period of instrumental thinking (*"Werkzeugdenken"*) Bühler proposed to call the chimpanzee-like age. We observed how a child at ten months tugged at an adult by the hanging end of his belt or used another object to move an object that was not accessible. Researchers are absolutely correct when they say that with the use of a tool, a completely new period begins for the child. The principal change that occurs in the child is the following: at ten months, the child can use a string to get an object and remains at this level of thinking, independently of speech, till he is a year old.

So we have before us a child whose behavior has developed along all three stages: instincts, conditioned reflexes, and simple forms of thinking. Establishing the fact that natural thinking is present in a one-year-old is a major achievement of modern experimental psychology. It shows that the genetic roots of thinking and speech do not coincide and that there is nothing more instructive than tracing month after month the development of reactions, thinking, and prattling in the child. But we will forget that we have before us the natural roots of thinking and speech. Tracing the one and the other over the months, we see that in the child, there is no direct connection between the one and the other. The decisive significance of the transition to tools consists also of the fact that this moment is the turning point in the development of basic forms of adaptation of the child to the environment.

Jennings indicates that the reactions of an organism represent not simply a disordered mass, but a system determined by the organization of the given being. An amoeba, he says, cannot swim like an infusorian, and the latter has no organs for flight. Man has a system of acts that limits the forms of his behavior; but in contrast to other beings, man extends the range of his actions with the help of tools. Man's brain plays a decisive role; among his organs, of decisive significance for implementing this are the hand, the eye, and the ear. The range of their activity is limitless owing to the use of tools. The natural inventory of this system of actions is possible for the human child beginning at the age of early use of tools.

We will note that even here, it seems to us, researchers gave insufficient consideration to the natural character of the child's behavior. Following Hans Driesch,[107] they tried to reduce behavior to elementary units, considering these to be not the simple reflexes that in pure, isolated form appear in the newborn infant as rarely as in the adult, but actions whose criteria, according to Driesch, are that the actions are determined by individual experience of a living being. For this reason, in determining actions, researchers introduced behavior that was actually or seemingly goal-directed.

As these researchers say, an action is behavior directed toward definite success regardless if the striving is conscious or unconscious and regardless of what kind of success is intended. This point of view, like the whole teleological position, seems spurious to us in the sense that for expressing a well-known objective fact or relation, specifically a functional relation, the term "goal-directedness," pertinent to earlier stages, is used essentially subjectively and genetically. Also, the boundary for determining actual primary goal-directed actions when they first appear in the child is lost. Both thinking and speech of the child in this period are manifested in a natural form. Speech does not at all serve intended or consciously set goals,

but appears as a simple activity of the child manifested in prattling, cries, and other expressive sounds. But the most decisive turn occurs in the sphere of activity of the child at the moment when he first begins to produce simple social reactions on the basis of speech. Social reactions absent in the first months of life begin with a cry inspired by the cry of another child, proceed to a glance at an adult, a calm smile after being spoken to, a cry when the adult leaves the child, and then a grasping of the adult and looking at another small child.

In just six months, the child develops the reaction of prattling to call the attention of an adult and responds with prattling in response to the words of the adult, stretching out his arms to him, etc. Calling the adult's attention by movement, by tugging at his clothing in order to get his attention develops only at nine months. At ten months, the child can show the adult objects and at eleven months, he is capable of organized play and activity, getting the attention of another child by prattling, etc. Prattling very early begins to fulfill the elementary function of calling attention, but these means are still primitive and essentially do not differ from those we find in animals.

Thus, ascribing a social function to speech (calling attention) and extending beyond the limits of natural organology through the use of tools are two very important instances that in the first year of life prepare for important changes that are the basis for further cultural development.

If we should want to connect the common factors with what we know of the cultural development of separate functions, we would have to say that this whole period is a transitional period from the natural to the cultural life of the child. Every action of the child during this time has a mixed animal–human, natural–historical, primitive–cultural, or organic–personal character. We arbitrarily termed the transitional stage in the development of the child the *magical* stage. Actually, according to Piaget,[108] who developed the most elegant and serious theory of the first year of life, the world view of the child at this level of development may best be described as magical.

Piaget proceeds from this simple form of child behavior that is most characteristic for the first year of life, which Baldwin called a chain reaction. It lies at the base of motor experience of the infant and is the point of departure for all adaptation of a child of this age. The child's hands make random movements and if he gets any interesting result from this, the infant repeats the movement endlessly. This is how he begins to suck his thumb, grasp objects, pound on the table, etc. The chain reaction is exploitation of chance.

Motor adaptation is continued in memory. As we know, memory in small children, beginning at the end of the first year, is different. Piaget observed that a child uses one and the same element of a chain reaction to affect the world that surrounds him. A researcher observed that at eight months, a child will rise, then drop with his whole body in order to move something that he sees at a distance. A somewhat older child screws up his eyes, looking at a lamp cord in order to light the lamp. The child does not distinguish which changes occur as a result of his own reactions and those that occur independently of him.

In his words, Piaget's hypothesis states that all movements carried out by the infant in the environment and all movements subsequently coinciding with his efforts will be perceived as the same until the resistance of objects or people brings the child to separating several actual centers in the world; put more simply, to separating his "I" from other objects.

We believe that Piaget's idea is quite correct that in the newborn there is not even the most primitive presence of "I"—the personality and world view—that is, relation to the external world and to others. The one and the other for him is

therefore indivisible and he senses the chain reaction when he moves his arms in order to make a sound and when he squints at the lamp in order to light it. If we were to ascribe to the child an innate consciousness of his "I," says Piaget, then we could not at all understand why he begins to imitate others nor why he makes such strange movements in order to interact with the external world. We could say even more simply that the child experiences closure of an ordinary conditioned reflex to external actions that randomly coincide with some reaction of his. But, says Piaget, if some want to limit all of psychology to conditioned reflexes, then we must ask: what is the meaning of the circumstance that the child uses the same devices to affect things and himself?

This seems to us to be the most clear indicator that formation of personality has actually not occurred in the child and that it is still completely merged with his world view as exhibited in his actions. Piaget correctly terms the undifferentiated stage of personality and world view as a paradoxical state of solipsism (not in the philosophical sense, but to indicate the fact that the child is, on the one hand, completely at the mercy of external things and on the other, that for him, external things are not at all distinct from the processes that are taking place in his own body).

If we recall what we have said about separate functions, we will see everywhere this transitional or magical phase that is characterized by the lack of differentiation of the personal and the external, objective world. The different, natural memory of the child when he acquires important information on the qualities and states of the external world, the natural maturing of one dominant after another, the stage of forming concepts that, as Piaget correctly says, consists of distributing all objects acting on the child according to patterns of the five basic organs of perception—these are the characteristic traits of this stage.

We shall consider two important examples that characterize it. The first is memory. Despite the exceptional strength of child memory, impressions of the first year of life are never retained and are not maintained for the duration of the subsequent life of the child. Why we do not remember anything about the first year or in general about the very early years of our life is a puzzling fact that has not yet been explained in psychology, but cannot, of course, be simply reduced to the fact that it happened a long time ago. In recent psychology we have two basic explanations for this fact. One was proposed by Freud, the other by Watson. Freud proposes that memories of early childhood are forced from consciousness because they refer to an organization of the child's behavior completely different from all the rest of his life. Watson identifies Freud's unconscious with non-speech behavior and explains this fact by saying that early impressions are accumulated without the participation of speech. Memory for Watson is the result of the verbal aspect of behavior.

Watson's explanation seems to us highly probable. From it, we can conclude that the first year of life in the development of the child is a kind of prehistorical epoch about which we remember nothing as we remember nothing of the prehistoric epoch of humanity that left no writing. Our speech is, in this way, a kind of unique writing of our past. In any case, the basic fact that we remember nothing about the first year of our life together with the other fact, specifically, the memory of the past as a basis for consciousness of our personality, allows us to say that the first year of life in a certain sense relates to later life just as development in utero relates to subsequent life. It is the second, seemingly prehistoric epoch in the cultural development of the child. The example in the area of development of concepts shows once again the extent to which the natural character of the epoch under consideration is connected with the absence of speech when, for the child, objects

are divided into objects to recognize, to grasp, etc., that is, they are sorted according to different sensory patterns.

In this way, in the plan proposed by Piaget, we see a kind of analogy to our concepts of natural behavior. We see how mistaken is the view according to which the child begins with recognition of single objects and only through generalizing from these comes to a concept. Actually, the child, like an animal, begins with the most general patterns; for him the five groups of things indicated exist and are not differentiated individually, but are perceived by him in accordance with the assimilation pattern. If the child could put his concept of things into words, he would need a total of five words and with these, he could convey the whole diversity of the world he knew.

It is interesting to note that the affective theory of the origin of language also projects a total of several basic words for conveying separate meanings realized by humanity in prehistoric times.

As Volkelt says, the pyramid of concepts is constructed simultaneously from two ends—from the specific and from the general. We could go even further and say that judging by the behavior of the child, before the age of one year, the pyramid of concepts is built specifically from nondifferentiation of the particular; the child goes from the general to the particular, gradually isolating ever smaller groups and the single object is evidently isolated later. This corresponds with what we know about the basic property of nervous activity, specifically about the radiation of nervous excitation that always results in the formation of generalized conditioned reflexes. Only later, as a result of differentiation, never happening instantly, does the child begin to isolate and distinguish objects.

Thus, natural speech, natural memory, logical development of the dominant, and assimilation of a pattern instead of concepts—this is what characterizes the infant. The transition to tools, to socialized speech, marks the turning points that are the basis for further cultural development, but in themselves, they still belong to the natural period in the history of humanity. Speaking in the language of comparative psychology, they do not differ very much from the same forms of behavior in animals. The lack of differentiation of the personality and world view, merged into a single magical action, points to the transitional stage of cultural development. The correction that we must make in Piaget's theory consists of the fact that socialized speech and the use of tools are instances that drive a wedge that splits off this magical stage. Adaptation to the natural world and to the social world begins to branch here into two separate lines. Finally, the fact of absence of memory in our first years, which we have already noted, is evidence that at this time the personality of the child has not yet formed and the means have not been created that it would use to manifest itself in external and internal actions.

The next epoch in the development of the child is characterized by two basic changes that have a decisive significance for subsequent development.

The first change is organic and consists of the fact that the child learns how to walk. From this follow a radical change in his adaptation to space, an extension of his control of things, a freeing of his hands from the function of moving around, and an abundance of things that the child can now manipulate and control. Another change is cultural and consists in mastering speech. We have already indicated that this most important instance in the development of the child is accomplished as follows if we consider it schematically. At first, grasping movements dominate. Unsuccessful movements result in the stretched out hand remaining extended toward the desired object; the pointing gesture develops from this, the first precursor of human speech. Its function is to indicate, to call attention. This may be done directly by holding out the object itself or perhaps by indicating an object. The child extends

his arms toward an object before the age of one year; during the second year, it is a pointing gesture. All speech of the child develops through gestures, and in this way what takes place here is a kind of roundabout and zigzag development of speech.

Contrary to what Meumann expected, the first words serve not an affective-expressive function, but an indicating function. They replace or accompany the pointing gesture. Audible speech develops slowly and gradually and together with it, the basic apparatus develops for connecting with those nearby and affecting others.

In the chapter on thinking, we showed that mastering speech leads to a reorganization of all the features of the child's thinking, memory, and other functions. Speech becomes the universal means for affecting the world. At this point, a new and unique form of the child's world view develops. Since the child acts on external things through adults, a shorter path between words and objects develops. Let us recall how in the experiments of Köhler and Bühler when a child could not get an object lying behind a net, he began to throw pillows, a belt and other objects at it.

Now the child proceeds in the same way with words, and it is interesting to note that this feature is retained in the adult (swearing at inanimate things with which the adult cannot cope). It is most interesting that the child tries to affect things through words. Thus, in the experiments of M. Ya. Basov, the child turns to a toy, asking it to drop down. The child retains such a merging of affecting people and affecting things for a long time, but it differs greatly from the situation that obtained during the first year of life. Affecting people and affecting things proceed along different lines. The child has mastered the tool and the sign, at least the principle of their use, and applies each as appropriate.

The decisive moment in the development of the child's personality in this period is his recognition of his "I." As we know, the child initially calls himself by his own name and acquires the personal pronoun with some difficulty. Baldwin correctly noted that the concept of "I" develops in the child from his concept of others. The concept "personality" is thus a social, reflected concept constructed on the basis of the fact that the child applies to himself the devices of adaptation that he applies with respect to others. This is why we can say that in us personality is social. For us, this conclusion is not at all unexpected: even in analyzing each separate function, we have seen that the child's mastery of one process of behavior or another is formed from the example of how an adult masters it. We have already seen, for example, that initially, adults direct the attention of the child to one thing or another and the child assimilates only those devices and means with which this was done. The same thing happens with speech. Initially, it fulfills the function of intercourse with others, then it becomes internal speech based on intercourse with himself. The personal name is frequently elicited in response to a question, as Delacroix correctly indicates, when children are asked: "Who wants this, who has this?" The personal pronoun, like the personal name of the child, is a pointing gesture to himself.

J. Fichte[109] wanted to celebrate the baptism of his son on the day that he began to say "I." But, of course, the appearance of this pronoun says just as little about the appearance of the recognition of personality as the pointing gesture says about the objective meaning of a word. This can be seen very clearly in French in which there are two separate particles for expressing "I": "I" in the self-contained sense of the word replacing the noun (moi) and "I" as a pronoun used only with the verb (je). Delacroix proposes that in the child, "I" in the meaning of the noun precedes the "I" that appears only as a grammatical element.

We know of a deaf-mute child who spoke freely from the age of seven, but only at the age of twelve started to used the personal pronoun. Before that, regardless of special schooling, he used his name instead of the word "I," for example: "Oleg has a father."

In this connection, Stern's statement is interesting: in first-born children, the child's own name frequently precedes the personal pronoun, but in second and later children, the pronoun, "I" appears simultaneously with the name and not just as a grammatical element. It is difficult to find confirmation of the fact that the personality of the child at this stage is constructed according to social example and that the child makes the transition to recognizing the "I" just as others do in indicating themselves with the word.

The next typical stage in the development of the child's world view we believe to be the age of play as a special form of child behavior, exceptionally interesting especially from this point of view. In play, the child, ascribing new meaning to toys and things, imagining himself to be a captain, a soldier, a horse, has, of course, gone beyond the magical stage when he did not differentiate between psychological and physical relations. Now, for him, a stick representing a horse is not a horse, he is under no illusion. As we tried to show above, this new (illusory) meaning often is not an arbitrary symbolic designation. The stick is no more a horse nor a sign of a horse, for example, than is a picture or a word. It is interesting to note that in the child's play, a picture or drawing rarely replace an unavailable object. Gettser noted such cases, but nevertheless, we are inclined to consider them extremely rare; they are the exception rather than the rule.

The relation between objects and the meaning ascribed to them in a given case is very unique and corresponds to the stage of the child's world view that he has now attained. As has been said, for him, the stick is neither an illusion nor a symbol.

We tried to show above that this meaning develops from gestures, that is, from that same common root from which the child's speech develops and from which the whole natural history of the development of the sign begins. The unsuccessful grasping that becomes extinct in the animal as goals are unattained, begins to fulfill a new function in man owing to his social environment and is, in essence, the true source of all of his cultural forms of behavior. It is primarily a plea for help, for attention, and consequently, is the first going beyond the boundaries of the personality, that is, a primitive cooperation in the psychological sense of the word. We tried to show that the stick acquires its meaning for the child owing to the gesture, movement, dramatization.

Psychologists, guided by what the child himself said, were susceptible to illusion. They saw only the ready result or product of a certain process, but did not detect the process itself, which is that the initial meaning is inherent in the imitative gesture, the pointing of the child, riding the stick, etc. Something is required to serve as an object for full implementation of the gesture, and the meaning that this something acquires is essentially a secondary, derived meaning based on the primary meaning of the gesture.

In this way, we see that the child at the stage of play very unstably localizes his personality and his world view. He can be somebody else just as easily as he can be himself, just as every thing can assume any appearance, but it is remarkable that with the general lability, the instability of the child's "I" and of the things surrounding him within each game, the child distinguishes not magically, but logically between treatment of things and treatment of people. It is remarkable that the child at this stage of development does not confuse activity in play with serious activity. He isolates the one and the other in separate spheres and he moves easily

from the meaning of one sphere to the meaning of the other, never confusing them. This means that he already has control of both spheres.

Only at *school age* does the child first exhibit a firmer, stable form of personality and world view. As Piaget has shown, the child of school age is also a much more socialized and a much more individualized being. What externally seems to us to be a contradiction is actually two aspects of one and the same process, and we believe that there can be no weightier evidence for the social origin of the child's personality than the fact that only with an increase, an intensifying and differentiating of social experience does the personality of the child grow, become formed and mature.

A very important basis for this change is the formation of internal speech that now becomes the child's main tool for thinking. If at the stage of play, the child thinks and acts in a mixed way and thinking of some activity embodied in signs, moves directly to dramatization, that is, to a factual carrying out of the activity, then the thinking and action of the school-age child are more or less separated from each other. In play, we see a unique form of using signs: for the child, the process of play itself, that is, the use of signs itself, is still closely linked with entering into the meaning of these signs, into imaginary activity; in this case, the child uses the sign not as a means, but as a goal in itself.

The situation changes decisively when the child reaches school age. Here his thinking and action are sharply divided.

Piaget proposed that explanation of all the features of the school age can be derived from two laws. The first he calls the law of the shift or displacement. The essence of this is that the features in behavior of the child and his adaptation to the external world that were observed in preschool years in the sphere of action now shift, are displaced and transferred to the plane of thinking.

Syncretic thinking and using it to explain visible phenomena, characteristic for the child's perception at the early stage of development, now appear in the form of verbal syncretism, examples of which Piaget presents in his experiments. This law can be formulated thus: the child of school age lives in a sphere of direct perception and action.

The second law, which Piaget calls the law of recognizing difficulty, was established by Claparède. The gist of the law is that the child is conscious of his operation only to the extent of his unsuccessful adaptation, and for this reason if for a child of preschool age impulsive, direct, unconscious reactive activity is characteristic in general, then for the school-age child, an essentially different situation obtains. This child is already conscious of his actions, and he plans them through speech and can give an account of them; he has already isolated the higher form of intellectual imitation that we termed a concept, which can be connected to what the child isolates through internal speech as a kind of extract of things and their relations. But what is most important has not yet happened to the child, namely, consciousness of his own processes of thinking. The child does not take account of them, he does not react to them and often he does not control them. They flow with him just as actions flowed previously, that is, in a purely reactive way. Only gradually, only with the passage of years does the child learn to control the course of his thoughts and just as he earlier controlled the course of his actions, he begins to regulate and select them. Piaget correctly notes that regulating thought processes is a voluntary act, an act of selection, to the same extent as a moral action.

Not without reason does Thorndike compare reflection with arithmetic based on selection of required associations, with selection in a conflict of motives, as this process occurs in real life. Only by the age of twelve, that is, by the end of ele-

mentary school does the child completely overcome egocentric logic and move on to mastering his thought processes.

The age of sexual maturity has usually been designated as the age at which two major changes in the life of the youngster are completed.

It is said that this is the age of discovering one's "I," of forming the personality on the one hand, and, on the other, the age of forming a world view. No matter how complex the relations these two moments might have with respect to the basic transformation that is taking place in adolescence, that is, to the processes of sexual maturity, there is no doubt that in the area of cultural development, they are central moments, with greatest significance for everything that is characteristic of this age.

For this reason, Spranger is fully justified in calling the transition age the age of growing into culture. When they say that the adolescent discovers his internal world with its possibilities, establishes his relative independence from external activity, then, from the point of view of what we know about the cultural development of the child, this may be designated as mastery of the internal world. Not without reason, the external correlate of this event is the development of a life plan as a certain system of adaptation that is first realized by the adolescent. Thus, this age crowns and completes the whole process of cultural development of the child.

We have already indicated that we are forced here to limit ourselves to a cursory and schematic review of childhood ages, since research at its present stage cannot yet give a complete and differentiated picture of the age features of mental development.

THE QUESTION OF MULTILINGUAL CHILDREN[1]

The question of being multilingual in childhood is one of the most complex and intricate in modern psychology <. . .>.

We must mention the research of Epstein, the first both chronologically and logically, based on personal observations of polyglots, on data from questionnaires answered by a number of people who spoke several languages, and, finally, on some experiments on teaching various languages carried out by the author in Switzerland. Epstein bases his work on the principle that the mental base of language is the process of associative connection established between the sound complex and corresponding meaning, that is, the subject or idea named by the given sound complex. All further consideration of the question is based on this fundamental psychological premise. If the basis for language is nothing other than an associative connection between sign and meaning, then the problem of being multilingual from this point of view is extremely simple. Instead of one associative connection, we have here two or more completely identical associative connections between one meaning and its various sound designations in two or more language systems.

Phenomena termed associative inhibition have been studied quite thoroughly in experimental psychology. In essence, they consist of several associative connections originating at one point that inhibit each other. If a certain idea is connected simultaneously with two sound designations, then both of these words have the tendency to appear in our consciousness immediately after the idea. A competition develops between the two associative tendencies as a result of which the stronger and more persistent associative connection prevails. But victory is the result of a conflict related to a slowing and disturbance of the associative process. For this reason Epstein proposes that two or more language systems may exist simultaneously as more or less autonomic systems without entering into direct connection with each other, but having an associative inhibition on each other. Epstein maintains that different languages may associate directly with an idea and function in all impressive and expressive forms regardless of the native language. However, between these systems, each of which is connected with the idea completely identically by an associative connection, antagonism develops that leads to conflict of various associative tendencies, to displacement of elements of one system by elements of the other, and to impeding and impoverishing not only the new, but also the native language.

Thus, interference or a displacement and interaction of one system with the other develop together with associative inhibition. The negative effect of one lan-

[1]This article was written in 1928. It was first published in 1935 in the book by L. S. Vygotsky: *Mental Development of Children in the Process of Schooling*, Moscow, Leningrad, 1935. The text of this article follows that of the first publication, with omitted material indicated by <. . . >.

guage on the other is expressed in a feeling of difficulty, awkwardness, stylistic errors, replacement of words by words of the different language, etc.

The harmful effect of one language on another is limited to this. The author states that polyglotism unavoidably impedes thinking. Due to competition of associative tendencies, an exceptionally complex interaction arises between them and a mutual negative effect of one speech system on the other develops. Because the different languages frequently lack completely identical words that correspond absolutely precisely to the words of the other language, and because there is always a certain difference not only in the languages, but also in the meaning due furthermore to the fact that each language has its own grammatical and syntactic system, polyglotism leads to serious difficulties in the child's thinking. Every nation, the author says, has its own special way of grouping things and their qualities, their actions, and their relations in order to name them. Terms that seem equivalent to us in different languages are so only partially. They have their shades of meaning and sense not directly translatable from one language to another. Difference in meanings is an extremely potent factor of interference in polyglotism. Not only a transfer of phonetic, or grammatical and stylistic features of one system are transferred to another, but also a certain erroneous identity of meanings.

This difficulty is more significant than the difficulty arising from the differences in words. While including words from another language is found comparatively rarely, some displacement of ideas and meanings arises extremely frequently. Antagonism of ideas, says Epstein, is more intensive than antagonism of words. An even more significant factor of mutual inhibition of two language systems is the difference not only in ideas denoted by words of different languages, but also in the combinations of these ideas.

In each individual, the native language establishes unique processes of linking ideas and their constructions that are expressed in syntactic forms. These forms acquire an exclusive associative rigidity, but are not the same in the various languages. Thus, interference of different principles of linking ideas arises and, together with mutual inhibition of words and meanings, a mutual inhibition of different methods of linking or connecting ideas also develops. On the basis of this theory, Epstein reaches the practical conclusion: least harmful is the passive use of several languages. In his opinion, all polyglotism is a social wrong and the whole task of the pedagogue is to reduce or ameliorate as far as possible the influence of this wrong on the development of the child. For this, the child must speak only one language since active mixing of two languages, according to Epstein's observations, is most harmful. That is why understanding and reading or passively using many languages is the practical conclusion that the author reaches from his studies. As he expresses it, there must be impressive polyglotism and expressive monoglotism.

Further, according to these observations, the damage done by polyglotism depends not only on the active or passive form of using language, but also on the age of the child. Most injurious is the influence of polyglotism at a very early age when the child is forming the first habits and forms of thinking, when associative connections between his thinking and speech are not yet firm and when, consequently, competition of other associative connections established in another language system is particularly harmful to the whole fate of speech and intellectual development <. . .>.

<. . .> Many pedagogues-linguists, differing with Epstein, stated that the study of several languages differing from each other does not so much lead to inhibition of mental development as promote it and that the differences of two languages promote a better understanding of the native language. Evidence for this point of

view is usually the citation of the extremely interesting experiment of the French researcher-linguist, Ronget, who observed the development of his own child over a number of years. Ronget, the father of the child, was French and his mother, German. In the child's upbringing, an experiment was carried out strictly according to the principle: one person, one language. This meant that the father always spoke in French with his son and the mother, in German. Of all other people with whom the child came into contact, some spoke German and some spoke French, but they almost always observed the same principle: each person spoke with the child mainly in one language. The result of the experiment showed that the child acquired both languages in parallel and almost completely independently of each other. Parallel mastery of two language systems pertains to both the phonetic aspect of language and its grammatical and stylistic form. It is especially interesting that the sounds in different articulation systems were simultaneously acquired in the one and in the other. The history of speech development in the child could be observed as if it were separated and converted into two independent processes. All phases and stages that characterize the transition from the first sounds of prattling to formal, correct speech with all its peculiarities and different traits were observed in the same sequence with respect to both French and German, although at first, German, as the language of the mother, advanced somewhat more rapidly.

But the most remarkable result of the experiment was the far-reaching independence of the one language system from the other that developed in the child relatively early. He completely mastered both languages, and very early, an exceptionally interesting speech phenomenon was manifested when the child had to express one and the same idea in different languages to his mother and his father. When the father, speaking in French, sent him with some message to his mother, the child expressed the sense of the message in pure German so that there was no noticeable influence of translation from French in which the child had just received the message. For example, the father sent the child from his room to another because the room was cold and said in French: "Don't stay here; it's a little cold here, go there." The child went to the other room and told his mother in German: "It was a little cold in father's room."

The processes of using one language and the other go forward in the child without mixing or interference. Very rarely was there a transfer from one language to the other of word order and expressions and a literal translation of untranslatable words. Thus, alteration of the word order of an adjective following a noun that is characteristic for French was very rarely observed in the child. Of course, even here there is some mixing of elements of one language with the other, but especially important is the fact, established experimentally, that these mistakes and mixing are characteristic for children's language in general and are the exception rather than the rule. The child developed early a consciousness of having two languages. When both parents were present, he named separate objects in both languages and only later began to differentiate the languages, labeling them as speaking like mama and speaking like papa.

To the question as to whether such parallel assimilation of two languages did not interfere with speech and intellectual development of the child, Ronget answers in the negative most categorically.

Also remarkable is the fact that the child does double work in mastering both languages without any kind of delay in speech development and without any kind of noticeable additional work due to assimilating the second form of speech. As always, the experiment gives us clean results because of the artificial conditions in which our observations were made, and in this case, Ronget justifiably credits the success of the experiment to the strictly maintained principle: one person, one lan-

guage. Specifically this organization of speech activity of the child evidently protected him from interference and from mixing, from mutual damage to both languages. In another case of which Ronget told us, both the mother and father spoke to the child in different languages; this completely changed the whole course of speech development so that the child fully mastered both languages significantly later than normal children.

Including speech in a definite and stable situation is, evidently, an essential trait that facilitates the study of the second language, as Stern correctly notes in analyzing this case.

The question that Epstein raised is significantly broader than the answer that Ronget's experiment gives. In essence, he considers the problem from only one aspect: how does teaching a second language reflect in a favorable or unfavorable way on the development of the native language? But there is another no less important question that goes beyond language learning in the narrow sense of the word and pertains to the connection between the multilingual child and his thinking. As we have seen, in this respect Epstein reaches pessimistic conclusions. Polyglotism in his opinion is disastrous with respect to developing the child's thinking. This factor, inhibiting the mental development of the child, results in confusing concepts, in mistaken linking and combination of ideas, and in slowing and making the mental process as a whole more difficult.

Authors who go into the problem more deeply from the theoretical aspect stop when they approach pathological disturbances in speech and the difficulties in speech and thinking that a polyglot experiences. Neuropathologists indicate very interesting phenomena that they observe in polyglots with aphasia.

Sepp points to motor aphasia in polyglots as a notable example which leads to the conclusion on the dependence of localization of speech centers on the order of speech formation. A patient with damage to a certain segment of the cerebral cortex loses the ability to speak in his native language while he retains the ability to speak in a language that was used less and sometimes quite forgotten, which seems not only not to have faded away, but to be much more free and full than it was before the illness. He says that it is obvious that engrams of speech functions are localized in different places each time depending on the order of their formation.

In these facts we see two points that are most interesting for us. First, indicating the different localization of different language systems and the possibility of retaining one language while losing the ability to speak another, that is, new evidence in favor of the relative independence of each of the different language systems and, second, indicating that one of the language systems that is little used and forgotten, as if displaced by the other, acquires the potential for free development when the first is disrupted.

Thus we come to the conclusion that confirms Epstein's position with respect to the autonomic nature of the systems and their direct connection with thinking and with respect to their mutual functional conflict. Many contemporary researchers point to a number of cases where a sharp transition from one language to another or learning several languages simultaneously resulted in a pathological disturbance of speech activity.

<. . .> However, these approaches to pathological disturbances of speech are only an extreme development from quite widespread studies that do not bring the matter to such an extreme, but nevertheless come to conclusions that are not heartening with respect to the effect of polyglotism on the mental development of the child <. . .>.

Data presented thus far are a basis for a most important conclusion in regard to theory and practice. We see that the question of the effect of being bilingual on purity of development of the native language of the child and on his general intellectual development cannot be considered at present as being resolved. We see further that, in essence, it presents a very complex and controversial problem that will require special studies for its solution. Even now the development of this problem does not allow us to assume that it will have a simple and unequivocal resolution. On the contrary, all the data presented thus far indicate that its resolution will be extremely complex, depending on the age of the children, on the nature of the meeting of the one language with the other and, finally, what is most important, on the pedagogical effect on the development of the native and the foreign language. One thing that no one doubts is, specifically, that the two languages that the child masters do not collide with each other mechanically and are not subject to simple laws of mutual inhibition.

<. . .> The most serious deficiency of all the studies in this area done thus far, including Epstein's studies, is the methodological and theoretical insupportability of the premises in the light of which the authors pose and study this problem. For example, modern psychological studies in no way allow us to look at the relations between thinking and speech as the simple associative connection of two concepts for which the basic law is the law of mutual inhibition. Moreover, we must reject such an invalid premise since, together with it, Epstein's whole conception falls. The problem of thinking and speech leads the psychologist to conclusions that the great complexity of those connections and interdependences that are the basis of this higher and specifically human function are not measurable. Then the very complexity of this phenomenon must inevitably be taken into account. <. . .>

<. . .> An important consideration that we believe is also required and which is also the result of the critical review of previous research is that the whole problem of being bilingual must be treated dynamically, not statically, from the aspect of the development of the child. We think that from the scientific point of view, posing the problem as it is posed in the work of Epstein and other authors is insupportable. We must not ask whether being bilingual is always and everywhere favorable or inhibiting under all circumstances regardless of the concrete conditions in which the child is developing and of the patterns of that development which change at each age level.

For this reason, the transition to concrete study taking into account the whole aggregate of social factors of the child's intellectual development on the one hand, and the transition to genetic study that attempts to trace the fact with all its multifaceted qualities in the process of the child's development on the other—these are two rules that must obviously be mastered by our researchers.

Finally, the prerequisite condition for setting up general studies is the need in studying this problem to descend from the surface, from taking into account external traits and indicators, and to penetrate deeply, to take into account internal structures of the processes that are directly involved in speech development of the child. In one respect, extending the breadth and depth of the problem in this way has already been done in the process of developing previous studies and we had the opportunity above to show how this problem developed beyond the narrow limits of the initial setting up of the question.

The question of child polyglotism is now not only a question of the purity of the native language of the child depending on the influence of the second language. This question is only a part of a more complex and broader question that includes general teaching on speech development in the child in all the richness of the psychological content that is usually included in this concept. All the child's speech

development, not just the purity of his native language, all intellectual development of the child and, finally, the development of character and emotional development—all of this reflects the direct influence of speech. But if extending the problem in this direction is already recognized by former researchers, it is one of the areas of speech which still remains little explored and to which we would like to call attention in concluding this outline. It is the area of hidden speech influences.

It seems a naive idea that speech participates only in the activity of such functions that involve an outwardly pronounced word. All so-called verbal tests contain either verbal formulation of the problem presented or a solution that requires verbal formulation. These tests are usually contrasted with so-called mute or nonverbal tests that do not contain spoken instruction, or use it minimally, and the solution of which consists in a certain compensation of actions without outward use of speech. This naive notion assumes that when we exclude the outward use of speech by purely external means, we can exclude all influence of language on intellectual operations of the child and obtain intellect in its pure form not obscured by words.

Our studies have shown that this naive point of view cannot withstand experimental criticism. Actually, the solving of so-called mute tests requires as an indispensable internal condition the participation of speech in a double form. On the one hand, we have before us speech that is simply internal that replaces external speech. In solving the problem, the child is silent, but at the same time, he does not solve it without the help of speech. He only replaces the processes of external speech with processes of internal speech that, of course, differ qualitatively from external speech, but are still a more complex and higher degree in its development. Thus, the researcher, in introducing a mute test and thinking that by doing so he removes the participation of speech from the child's operation, actually without noticing it, introduces this speech in a cryptic form, in the form of internal speech, that is, in a form that is more difficult for the child. Thus, he is not facilitating, but making more difficult the speech part of the test, not eliminating the effect of speech, but setting higher requirements for the child's speech development, since it is more difficult for the child to solve the problem with internal speech than with external speech since internal speech is a higher level of speech development.

Another form of cryptic effects of speech is even more interesting. The mute test that requires logical, considered, complex action of the child may not include unfailing participation of internal speech or may involve it in the least significant degree. Nevertheless, the test places such requirements for this action which may be carried out only on the basis of a high development of the child's practical intellect. Studies in turn show that the development of a child's practical intellect occurs with the help of speech, and so if speech does not participate in solving a problem presented by a mute test immediately and directly at the time the problem is being solved, it participated in the past because it provided the conditions necessary for the development itself of the practical intellect of the child.

We must not forget the position that is basic to modern psychology of thinking that one researcher formulates in the following form. He says that knowing how to think like a human being without words is, in the final analysis, made possible only by speech. Thus, it is not easy to eliminate the factors of speech: when we push speech out the door, it comes in through the window, and researchers must not ignore the whole multifaceted and qualitative uniqueness of these various forms of the participation of speech in the intellectual operations of the child.

But the matter is not limited only to thinking and the practical intellect of the child. We have already spoken of how closely speech is connected with the right- or left-handedness of the child. It is possible that such dependences may also exist with respect to emotions and even to character. Previous investigators indicated

the dependence on speech of certain changes in emotional and character development in the child. There is every factual and theoretical basis for stating that not only intellectual development of the child, but also the formation of his character, emotions, and personality as a whole depend directly on speech and, consequently, we must disclose in one form or degree or another the connection between being mono- or bilingual and the child's speech development.

Thus the problem becomes broader and assumes the following form: being bilingual must be studied in all its breadth and in all its depth as it affects the whole mental development of the child's personality taken as a whole.

Only such an approach to the problem of being bilingual is justified with the present state of the theory on this question.

EPILOGUE

The third volume of *The Collected Works of L. S. Vygotsky* contains the basic theoretical studies on the general problems of the development of higher mental functions during childhood. It includes both the published first five chapters and unpublished material from his monograph, *"The History of the Development of Higher Mental Functions."* The part that was published earlier contains solutions to general problems in the development of mental functions, including a basis for the problem of development and methods of research and analysis of their general structure and genesis. In the chapters published for the first time, the general theoretical positions are specified using material on development of separate mental processes: attention, memory, thinking, development of speech and arithmetic operations, higher forms of voluntary behavior, and development of personality and world view of the child. Realizing the general theoretical positions, Vygotsky considers the development of concrete mental functions and forms of behavior as a dramatic process, converting innate, natural forms into cultural forms that develop when the child socializes with adults, mediating this process through the sign aspect of speech.

1

The central problem is formulating the subject of studying higher mental functions.

Determining the **subject of study** requires changing the traditional view of the process of mental development of the child. The difficulty "consists not so much in underdevelopment and novelty of the questions entering into it as in the one-sided and erroneous formulation of these questions, affected by all the factual material accumulated over the decades and by the inertia of erroneous interpretation . . ." (p. 2). In this basic and pointed way L. S. Vygotsky poses the problem of development of higher mental functions of the child.

What was the main error, the one-sidedness of his predecessors? It consists "primarily and mainly in an inability to look at these facts as facts of historical development, in the one-sided consideration of them as natural processes and formations, in merging and not distinguishing the natural and the cultural, the essential and the historical, the biological and the social in the mental development of the child; in short—in an incorrect basic understanding of the nature of the phenomena being studied" (p. 2). Thus, Vygotsky places the general problem of the mental development of the child in the context of the relation of biological and social, natural and historical, and innate and cultural, that is, in that context in which even now many problems still remain unresolved definitively. In such a setting up of the problem, Vygotsky sees not a special aspect of studying the problem of mental de-

velopment in children, but the general subject of research, the study of higher mental functions. Correspondingly, it might be said that real, innate, natural, and biological processes belong to lower mental functions and cultural, historical, and social processes belong to the higher. At the stage of research under consideration, for Vygotsky it was important to separate and even oppose the processes and phenomena described as differing in nature, as opposed to each other. This kind of formulation of the problem ensured its polemicism and distinctness. Sometimes it acted as a position directed against the innate, natural, biological, and real in human mental development.

Children's speech and drawing, reading and writing, developing mathematical operations and logical thinking, formation of concepts and world view of the child—this is far from a complete list of mental functions that belong to the higher mental functions and which, before the studies of Vygotsky, were considered in the works of psychologists to be complicated and natural.

Vygotsky sees the principal deficiency of the works of his precursors to be that in these works, the enumerated functions were considered mostly from their "innate aspect, from the aspect of the natural processes that formed them and were a part of them" (p. 2). Vygotsky notes as a deficiency the tendency to reduce more complex phenomena to simpler and more elementary phenomena. "Complex formations and processes were partitioned into component elements and no longer existed as wholes, as structures. They were reduced to processes of a more elementary order occupying a subordinate position and fulfilling a definite function with respect to the whole of which they were a part" (p. 2). As Vygotsky believes, with such an approach, there is inevitably a reduction of the complex to the simple, an unavoidable loss of specifically psychological, integral formations, of their unique patterns. We must keep in mind that specifically during the period of work over the manuscript, there was an intensive self-determination of psychology as a science, its separation from related sciences, a self-determination of materialistic psychology in a number of different schools of psychology.

For Vygotsky, these situations took on a sharply different aspect in formulating and solving the general problems of the mental development of the child. Characterizing the traditional point of view of mental development, Vygotsky formulates three basic positions on which it was based: a study of higher mental functions from the aspect of natural processes comprising it, reducing higher and complex processes to elementary, and ignoring specific features and patterns of cultural development of behavior. The main problem and basic criticism of Vygotsky with respect to traditional associative and objective (most of all, behaviorist) psychology is that the automatic formulation of these schools made it essentially impossible to study higher mental processes as would be appropriate to their psychological nature.

It is very important to understand that when Vygotsky compares higher and lower forms of behavior, he is looking for relations and transitions between them in the mental development of the child. " . . . The very concept of development of higher mental functions is foreign to child psychology . . . of necessity, it limits the concept of mental development of the child solely to the biological development of elementary functions that are directly dependent on maturation of the brain as a function of organic maturation of the child" (p. 6). In this situation, the idea of the need for "something other" than a biological understanding of the development of higher mental functions in man is clearly expressed. However, isolating theoretically the problems of studying higher mental functions, Vygotsky, in his polemical position, places in opposition the development of elementary and higher functions, of biological and cultural bases. Meanwhile, in a concrete analysis, he notes their mutual interchanges in all cases.

Beginning his own analysis, Vygotsky indicates the achievements in the direction of distinguishing and studying phenomena and processes that were called higher mental functions. He notes that in objective psychology (that is, in behaviorism and reflexology) there is only one differentiation of lower and higher forms of behavior: as innate and as acquired reactions. The latter are considered as habits. Empirical psychology presented every mental function as including "two stages." "Together with mechanical memory, logical memory was differentiated as its higher form, voluntary attention was added above involuntary attention, creative imagination was added above reproductive imagination, thinking in concepts rose as a second story above figurative thinking, lower feelings were symmetrically supplemented with higher feelings, impulsive volition, with foresight" (p. 6). This was the material for the point of departure that was reached in the preceding psychology which is the subject of Vygotsky's analysis.

In order to present the theoretical position and the basis of his own formulation of the problem more precisely, Vygotsky brings together three fundamental concepts previously considered to be separate: the concept of higher mental function, the concept of cultural development of behavior, and the concept of mastering the processes of one's own behavior. Thus, Vygotsky not only poses a new problem, but at the same time proposes a way of solving it that includes analysis of cultural development of behavior as historical and based on mastering the processes of one's own behavior. We must note that in a number of studies on Vygotsky, only one of the ways of solving the problem of development of higher mental functions—their cultural, historical development—was analyzed and emphasized; mastering processes of one's own behavior, which is another way connected with the first, was studied to a lesser extent. Another point must be made. Vygotsky considers and analyzes not only the simpler, but also the higher mental functions as forms of behavior. This kind of use of concepts corresponded to the total scientific context of the epoch in which the scientific conceptions of cultural-historical development of higher mental functions were being developed.

In formulating the problem of the development of higher mental functions as a new problem, Vygotsky was clearly aware of the complexity of its solution. He saw the primary difficulty specifically in the separation that developed and in trying to compare two types of sciences, the natural and the humanistic, which, respectively, study the lower and the higher mental functions. "The dualism of lower and higher levels, a metaphysical division of psychology into two levels, has its most extreme expression in the idea of dividing psychology into two separate and independent sciences: into physiological, natural-science, explanatory, or causal psychology[6] on the one hand and interpretive, descriptive or teleological psychology of the mind[8] as a basis of all humanistic sciences on the other" (p. 7). Vygotsky was clearly aware of the noted dualism and the presence of the opposite tendencies in science and tried to find ways to overcome them, but could not do this on the basis of the data of contemporary science. Vygotsky considered the position in psychology that developed at that time in the form of contrasting the indicated trends as a psychological crisis which led idealistic philosophy and the psychology based on it to reach a number of erroneous conclusions.

Dualism and the clearly expressed trends of the crisis in psychology even now divide modern psychology in other countries into two parts, in which psychology as a science of the mind opposes itself to psychology as a natural-science discipline.

Subsequently we will trace how and along which basic lines Vygotsky seeks to solve the problems posed and to overcome those contradictions that we noted between the two directions in psychology as a science of higher mental functions.

Thus, on the basis of theoretical analysis, Vygotsky carefully formulates his own historical approach to the study of higher mental functions; his task is to show the origin and development of these functions. In the general concept "development of higher mental functions," Vygotsky includes two groups of phenomena. "These are, first, the processes of mastering external materials of cultural development and thinking: language, writing, arithmetic, drawing; second, the processes of development of special higher mental functions not delimited and not determined with any degree of precision and in traditional psychology termed voluntary attention, logical memory, formation of concepts, etc. Both of these taken together also form that which we conditionally call the process of development of higher forms of the child's behavior" (p. 14).

The two indicated basic parts of higher mental functions, which, from Vygotsky's point of view, comprise the higher forms of behavior, have both common and special features of development. This necessary differentiation of two groups of phenomena is rarely made. Most often, the development of higher mental functions is considered as being accomplished according to a single common path that is most characteristic for the first group of phenomena, including writing, arithmetic, etc. The absence of this kind of differentiation may lead to errors in understanding Vygotsky's scientific views.

In solving the general problem of the historical approach to research, he included two aspects of individual, genetic development of the child, biological and cultural development, and in history, presented as two "stages" of the development of man, the biological, including evolution, which ensured the appearance of man as a special biological type (*Homo sapiens*), and the historical, which continued the preceding stage on the basis of its own historical laws. Differentiating the two stages and types of development indicated as fundamental, Vygotsky also depends on the idea that biological development of man as a separate species is fully completed and all subsequent progress is accomplished according to different laws. (Contemporary biology leaves this as an open question and considers the process of biological change of man to be continuous.) Defining the essence of this position, Vygotsky notes: "A wholly different type of adaptation in man, the development of his artificial organs, tools, and not a change in the organs and structure of the body, is of primary importance" (p. 16).

Vygotsky sees the general idea of comparing biological (evolutionary) and historical (cultural) development as two historical stages as a way to differentiate and uniquely contrast them as two types of development in ontogenesis as well. At the same time, Vygotsky distinctly realizes that under conditions of ontogenetic development both lines are in complex interaction. All the uniqueness, all the difficulty of the problem of development of higher mental functions of the child lies in the fact that both of these lines are merged in ontogenesis and actually form a single, although complex process.

Continuing the same line of discussion, Vygotsky cites the concrete and quite common example of the development of activity in the child in which such a major change in development as the use of tools occurs. Formerly, child psychology, including that of Bühler, noted this fact and the transition as a major modification of behavior. But for Vygotsky, the most important point in this transition was not the transition itself but the fact that it did not change the preceding form of activity, but merged with it. "All the uniqueness of a transition from one system of activity (animal) to another (human) made by a child consists in the fact that the one system does not simply replace the other, but both systems develop simultaneously and together: a fact which is unlike any other in the history of the development of animals or in the history of the development of man" (p. 21).

"The process of cultural development of child behavior on the whole and development of each separate mental function is completely analogous to the example given in the sense that each mental function in its time goes beyond the limits of the organic system of activity proper to it and begins its cultural development with limits of a completely different system of activity, but both systems develop jointly and are merged to form an interlacing of two essentially different genetic processes" (pp. 21-22).

Thus, for Vygotsky the main problem and subject for study in order to understand the "interlacing" of the two types of processes is to trace their concrete uniqueness at each step of development, to disclose the age and individual-typological picture of development at each of the stages and with respect to each higher mental function. The difficulty for Vygotsky is not to trace and understand the separate process of cultural development, but to understand its features in a complex interlacing of processes.

Particularly significant is Vygotsky's determination of the relations between the biological and the cultural at different stages of ontogenesis and in concrete manifestations, for example, in various cases of deviation from normal development, that is, with one defect or another in "biological" development. To solve this problem, Vygotsky proceeds from the idea of the historical development of higher mental functions in which both processes are the result of a common historical development of humanity and the higher processes and functions are a unique continuation of preceding "natural" forms.

2

For Vygotsky, **determining the subject of study** was inseparably connected with **searching for a new method of experimenting** and determining its structure and separable units of analysis. The problem of research method occupied Vygotsky in solving every problem that confronted him and was resolved from various aspects: the historical, genetic, experimental, and didactic. We are now interested in the most adequate description of this method as it is presented by Vygotsky himself on the basis of the classical examples he presented which form unique models for studying the development of higher mental functions.

The development of a new research method as found in the thinking of Vygotsky was accomplished by means of contrasting it with the common method of experimentation based on theoretical positions of classical behaviorism and expressed in the theoretical and experimental pattern of stimulus–response. The method that Vygotsky considers as universal was equally accepted in various divisions of psychological science and was actually used in experiments in all basic schools of experimental psychology. It was used in psychophysics and psychophysiology, in animal psychology and child psychology, and in various divisions of general psychology for the study of perception and attention, memory and thinking. Concrete specific variations of this method as an experimental model consisted only in a sequential increase in complexity of the stimulus series and analysis of a correspondingly increasing system of reactions that grew into various types of behavior. As Vygotsky noted, in this respect, psychology did not know the principal difference between the method of studying lower, elementary and higher, complex processes and functions.

The first and most general feature of higher mental functions is that they represent another class of activity of the subject characteristic only of man. This class of activity differs, according to Vygotsky, by the fact that it assumes mediated in-

teraction between man and nature and includes real activity not elicited by a stimulus alone. The most convincing model of this type of activity that characterizes the appearance and realization of higher mental functions is the "situation of Buridan's ass." This situation, described by Vygotsky, is classical in many respects. First, it presents the possibility of comparing a simple "two-stimulus" situation that determines some act of behavior with another, strictly intellectual situation, which psychologists now describe as an indeterminate situation or as a problematic situation. Second, this situation presents the possibility of intellectual behavior that includes a transformation of it so that it becomes a solved situation that ensures adequate behavior. In this situation, Vygotsky is interested mainly in the system of means that make it possible to transform (solve) the situation that developed. According to Vygotsky, the means that man uses to transform (solve) the given situation are dice.

The essence of the change that occurs in the structure of behavior consisting of a transition from a lower to a higher form is that man introduces into a complex stimulus situation a new system of neutral stimuli that play the role of stimuli-means. Thus, the main characteristic of the principal change that takes place, which is a model of research of higher mental functions and the principal way in which they develop, is that the lower mental functions begin to be mediated by a new system of stimuli-means that carry out a new function in the organization of behavior.

We note that at this stage of development of psychology, Vygotsky himself, deviating from the model of stimulus–response as being inadequate, could not finally reject it. He was forced, like many of his contemporaries, to think and to conduct research within the framework of this same original model, changing it in the indicated link: the means of transforming the situation (stimulus situation) and the means of controlling reactions.

This formula, traditional at the time, allowed Vygotsky, on the one hand, to pose substantial problems of its transformation and to introduce limitations into it and, on the other hand, acted as an obstacle to further development of his own theoretical conception. Vygotsky undoubtedly took an important step forward toward disclosing the specifics of higher, uniquely human forms of behavior that allowed him even on the indicated limited basis to present completely anew one of the aspects of human behavior. Thus, two important positions characterize the model of higher behavior under consideration: first, the creation and inclusion in behavior of artificial, special stimuli-means, and second, the use of these means for controlling one's own behavior. The step forward consisted in introducing stimuli-means for controlling behavior, but it was taken on paths using a common pattern of stimulus–response.

In the same way, Vygotsky analyzes the second principal case, the use of auxiliary means ("knots for memory") for voluntary remembering. In contrast to involuntary memory, voluntary memory is characterized by the fact that the person uses special auxiliary stimuli-means in order to remember and reproduce, that is, to control the process of memory. "If in the first case, remembering was wholly determined by the principle of stimulus–response, then in the second case, the activity of the man hearing the speech and memorizing it by means of notches on wood is a unique activity consisting in creating artificial stimuli and in mastering his own processes by means of the notches; it is based on a completely different principle" (p. 51). Together with the general principle inherent in the first and second models, there is a difference between them: in the first case, the stimulus-means (in the form of a die) is introduced to control behavior and in the second, to control process (memory). This difference is important in subsequent analysis of transitions

from natural to higher mental functions and for understanding the main structure of higher mental functions.

Artificially produced stimuli-means used by a person to control his behavior differ mainly from all other types of stimuli that directly elicit and determine behavior. They differ from other stimuli also in origin and in function. For a more precise definition, Vygotsky calls them signs. Thus, stimuli-means acquire not only a new verbal designation, but also a new psychological characteristic. "According to our determination, every conditioned stimulus created artificially by man that is a means of mastering behavior—that of another or one's own—is a sign. Two points are therefore essential for the concept of a sign: its origin and its function" (p. 54). Together with including the sign as a means of denotation and a means of controlling behavior, the structure of higher mental functions begins to be subject to a new principle, signification, together with the principle of signaling (stimulation). "Man introduces artificial stimuli, signifies behavior, and with signs, acting externally, creates new connections in the brain. Together with assuming this, we shall tentatively introduce into our research a new regulatory principle of behavior, a new concept of determinacy of human reaction which consists of the fact that man creates connections in the brain from outside, controls the brain and through it, his own body" (p. 55).

The appearance and development of this second principle of regulating behavior is based on two main prerequisites: first, on the signalizing mental regulation that appeared in the course of development, and second, on the system of sign regulation of behavior that appeared in the course of historical development. Vygotsky systematically stresses two positions that he finds significant: the social aspect and the sign aspect of the new principle of regulating higher mental functions.

From Vygotsky's point of view, the new principle of behavior that developed not only is a means of regulation, but also acts as a principle of "social determination of behavior carried out with the aid of signs" (p. 56). Thus, the sound trend of Vygotsky toward disclosing specific human methods of regulating activity and behavior led him to a one-sided presentation of sign determination, and as a result of this, the general problem of factors of social determination in the development and structure of higher mental functions of man was expressed through their sign mediation. Naturally, in this case, other factors of social history formed in Marxist philosophy were still not recognized and realized by Vygotsky in his theory on the origin and development of specific human higher mental forms. We must, of course, remember that Vygotsky notes and stresses the role of society in determining mental development of man, but in this case, what is meant specifically is the indicated form of realization of community and the social determination of the origin and development of the mind of man. "Not nature, but society must, in the first place, be considered as a determining factor of human behavior. This is the whole idea of cultural development of the child" (p. 59).

The most important significance of the models of the structure of higher mental functions considered above consists not just in the potential for external control of one form or another of behavior. There is another aspect of this process that has a more important significance for understanding the conditions and form of mental development of higher mental processes. The essence of the change achieved at the level of another type of mental regulation consists of "taking" it outside the mental process, implementing it with the aid of other means (signs) in an external form. " . . . Man, in essence, constructs externally a process of remembering, an external object compels him to remember, that is, he reminds himself through an external object and, in this way, carries out a process of remembering as if externally, converting it to external activity" (p. 59). In a commentary on Vygotsky's

studies, it is right to stress the significance of transforming the external into the internal considered as a process of interiorization of the forms of activity that have developed. The position cited above shows a somewhat different aspect and a somewhat different sense in the relation between external and internal forms of mental processes. Making the process external indicates accomplishing the process with the aid of other means, auxiliary stimuli-means, signs that mediate the process of remembering and of subsequent reproduction. The external form of accomplishing the process is accomplishing the same process with the aid of auxiliary means. Thus, external and internal accomplishing of one process or another differ in the means of its accomplishing and not by the presence or absence of the process as a mental process. The process accomplished externally is the same mental process (memory, thinking, etc.) but is done with the help of additional, auxiliary means.

3

In formulating the principle of studying higher mental functions, Vygotsky simultaneously formulates the principles of scientific analysis of psychological facts. This sets the approach to the development of the **problem of scientific psychological thinking**. Three basic principles characterize and comprise the more important requirements of scientific psychological thinking: analysis of the psychological as a process; explanatory (causal-dynamic) and not descriptive analysis; genetic analysis that allows reestablishment of any form of behavior or function that develops. These principles together comprise a unified approach to studying and interpreting higher mental functions. At the same time, they act as principles of genetic and experimental study of higher mental processes. Each of the indicated principles is seemingly merged with the others and in this way ensures the possibility of genetic, process-related, causal-dynamic analysis of higher mental functions. The need to formulate special principles for analysis of higher mental functions is stipulated by the fact that, with respect to them, either methods of analysis and study of simpler mental processes were applied without a basis, or scientific analysis was limited to describing these higher processes, which actually led to denying understanding the mental as process and rejecting study of the causal dependence of higher mental processes and functions.

Each of the noted requirements of scientific analysis is essential. Moreover, we may note that for Vygotsky, all of these requirements were connected primarily with the genetic principle. For this reason, Vygotsky's own internal striving was to understand both the process and the causal-dynamic relations through genetic relations that provided understanding or experimental reproduction of the original (not the derivative) processes, through a genetic reestablishment of primary causal-dynamic relations that determined the appearance and development of certain psychological structures and forms of behavior. " . . . The method we use may be called an experimental-genetic method in the sense that it artificially elicits and creates a genetic process of mental development. Now we may say that the basic problem of the dynamic analysis that we have in mind is also contained in this. If we replace analysis of things with analysis of process, then the basic problem for consideration naturally becomes the genetic restoration of all the instances of development of the given process. Here, the principal task of analysis is restoring the process to its initial stage or, in other words, converting a thing into a process" (p. 68). Vygotsky notes that the task of such analysis is to present every higher form of behavior as a process of its establishment in order to find not its separate elements, but to disclose all the fundamental instances of the establishment of the higher form of behavior as a process.

Describing the second principle of analysis, the need to disclose and study the causal-dynamic relations that ensure the possibility of explaining and not just describing some higher forms of behavior that develop, Vygotsky compares the descriptive approach with the phenotypic and the causal-dynamic (explanatory) with the genetic. "Under genetic consideration of the problem, we will understand disclosure of its genesis, its causal-dynamic bases. Under phenotypic consideration, we will understand analysis that is based on directly presented traits and external manifestations of the object" (p. 69). Meanwhile, the method of psychological analysis formulated does not reject and does not eliminate the need for analysis and explanation of the phenotypic features and patterns of the mental process that developed. What is new is that these features now must be understood as determined by the origin of these processes, that is, as dependent on their genesis.

Vygotsky links the third principle, his genetic principle of scientific analysis, with the need to disclose the origin of historically developed forms of behavior and mental processes. This includes primarily such processes as are described in psychology as automatized. In this case, relations between the form of implementing processes of different levels most often seem to change places: voluntary processes precede involuntary. What has become automatic appears here as the result of preceding development.

To illustrate, Vygotsky cites the example of converting voluntary attention to involuntary attention, considered by Titchener to be a third stage in the development of attention. At this stage of his research, Vygotsky does not pose the question of psychological patterns or mechanisms of transition from one form to another; the main thing for him is the principle itself that requires understanding the transition from the third phase to the first. We know that most often in analyzing similar positions of Vygotsky, only two phases (or two stages) of transition are considered: from the external, voluntary, to the internal, involuntary. From Vygotsky's point of view, this is a process of transition to the same type of mental process that is accomplished according to the laws of the primary forms. These positions of Vygotsky have not yet been adequately analyzed.

How can the form of reacting that has developed be transformed into a process? For example, how can the automatic selection reaction or any other complex reaction be analyzed into a process? The question Vygotsky poses has important significance for experimental psychology and for a more adequate understanding of the way in which the scientist approaches the development of experimental study of the mental process. For these purposes, Vygotsky considers it possible to use two basic devices: the device of difficulty, which prevents the implementation of some activity or carrying out a reaction automatically, and the device of pointing out, which includes means for carrying out the reaction or implementing the action. It is remarkable—and Vygotsky notes this—that in the case of difficulty, the process begins and is carried out as a search or as recollecting and it may be implemented with the help of questions asked of the experimenter. This process of "seeking" to reestablish the initial link of the reaction or action has not yet been sufficiently studied. It is possible that this is due to the fact that Vygotsky to a large extent and in great detail considered the second link of this process, which included using auxiliary means, and the first link was just noted and left without adequate analysis.

4

Vygotsky may have focused his analysis of the traditional point of view of the **problem of construction and development of higher mental functions** on isolating

the mediating quality (the tool or sign aspects) of higher mental functions and on their social origin and development through interiorization. From the very beginning, Vygotsky considers it necessary to reestablish the basic definition of the lower (natural) and higher mental functions. "We will term the first structures primitive; this is a natural psychological whole that depends mainly on the biological features of the mind. The second, arising in the process of cultural development, we will term higher structures (p. 83) . . . New structures that we contrast with lower or primitive structures differ mainly in that direct fusion of stimuli and reactions into a single complex seems to be disrupted . . . . Between the stimulus to which behavior is directed and the person's reaction, a new intermediate member intervenes and the whole operation assumes the character of a mediated act" (p. 84). Because of this mediation, there is a mastery of processes of one's own behavior, that is, a mastery of those processes that formerly were of a natural character. In the case under consideration, "man himself creates the connection and ways for his reacting; he reconstructs the natural structure; with the help of signs, he subordinates to his will processes of his own behavior" (p. 86). This determination and differentiation of lower and higher mental functions appears as most essential in an analysis of the processes of transition from the one into the other. Based on isolating the sign as a main element that ensures the possibility of reconstructing the lower function into the higher, Vygotsky formulates with complete clarity the position of development that he defines as the natural history of signs. Here, neither the approaches in which the process of mental development included the possibilities of subjective discoveries nor the approaches that proposed the formation of habits were considered as ensuring the possibility of understanding and analyzing cultural development.

The problem of development of higher mental functions in this case currently appears in a different form: as a process of assimilating forms of behavior that developed and were cultivated in the history of society and a process that acts primarily as a "history of the development of signs."

Based on Janet's conception of mental development, Vygotsky considers this process as the most general law of mental development of the child. "The essence of this law is that in the process of development, the child begins to apply the same forms of behavior to himself that others initially applied to him. The child himself assimilates the social forms of behavior and transfers them to himself" (p. 102). Later this law of development is formulated completely precisely: "If we take this law into account, it becomes absolutely clear why everything that is internal in higher mental functions was formerly external. If it is true that the sign is initially a means of socializing and only later becomes a means of behavior of the individual, then it is absolutely clear that cultural development is based on the use of signs and that including them in the whole system of behavior occurred initially in a social, external form" (p. 103). Formulating these positions on the social determination of the mind as being sign-mediated allowed Vygotsky to mark the line of studying the operational structure of higher mental functions, but limited the possibility of studying mental processes, states, etc.

Thus, with respect to analysis of the mental development of the child, Vygotsky formulates the position that the process of this development is accomplished as a transition from the external (social) to the internal (mental); the means of socializing appear as means of behavior and the structure of higher mental functions corresponds to the structure of relations between people, "verbal thinking represents the transfer of speech inward" and "deliberation is a transfer of argument inward."

The common psychological "mechanism" for forming and developing higher mental functions is imitation, which ensures assimilating separate functions among people. Considering this aspect of the social determination and the structure of higher mental functions in detail, Vygotsky formulates the positions stated as a law of cultural development of higher mental functions: "Every function in the cultural development of the child appears on the stage twice, in two planes, first, the social, then the psychological, first between people as an intermental category, then within the child as an intramental category" (p. 106). "All higher mental functions are the essence of internalized relations of a social order, a basis for the social structure of the individual. Their composition, genetic structure, method of action—in a word, their entire nature—is social; even in being transformed into mental processes, they remain quasisocial. Man as an individual maintains the functions of socializing" (p. 106).

The development of higher mental functions is not only socially determined, but higher mental functions in their content are social and individual—this is an assimilated social quality. Concretely, with respect to individual mental development of the child, this means that psychology must study not individual development of the child in the group, but the transformation of group relations into individual, personal characteristics of the child. "The usual question is how does one child or another behave in a group. We ask how does the group create higher mental functions in one child or another" (p. 107). Stressing this sociogenetic aspect that is fundamental to the position he developed, Vygotsky contrasts sharply the relations between the social and the individual, the internal and the external. With this sharp contrast, which suits Vygotsky's style of scientific polemic thinking, these positions themselves begin to be controversial since they express to a large extent one of the main aspects, but not the real complex process of the development of higher mental functions.

As we have noted, Vygotsky presents this process of development of higher mental functions as a process of mastering one's own behavior. In the case under consideration, this process appears not only as assimilating "external" forms of behavior, but also as mastering one's own processes and forms of behavior. " . . . . At the higher stage of development, man begins to control his own behavior, subjects his own reactions to his own control. Just as he controls the actions of outside forces of nature, he also controls his own processes of behavior on the basis of the natural laws of behavior" (p. 112).

Thus, in studying the structure and development of higher mental functions, Vygotsky formulated two basic principles: (1) higher mental functions arise as a result of their interiorization; (2) they develop as mastery of natural, innate processes and forms of behavior in accordance with their own laws. Correlation and realization of both principles pose significant difficulties.

The difficulty arising in the theory is simultaneously a contradiction, insufficiently realized by Vygotsky himself, that, when considered with one-sided emphasis on one aspect or another, subsequently led to sharp discussions of the positions of the author in solving the problem of development of higher mental functions. This contradiction was also sharply expressed in the solution to the problem of development of concrete mental processes and forms of activity and behavior.

5

The section on **the development of separate mental processes and forms of behavior** contains concrete material that continues analysis of the problem of the

development of higher mental functions. This material makes possible a more complete presentation and understanding of the realization of general positions of the study as well as the formation in training and cultivating the higher forms of behavior and mastering the basic mental processes that Vygotsky considered in greater detail. The material published for the first time can be arbitrarily combined in three basic sections: development of speech and arithmetical operations; development of cognitive processes, including attention, memory, and thinking; and development of higher forms of behavior, world view, and personality.

Development of speech and arithmetical operations. Development of oral and written language is a special subject of study. In a more complete and precise form, it permits the expression of basic characteristics of the process of development of higher mental functions. Speech is a higher mental function that serves as a means of communication and acts as a major social link mediating all higher mental functions and forms of behavior in development. At the same time, speech in individual development passes through very typical stages: from a reflex cry to extended forms of oral and written speech and later, internal speech and direct understanding of text presented in the act of reading. Carefully tracing the development of speech, Vygotsky tried to show both special as well as general features that characterize the development of higher mental functions.

The process of developing oral speech begins with an innate, natural reaction. It appears and develops according to the general type of development of the reflex form of behavior. However, even during the first year of life, vocal reaction begins to fulfill two basic functions: expressive, characterizing a change in emotional state of the organism, and the function of social contact. The second function leaves its mark on all subsequent development. One of the more important aspects of this development of speech is the relation of speech to thinking. At the first stage of development, speech fulfills only the expressive function and is reflexive; it develops "independently" of thinking. "Thus, there is no doubt that the first phase in the development of children's speech is not related at all to the development of children's thinking; it is not connected with the development of the intellectual processes in the child" (p. 123). Similarly, thinking in the child develops at an early age regardless of speech. When the child is one and a half to two years of age, there occurs a kind of intersection, a meeting of thinking and speech. After this, "speech becomes intellectual, connected with thinking, thinking becomes verbal and connected with speech" (pp. 123-124).

Following Stern, Vygotsky notes three points as the main bases for such a singling out and characterization of the new stage in the development of speech and thinking: a jumpwise increase in vocabulary, the appearance of first questions, and the beginning of active extension of vocabulary. The child seems to discover for himself the relation between sign and meaning; he establishes that every object has its own name. Here, as Vygotsky believes, "the word standing for the thing becomes as if the property of the thing itself" (p. 126). In this way, Vygotsky, in considering the child incapable of making the indicated "discovery," contradicts Stern. In all subsequent cases, Vygotsky will object sharply to "discoveries" by a child, considering that discoveries are possible only at quite high stages of the development of thinking. He considers the extension of vocabulary at this stage as a sequential assimilation of it.

The development of written language is even more representative of a process of assimilation accomplished under conditions of and with the help of special training. The greatest difficulty and main inadequacy in teaching written language is reducing this process to training in which the written language itself is considered only as a complex motor habit. Vygotsky believes that "the development of written

language belongs to the first, most obvious line of cultural development because it is connected with the mastery of an external system of means developed and created in the process of cultural development of humanity" (p. 133). Specifically for this reason, from the very beginning, Vygotsky considers mastery of written language as a process of mastering a social form of behavior developed during the history of man. With this goal, Vygotsky carefully traces the connections of written language with other similar means that preceded it. These include the gesture of the child.

It is Vygotsky's opinion that two instances connect the gesture with written language: children's scribbling and the symbolic function of objects in children's play. "In this way, a child's symbolic play may, from this point of view, be understood as a very complex system of speech aided by gestures that supplement and indicate the meaning of individual toys" (p. 135). Vygotsky calls this use of gestures in play object speech. Further development includes sequential transitions and replacing some methods of designation with others. "The child gradually converts the nondifferentiated marks into indicating signs; the symbolic lines and scribbles are replaced by figures and pictures and the latter yield to signs" (p. 141). However, for transition to written language, the child must attain "symbolism of the second order which consists of using written signs for oral symbols of words" (p. 142). Written language comprises an important link in the general speech system. Mastering written language assumes the establishment of complex connections of written language with oral language and the establishment of a two-sided connection, writing–reading. Corresponding to the conception he developed, Vygotsky considers the process of formation of writing and reading genetically, including in the process the transitional link that comprises abbreviation of extended forms of reading and which ensures the possibility of "silent" reading. "Understanding written language is done through oral speech, but gradually this path is shortened, the intermediate link in the form of oral speech drops away, and written language becomes a direct symbol just as understandable as oral speech" (p. 142).

Thus, establishing the higher forms of reading, including seeming direct understanding, is accomplished through abbreviation (dropping out) of intermediate links that were necessary during the process of assimilation. It must be noted that Vygotsky did not interpret this form as "revolution"; he analyzes it as a shortening of auxiliary links, their exclusion from a complex process as a result of which the process of understanding acquires the form of a simple direct act.

As in the process of acquiring speech, in the development of arithmetical operations, the main question is studying the patterns of transition from "natural" to "cultural" arithmetic, from direct to mediated counting. In this case, Vygotsky also notes that there is "a transition from direct perception of number to mediated perception, to the child's beginning to compare numbers to certain signs and to operating with these signs" (p. 150). On the whole, in solving problems on psychological patterns of development of arithmetical operations in the child, Vygotsky sequentially and precisely shows the need for "converting" the child from "natural" to "cultural" arithmetic, the need for mastering number systems that do not coincide with natural conceptions of number and methods of counting.

Analysis of the development of speech and arithmetical operations showed ways of realizing the general positions of the cultural-historical approach to understanding and studying these processes in the child. What these processes have in common is the need to make a transition from natural reactions to historically developed, cultural reactions that assume the use of sign forms of mediating speech and counting. The process itself of developing new cultural forms passes through specific stages that include not only mastering behavior through mediated methods, but also subsequently excluding these forms, which results in the process of reading

itself acquiring the form of a direct process from which the system of sign mediation is excluded.

The development of cognitive processes. In contrast to processes of assimilating specially developed means of behavior (speech, counting), cognitive processes (attention, memory, thinking) do not have similar equivalents precisely represented in social life. For this reason, specifically in analysis of the psychological structure of mental processes themselves, Vygotsky presents a more precise formulation of his theoretical position and approach to understanding their development in childhood as mastery of these processes: "mastery" of attention, memory, thinking. The transition to higher levels of development of mental processes occurs in this case not only as assimilation of "cultural" forms of behavior, but also as sequential change in type of mental regulation in the mental processes themselves. As in the analysis of development of other higher mental functions, Vygotsky isolates their "natural" and "higher" form.

The basis of "natural" forms of attention, according to Vygotsky, is the separate dominant foci of excitation that determine the primary directions of behavior. Corresponding patterns that determine the appearance, functioning, and development of attention are especially characteristic for the very early age, but also appear at all subsequent stages of human life. Another line is the line of cultural development of attention that includes mastering the process with the aid of stimuli-means that make it possible to transfer the internal process of attention to external behavior and to control the process in this way. These cases of transition to a higher level of attention are also described as an intellectual method of carrying out tasks that are placed before the child. In all cases of doing complex problems that require voluntary attention, the child is actually required to solve the problems as intellectual problems. It is completely natural that he solves them using intellectual, thinking methods and means.

As in other mental processes, in the development of memory Vygotsky also isolates two basic forms, the real (natural) and the cultural. He writes: "In our studies, we tried to compare directly the two types of memory, the two methods of remembering, and to elucidate by comparative analysis the elementary composition of both operations, their structures and genesis" (p. 180). According to patterns, natural memory coincides with physiological processes, and cultural memory is assimilated in the process of developing a system of means of remembering.

In studying memory, Vygotsky tries to present the transition from natural to cultural remembering under conditions of child development not just as the use of additional means (mnemotechnical) that provide the possibility of mediated remembering. Vygotsky interprets this as a change in the movement of nerve processes aided by the stimuli used that appear in the role of means of remembering. "Whoever observed the direct transition from the natural method of remembering to the mnemotechnical cannot help but have the impression that he has seen a seemingly experimentally elicited change from innate to cultural memory ... mnemotechnical remembering introduces a certain new, initially neutral stimulus-card that plays the role of a mnemotechnical sign and directs the course of nerve connections along a new path replacing one nerve connection with two new connections" (pp. 181). Thus, Vygotsky connects the process of formation of a new type of remembering with a special type of controlling nerve processes that are mediated by introduced signs as means of remembering. Cultural, voluntary remembering appears in relation to natural remembering in such a way that it is one of the methods of controlling natural processes, including physiological processes.

Meanwhile, the process of development of voluntary memory presupposes its sequential intellectualization. "If in the first case, we dealt with the effect of the

mnema, remembering in the organic sense of the word, then in the second case, the child replaces direct remembering with such operations as comparison, isolating the common factor, imagination, etc." (p. 182). Vygotsky considers these intellectual operations as means of remembering that provide both sense transformations of the material and its new structuring and make possible voluntary remembering and reproducing. Thus, the process of developing memory in childhood on the basis of finding means for remembering proceeds along two main lines: along the line of using intellectual means and along the line of increasing volition.

For Vygotsky, most important in the analysis of this process of development is the problem of sequential transitions from some types of memory to others. They comprise four basic stages in the development of memory characterizing the general genetic pattern of development of higher mental functions. In keeping with this pattern, "at the beginning of the development of memory there is a purely mechanical remembering corresponding in our diagram to the primitive stage in the development of any function" (p. 187) . . . "This is followed by a stage of naive psychology in the application of memory . . . . Next follows the stage of external mnemotechnical remembering that alternates with the stage of turning inward or logical memory" (p. 187). Analyzing the general stages of the development of memory, Vygotsky considers them not as simple age-related changes, but as a process included in the general mental and intellectual development of man and occurring under conditions of training and education. It must also be noted that in studying these changes that comprise the stages of development of memory, Vygotsky was the first to propose a theoretical plan of analyzing and explaining various mnemotechnical means for remembering that were quite popular at that time. In these extremely various, empirically developed mnemotechnical devices and means, Vygotsky sees one of the links in the cultural development of memory and the means as well for controlling the memory of the adult.

Considering the problem of Vygotsky's research on the development of speech and thinking, we must keep in mind the understanding that he contributed to characterizing the process of thinking, which is a special type of habit that ensures the creation of new combinations of images, concepts, relations, etc. Thinking may occur in two forms: in the form of practical action (or operating with concrete images) and in a verbal form. The relations between the one form and the other are the main problem for research. We might express it in other words. The carrying out of any difficult practical action sets up practical, natural thinking, and its "verbal implementation," that is, the verbal accomplishment of this action, sets up thinking in the true sense of the word, cultural thinking. Thus, even in the analysis of the processes of development of the child's thinking, the main thing for Vygotsky is explaining the relation between thinking with the aid of practical action and thinking done with the help of speech—oral or written, external or internal. Vygotsky compares the transition from different forms of practical action to verbal implementation of actions to using tools, that is, to the change in methods of transforming some situations. In the study itself of thinking, its operational components are most clearly expressed.

Studying the relations between speech and thinking at various stages of development, Vygotsky formulates a general and fundamental position on the fact that all the various types of practical, actual solving of problems precede the verbal forms and the general position that with more complicated problems or in situations that are more or less difficult for the child, there is always a transition to a lower level of solving the problem, that is, from the verbal form of solving to the practical form or from solving the problem in written form to using oral expression. Thus, the transition to using simpler, that is, practical, methods of solving problems makes

it possible, on the one hand, to open significantly greater possibilities to the child, and on the other, to use this device as a special means for developing a verbal plan for carrying out various actions in different training situations.

Vygotsky gives a precise presentation of the general plan for developing relations between speech and thinking, for example, in an analysis of the relation of speech and drawing. "In all areas of the child's activity we find the same sequence. The same thing happens also in drawing. The small child usually draws first, then speaks; at the next stage, the child talks about what he is drawing, at first about parts of the drawing; finally the last stage is formed: the child first says what he will draw, then he draws it" (p. 201). The thinking of the child changes in the same way when he tells a story from a picture with difficulty but can use and reproduce the whole system of action from the picture under conditions of dramatizing, that is, in real action.

The development of voluntary behavior and world view of the personality. We have already noted the principal significance for the process of developing higher mental functions of the mechanism of mastering mental processes and elementary reactions as a prerequisite for the transformation of natural forms of behavior into cultural forms. The most typical manifestation of this psychological mechanism in the development of behavior is the establishment of voluntary behavior, the possibilities for accomplishing voluntary acts, making decisions, etc. This type of behavior, according to Vygotsky, is one of the most complex as well as the most general cases of development of higher forms of behavior, and it is an important link in the development of personality.

The most typical situation that allows one to trace the features of the structure of the voluntary act and the process of its establishment is the situation of selection. Previously, we noted Vygotsky's use of this situation for analyzing the general principles of higher mental functions. The situation of opposing stimuli (the situation of Buridan's ass) pertained to this when the die acted as a means of reaching a decision. However, in all similar situations, it was necessary to make a selection between external stimuli. The child solved such problems in situations of voluntary attention with the aid of a pointing gesture, and in a situation of voluntary remembering, with the aid of mnemotechnical devices and signs as means. In the case of the voluntary act, the situation of selection pertains not to external stimuli, but to internal states that require making a decision. "This is free choice between two possibilities determined not externally, but from within by the child himself" (p. 207).

In the experiments that were carried out, the main thing was how the use of an external stimulus-means transforms the internal behavior of the child. In all experimental situations, the main thing was not how the child "invents," creates one means or another for solving the problem, but how he uses the ready means proposed to him. "Sometimes we were able to observe how the subject uses the die or some other device of this type completely independently, but since our main task was not to study inventiveness of the child but the process of selection using a die ... We resorted to the device we used repeatedly: direct proposal that the child use the appropriate device" (p. 208). This point subsequently became one of the controversial points between representatives of Vygotsky's school and representatives of other scientific schools in Soviet psychology. The question is specifically what kind of role in mental development of the child does active "discovery" have in the means and methods of solving problems that he has assimilated and uses. It was noted that only in cases of active creative assimilation and use of a new means did the child move to a higher level of mental development, but a formal use of ready means did not ensure this development. However, at the stage of

research considered, these controversial problems were not yet posed. It seemed that any use of ready means ensures attaining higher levels in the mental development of the child.

What is the psychological mechanism of the process of selection accomplished with the help of external means? How can the psychological changes that occur in a situation of selecting between two opposite motives be explained? Vygotsky believed that the use of external means in this situation represents not only solving an intellectual problem, but primarily the creation of a new external motive in which a die or card or sign, etc., are the external means. "The child resorts to a die and introduces into the situation new stimuli that are completely neutral in comparison with the whole situation and ascribes to them the force of motives. He decides in advance that if the die turns black side up, he will choose one series and if it turns white side up, the other series. In this way, the choice is made in advance" (p. 209-210). That is, in this process, a connection is established between the "desired" object (cup, number, etc.) that acts as a primary, higher motive and the color of the side of the die. As a result, the side of the die acquires the function of motive taken outside and used to guide the subject's behavior in solving a problem of choice. Here the means used has two functions: it is a means of intellectual solving of a complex intellectual problem and it is a means of "objectifying" an internal motivation, taking it out into a system of external stimulation subject to changes and control.

It is possible that these ideas of Vygotsky will serve in the future as a basis for a theory of motivation as an objectification of needs (see A. N. Leont'ev: *Problems of Mental Development*, Moscow, 1959, pp. 431-445). Meanwhile we must keep in mind that the position on external objectification of motivation has been discussed more than once, that for Vygotsky the external object that a person uses in the role of a motive is an additional stimulus, that is, that the motive-stimulus is added to the preceding basic stimulus and in this way ensures the possibility of mastering one's own behavior. " . . . I, myself, through a signal and a connection with it, got up, that is, I controlled my behavior through an auxiliary stimulus or an auxiliary motive" (p. 211). In the general pattern of controlling one's own behavior, the motive is included in this way as a natural link between the stimulus and the reaction, a means of controlling behavior introduced from outside. But the natural, innate characteristic of this process, as in all other cases, corresponds to the patterns of formation and functioning of the conditioned reflex. "In brief, we might say that this is an artificially created reflex" (p. 213). The artificial is included in the natural, is used as a means of controlling the natural and in this way ensures achieving the level of higher mental function.

We have considered the basic positions that characterize the patterns of establishing separate higher mental functions. The process of their establishment accomplished as a process of cultural development is not just "superimposed" on the natural processes but determines, as if secondarily, the further development of the natural processes themselves, that is, the development of attention, memory, and thinking, on the basis of their being established as higher mental functions, occurs in an essentially different way in comparison with their development as natural processes. Mastering devices of cultural behavior and especially speech not only depends on the natural base of these processes, but subsequently changes even the course of their development, and the processes themselves appear as a single system.

Finally, as higher mental functions are established, and as higher forms of behavior are mastered, the whole system of processes that comprise cultural development results in the formation of the personality and world view of the child.

These two higher formations seemingly store all the preceding accumulation and ensure its availability for analysis of the structure and levels of development of world view and personality. Vygotsky limits the term "personality" precisely and does not include in it such characteristics of personality as individuality. "Personality as understood here has a narrower sense than in the usual sense of the word. We will not include here all the traits of individuality that distinguish it from a number of other individualities, that make up its uniqueness or relate it to one specific type or another. We are inclined to put an equals sign between the child's personality and his cultural development. Thus, the personality is a social concept; it encompasses what is supernatural and historical in humanity" (p. 242). Subsequently these positions came to be considered not in the narrow sense that the author ascribed to them, but more broadly.

Correlating the narrow and the broader sense of the problem of the natural and the social in the development of personality still remains as one of the problems for research and a concrete problem of psychology as a science.

For his time and the stage of development of psychology, Vygotsky proposed general and sometimes contradictory solutions of this problem. His merit lies in the fact that perhaps in the indicated contradiction, the unsolved problems appeared more exposed and more distinct. Not just in stressing the main significance of the cultural, social, and historical in the development of higher mental functions do we see Vygotsky's merit, but in disclosing the whole contradictory relation between the natural and the social that is especially clearly and dramatically apparent in the mental development of the child. The depth of the living ideas of Vygotsky, the boldness of the scientist, are contained not in a simplified system, but in accentuating this dramatism.

Also included in the present volume is a shortened version of the paper, "The Question of Multilingual Children." In the paper on analysis of a comparatively personal question, a number of problems are touched upon that pertain to the connection between the cognitive processes and speech. In this sense, it continues organically the basic ideas of *The History of the Development of Higher Mental Functions.* The paper is of current interest in the plan for solving the problem of being multilingual.

A. M. Matyushkin
Editor

NOTES TO THE RUSSIAN EDITION

1. The monograph was written in 1931. The first five chapters were published in the book: Vygotsky, L. S., *Razvitie Vysshikh Psikhicheskikh Funktsii* [*Development of Higher Mental Functions*] (Moscow, 1960). Chapters 6-15 are being published for the first time. The notes to the 1960 edition indicate erroneously that these chapters had not been written.
2. Empirical psychology, see Vol. 1, p. 460.
3. Behaviorism, see Vol. 1, p. 460; Vol. 2, p. 489.
4. Reflexology, see Vol. 1, p. 459; Vol. 2, p. 487.
5. Darwin, Charles (1809-1882), see Vol. 1, p. 462.
6. Explanatory or causal psychology: a direction in psychology that attempted to find physiological reasons for mental phenomena. In the broad sense, it proposes to disclose determination, the reasons and nature of the mind.
7. As comprehending or descriptive psychology, the author has in mind the idealistic direction in German psychology presented in the works of W. Dilthey and E. Spranger and contrasting himself with natural-science "interpretive psychology." See also Vol. 1, p. 465.
8. Psychology of the mind is the idealistic direction in West European psychology that did not link mental and material physiological processes.
9. Dilthey, Wilhelm (1833-1911), see Vol. 1, p. 465.
10. Münsterberg, Hugo (1863-1916), see Vol. 1, p. 463; Vol. 2, p. 490.
11. Husserl, Edmund (1859-1938), see Vol. 1, p. 463; Vol. 2, p. 484.
12. Natural-science, deterministic thinking. This includes such approaches to mental research in which attempts were made to disclose the natural-science basis for mental processes and phenomena. These include psychophysiological directions that disclose, for example, the link between sensory processes and anatomical structure and the physiology of organs of sensation and the nervous system.
13. Structural theory of mental development. This includes primarily Gestalt approaches to the analysis of mental development, including the book of K. Koffka, *Osnovy Psikhicheskogo Razvitiya* [*Fundamentals of Mental Development*] (Grundlagen der psychische Entwicklung, Berlin, 1925).
14. Vygotsky has in mind the idealistic conception of Faininger, widespread while he was writing his book, known by the title *Psychologie der "als ob."*
15. This includes all basic directions in general and child psychology, behaviorism, Gestalt psychology, and psychoanalysis.
16. Psychoanalytic theory (psychoanalysis), see Vol. 1, p. 462; Vol. 2, p. 482.
17. W. Dilthey is intended here.
18. Spranger, Eduard (1882-1963), German philosopher-idealist, psychologist, pedagogue. In the basic philosophical work *Forms of Life* (1914), he developed the idea of integral ("structural") psychology, which he contrasted with the

natural-science "psychology of elements." The author of works on theory and history of pedagogy *Juvenile Psychology* (1924; see the Russian translation in the collection *Juvenile Pedology*, 1931), etc.

19. Freud, Sigmund (1856-1939), see Vol. 1, p. 462.
20. Probably what is meant here is one of the first studies of primitive thinking of L. Lévy-Bruhl.
21. Associative psychology, see Vol. 2, p. 481.
22. Probably this refers to L. Lévy-Bruhl.
23. Bühler, Karl (1879-1963), see Vol. 1, p. 465; Vol. 2, p. 484.
24. Kretschmer, Ernst (1888-1964), see Vol. 2, p 486.
25. Wundt, Wilhelm (1832-1920), see Vol. 1, p. 461; Vol. 2, p. 484.
26. Braille, Louis (1809-1852), French teacher of the blind, inventor of the relief-tactile type for the blind (1829).
27. Volkelt, Hans, German psychologist-idealist.
28. Würzburg school, see Vol. 1, p. 460; Vol. 2, p. 481.
29. Külpe, Oswald (1862-1915), founder and director of the first experimental laboratory of the psychology of thinking based at Würzburg University. The main direction of the work of the laboratory was to oppose the traditional associative concept of thinking. N. Ach, K. Bühler, O. Zelts, and others were part of this group.
30. Binet, Alfred (1857-1911), see Vol. 1, p. 462; Vol. 2, p. 490.
31. Bekhterev, Vladimir Mikhailovich (1857-1927), see Vol. 1, p. 459; Vol. 2, p. 488.
32. Watson, John Broadus (1878-1958), see Vol. 2, p. 483.
33. Ach, Narciss (1871-1946), see Vol. 1, p. 470; Vol. 2 p. 483.
34. Pavlov, Ivan Petrovich (1849-1936), see Vol. 1, p. 459; Vol. 2, p. 484.
35. Hegel, Georg Wilhelm (1770-1831), see Vol. 1, p. 464.
36. Mechnikov, Il'ya Il'ich (1845-1916), Russian biologist and pathologist, one of the founders of evolutionary embryology, originator of the comparative pathology of inflammation and the phagocytic theory of immunity.
37. Blonskii, Pavel Petrovich (1884-1941), see Vol. 1, p. 462; Vol. 2, p. 486. This position reflects the general idea expressed by P. P. Blonskii on the historical approach to the study of behavior; he wrote: "Psychology must become like natural science since as a science of behavior of living beings, it is, of course, only a part of natural science. Psychology studies the behavior of humanity as a function of time, that is, using appropriate terminology, it studies behavior of humanity genetically . . . Thus, scientific psychology is first of all genetic psychology" (P. P. Blonskii, *Collected Psychological Works*, Moscow, 1964, pp. 43-44 [in Russian]).
38. Köhler, Wolfgang (1887-1967), see Vol. 2, p. 485.
39. Buridan, Jean (circa 1300-1358), French physicist, philosopher, and logician. Buridan is credited with the example of the so-called "Buridan ass": The ass, finding himself between two completely identical and equidistant sheaves of hay, starves to death since in the presence of two equal motivating stimuli, he cannot decide which sheaf of hay to eat first. This example illustrated Buridan's view of the interrelation of mind and will. When mind reaches the conclusion that there are possibilities of different value before him, then will becomes inactive. In literature, the opinion has been expressed that the example of "Buridan's ass" is erroneously ascribed to Buridan, since even Aristotle and Dante described this kind of situation.
40. James, William (1842-1910), see Vol. 1, p. 460; Vol. 2, p. 487.
41. Lévy-Bruhl, Lucien (1857-1939), see Vol. 1, p. 464; Vol. 2, p 482.

42. Thurnwald, Richard (1869-1954), see Vol. 2, p. 486.
43. Arsen'ev, Vladimir Klavdievich (1872-1930), Soviet researcher of the Far East, ethnographer, and writer. During expeditions, he studied the life, customs, works, religious beliefs, and folklore of the local population.
44. Polizer, Georg (1903-1942), French philosopher and psychologist who treated the problems of psychology from the position of Marxism.
45. Lichtenberg, Georg Kristof (1742-1799), see Vol. 1, p. 471.
46. Bastian, Adolph (1826-1905), psychologist-naturalist, predecessor of William James in appreciation of the significant role of kinesthetic perception in regulating behavior.
47. Zigvart, Kristof (1830-1904), German philosopher and logician. He followed the psychological trend in logic.
48. Here and subsequently, Vygotsky has in mind one of the specific characteristic of reflexological thinking of man noted by John Dewey in his book, *The Psychology and Pedagogics of Thinking*; "By thinking, man also develops and creates artificial signs that warn him in advance of consequences and of ways of alleviating or avoiding them. As this trait (interpretation—A.M. [A. M. Matyushkin, ed.]) is the difference between a savage and an animal, in the same way, it is the difference between the cultured man and the savage . . . The very essence of civilization consists in the fact that we purposely erect monuments and memorials in order not to forget . . . All forms of artificial adaptation are deliberately devised modifications of natural objects so that they would serve to indicate what is hidden, what is absent and remote, better than in their natural state" (John Dewey, *The Psychology and Pedagogics of Thinking*, Berlin, 1922, pp. 21-22).
49. Dewey, John (1859-1952), see Vol. 1, p. 463.
50. Aristotle (374-322 B.C.), philosopher and scholarly encyclopedist in ancient Greece, founder of the science of logic, one of the founders of theoretical psychology, first presented data of science and philosophy in the tract, "On the Soul." He was educated in the school of Plato (in Athens). Subsequently he opposed Plato's theory of "incorporeal forms."
51. Lewin, Kurt (1890-1947), see Vol. 2, p. 487.
52. Gestalt psychology, see Vol. 1, p. 460; Vol 2, p. 490.
53. Basov, Mikhail Yakovlevich (1892-1931), Soviet psychologist and pedagogue, a specialist in the area of general and pedagogical psychology. He worked in the Psychoneurological Institute in Petrograd under the direction of A. L. Lazursky on the study of motor-voluntary activity. His comprehensive work, *General Fundamentals of Pedagogy* (1928), contains a number of chapters on problems of pedagogical and child psychology and is a serious review of problems of the mental development of the child.
54. Koffka, Kurt (1886-1941), see Vol. 2, p. 484.
55. Stern, William (1871-1938), German psychologist and philosopher-idealist, author of classical works on child psychology (*Psychology of Early Childhood*, 1914, Russian translation, 1915). He paid special attention to giftedness in children. Stern's works encompassed a broad spectrum of problems of general, genetic, and applied psychology, including differential psychology. Stern, one of the first to turn to systematic study of individual differences, began to use tests, and introduced the coefficient of intelligence (IQ).
56. Titchener, Edward (1867-1927), see Vol. 1, p. 471. Citing the noted positions of Titchener as a law, Vygotsky has in mind the three stages in the development of attention identified by Titchener. Previously psychology identified only two forms of attention: involuntary and voluntary. Titchener stated the position

that while two forms of attention were noted, it passes through three phases in its development: at the first, it functions as involuntary, at the second, as voluntary, and at the third, it is carried out with mechanisms of involuntary attention. The positions noted were presented by Titchener in the following context: "Attention in its popular meaning has two forms. It can be passive and involuntary or it can be active and voluntary. These two forms of attention are actually characteristic for different stages of mental development; they differ from each other only in their complexity as earlier and later forms . . . However, there is still another stage of development of attention, and it consists of nothing other than a return to the first stage . . ." (E. Titchener, *Psychology Text*, Chapter I. Moscow, 1914, pp. 226-231).

57. Quetlet, Lambert Adolph Jacques (1796-1874), Belgian mathematician, one of the founders of modern statistics, applying it to analysis of social forms of behavior.
58. We have in mind here the following general context of analysis of complex reactions in which Titchener, as in the analysis of voluntary attention, emphasizes that complex reactions may acquire the form of simple reactions. "It must be firmly remembered that the terms given these complex reactions—reaction of differentiation, reaction of recognition, reaction of selection—are only conditional. Differentiation and selection refer to external conditions of the experiment and only to them; in the differentiation reaction, we do not differentiate, in the selection reaction, we may produce various operations, but we do not select; recognition, direct understanding is included in all reactions, both simple and complex; even in a muscular reaction, we recognize 'something other' . . ." We must now add that carrying out instructions, if they are properly understood, depends on habit; the time of careful preparation of the selection reaction, if coordination is the stimulus and movement is adequately mastered, may be equal to the time of a simple sensory reaction. From these data it follows that complex reactions are not made up in parts by simple reactions; the reactions of differentiation and recognition are not sensory reactions to which the time of differentiation and time of recognition have been added; selection reactions are not reactions of differentiation to which selection time has been added (E. Titchener, *Psychology Text*, Chapter II. Moscow, 1914 p. 129.
59. Merkel, F. (?), German histologist. He first described (1875) the epithelial receptor cells in the deep layers of the epidermis in the skin of mammals and man.
60. Høffding, Harold (1843-1931), Danish philosopher-idealist, historian of philosophy. Under the influence of the historical-philosophical method of Hegel, he attempted to consider philosophy in its connection with science and to compare at a theoretical level the knowledge of philosophers of different epochs considering their teachings as stages of development of integrated thought. In psychological studies, Høffding attempted to unite introspectionist representations with ideas and methods of Darwinism in biology: he treated consciousness as a higher form of biological development. Høffding's criticism played a positive role in history in regarding consciousness as an aggregate of independent elements—sensations and concepts. With this he contrasted "the law of relations": properties of each separate mental element are determined by the aggregate connections and relations in which they are included.
61. Goethe, Johann Wolfgang (1749-1832), see Vol. 1, p. 464.
62. Thorndike, Edward (1874-1949), see Vol. 2, p. 485.
63. Hall, Stanley (1844-1824). See Vol. 1, p. 470.

64. Pre-formism is the study of the presence of sex cells of the organism's maternal structures that predetermine the development of the embryo and traits that are formed in its organism.
65. Claparède, Edward (1873-1940). See Vol. 2, p. 482.
66. Piaget, Jean (1896-1980). See Vol. 2, p. 482. We have in mind a book by Piaget, *Speech and Thinking of the Child*, edited with an introduction by L. S. Vygotsky (Moscow–Leningrad, 1932).
67. Jean-Batiste Lamarck (1744-1829). French biologist.
68. We have in mind a book by K. Koffka, *Fundamentals of Mental Development* (Grundlagen der psychischen Entwicklung, Berlin, 1925).
69. Hering, Ewald (1834-1918). See Vol. 1, p. 466; Vol. 2, p. 490.
70. Janet, Pierre (1859-1947). French psychologist and psychopathologist. Continuing the work of the French doctor, J. Charceau, he developed the psychological concept of neuroses based, according to Janet, on disturbance in synthetic functions of consciousness. The sphere of the unconscious is limited by him to the simplest forms of mental automatisms. In the 1920's and 1930's, Janet developed a general psychological theory proceeding from an understanding of psychology as the science of behavior. As distinct from behaviorism, Janet does not reduce behavior to elementary acts, including in the system the psychology of consciousness. On this basis, Janet developed a complex, hierarchical system of forms of behavior from the simplest reflexive acts to higher intellectual actions. Janet developed a historical approach to the human mind, emphasizing especially the social level of behavior and its derivatives: the will, memory, thinking, and self-consciousness. He considered thinking genetically as a replacement for real action, functioning in the form of internal speech.
71. Baldwin, James Mark (1861-1934). American psychologist, sociologist, and historian. He was one of the founders of American social psychology; in philosophical views, he was an idealist. Baldwin saw the task of general psychology to be a study of individual differences. He tried to introduce the principle of evolutionism into psychology and considered the mental development of the child from the position of biogenetism. In pedagogics, Baldwin tried to substantiate the necessity for an individual approach to the student based on data from experimental psychology.
72. Seguin, Edouard (1812-1880). A doctor and pedagogue, he was one of the founders of oligophrenopedagogics, and the author of a medical-pedagogical system of education and training of seriously retarded children. Seguin believed that it was possible to educate and train all the retarded. He understood retardation as a disorder of the nervous system in which complete lack of will and inertia are manifested. The task of the educator was to bring the retarded out of this inert state and make him capable of working.
73. Bühler, Charlotte (1886-). See Vol. 1, p. 464; Vol. 2, p. 485.
74. We have in mind children with an underdevelopment of the cerebrum.
75. Wallon, Henri (1879-1962). An outstanding French psychologist who made a great contribution to child development and pedagogical psychology.
76. Potebnya, Aleksandr Afanas'evich (1835-1891). Ukrainian and Russian philologist-Slavicist. He worked on problems of the theory of philology, folklore, and ethnography (separating the views of the mythological school), mainly in general linguistics, phonetics, morphology, syntax and semantics. From the theoretical aspect, he studied problems of the interrelation of language and thinking, language and nation, and the origin of language. It was his opinion that the thinking-speech act is an individual-mental creative act, but in speech activity, the social, which is language (more precisely, its sound aspect), is in-

volved together with its individual origin and appears as "objectivized thought." Tracing the historical development of concrete language, Potebnya reached conclusions on the historical changes in the character of verbal thinking of a given people and of humanity as a whole (see *Thinking and Language* [in Russian], 1862).

77. Shakhmatov, Aleksei Aleksandrovich (1864-1920). Russian linguist, researcher of Russian chronicles. He discovered ancient oral languages different from living languages and studied problems of the ancient mother country and parent language (see: *Introduction to a Course on the History of the Russian Language,* Petersburg, 1916, Part I).
78. Dal', Vladimir Ivanovich (1801-1872). Russian writer, ethnographer. He devoted more than a half century to his basic work, *The Great Dictionary of the Living Great Russian Language* (Vols. 1-4, 1863-1866).
79. Delacroix, Henri Joachim (1873-1937). See Vol. 2, p. 484.
80. J. Sully (?). One of the researchers of voluntary attention, he spoke at a discussion of the motor concept of attention proposed by N. N. Lange.
81. Luria, Aleksandr Romanovich (1902-1977). See Vol. 2, p. 483.
82. Troshin, Petr Yakovlevich (?). Psychologist and pedagogue, author of the anthropological theory of education; he shared the concept of "morally defective" children (see "Anthropological Theory of Education" in *Comparative Psychology of Normal and Abnormal Children*, Petersburg, 1915).
83. Montessori, Maria (1870-1952). Italian pedagogue, professor of anthropology and hygiene. Montessori sharply criticized the traditional school for regimentation and for ignoring the natural needs of the child. According to Montessori, the elementary school should be a laboratory that would make it possible to study the mental life of the child. She developed an original system of sensory development for children in special preschool institutions and in elementary school. In theoretical work and in practical activity, she promoted the ideas of free education.
84. Burt, Cyril Lodovik (1883-?). English psychologist who worked on problems of capabilities and giftedness, professional orientation, retardedness, its cause and prevention. In his studies, he depended exclusively on testing.
85. Fröbel, Friedrich (1782-1852). German pedagogue, theoretician of preschool education. The concept of the active nature of the child, his mobility, directness, the constant development of physical and intellectual powers, sociability, and curiosity was original in his system of education. He advocated the creation of kindergartens and proposed special didactic material, the so-called "gifts" of Fröbel. His teaching made possible the separation of preschool pedagogy into a separate branch of pedagogical science. The defect in his system was the severe regulation of the child's activity.
86. Laj, Wilhelm August (1862-1926). German pedagogue, representative of experimental pedagogics. On the basis of data from biology, he attempted to forge a new direction in pedagogy. The basis for Laj's concept was the biological concept of reaction–action, which, with respect to the process of teaching, is treated as a unit of perception, a mental processing of the perceived, external expression of a configuration of ideas with the help of various means (the word, drawing, experiment, work, etc.).
87. Leont'ev, Aleksei Nikolaevich (1903-1979). See Vol. 1, p. 464; Vol. 2, p. 483.
88. Ribot, Theodule (1839-1916). French psychologist, a specialist in pathopsychology and general psychology. He worked in the area of the psychology of feelings, memory, voluntary attention, etc. Considering the origin of voluntary attention, Ribot noted, "How did it arise? It arose due to necessity, under the

pressure of need and together with successes of intellectual development. It is a perfected apparatus, a product of civilization. Progress in the area of intellectual development caused man to make a transition from the rule of involuntary attention to the rule of voluntary attention" (*The Psychology of Attention*, St. Petersburg, 1897, p. 33).

89. Considering the development of attention, E. Titchener traces the conditions for the development of its higher forms and the interconnections between them. "Attention in its hemispheric significance has two forms. It may be passive and involuntary or it may be active and voluntary. Primary attention, however, represents a certain stage of development, specifically, the earliest stage of development of attention. For this reason, it is not enough to consider it only from the aspect of determining physiological factors; we must also consider it from the biological point of view . . . But what can we say of novelty, surprise, and movement? Stimuli of this type have a special biological significance; of course, the new, unexpected, and moving are probably sources of danger, and the living being that would not turn its attention to them would soon die. But there are many cases in which an impression not only does not attract and keep our attention, but on the contrary, it seems that we maintain our attention to an impression through our own effort. A problem in geometry does make as strong an impression on us as a clap of thunder . . . Attention to such objects is termed ordinary active or voluntary attention; but we will call it secondary attention . . . There is, however, still a third stage in the development of attention, and it consists in nothing other than a return to the first stage. When we solve a geometry problem, we gradually become interested in it and become completely absorbed by it; in a short time, the problem acquires the same power over our consciousness as the clap of thunder had at the instant it penetrated our consciousness" (*Psychology Text*, Moscow, Part I, 1914, pp. 226-230).
90. Meumann, Ernst (1862-1915). See Vol. 1, p. 464; Vol. 2, p. 485.
91. Bergson, Henri (1859-1941). See Vol. 2, p. 485.
92. Rubin, E. (1850-1934). German psychologist, a student of G. Müller. He was the first to describe the psychological phenomenon "figure and background" (1915), studied in detail in Gestalt psychology.
93. Müller, George Elias (1850-1934). See Vol. 1, p. 462; Vol. 2, p. 486.
94. Ukhtomskii, Aleksei Alekseevich (1875-1942). See Vol. 1, p. 462.
95. We have in mind H. Bergson, *Matter and Memory* (1889).
96. Bain, Alexander (1818-1903), English philosopher, psychologist, and pedagogue. A major representative of associative psychology in the 19th century, he considered the phenomena of consciousness to be subject to the psychological laws of association and tried at the same time to link them with bodily processes, studying reflexes, habits, instincts, and motor activity of the organism. New forms of the latter, according to Bain, arise as a result of selection of advantageous movements on the basis of the trial and error mechanism. Defending the indivisibility of the mental and the physiological, Bain also rejected a causal connection between them and adopted the positions of psychological parallelism.
97. The experimental data analyzed by L. S. Vygotsky present the results of the work done by A. N. Leont'ev in 1928 and 1930 in the N. K. Krupskaya Psychological Laboratory of the Academy of Communist Education. Formulating the law of development considered by Vygotsky, subsequently called the parallelogram of the development of memory, Leont'ev said: "In this way, the common dynamic of these two lines of development may be most simply ex-

pressed in the graphic form of a parallelogram, one pair of opposite angles of which is formed by the drawing together of the coefficients in their upper and lower ranges and the other two angles, joined by a shorter diagonal, correspond to the point of their greatest divergence. In the future we will briefly designate this pattern of development of remembering by the arbitrary term, 'the parallelogram of development'... The principle of the parallelogram of development also represents nothing other than an expression of the same general law that development of higher human forms of memory proceeds through the development of remembering with the aid of external stimuli-signs." (*Problems of Mental Development*, Moscow, 1959, pp. 351-353).

98. Spinoza, Benedict (1633-1677), see Vol. 1, p. 464.
99. Jaensch, Erik (1883-1940), See Vol. 1, p. 464.
100. Bacon, Francis (1561-1626), see Vol. 2, p. 483.
101. Spiritualism: objective-idealistic philosophical view that considered the soul as the fundamental principle of reality, as a special incorporeal substance existing outside material and independent of it.
102. Ramon y Cajal, Santiago (1852-1934), Spanish histologist. Through his research, he developed a basis for the neuron theory of the structure of the nervous system. He is the author of works on the structure of the retina of the eye, the medulla, and the pons. He developed a number of special histological methods.
103. Neurath, Otto (1882-1945), Austrian philosopher, sociologist, and economist. His philosophical and sociological views unite eclectically the tendencies of natural science materialism with the views of logical positivism. Seeing the establishment of unity of knowledge as the major task of the philosophy of science, he believed that it could be attained with a "unified language of science"; he gave most of this attention to a translation of the views of psychology and sociology into such "language."
104. Bleuler, Eugene (1857-1939), see Vol. 1, p. 464; Vol. 2, p. 482.
105. Sherrington, Charles Scott (1859-1952), English physiologist whose main work was on the physiology of the central nervous system. Of special significance is his work on the study of the laws of reflex activity of the medulla. Sherrington's work enriched physiology with new data on the relation between processes of excitation and inhibition and on the nature of muscle tone and its disruption. He formulated the principle of convergence of excitation and the "funnel" principle.
106. Katz, David (1884-1953), West European psychologist who worked on a broad range of problems in theoretical, experimental, comparative, genetic, and social psychology. He gave significant attention to problems of child psychology. In his interpretation of some questions, he was close to Gestalt psychology, but did not consider it possible to include in the concept of Gestalt all of the manifestations of the mind, especially those connected with the formation of personality.
107. Driesch, Hans (1867-1941), see Vol. 1, p. 468.
108. We have in mind the book of Jean Piaget: *Speech and Thinking in the Child* (Moscow; Leningrad, 1932).
109. Fichte, Johann Gottlieb (1762-1814), German philosopher and social activist, representative of German classical idealism.

REFERENCES

Leont'ev, A. N., *Problems in Mental Development*, Moscow (1959).
Pavlov, I. P., *Complete Works*, Vol. 4, Moscow, Leningrad (1951).
Ribot, T., *The Psychology of Attention*, St. Petersburg (1897).
Titchener, E. B., *Psychology Text*, Moscow (1914).
Tolstoy, L. N., *Complete Works*, Vol. 11, Moscow (1932).

AUTHOR INDEX

Ach, N., 36, 72, 74, 77, 162, 172
Aristotle, 61, 242, 280, 281
Arsen'ev, V. K., 50, 281

Bacon, F., 210, 218, 286
Bain, A., 184, 285
Baldwin, J., 103, 132, 245, 248, 283
Bashushinskii, 134
Basov, M. Ya., 66, 87, 248, 281
Bastian, A., 59, 281
Bekhterev, V. M., 35, 153, 174, 280
Bergson, H., 161, 180, 189, 285
Binet, A., 34, 35, 37, 93, 114, 157, 158, 176, 189, 233-236, 280
Bleuler, E., 212, 213, 286
Blonskii, P. P., 43, 97, 102, 144, 158, 192, 195, 280
Bogen, H., 115
Braille, L., 24, 227, 229, 280
Bühler, C., 121, 122, 137, 138, 139, 283
Bühler, K., 20, 23, 100, 101, 105, 123-125, 139, 165, 168, 222, 244, 248, 264, 280
Buridan, J., 44, 209, 276, 280
Burt, C. L.,, 144, 284

Charceau, J., 283
Claperède, E., 98. 216, 250, 283

Dal', V. I., 128, 284
Dante, 280
Darwin, C., 7, 69, 91, 99, 100, 101, 125, 279
Delacroix, H., 132, 148, 248, 284
Descartes, R., 219*n*
Dewey, J., 61, 281
Dilthey, W., 7, 69, 279
Dostoevski, F. M., 11
Driesch, H., 244

Edinger, L., 123
Eliasberg, W., 108, 168-169, 170-175, 194, 195
Engels, F., 1, 38, 39, 53, 55, 56, 62, 70, 81, 82, 218, 219
Epstein, 253-257

Faininger, 279
Fedorchenko, 119
Fichte, J. G., 248, 286
Foucault, M., 162
Freud, S., 11, 40, 180, 246, 280
Fröbel, F., 146, 284

Gessen, 145
Gettser, G., 137, 139, 143, 144, 145, 147, 197, 249
Goethe, J. W., 85, 108, 282

Hall, S., 97, 282
Hegel, G. W., 39, 61, 81, 104, 218, 280, 282
Heller, T., 176, 177
Hering, E., 100, 166, 179, 283
Høffding, H., 80, 81, 92, 190, 282
Husserl, E., 7, 279

Jaensch, E., 197-199, 202-203, 231, 286
James, W., 45, 86, 211, 216-217, 280, 281
Janet, P., 102, 103, 104, 219, 270
Jennings, G., 20, 38, 63, 201, 244

Kapp, E., 61
Katz. D., 231, 286
Koffka, K., 68, 89, 100, 179, 281, 283
Köhler, W., 44, 49, 85, 88, 91, 95, 96, 100, 101, 104, 115, 123, 140, 162-167, 170, 197, 198, 199, 200, 231, 244, 248, 280
Kompeire, G., 189
Kretschmer, E., 22, 58, 80, 102, 105, 213, 214, 217, 218, 219, 242
Krupskaya, N. K., 285

Külpe, O., 34, 35, 280

Laj, W. A., 152, 223-225, 284
Lamarck, J.-B., 100, 283
Lange, N. N., 284
Lazursky, A. L., 281
Leonardo da Vinci, 11
Leont'ev, A. N., 154, 185*n*, 277, 284, 285
Lévy-Bruhl, K., 46, 47, 253, 280
Lewin, K., 65, 68, 69, 70, 86, 87, 211, 212, 213, 214, 281
Lichtenberg, G., 59, 281
Lindworsky, J., 109
Lipmann, O., 115, 199-200
Luria, A. R., 140, 284

Marx, K., 38, 39, 53, 55, 56, 62, 70, 82, 106, 267
Mechnikov, I. I., 41, 280
Merkel, F., 77, 282
Meumann, E., 160, 168, 179, 184, 190, 217, 225, 248, 285
Montessori, M., 144-146, 147, 284
Mukhov. M., 146
Müller, G., 166, 186, 285
Münsterbert, H., 7, 77, 279

Neurath, O., 211, 286

Pavlov, I. P., 37, 45, 46, 54, 60, 167, 192, 193, 213, 216, 280
Piaget, J., 98, 103, 106, 192, 245-246, 247, 250, 283, 286
Plato, 281
Polizer, G., 58, 59
Potebnya, A. A., 126, 127, 128, 283

Quetlet, L. A., 74, 282

Ramon-y-Cajal, S., 210, 286
Ranschburg, 150
Revault d'Allonnes, 160, 161, 162
Ribot, T., 157, 158, 160, 172, 175, 284
Ronget, 255-256
Rubin, E., 162, 285

Seguin, E., 108, 147, 176, 283
Semon, A., 179
Sepp, E. K., 256
Shakespeare, W., 11, 190
Shakhmatov, A. A., 128, 284
Sherrington, V., 215, 216, 286
Sollier, P. 175, 176
Spinoza, B., 190, 209, 217, 219*n*, 286
Spranger, E., 11, 13, 279
Stern, W., 70, 88, 94, 118, 119, 124-126, 130, 134, 140, 146, 168, 181, 104, 195, 226, 256, 281
Sully, J., 138, 139, 284

Titchener, E., 71, 73, 74-75, 77, 158, 159*n*, 160, 269, 281, 282, 285
Thorndike, E., 95, 101, 111, 112, 223, 224, 225, 233, 234, 235, 236, 237, 238, 282
Thurnwald, R., 46, 50, 51, 58, 281
Tolstoy, L. N., 46, 233
Troshin, P. Ya., 143, 176, 284
Tudor-Hart, 197

Ukhtomskii, A. A., 166, 167, 285

Vangemann, H., 51
Volkelt, H., 34, 67, 84, 85-88, 247, 280

Wallon, H., 125, 283
Watson, J., 35, 104., 246, 280
Werner, H., 33, 43, 68, 84, 85, 102
Whitney, 61
Wundt, W., 22, 29, 30, 32, 33, 34, 61, 76, 133, 145, 222, 280

Zelts, O., 280
Zigvart, K., 59, 281

SUBJECT INDEX

Abstraction
  role of attention in abstraction, 168-172
Adjustment, 215
Analysis
  conditional-genetic, 69-70
  dynamic, 71
  genetic, 71
  phenomenological, 69
  of the process, 68, 74
  of the problem, 68, 69
  subjective-introspective, 70, 74
  of things, 67, 68, 74
Abnormal children
  concept formation, 203, 204, 205
  detours in development, 24, 25, 107, 108, 227, 229
  development of higher mental functions, 23-25, 107, 109, 122, 150, 172, 227-229
  education, 227
  mastering behavior, 108, 109
  teaching reading and writing, 147-148, 228
Anthropomorphism, 100
Arithmetic operations
  in abnormal children, 150
  mastering signs, 151
  in preschool children, 149, 224
  in school children, 224
  teaching arithmetic, 152, 222-224, 224, 232, 236, 237, 241
Association, 52, 80
Attention
  in the abnormal child, 172-177
  direct, 155
  establishing attention, 165-166
  involuntary, 71, 72, 157, 158, 160, 161, 162, 177
  mastering attention, 161
  mediated, 155, 156, 157, 161, 170, 171
  method of double stimulation, 154-157
  as a reflex, 153, 158
  role in abstraction, 168-172
  role of the sign, 166-168, 171, 172, 175, 183
  in the selection reaction, 162-165, 169-172, 177, 205
  stages of development, 159, 160
  theory
  G. Müller, 166
  Revault d'Allonnes, 161, 162
  T. Ribot, 157, 158
  E. Titchener, 159
  voluntary, 71, 72, 156-159, 160-162, 164, 165, 173, 177
  and voluntary process, 160, 175-177

Behavior
  development of behavior, 18, 89, 90, 92, 93, 100-103, 110-111
  higher forms, 8, 88
  lower forms, 88
  magical, 47
  mastery of one's own behavior, 7, 49, 50, 51, 52, 53, 55-57, 60, 85-87, 103, 108, 112, 154

system of activity (according to G. Jennings), 20-22
Brain, 5, 16, 102

Casting lots, 45-48, 208-210, 211, 213
Concept
formation of concepts, 3, 172, 203, 203-205
general, 204
pseudoconcepts, 204
Counting, 202
and perception of form, 151, 152, 224

Decision, 212, 213
decisions made, 215, 216
Detours, 24, 25, 88, 123, 199
Dualism, 7, 8

Eidetics, 197, 203

Gesture
and drawing, 134, 136
and pictographic writing, 133
and play, 135
pointing, 1o4, 105
as a visual sign, 133, 135, 136
Giftedness, 231-233, 238
general, 232, 233
intellectual, 232
measuring, 233-236
musical, 232
special, 232, 233
Growing into culture, 11, 19, 221, 222, 225, 231, 251

Habit
and imitation, 95
speech-motor, 5
Human activity
effect on another person, 50
effect on process, 50
effect on situation, 49-50
system of activity (according to G. Jennings), 20-22
Hysteria, 212, 214, 217-219

Imitation
of animals, 95
of a child, 95, 96, 200, 201
connection to understanding, 96
as formation of habit, 95
as a method of research, 96
Intention, 86, 190, 211, 212, 217, 246

Means
external means of cultural development, 14, 18
mnemotechnical means, 52
Memory, 179, 184, 207, 217
artificial, 188, 189
concrete, 225
cultural, 50, 51, 59, 60
development, 179-181, 186, 187, 190
effectiveness, 184-185
forgetting, 181-183, 186, 189
genetic law, 185
logical, 6, 187, 188
mastering memory, 181, 182, 184
mechanical, 6, 184, 189
mediated, 188
methods, 184, 185, 188
mnemotechnical, 179, 180, 183-184, 217
natural, 188, 189
parallelogram of memory development, 185
primitive (natural), 50, 51, 179, 246
remembering (recollection), 182, 189,
revolution of mnemotechnical devices, 186-187
verbal, 188
voluntary, 187
Mental development
age and mental development, 229, 231, 233
cultural, 2, 3, 6, 7, 10, 11, 18, 93, 221-222, 226-233, 236, 238, 241, 243
cultural experience, 109-110
external means of cultural development, 14, 18
genetic law of cultural development, 106
diagnostics of development, 232
measurement, 233-236
organic (natural, innate), 2, 3, 5, 6, 10, 223, 231, 235, 236, 243
Mental functions (processes)
the abnormal child, 23-25
cultural, 2
development, 24, 68
external, 105
higher, 6, 7, 53
internal, 105
lower, 6
natural (innate), 2
rudimentary, 40-45, 47, 53
Method
analytical, 70

of conditioned reflexes, 16, 32
of double stimulation, 154-157
experimental-genetic, 68
experimental methods, 29, 31, 33, 35, 38
of interpretation, 33
of irritation, expression and reaction (W. Wundt), 30, 32
role of instruction, 36, 74
of self-observation, 29, 31, 36
of stimulus-reaction, 27, 28, 31
Motive, 45, 205-209, 211
auxiliary motives, 211, 212, 215, 217
conflicting motives, 47, 205-206, 215-216
stimuli-motives, 210, 215
Multilingualism, 253, 259

Need, 214
quasineed, 214

Ontogenesis, 18-20
Oral speech
in abnormal children, 122, 123
as a conditioned reflex, 122-124, 126, 128-130
and thinking, 122-124
vocal reaction of the child, 122

Personality, 242-243
development, 242-243, 246, 247, 248
the "I," 245, 248, 249
Phylogenesis, 19
Play, 135, 194, 249
Psychological parallelism, 8
Psychological science
branches
animal psychology (comparative psychology), 3, 15, 16, 247
child psychology (genetic), 1-3, 5-6, 17, 18, 26, 33, 99, 100, 107, 110
ethnic, 3, 15, 17, 18, 42
historical, 42, 43
crisis, 3, 8, 65, 97
directions
associative psychology, 17, 37
descriptive (interpretive), 7, 8, 11-13
explanatory (causal, physiological), 7, 8
functionalism, 9
objective (behaviorism, reflexology), 4, 5, 6, 35, 36, 94
psychoanalysis, 11-12
spiritualistic, 210
structural (Gestalt psychology), 8, 31, 66
subjective (empirical), 4, 5, 6, 8, 90
Wurzburg school, 33, 90

Reaction
acquired, 6
difficulties, 77, 78
distinctions, 72-75
innate, 6, 114
reaction rate, 74
and reflexes, 76, 77
of selection, 72-80, 85, 113, 114,116, 117, 162, 164, 165
stages of development, 114-118
vocal reactions of the child, 121, 122
Reading
oral, 142, 143
silent, 142, 143
and understanding, 143, 144
Reflexes
associative, 40, 153
conditioned, 60, 102, 110, 121-124, 126, 128, 129, 153, 198, 211-214, 217, 245, 247
inhibited, 4
principle of the dominant, 153, 166
and reaction, 76, 77
unconditioned, 110, 112, 121, 166
Revolution
and development of speech, 118, 119
of mnemotechnical devices, 117, 118, 185-187
types, 117

Selection, 80, 115, 205, 206, 210, 213, 215, 216
Sign, 54, 56, 57, 60, 62, 84, 95, 106, 108, 112, 125, 129, 154,
artificial, 85
mastering signs, 151
and meaning, 125, 127, 128, 130, 172
as a means of influence, 103
signification, 55, 56, 60
use of, 60, 85, 117
the written sign as a symbol of the first and second order, 141, 144
Speech
and attention, 275
children's, 5, 69, 88, 103, 122, 128
development, 94, 118, 119, 122, 128, 190, 193, 196, 202, 222, 238, 247
egocentric, 69, 119, 137, 174, 199
external, 5, 104

internal, 69, 104, 119, 250
as a motor habit, 36
oral (see Oral speech)
and socializing, 106, 172
as a stimulus, 33
theory
P. Janet, 103
W. Stern, 123-125, 130
and thinking, 122, 123, 130, 190-106, 198, 202, 203, 222, 238, 258
and understanding, 57, 58
written (see Written speech)
Stimuli
artificial, 85
auxiliary, 79, 155-157
stimuli-means, 47, 49-51, 60, 79, 80, 84, 154-156, 161, 210
stimuli-motives, 210, 215
stimuli-objects, 79, 84, 95, 161
stimuli-signs, 85, 87-89, 128, 185

Thinking
abstract, 229
of animals, 197, 201, 213
arithmetical, 52
causal, 203
and conception, 197, 198
concrete, 202, 204
detour in resolving problems, 199
development of thinking, 190, 191, 192, 193-196, 198, 222, 238
eidetic, 197-198, 203
in images, 202
without images, 35
magical, 97, 115
means of thinking, 154, 200
natural, 204, 243, 244
planning, 200
pre-speech, 197
primitive, 18, 47
the problem in thinking, 198, 199, 200, 202
and solving problems, 199, 204, 237, 238
and speech, 190-196, 198, 202, 203, 222, 238, 258
syncretic, 192, 202, 203, 250
vocal, 201, 202. 250
Tools, 60-62, 128, 197, 198, 244
use of, 6, 16, 18, 20-22, 60, 88, 108, 123, 199, 201

Understanding
of speech, 57, 58
in imitation, 95, 96

Will, 80, 85, 86, 92, 205, 211-212, 217, 218
development, 7, 218, 219
freedom of the will, 50, 209-210, 217, 219, 221
voluntary act, 45
voluntary action, 205, 211, 213-215, 216, 217, 251
Word, 57, 103, 129, 203
and image, 126-128
and meaning, 106
as a means of mastering behavior, 103
as a means of socializing, 106, 172
relation to thing, 106
social function, 103
World view, 242-243
development, 242, 243, 245, 246, 247, 249
Written speech, 51, 131, 142, 187, 188, 196, 225, 246
and drawing, 138-139, 141, 142
and gesture, 134
ideographic writing, 139-141
as a motor habit, 131, 144, 146
oral and silent reading, 142, 143
pictographic writing, 133, 141
and play, 137, 138, 142
as a system of symbols and signs, 131
teaching writing, 141, 144-146
understanding, 144
written sign as a symbol of the first and second order, 141, 144