

Thinking and Speech Chapter 5

An Experimental Study of Concept Development

I

Until recently, a major impediment to the study of concepts has been a lack of experimental methods that would allow the investigation of their formation and their psychological nature.

Traditional methods for studying concepts fall into two basic groups. The first is typified by what is called the method of definition. This method involves the study of fully developed and fully formed concepts through the use of verbal definitions. Despite its wide acceptance, this method suffers from two fundamental inadequacies that make it unreliable for any realistic investigation of concept formation.

1. This method deals with the results of the completed process of concept formation, with the ready-made product of that process. When we use this approach, we are not looking at the dynamics of the process itself, at its development, its course, its beginning and its end. This method is an investigation of the product not of the process that leads to its formation. Consequently, in studying definitions of developed concepts, we are frequently dealing less with the child's thinking than with his reproduction of fully formed knowledge and definitions. Thus, when we study the child's definitions of a particular concept, we are studying his knowledge or experience and the level of his verbal development more than we are studying his thinking in the true sense of the word.

2. The method of definition depends almost exclusively on the word. It overlooks the fact that, for the child in particular, the concept is linked with sensual material, the perception and transformation of which gives rise to the concept itself. This sensual material and the word are both necessary for the concept's development. Divorced from this material, the word transfers the process involved in the concept's definition to a purely verbal plane, a plane that is not characteristic of the child. When this method is used, we therefore rarely succeed in identifying the relationship that exists between the meaning the child attributes to the word in a purely verbal definition and the word's real meaning in the process of its living relationship to the objective reality it designates.

When this method is used, that which is most essential to the concept (i.e., its relationship to reality) remains unexplored. When we attempt to approach the meaning of the word through other words in this way, what we discover would better be attributed to the relationships among word families that have already been learned or mastered than to a true reflection of the nature of the child's concepts.

The second group of methods used in the study of concepts attempts to overcome the inadequacies of the purely verbal approach of the method of definition by focusing on the mental functions and processes that underlie the formation of concepts. These methods are concerned with the functions and processes that underlie the transformation of the concrete experience from which the concept is born. Here, the child is presented with the task of isolating some general feature from several concrete impressions, of isolating or abstracting this feature from others that are perceptually intertwined with it. The child is presented with the task of generalizing or abstracting this feature.

The inadequacy of this second group of methods is that they replace a complex synthetic process with an elementary one that constitutes only one part of the whole. The role of the word or sign in the process of concept formation is ignored. The result is that the process of abstraction is radically oversimplified. It is torn away from its relationship with the word. This relationship, however, is fundamental to the process of concept formation. It is, indeed, the determining feature of that process.

Thus, both of these traditional methods for studying concepts divorce the word from objective material. One begins by isolating the word from the objective material. The other begins by isolating the objective material from the word.

The development of an experimental method that could adequately reflect the process of concept formation by including both features of the process, by including the material on the basis of which the concept is worked out and the word through which it arises, represented an important step forward in the study of concepts.

We will not dwell on the complex history of this new method. We will only note that its introduction opened up an entirely new plane for the researcher. This method created the potential for studying the process of concept formation rather than merely studying the fully developed concept. As used by N. Ach, the method was justifiably called the synthetic-genetic method. It involves investigating the process through which the concept is constructed, the process involved in the synthesis of the several features that form the concept. That is, this method involves the investigation of the process of the concept's development.

This method involves the introduction of: (1) artificial words that are initially meaningless to the subject and have no connections with the child's previous experience, and (2) artificial concepts that are composed for experimental purposes by combining features so that the resulting set of features is not encountered in the concepts designated by our normal speech. In Ach's experiments, for example, the word "gatsun" was initially meaningless to the subject but acquired a certain meaning over the course of the experiment. This word became the bearer of a concept designating things that are big and heavy. In a similar way, the word "fal" became the bearer of a concept that designated things that are small and light.

In this experiment, the whole process through which the initially meaningless word acquires meaning (i.e., the concept's development) is laid out in front of the investigator. Through the introduction of artificial words and concepts, this method overcomes a critical failing of other methods. Specifically, the subject's resolution of the task that faces him in the experiment presupposes no previous experience or knowledge. Therefore, the positions of the young child and the adult are equalized in this respect. Ach utilized his method with both a five year old child and an adult. This allowed him to study the process involved in concept formation in pure form.

A major deficiency of the method of definition is that the concept is torn from its natural connections. It is isolated in a congealed and static form from the actual processes of thinking where it is encountered. It is isolated from the processes of thinking where it is born and lives. The experimenter selects an isolated word and the child must define it. This definition of the isolated word taken in a congealed form tells us nothing of the concept in action. It tells us nothing of how the child operates with the concept in the real-life process of solving a problem, of how he uses it when some real-life need for it arises.

As Ach suggests, ignoring this functional aspect of the concept reflects a failure to remember that the concept does not live in isolation, that it is not a congealed, static formation but a formation that is always encountered in the vital and complex process of thinking. A concept always fulfills some function in communication, reasoning, understanding, or problem solving.

The new method is not deficient in this way. Here, the *functional conditions of the concept's origins* are the focus of investigation. The concept is taken in connection with a particular task or need that arises in thinking, in connection with understanding or communication and with the fulfillment of a task or instruction that cannot be carried out without the formation of the concept. As a consequence, this new research method is an extremely valuable tool for studying concept development.

Although Ach himself did not study the formation of concepts in the transitional age, he could nonetheless not help but note the dual transition (involving both the content and the form of thinking) that occurs in the intellectual development of the adolescent. This transition signifies the transition to thinking in concepts.

Rimat conducted a special and thorough investigation of the processes involved in the formation of concepts in adolescence. These studies were based on methods developed by Ach. Rimat found that concept formation begins to occur only when the child approaches the transitional age, that it is inaccessible to the child before this period. Ach writes that:

We can firmly establish that only toward the end of the twelfth year of life do we see a sharp increase of the capacity for independent formation of general objective representations. In my view, it is extremely important to turn our

attention to this fact. Thinking in concepts divorced from immediately perceivable features presents the child with demands that exceed his mental capacities before the age of twelve years (Rimat, 1925, p. 112).

We will not dwell on how this study was conducted or on the other theoretical conclusions Rimat derives from it. We will limit ourselves to emphasizing its central findings. Specifically, Rimat's findings contrast with the claims of psychologists who reject the emergence of any new intellectual functions in adolescence, psychologists who claim that the three year old has all the intellectual operations of the adolescent. His research shows that it is only after the age of twelve (i.e., with the beginning of adolescence and the completion of the first school age) that the child begins to develop the processes that lead to the formation of concepts and abstract thinking.

One of the basic conclusions to which we are led by the research of Ach and Rimat is the refutation of the associative perspective on concept formation. Ach's research shows that however numerous and strong the associative connections between verbal signs or objects, the presence of such connections is insufficient for the formation of concepts. There is no experimental support here for the old idea that the concept arises through associative processes, through the reinforcement of the associative connections that correspond to the features common to several objects and through the weakening of the connections that correspond to the features with respect to which these objects differ.

Ach's experiments show that concept formation always has a productive rather than reproductive character. They show that the concept arises and is formed in a complex operation that is directed toward the resolution of some task. They show that the simple presence of certain external conditions and the mechanical establishment of connections between objects and the word is not sufficient for the emergence of the concept. In addition to establishing the non-associative and productive character of the process of concept formation, these experiments led to another equally important conclusion. Specifically, Ach's experiments identified what he views as the basic factor which defines the course of concept formation. Ach calls this factor the *determining tendency*.

Ach uses this phrase to refer to the tendency that regulates the flow of our representations and actions. The tendency emerges from the representation of the goal toward which these actions are directed and from the task that the activity is meant to achieve. Prior to Ach, psychologists distinguished two basic tendencies that subordinate the flow of our representations, specifically, the reproductive (or associative) tendency and the perseverative tendency. The first is the tendency to elicit representations associated with a given representation in previous experience. The second is the tendency of each representation to return or re-enter the flow of representations.

In his early studies, Ach showed that these tendencies are insufficient to explain consciously regulated acts of thinking that are directed toward the resolution of some problem. The latter are regulated not by acts of reproduction of representations through associative connections or by the tendency of each representation to re-enter consciousness but by a special determining tendency deriving from the representation of the goal. In studying concepts, Ach once again showed that the critical feature in the emergence of a new concept is the determining tendency that regulates the action, the tendency that emerges from the task presented to the subject.

Thus, according to Ach's scheme, concepts are not constructed as associative chains, where one connection elicits another that is connected with it through processes of association. Rather, they are constructed through a goal-directed process composed of several operations that function as means for the solution of the basic task. In itself, learning words and their connections with objects does not lead to the formation of concepts. The subject must be faced with a task that can only be resolved through the formation of concepts.

We have said that Ach's work represents a tremendous step forward in comparison with earlier research. He included the process of concept formation within the structure of the resolution of a particular task. He studied the functional significance and the role of this aspect of the problem. However, this is not a complete solution to the problem. Of course, the goal or task that is established is necessary for the emergence of the process that is functionally linked to the task's resolution. There are, however, goals in the activity of the preschooler and even younger

children. As we have seen, however, no child younger than twelve years is fully capable of conscious awareness of the task before him nor is he capable of working out a new concept.

Ach himself demonstrated experimentally that the difference between preschool children and adults or adolescents in the solution of a problem is not that the former represent the goal of the task less fully or correctly than the latter but that the act of resolving the problem unfolds in a completely different manner. In an extensive experimental study of concept formation in the preschooler (which we will discuss in more detail later), Uznadze has shown that in functional terms the preschooler encounters the problem in precisely the same way as the adult who is operating with concepts. However, the preschooler resolves the task in an entirely different way. Like the adult, the child uses the word as a means. Consequently, the word is for him connected in the same way with the functions of communication, interpretation, and understanding.

Thus, it is not the task, the goal, or the determining tendency but factors not considered by these researchers that underlie the difference between adult conceptual thinking and the forms of thinking characteristic of the young child. In particular, Uznadze pointed out the importance of a functional factor which is advanced to the forefront by Ach's research, specifically, the factor of communication, of mutual understanding between people through speech.

However, the word is a tool used for the attainment of mutual understanding. This plays a decisive role in the development of the concept. In the process of attaining mutual understanding, a complex of sounds acquires a definite meaning and is consequently transformed into a word or concept. If this functional aspect of mutual understanding did not exist, this complex of sounds could not be transformed into a carrier of meaning. Not a single concept would arise (Uznadze, 1966, p. 76).

Contact between the child and the adult world that surrounds him is established extremely early. From the outset, the child develops within the atmosphere provided by a speaking environment. He begins to use the mechanism of speech in the second year of life. "There is no question that what he uses are not complex meaningless sounds but true words. In time, they acquire increasingly differentiated meanings" (ibid, p. 77). Nonetheless, it seems to be relatively late that the child achieves the degree of socialization in his thinking necessary for the emergence of fully developed concepts.

Thus, we see on the one hand that the true concept, which indicates a high level of socialization of thinking, develops only at a late stage. On the other, we see that the child begins to use words and understand the words of adults at a very early age. It is clear, then, that before it attains the status of a true concept, the word can take on this communicative function and serve as a means of establishing mutual understanding. A special investigation of the appropriate age group would show how these forms of thinking (the equivalent of conceptual thinking though non-conceptual) develop and achieve the level characteristic of fully developed thinking (ibid).

Uznadze's research shows that though these forms of thinking are the functional equivalent of conceptual thinking, they differ qualitatively and structurally from the more developed thinking of the adolescent and adult. Nonetheless, this difference is not a function of the factor that Ach identifies. As Uznadze has shown, it is precisely in the functional sense, that is, with respect to the resolution of particular tasks and with respect to the determining tendencies that are derived from representations of goals, that these forms are the equivalent of the concept.

We are confronted with the following situation. First, the task - and the goal representations that are derived from it - turn out to be accessible to the child at a relatively early stage of development. Precisely because the task of understanding is the same for the child and the adult the functional equivalents of the concept develop at a very early stage of childhood. Given this identity in task, this functional equivalence, there is nonetheless a profound difference in the composition, structure, and mode of activity of the forms of thinking that function to resolve the task in the child and the adult.

Obviously, the task and the representation of a goal do not themselves determine and regulate the entire process. There is an additional factor that Ach has failed to consider. It is also apparent that the task and the determining tendency that is associated with it are inadequate to

explain the genetic and structural differences that we observe in these functionally equivalent forms of thinking in the adult and child.

The goal is not a sufficient explanation. Of course, without the goal no form of goal-oriented action is possible. However, irrespective of whether we are speaking of its development or its structure, the presence of this goal does not explain the process through which it is attained. As Ach himself says with reference to the older methods, the goal and the associated determining tendency make the process possible but they do not regulate it. The presence of the goal and task is a necessary but not sufficient condition for the emergence of goal-oriented activity. They do not guarantee that a true goal-oriented activity will emerge. At any rate, they do not possess the power to determine and regulate the course and structure of that activity. The child's experience and the experience of the adult, correspond fully when unresolved tasks arise before them. Thus, we must begin with the goal in our attempt to explain the nature of the mental processes that lead to the resolution of a task, but we cannot limit our explanation to it.

As we said earlier, the goal cannot explain the process. The basic problem associated with the process of the concept formation, and, more generally, with the process of goal-oriented activity, is the problem of the means through which a given mental operation is fulfilled, the problem of how a given goal-oriented activity is completed. In much the same way, we cannot satisfactorily explain labor by saying that it is called to life by the goals and tasks with which man is faced. Labor must be explained in terms of the use of tools and the application of the means without which it could not arise. In precisely the same sense, the central problem for the explanation of the higher forms of behavior is the problem of the means through which man masters the processes of his own behavior.

As is indicated by the study that we will discuss here, all the higher mental functions are mediated processes. A central and basic aspect of their structure is the use of the sign as a means of directing and mastering mental processes.

In the problem of interest to us, the problem of concept formation, this sign is the word. The word functions as the means for the formation of the concept. Later, it becomes its symbol. Only the investigation of the functional use of the word and its development from one age to the next (a development where the various uses of the word are genetically linked with one another) provides the key to the formation of concepts.

The major inadequacy of Ach's method is that it cannot help us clarify the genetic process involved in concept formation. It can only establish the presence or absence of this process. The organization of Ach's experiment presumes that the means through which the concept is formed (i.e., the experimental words which function as signs) are given from the outset; it presumes that they are constants that do not change over the course of the experiment. Moreover, their mode of application is predetermined by the instructions. Given his critical and polemical goal of trying to show that a single associative connection between words and objects is insufficient for the emergence of meaning, the goal of trying to show that the meaning of the word or concept is not equivalent to an associative connection between a sound complex and a series of objects, Ach consistently maintained a scheme that can be expressed in the following words: from below to above, from separate concrete objects to the concepts that grasp them.

Ach himself shows, however, that the organization of this kind of experiment directly contradicts the actual process involved in concept formation. Fogel has stated that concept formation cannot be reduced to a movement upwards through a conceptual paradigm, to a transition from the concrete to the increasingly abstract. This is the basic conclusion of Ach and Rimat's research. They have demonstrated the falsity of the associative perspective on concept formation. They have shown the productive, creative character of the concept and clarified the essential role of function in the concept's origin. They have emphasized that the concept is formed only with the emergence of a need that can be satisfied in the concept, only in the process of some meaningful goal-oriented activity directed on the attainment of a particular goal or the on resolution of a definite task.

These studies have done away with the mechanistic representation of concept formation once and for all. Nonetheless, they have failed to reveal the actual genetic, functional, and structural nature of this process. They have taken a common path in using a purely teleological explanation of the higher functions. In essence, they are reduced to the assertion that the goal

itself creates the corresponding goal-oriented activity through a determining tendency. They are reduced to the assertion that the solution is contained in the task itself.

We have mentioned that, in addition to the general philosophical and methodological inadequacies of this perspective, it leads to an irresolvable empirical contradiction. Given the functional identity of the tasks and goals throughout the process, it is impossible to explain within this framework why there are such profound differences in the forms of thinking with which the child approaches these tasks at various stages of development. It becomes incomprehensible how these different forms of thinking develop.

The studies of Ach and Rimat have initiated a new epoch in the study of concepts, but they have failed to offer a causal-dynamic explanation of concept formation. Therefore, experimental research is presented with the task of studying the development of concept formation, the task of studying how this process is causally and dynamically determined.

2

To resolve this problem, we have used an experimental method that we call the functional method of dual stimulation. In using this method, we study the development and activity of the higher mental functions with the aid of two sets of stimuli. These two sets of stimuli fulfill different roles *vis-à-vis* the subject's behavior. One set of stimuli fulfills the function of the object on which the subject's activity is directed. The second function as signs that facilitate the organization of this activity.

In the present context, we will not provide a detailed description of the application of this method to the study of concept formation. The method was developed by our colleague L. S. Sahkarov and described elsewhere (Sahkarov, 1930). We will outline only the most basic characteristics of the method, focusing on those which are of particular significance to the problems discussed above. In this research, we wanted to clarify the role of the word – that is, the nature of its functional application – in the process of concept formation. In this respect, the organization of this experiment was the opposite of Ach's.

Ach's experiment begins with a learning period in which the experimenter has not yet assigned any task to the subject. The subject is, however, given the means (i.e., the words) necessary for the solution of the problem. During this period, the subject studies, picks up, examines, and names the objects that have been placed in front of him. The task is not given at the outset, but introduced later. However, the means (i.e., the words) are given from the outset. They are given in direct associative connection with the stimulus objects.

When the method of dual stimulation is used, the opposite situation holds. The task is presented fully to the subject in the initial moments of the experiment and remains consistent throughout. The underlying idea is that the establishment of the task or emergence of the goal is a prerequisite for the development of the process as a whole. In contrast, the means are introduced gradually. They are introduced as the words which have been provided prove inadequate for the subject's attempts to solve the task. There is no learning period before the experiment begins. Thus, the way that the task is to be resolved is transformed. The stimulus-sign or word constitutes the variable. The task is the constant. This makes it possible to study how the subject uses the sign as a means of directing his intellectual operations. Depending on how the word is used, depending on its functional application, we are able to study how the process of concept formation proceeds and develops.

When the experiment is organized in this way, the pyramid of concepts is turned on its head. This factor is extremely important and we will discuss it in more detail later. Here, the path through which the task is resolved in the experiment corresponds with the actual process of concept formation. As we will see, this process does not occur mechanically or through a summarizing process as with Galton's photographs. It does not occur through a gradual transition from the concrete to the abstract. The reverse movement, the movement from above to below, from the general to the particular or from the top of the pyramid to its base is as characteristic of this process as is the reverse movement toward the pinnacle of abstract thinking.

Finally, the functional aspect that Ach referred to is extremely important. The concept does not emerge in a static and isolated form but in the vital process of thinking and resolving a task. The

whole investigation can be broken down into several separate stages, each of which includes the concept in action, that is, in one of its functional applications to the processes of thinking. There is initially a process in which concepts are worked out. This is followed by a stage in which these concepts are transferred to new objects, then by the use of the concept in free association, and, finally, by the application of the concept in the formation of judgments and the definition of developed concepts.

The experiment proceeds in the following manner. First, several objects varying in color, form, and dimension are placed on a special board that is divided into separate sections. These objects are illustrated in Figure 1. One of these objects is then shown to the subject. On the underside of each is a nonsense word that the subject reads.

The subject is then asked to place all the objects on which he believes the same word is written on a single section of the board. After each attempt by the subject to solve the task, the experimenter corrects him and reveals the name on an additional object. This new object may have the same name as that which was revealed previously. In this case, it may differ from the former in a single feature and be similar to it in all others. The new object may also have be designated by another sign. In this case, it will be similar to the former in one feature and different in all others.

Thus, after each new attempt, the quantity of objects and the number of designating signs that are revealed to the child both increase. This allows the experimenter to study how the character of the task resolution changes in dependence on this factor. The task itself remains the same throughout the experiment. That is, the same word is found on the objects throughout the experiment. The objects are associated with a single general experimental concept designated by a single word.

3

A series of studies on the process of concept formation were begun in our laboratory by Sakharov and completed in cooperation with Iu.V. Kotelova and E. I. Pashkovska. More than 300 normal children, adolescents, and adults participated in these studies. In addition, we studied several subjects suffering from various pathologies of intellect and speech.

The basic conclusion of this research has direct relevance for the theme with which we are currently concerned. We were able to study the genetic path characteristic of concept formation in subjects of various age groups. We compared and evaluated this process as it occurred under identical conditions in children, adolescents, and adults. On the basis of this experimental research, we were able to clarify the basic laws governing the development of this process.

In genetic terms, the basic conclusion of our research can be formulated in the following way: *The development of the processes that eventually lead to the formation of concepts has its roots in the earliest stages of childhood. However, these processes mature only in the transitional age. It is only at this point that the intellectual functions which form the mental basis for the process of concept formation are constituted and developed.*

Only with the transformation of the child that occurs in adolescence does the decisive transition to thinking in concepts become possible. Before this age, a unique intellectual formation that is externally similar to the true concept is present. A superficial research effort might be misled by the external similarity of these two formations, resulting in a claim that true concepts are present at a very early age. The unique intellectual formations present in the preadolescent period are, in fact, functionally equivalent to the true concepts that mature later. They fulfill a function similar to that of concepts and function in the resolution of similar tasks. However, experimental analysis indicates that their psychological nature, their constituents, their structure, and their mode of activity differ significantly from those of the true concept. These formations have much the same relationship to the true concept that the embryo has to the mature organism. If we identify these two formations with one another, we ignore an extended developmental process and put an equal sign between the initial and final stages of this process.

We would not be exaggerating if we said that the common tendency to identify the intellectual operations emerging in the transitional age with those of the three year old child has no more foundation than an identification of the epoch of sexual maturation characteristic of the transitional age with the sexuality of the infant. Just as the elements of the adolescent's future

sexuality and sexual attraction are present in infancy, the elements and constituents of the adolescent intellect are present in the young child.

We will conduct a detailed comparison of true concepts and the functionally equivalent formations found in the thinking of the preschool and school-aged child. However, as a foundation for that discussion, we must first establish what actually does emerge in the child's thinking in the transitional age. We must establish what impels the formation of concepts toward the center of the mental transformation that constitutes the crises of this period. As a first step, we must consider the most general characteristic of the process of concept formation and indicate why it is only in adolescence that the child masters this process.

Experimental research on concept formation has shown that a fundamental and necessary part of the process is the functional use of words or other signs as means of actively directing attention, partitioning and isolating attributes, abstracting these attributes, and synthesizing them. The formation of the concept and the acquisition of word meaning is the result of a complex activity (i.e., the activity of operating on the word or sign) in which all the basic intellectual functions participate in unique combination.

This allows us to formulate the basic claim to which our research has led us. This research indicates that the proximal factor determining the formation of concepts (i.e., of this unique mode of thinking) is not association (as many authors suggest), attention (as G. Muller argues), the mutual cooperation of judgment and representation (as Buhler's theory of concept formation implies), or the determining tendency (as Ach proposes). All these processes participate in the formation of concepts. None of them, however, is the determining and essential factor. None of them is a factor which itself constitutes an adequate explanation of the emergence of this new form of thinking. This form of thinking is unique and irreducible to elementary intellectual operations.

None of the processes mentioned above undergoes any noticeable transformation during the transitional age. None of these elementary intellectual functions emerge for the first time during this period. They are not a new acquisition of the transitional age. In this connection, the widespread notion that there is nothing fundamentally new in the intellect of the adolescent is correct. These functions were defined and matured at a much earlier age. During adolescence they simply continue the smooth course of their development.

The process of concept formation cannot be reduced to the processes of association, attention, representation, judgment, or determining tendencies, though all of these functions are indispensable for the complex synthetic process involved in concept formation.

Research indicates that what is central to this process is the functional use of the sign or word as the means through which the adolescent masters and subordinates his own mental operations and directs their activity in the resolution of the tasks which face him.

All the elementary mental functions that are commonly cited in connection with concept formation do actually participate in that process. However, their participation takes an entirely different form than is generally assumed. These processes do not participate as processes developing independently of one another in accordance with their own internal logic. They participate as processes that are mediated by the sign or word, as processes that are directed toward the solution of a given task and are thereby introduced into a new combination or synthesis. It is only within this new synthesis that each of the participating processes acquires its true functional significance.

Applied to the problem of concept development, this means that factors such as the accumulation of associations, the development of the volume or stability of attention, the accumulation of groups of representations, or the existence of determining tendencies, cannot themselves lead to the formation of concepts, however far the development of these factors may have progressed. None of these processes alone is the genetic factor that determines the development of concepts. The concept is not possible without the word. Thinking in concepts is not possible in the absence of verbal thinking. The new, essential, and central feature of this process, the feature that can be viewed as the proximal cause of the maturation of concepts, is a *specific way of using the word*, specifically, the functional application of the sign as a means for forming concepts.

In discussing our research method, we noted that neither the establishment of the task nor the emergence of a need for the formation of the concept can be considered the cause of the process of concept formation. These factors can set the process of task resolution in motion, but cannot insure its realization. Identifying the goal as the active force in concept formation cannot explain the causal-dynamic and genetic relationships that constitute the basis of this complex process any more than the target toward which a cannon ball is directed explains its flight. To the extent it is taken into consideration by those who aim the cannon, there is no question that the end goal is one of the features that determines the cannon ball's actual trajectory. In the same way, the character of the task with which the adolescent is faced and that he resolves through the formation of concepts is without question among the functional features that must be considered in a complete scientific explanation of the process of concept formation. It is precisely this emerging task, need, or goal that is posed for the adolescent by the surrounding social environment that impels and forces him to make this decisive step in the development of his thinking.

In contrast to the maturation of instincts or innate tendencies, the motive force that determines the beginning of this process and sets in action the maturational mechanism of behavior impelling it forward along the path of further development is located not inside but outside the adolescent. The tasks that are posed for the maturing adolescent by the social environment – tasks that are associated with his entry into the cultural, professional, and social life of the adult world – are an essential functional factor in the formation of concepts. Repeatedly, this factor points to the mutually conditioned nature, the organic integration, and the internal unity of content and form in the development of thinking.

Later, in our discussion of the factors underlying the cultural development of the adolescent, we will consider the fact – long established by scientific observation – that where the environment does not create the appropriate tasks, advance new demands, or stimulate the development of intellect through new goals, the adolescent's thinking does not develop all the potentials inherent in it. It may not attain the highest forms of intellect or it may attain them only after extreme delays. Therefore, it would be a mistake to ignore or fail to recognize the significance of the life-task as a factor that nourishes and directs intellectual development in the transitional age. However, it would also be a mistake to view this aspect of causal-dynamic development as the basic mechanism of the problem of concept development or as the key to this problem.

The researcher is faced with the task of understanding the internal connections between these factors. That is, the researcher is faced with the task of understanding the process underlying concept formation as a function of socio-cultural development, taking both the content and mode of the adolescent's thinking into account. The new use of the word as a signifier, that is, its use as a means of concept formation, is the proximal psychological cause of this intellectual revolution that occurs on the threshold between childhood and the transitional age.

Though no new elementary functions appear during this period, it would be incorrect to conclude that there is no transformation of the existing elementary functions. These functions are included within a new structure. In a subordinate position, they form a new synthesis or complex whole. The fate of each of the component parts is determined by the laws that govern the whole. Fundamental to the process of concept formation is the individual's mastery of his own mental processes through the functional use of the word or sign. This mastery of the processes of one's own behavior through auxiliary means attains its final form only in adolescence.

It has been demonstrated experimentally that the formation of concepts cannot be equated with the formation of habits. Experimental research on concept formation in adults, the investigation of their development in childhood, and the study of their disintegration with the pathological disturbance of intellectual activity permits the conclusion that the identification of the nature of the higher intellectual processes with the kinds of elementary, associative processes involved in habit formation (an identification made by Thorndike) is unsupported by data concerning the content, functional structure, and genesis of concepts.

This research shows that like the development of any higher form of intellectual activity the process of concept formation is not simply the product of a quantitative transformation of lower forms. The difference between the process of concept formation and purely associative activity is not merely the function of the quantity of connections involved. This process represents

something fundamentally new, something qualitatively irreducible to any type of activity based on associative connections. The basic difference between these two qualitatively different kinds of intellectual activity consists in the *transition from unmediated intellectual processes to operations that are mediated by signs*.

The signifying structure (i.e., the function associated with the active use of signs) is the law that is common to the construction of all the higher forms of behavior. This law is not identical to the associative structure of the elementary processes. In itself, the accumulation of associative connections will never lead to the emergence of the higher forms of intellectual activity. The difference between the lower and higher forms of thinking cannot be explained in terms of quantitative change.

In his theory of intellect, Thorndike maintains that the higher forms of intellectual operations are identical to purely associative activity, to the formation of connections. He maintains that they depend on the same type of physiological connections but simply require more of them. The difference between the adolescent's intellect and that of the child is reduced to one of the quantity of connections. Thorndike argues that an individual whose intellect is more powerful, more advanced, or better than that of others differs not because he possesses a new type of physiological process but because he possesses a greater quantity of the normal types of connections.

As we have said, this hypothesis does not find support in the experimental analysis of the formation of concepts, in the study of their development, or in what we know of their disintegration. Thorndike takes the position that selectivity, analysis, abstraction, generalization, and reasoning arise as a direct consequence of an increase in the quantity of connections in both the phylogenesis and ontogenesis of intellect. Again, this position is not supported by research on experimentally organized concept development in the child and adolescent. The development from lower to higher forms of concepts does not occur through a quantitative increase in the number of connections. It involves the emergence of a qualitatively new type of formation. Speech, one of the basic components in the construction of the higher forms of intellectual activity, is incorporated into this new formation, not associatively as a function flowing in parallel with others, but in a functional manner as a rationally applied means of behavior.

Speech itself is not based on purely associative connections. It requires a fundamentally different type of relationship between the sign and the structure of the intellectual operation, a relationship characteristic of the higher intellectual processes generally. To the extent that we can explore the phylogenetic development of intellect by studying the mind and thinking of primitive man, we again find little evidence in this domain that would indicate that the path of development moves from lower to higher forms through a quantitative increase in the number of associations. Finally, research by Kohler, Yerkes, and others indicates that there is little reason to think that the investigation of the biological evolution of the intellect will provide support for this identification of intellect and association.

4

If we attempt to represent the genetic implications of our research schematically, it indicates that the course of concept development is composed of three basic stages, each of which breaks up into several distinct phases.

The first stage in the formation of concepts is most frequently manifested in the behavior of young children. Faced with a task that an adult would generally solve through the formation of a new concept, the child forms an unordered and unformed collection. He isolates an unordered heap of objects. The child's isolation of these objects, objects that are unified without sufficient internal foundation and without sufficient internal kinship or relationships, presupposes a diffuse, undirected extension of word meaning (or of the sign that substitutes for the meaning of the word) to a series of elements that are externally connected in the impression they have had on the child but not unified internally among themselves.

At this stage of development, word meaning is an incompletely defined, unformed, syncretic coupling of separate objects, objects that are in one way or another combined in a single fused image in the child's representation and perception. A decisive role is played in the formation of

this image by the syncretism of the child's perception and action. This image is, therefore, extremely unstable.

In his perception, thinking, and action, the child has a tendency to connect the most varied elements, elements that may have no internal connections. Elements may sometimes be connected on the basis of a single impression. The result is an undifferentiated, fused image. Claparède referred to this tendency as the syncretism of the child's perception. Blonskii referred to it as the connection-less connectedness of the child's thinking. Elsewhere, we have described this same phenomenon as the child's tendency to substitute a surplus of subjective connections for an insufficiency of objective connections. We have described it as the child's tendency to take connections of impression and thought for actual connections between things. Of course, this reproduction of subjective connections is a significant factor in the development of the child's thinking. It is the basis for the subsequent process of selecting connections that correspond to reality, connections that are verified in practice. In its external form, the type of word meaning characteristic of the child at this stage in his development can appear similar to the word meaning of the adult.

The child establishes social interaction with adults through words that have meaning. To a significant extent, objective connections are reflected in these syncretic connections, in this unordered syncretic heap of objects formed with the help of the word. *Objective connections* are reflected here to the extent that they correspond with the child's own impressions and perceptions. Therefore, the meaning of the child's words will frequently correspond with the meanings established in adult speech. This is particularly true where words are related to the concrete objects that form the reality immediately available to the child.

Thus, the meanings of the child's words frequently coincide with those of the adult; the meanings of a given word for the child and the adult often intersect on the same concrete object. This allows mutual understanding between the adult and child. However, the mental paths or modes of thinking that lead to this point of intersection are completely different. Even where the meaning of the child's word corresponds partially with that of the adult's speech, it is derived from entirely different mental operations. The meaning of the child's word is the product of the syncretic merging of images that stands behind it.

This general stage in the formation of concepts in the child can be broken down into three phases which we were able to study in some detail.

The first phase in the formation of the syncretic image (i.e., the heap of objects that corresponds at this stage with the meaning of the word) coincides with the trial and error period in the child's thinking. In this phase, a new group of objects is randomly formed by the child through a series of separate probes that supersede one another as their erroneous nature becomes apparent.

In the second phase, it is the spatial distribution of the objects in the experiment that plays the decisive role. Once again, the purely syncretic laws that govern the perception of the visual field and the organization of the child's perception are critical. The syncretic image or heap of objects may be formed on the basis of the spatial or temporal encounter of isolated elements, the direct contact among these elements, or some more complex relationship arising among them in the direct process of perception. The factor that continues to be basic to this period is the fact that the child is guided not by the objective connections present in the things themselves, but by the subjective connections that are given in his own perception. Objects are brought together in a single series and subordinated to a common meaning not on the basis of general features that are inherent to them and that have been isolated by the child but on the basis of a kind of kinship that has been established between them by the child's impressions.

The third phase of this stage signifies its completion and the transition to the second stage of the process of concept formation. In this phase, the basis on which the syncretic image is formed is more complex. Here, representations of various groups that have already been united in the child's perception are reduced to a single meaning. Thus, each of the elements of the new synthetic series represents some group of objects previously united in the child's perception. There are, however, no internal connections among these groups. They represent the same kind of unconnected heap that we find in the previous two phases.

The critical difference between this phase and the two that precede it is that here the connections which the child places at the foundation of the word are the product of what might be called a two-stage development of syncretic connections rather than of isolated perceptions. First,

syncretic groups are formed. Subsequently, representatives of these groups are isolated and once again syncretically united. Thus, behind the meaning of the child's word we find not a one dimensional plane but a three dimensional space. We find a dual series of connections, a dual structured group. Nonetheless, this series and structure still fails to transcend the unordered collection or heap.

Having achieved this phase, the child completes this first stage in the development of concepts. He moves beyond heaps as the basic form of word meaning and advances to a second developmental stage. We will refer to this as the stage of the formation of complexes.

5

The second major stage in the development of concepts includes several different types of what is a single mode of thinking. These types vary functionally, structurally, and genetically. Like other modes of thinking, this one leads to the formation of connections, the establishment of relationships among different concrete impressions, the unification and generalization of separate objects, and the ordering and systematization of the whole of the child's experience.

Nevertheless, this mode of uniting concrete objects in a common group differs from that based on thinking in concepts or conceptual thinking. First, the nature of the connections that are established among the objects in the group differs from that characteristic of concepts. Second, as defined by the relationship of each object in the group to the group as a whole, the structure of the unified group differs profoundly in type and mode of activity from that based on conceptual thinking.

We will refer to this mode of thinking as *thinking in complexes* [*complexive thinking* – N.M.].

In structural terms, generalizations created on the basis of this mode of thinking are complexes of distinct concrete objects or things that are united on the basis of objective connections, connections that actually exist among the objects involved. This contrasts with the structure of generalizations created in the previous stage, generalizations which are formed on the basis of subjective connections arising in the child's impressions.

We have said that the first stage in the development of thinking is characterized by the construction of syncretic images that are the child's equivalent of adult concepts. Correspondingly, the second stage is characterized by the construction of complexes which have the same functional significance. This is a new step on the road to the mastery of concepts, a new stage in the development of the child's thinking. It constitutes a significant advance over the preceding stage and it is an extremely significant step forward in the child's life. Rather than the "unconnected connectedness" that provides the foundation for the syncretic image, the child begins in this second stage to unite homogeneous objects in a common group, to combine them in accordance with the objective connections that he finds in the things themselves.

To some degree, the child who has advanced to this form of thinking has overcome his egocentrism. He no longer takes the connections among his own impressions for the connections among things. In this, he has completed a decisive step in the movement from syncretism to the mastery of objective thinking. Complexive thinking is thinking that is both connected and objective. These two features of complexive thinking distinguish it from the syncretic thinking characteristic of the previous stage. Nevertheless, this connectedness and objectiveness is still not the connectedness that is characteristic of thinking in concepts, a form of thinking that is attained only in adolescence.

The complexes formed during this second stage are constructed in accordance with entirely different laws of thinking than are concepts. Objective connections are reflected in the complex, but they are reflected in a different manner and form than in the concept. Vestiges of complexive thinking can be found in adult speech. Perhaps the best illustration of the laws underlying the construction of the thought complex to be found in adult speech is the family name. Any family name such as "Smith" incorporates within it a complex of distinct objects, a complex that approximates the complexive character of the child's thinking. In a certain sense, we can say that the child at this second stage thinks in accordance with family names. In other words, the world of objects is united and organized for him by virtue of the fact that objects are grouped in separate though interconnected families. At this stage of development, word-

meanings are best characterized as family names of objects that are united in complexes or groups.

What distinguishes the construction of the complex is that it is based on connections among the individual elements that constitute it as opposed to abstract logical connections. It is not possible to decide whether a given individual belonging to the Smith family can properly be called by this name if our judgment must be based solely on logical relationships among individuals. Resolving this question means resolving the empirical question of whether the individual belongs to this group. The question becomes an empirical one of whether a particular form of kinship exists among the group members.

The foundation of the complex lies in empirical connections that emerge in the individual's immediate experience. A complex is first and foremost a concrete unification of a group of objects based on the empirical similarity of separate objects to one another. This is fundamental to all the characteristics of this mode of thinking. The most important characteristic of complexive thinking is that it occurs on the plane of concrete-empirical thinking rather than on the plane of abstract-logical thinking. Therefore, the complex is not characterized by the underlying unity of connections which helped to establish it.

Like the concept, the complex is a generalization or unification of heterogeneous concrete objects. However, the nature of the connections through which this generalization is constructed is very different for the complex than for the concept. If empirically present, *any* connection is sufficient to lead to the inclusion of an element in a given complex. This is the essential characteristic of the complex's construction. The concept is based on connections of a single, logically equivalent type. In contrast, the complex is based on heterogeneous empirical connections that frequently have nothing in common with one another. Stated somewhat differently, objects are generalized by a single feature in the formation of the concept but by multiple features in the formation of the complex. Therefore, a single, essential, and uniform connection or relationship among objects is reflected in the concept while the connections are empirical, accidental, and concrete in the complex.

Thus, it is the heterogeneous nature of the connections which provide the foundation for the complex that constitute the main feature distinguishing it from the concept. The concept is based on uniform connections. In the concept, each object is included within the generalization on the same basis as are all the other objects. Each of the elements is connected to the whole that is expressed in the concept, and through this whole to each of the other elements, *by a single image and by the same type of connections*. In contrast, the elements of the complex may be connected to the whole and the other elements that constitute it by extremely heterogeneous connections. In the concept, these connections are essentially the relationship between the general and the particular, and between the particular and the particular through the general. In the complex, these connections can be as heterogeneous as the kinds of empirical contiguity and empirical kinship that can exist among the most varied objects found in any concrete relationship with one another.

Our research indicates that there are five basic types of complexes that provide the foundation for the generalizations that arise in the child's thinking during this stage of development.

We will refer to the first type of complex as an associative complex because it is based on an associative connection between an object that is included in the complex and any of the features that the child notices in the object that acts as the complex's nucleus. Around this nucleus, the child can build an entire complex composed of the most varied objects. Some objects may be included in the complex because they are the same color as the nucleus. Others may be included on the basis of similarity in form, dimension, or any other distinguishing feature that the child notices. *Any* concrete relationship that becomes apparent to the child, *any* associative connection between the nucleus and another object, is sufficient grounds for relating that object to the group and for designating it by the common family name.

The various elements of the complex may not be united with one another in any way. The sole principle for their generalization is their empirical kinship with the nucleus of the complex. As we have said, any associative connection may link an element to the nucleus. One element may be linked to the nucleus of the emerging complex because of its color. Another may be linked to it because of its form. If we remember that this connection may vary not only in terms of the particular feature on which it is based but in terms of the character of the relationship between

the two objects, we can begin to understand how varied, unordered, unsystematic, and un-unified the collection of concrete features lying behind complexive thinking may be at any given time. The complex may be based on a direct identification of features, on similarity or contrast among objects, or on an associative connection among objects stemming from their physical contiguity. However, the complex is always based on *concrete connections*.

In this phase of his development, words no longer function for the child as designations for distinct objects, each of which has its own name. Words have become family names. Thus, at this point in his development, when the child says a word, he indicates a family of things that are connected to one another by the most varied lines of kinship. To refer to a particular object using the appropriate name means to relate it to a particular concrete complex with which it is connected. To name an object is to name its family.

6

The second phase of the development of complexive thinking consists of the unification of objects and concrete images of things in groups that are reminiscent of what is commonly called a collection. Here, various concrete objects are united in accordance with a single feature, that is, on the basis of reciprocal supplementation. These objects form a unified whole consisting of heterogeneous, though supplementary, parts. What is most characteristic of this stage in the development of thinking is the *heterogeneous nature of the constituents, their reciprocal supplementation, and their unification on the basis of a collection*.

Under experimental conditions, the child selects objects to match the model that differ from it in color, form, size, or some other feature. However, the child's selection of these objects is neither chaotic nor accidental. Objects are selected in accordance with features that differentiate them from the model, in accordance with a principle of supplementing the feature of the model that has been taken as the basis for unification. The collection that arises on the basis of this kind of construction is a collection of objects that differ in color or form. It represents a set of the basic colors or the basic forms found in the experimental materials.

What distinguishes the collection from the associative complex is the fact that we do not find two objects with the same features. A single exemplar is selected from each group to represent that group. Rather than association by similarity, what we have here is something more like association by contrast. Frequently, this form of thinking is combined with the associative form of thinking we described above. When this happens, we find a collection constituted on the basis of different features. In forming the collection, the child does not maintain the sequential principle that is basic to the formation of the complex. Rather, he unites various features through association although each feature becomes part of the foundation.

This extended and stable phase in the development of the child's thinking has very deep roots in his concrete, visual, and practical experience. In visual and practical thinking, the child is always dealing with collections of things that mutually supplement one another. The most frequent form of generalization of concrete impressions that the child's concrete experience teaches him is a set of mutually supplementary objects that are functionally or practically important and unified. Sets such as the cup, saucer, and spoon, the fork, knife, spoon and plate, or clothes are good examples of the kinds of complex-collections that the child encounters in his daily life.

It is both natural and understandable, then, that the child constructs these kinds of complex-collections even in his verbal thinking, that he combines objects in concrete groups in accordance with the principle of functional supplementation. As we will see later, this type of complex plays an extremely important role in adult thinking as well, especially in the thinking of the neurologically impaired or the mentally ill. In concrete speech, when the adult speaks of dishes or clothes, what he has in mind is often not the corresponding abstract concept but a set of concrete things that form a collection.

Thus, the syncretic image is based on subjective emotional connections among impressions that are taken by the child for the actual connections among things. The foundation for the associative complex, on the other hand, is found in shifting features of similarity between objects. In the same sense, the foundation for the collection is found in the connections and relationships among things that are established in the child's practical action and visual

experience. Thus, the complex-collection is *a generalization of things based on their co-participation in a single practical operation*, a generalization of things based on their functional collaboration.

In the present context, these three forms of thinking are of interest in their capacity as different genetic paths leading to a single point, to the formation of the concept.

7

In correspondence with the logic of experimental analysis, the phase of the complex-collection is followed by the chained complex. The chained complex is also an inevitable step in the child's movement toward the mastery of concepts.

The chained complex is constructed in accordance with the principle of a *dynamic, temporal unification of isolated elements in a unified chain, and a transfer of meaning through the elements of that chain*. Under experimental conditions, this type of complex is generally manifested in the following manner: The child selects an object, or several objects, to match the model on the basis of some type of associative connection they have with it. The child then continues to select concrete objects to form a unified complex. However, his selection is guided by the features of objects selected in previous stages of the action, features that may not be found in the model itself.

For example, the child may select several objects having corners or angles when a yellow triangle is presented as a model. Then, at some point, a blue object is selected and we find that the child subsequently begins to select other blue objects that may be circles or semicircles. The child then moves on to a new feature and begins to select more circular objects. In the formation of the chained complex, we find these kinds of transitions from one feature to another.

The meaning of the word shifts in accordance with the connections that constitute the complex chain. Each element in the chain is united with that which precedes it and with that which follows it. The distinguishing feature of this type of complex is that the character of the connection between any element in the chain and the elements that precede and follow it may be entirely different.

Once again, the complex has its foundation in associative connections among the separate concrete elements that form it. Here, however, these connections will not necessarily connect each element with the model. By virtue of being included in the complex, each element assumes a position equal to that of the model. Through association, it may become the critical element that allows several objects to be attached to the complex.

The concrete and graphic character of complexive thinking becomes apparent here. In accordance with some associative feature, the object is included in the complex as a particular concrete object which retains all its features rather than as the carrier of a single feature which defines the object's membership in the complex. No single feature abstracted from others plays a unique role. The significance of the feature that is selected is essentially functional in nature. It is an equal among equals, one feature among many others that define the object.

Here we can begin to sense the common characteristic that distinguishes complexive thinking generally from conceptual thinking. In contrast to the concept, no hierarchical connections or relationships among features are found in the complex. The functional significance of all features are, in principle, equal. Whether we consider the relationship of the general to the particular (i.e., the relationship of the complex or concept to each of its constituents), the relationships among the elements, or the laws underlying the construction of the whole, we find that the complex differs fundamentally from the concept.

There may be no structural center in the chained complex. The separate elements may come into connection with one another, changing the central or model element at each stage. Some elements may have nothing at all in common with the other elements of the complex. Each belongs to the complex because it shares some feature with some other element. The first and third elements in a chain may have no connection other than their mutual connection with the second.

With some justification, then, the chained complex can be considered the purest form of complexive thinking because it does not have the central element which acts as a model that we find in the associative complex. As we have seen, the connections among the separate elements

of the associative complex are established through some common element that constitutes a center. There is no such center in the chained complex. Here, the connection exists wherever its separate elements can be brought together empirically. The chain's final element may have nothing in common with its initial element. The fact that they are connected by an intermediate unifying element is sufficient for their membership in a single complex.

If we were to attempt to characterize the relationship of the separate concrete element to the complex as a whole, we would say that in contrast to the concept the element enters the complex as a real concrete unit with all its empirical features and connections. The complex is not superordinate to its elements in the way the concept is superordinate to the concrete objects that are included within it. The complex merges empirically with the concrete elements which constitute it. This merging of the general and the particular, of the complex and its element (i.e., what Werner has called a mental amalgam), constitutes the essential feature of complexive thinking generally and of the chained complex in particular. The complex is inseparable from the concrete group of objects that are unified by it. It merges with this concrete group. As a result, it acquires an undefined character, what might be referred to as an overflowing character.

The connections that form the chained complex and their character and type shift imperceptibly. Sometimes, the most remote similarity, the most superficial point of contact, will be sufficient for the formation of a connection. Here a remote, vague impression of some commonality between the objects, rather than any real similarity, may lie at the foundation of a connection. For purposes of experimental analysis, we call what emerges under these conditions a diffuse complex. This diffuse complex constitutes the fourth phase in the development of complexive thinking.

8

In this fourth type of complex, the feature that unifies the separate concrete elements in the complex is diffuse, undefined, and vague. The resulting complex is formed on the basis of diffuse, undefined connections of concrete groups of images or objects. Given a yellow triangle as a model, for example, the child selects not only a triangle but a trapezoid. With its sharp angles, the latter reminds the child of the triangle. Subsequently, a square is affiliated with the trapezoid, a hexagon with the square, a polygon with the hexagon, and finally a circle with the hexagon. Further, just as we find this kind of spreading and lack of definition when form is taken as the object's basic feature, we sometimes find that a diffuse feature of color provides the basis for a complex. The child may follow a yellow object with a green one, a green with a blue, and a blue with a black.

This form of complexive thinking is extremely stable and important in the natural conditions of the child's development. It is also of particular interest for experimental analysis, since it clearly reflects another extremely important feature of complexive thinking, that is, the undefined nature of its outlines and the fact that it is by nature undefined.

Just as the ancient biblical family, a concrete familial unity of people, dreamed of multiplying and becoming as numerous as the stars in the heavens, the diffuse complex in the child's thinking is a familial unification of things. It includes within itself limitless possibilities for extension. New concrete objects are continually included within the basic family.

As we said, the complex-collection is represented in the child's natural life primarily by generalizations that are based on the functional similarity of various objects. The corresponding prototype of the diffuse complex in life, the natural analog of the diffuse complex in the development of the child's thinking, is the type of generalization he creates in domains of thinking that are not subordinated to practical verification. In other words, they are generalizations in domains other than the domain of concrete or practical thinking. We are all familiar with the unexpected rapprochements, the leaps of thought, the treacherous generalizations, and the diffuse transitions that the child manifests when he begins to discuss or think beyond the limits of the concrete-object world, beyond his actual practical experience. The child enters a world of diffuse generalizations where features glide past one another and constantly shift, where the transitions from one feature to another are often imperceptible. There are no firm outlines here. Unbounded complexes govern. These complexes which are often striking because of the universal character of the connections which unify them.

One need only look carefully at this type of complex to realize that the principle underlying its construction is identical to that which underlies the construction of restricted concrete complexes. In neither case does the child go beyond the concrete image or empirical connections between different objects. What is unique to the diffuse complex is that it unifies things that are outside the child's practical knowledge. The result is that the connections which provide its unity depend on false, vague, and undefined features.

One final phase remains to complete the picture of the development of complexive thinking. This final form of complexive thinking has tremendous significance for the child's thinking in both the experiment and real life. It casts light both backward and forward. On the one hand, it illuminates the phases of complexive thinking that the child has already passed through. On the other, it serves as a bridge to a new and higher stage, as a bridge to the formation of concepts.

We call this complex a pseudoconcept because it has strong external similarities to the concept that we find in the adult's intellectual activity. However, in its essence, in accordance with its true psychological nature, it is very different from the true concept.

A careful study of this final stage in the development of complexive thinking demonstrates that this form of generalization is a complexive unification of a series of concrete objects. Phenotypically, on the basis of its external appearance and external characteristics, the pseudoconcept corresponds completely to the concept. However, genotypically, in accordance with its emergence, its development, and the causal-dynamic connections which underlie it, the pseudoconcept is clearly not a concept. Externally, we see a concept – internally a complex. This is why we call it a pseudoconcept.

Under experimental conditions, the child forms a pseudoconcept when he selects objects to match a model which are like those that would be selected and united with one another on the basis of an abstracted concept. Thus, this generalization could arise on the basis of a concept. In fact, however, it arises on the basis of the child's complexive thinking. It is only in terms of the final result that this complexive generalization corresponds with a generalization constructed on the basis of a concept. For example, given a yellow triangle as a model, the child selects all the triangles in the experimental materials. A group of this kind could arise on the basis of abstracted thinking (i.e., on the basis of the concept or idea of a triangle). However, our research indicates that the child actually unites the objects on the basis of their concrete, empirical connections, on the basis of simple association. He constructs only a bounded associative complex. He arrives at the same point as one would have through thinking in concepts, but he takes an entirely different route.

This type of complex, this form of concrete thinking, is predominant in both functional and genetic terms in the child's actual thinking. Therefore, more detailed consideration must be given to this critical moment in the development of the child's concepts, a moment which simultaneously separates and connects complexive and conceptual thinking.

10

The pseudoconcept is the most common form of complex in the preschooler's real life thinking. It is a form of complexive thinking that prevails over all others. It is sometimes the exclusive form of complexive thinking. Its wide distribution has a profound functional basis and significance. This form of complexive thinking gains its prevalence and dominance from the fact that the child's complexes (which correspond to word meanings) do not develop freely or spontaneously along lines demarcated by the child himself. Rather, they develop along lines that are preordained by the word meanings that have been established in adult speech.

It is only in the experiment that we free the child from the directing influence of the words of adult language with their developed and stable meanings. It is only here that we allow the child to develop word meanings and create complexive generalizations in accordance with own his free judgment. The experiment is of tremendous significance in this sense. It allows us to discover how the child's own activity is manifested in learning adult language. The experiment indicates what the child's language would be like and the nature of the generalizations that would direct his thinking if its development were not directed by an adult language that effectively predetermines the range of concrete objects to which a given word meaning can be extended.

One could argue that our use of phrases such as “would be like” and “would direct” (i.e., our use of the subjunctive mood) in this context provides the basis for an argument against rather than for the use of the experiment since the child is not in fact free to develop the meanings he receives from adult speech. We would respond to this argument by noting that the experiment teaches more than what would happen if the child were free from the directing influence of adult speech, more than what would happen if he developed his generalizations freely and independently. The experiment uncovers the real activity of the child in forming generalizations, activity that is generally masked from casual observation. The influence of the speech of those around the child does not obliterate this activity. It merely conceals it, causing it to take an extremely complex form. The child’s thinking does not change the basic laws of its activity simply because it is directed by stable and constant word meanings. These laws are merely expressed in unique form under the concrete conditions in which the actual development of the child’s thinking occurs.

With the stability and consistency of its meanings, the speech of those who surround the child predetermines the paths that the development of the child’s generalizations will take. It links up with the child’s own activity, directing it along a certain, strictly defined, channels. However, as he moves along this predetermined path, the child thinks in correspondence with the characteristics of a particular stage in the development of intellect. By addressing the child in speech, adults determine the path along which the development of generalizations will move and where that development will lead, that is, they determine the resulting generalizations. However, the adult cannot transfer his own mode of thinking to the child. Children acquire word meanings from adults, but they are obliged to represent these meanings as concrete objects and complexes.

The paths through which word meanings are extended or transferred are determined by the people around the child in their verbal interaction with him. However, the child cannot immediately learn adult modes of thinking. The product he receives is similar to that of the adult. However, it is obtained through entirely different intellectual operations. This is what we call a pseudoconcept. In its external form, it appears to correspond for all practical purposes with adult word meanings. However, it is profoundly different from these word meanings in its internal nature.

It would be a profound mistake to view the dual character of this product as a reflection of discord or bifurcation in the child’s thinking. This discord or bifurcation exists only for the observer who is studying this process from two different perspectives. For the child himself, what exist are complexes that are the equivalent of the adult’s concepts. That is, what exist are pseudoconcepts. This situation was observed frequently in our experimental studies of concept formation. The child formed a complex with all the typical structural, functional, and genetic characteristics of complexive thinking. For all practical purposes, however, the product of this complexive thinking corresponded with the generalization that would have been constructed on the basis of thinking in concepts.

This correspondence in the result or product of thinking makes it extremely difficult for the researcher to differentiate between cases where he is dealing with thinking in complexes and those where he is dealing with thinking in concepts. This masking of complexive thinking that arises from the external similarity between pseudoconcepts and true concepts is a serious obstacle for the genetic analysis of thinking. It is precisely this circumstance that has led many researchers to the conclusion we discussed at the beginning of the chapter. The external similarity between the thinking of the three year old child and the thinking of the adult as well as the practical correspondence between the word meanings of the child and adult creates the possibility for verbal interaction and mutual understanding between them. This functional equivalence of the complex and concept has led researchers to the false conclusion that all the forms of adult intellectual activity are present in undeveloped form in the three year old child. It has led researchers to the conclusion that no fundamental transformation, no new stage in the mastery of concepts, occurs during the transitional age.

It is not difficult to understand how this mistake has been made. At an early age, the child learns a whole series of words that mean for him just what they mean for the adult. The resulting potential for mutual understanding between the adult and child creates the impression that the beginning and the end point in the development of word meaning correspond, that the

completed concept is given from the outset with no role for development. Identifying the word's initial meaning with the concept (a mistake that was made by Ach) leads inevitably to this false conclusion, this conclusion that has its foundation in illusion.

It is extremely difficult to identify the boundary which separates the pseudoconcept from the true concept. This problem is nearly inaccessible to a purely formal, phenotypal analysis. In its external characteristics, the pseudoconcept is as similar to true concept as the whale is to the fish. However, if we turn to the "origin of the species" of intellectual and animate forms, it becomes apparent that the pseudoconcept is related to complexive thinking and the whale to the mammals.

Thus, in the most widely distributed concrete form of complexive thinking in the child (i.e., in the pseudoconcept) there lies an internal contradiction that is engraved in its very name. On the one hand, this contradiction presents a tremendous obstacle for the scientific investigation of the pseudoconcept. On the other, this contradiction is why the pseudoconcept is of such extraordinary functional and genetic significance, why it is such a critical moment in the development of the child's thinking. This contradiction consists in that, in the pseudoconcept, we have a complex that is the functional equivalent of the concept. This complex and the concept are equivalent in functional terms in that we notice no difference in them in the speech interaction and mutual understanding between the adult and child.

Thus, we have a complex which corresponds for all practical purposes with the concept, which includes the same group of concrete objects as the concept. We have a shadow of the concept, one that reproduces its contours. Yet, this complex is a form of generalization that is constructed in accordance with entirely different laws than the true concept.

Earlier, we showed how this real contradiction arises and what causes it. We saw that adult speech, through its stable, well-defined meanings, determines the developmental course taken by generalizations; we saw that it determines the child's complexive formations. The child does not choose the meaning of the word. It is given to him through verbal interaction with adults. The child is not free to construct his own complexes. He finds them in completed form in the process of understanding unfamiliar speech. He is not free to select the separate concrete elements that constitute the complex in which he will include them as elements. The child receives in completed form a series of concrete objects generalized by a given word. The child does not spontaneously relate a given word to a given concrete group of objects and then transfer its meaning from object to object, extending the circle of objects that are grasped by the complex. He follows adult speech, learning established concrete word meanings that are given to him in developed form. Stated simply, the child does not create his speech but learns the developed speech of the adults around him. Everything is contained in this statement. It implies that the child does not create the complex that corresponds with the meaning of a word but finds it ready made, classified by a common word or name. The result is that the child's complexes correspond with the adult's concepts. The pseudoconcept, a concept-complex, arises.

We have said, however, that while there is an external correspondence between the pseudoconcept and the concept in terms of the end product, the thinking of the child that leads to the pseudoconcept does not correspond with the intellectual operations characteristic of adult thought. This is precisely the source of the tremendous functional significance of the pseudoconcept as a special, internally contradictory, form of thinking in the child. The pseudoconcept would not be the dominant form of childhood thinking if the child's complexes diverged from adult concepts, as was the case in our experiment where the child was not bound to an assigned word meaning. Mutual understanding by means of words, verbal interaction between the adult and child, would be impossible if word meanings diverged in this way. This interaction is possible only because the child's complexes correspond empirically with the concepts of the adult. The concept and the complex turn out to be functionally equivalent. As we noted earlier, this gives rise to an extremely important circumstance which leads to the extraordinary functional significance of the pseudoconcept. The child who thinks in complexes and the adult who thinks in concepts establish mutual understanding and verbal interaction because their thinking meets in the corresponding complex-concept.

In beginning this chapter, we said that the entire difficulty of the genetic problem of the formation of concepts in childhood lies in clarifying this internal contradiction inherent to the child's concepts. From the outset, the word serves as a means of interaction and mutual

understanding between the child and adult. As Ach demonstrated, it is this functional aspect of the word that leads to the emergence a definite word meaning and to the ultimate fate of the word as the carrier of the concept. As Uznadze notes, without this functional aspect of mutual understanding, no sound complex could become the bearer of meaning, no concept could arise.

Verbal contact and verbal understanding between the adult and the child appears very early. As we have said, this is why many researchers assume that the emergence of the concept also occurs at an early stage in the child's development. We have seen, however, that the true concept emerges at a comparatively late stage in the development of the child's thinking and that this is true despite the fact that mutual verbal understanding between the child and the adult is established very early.

Uznadze writes: "This makes it clear that before the word achieves the status of a true concept it can assume the concept's function; it can serve as a tool for mutual understanding" (1966, p. 77). The researcher is faced with the task of discovering the development of forms of thinking that are not concepts but are their functional equivalents. The contradiction between the late development of the concept and the early development of verbal understanding finds its actual resolution in the pseudoconcept, a form of complexive thinking that provides the potential for correspondence between the thinking and understanding of the child and adult.

Thus, we have discovered the cause as well as the significance of this important form of complexive thinking in the child. We must now consider the genetic significance of this concluding stage in the development of the child's thinking. Because of the dual functional nature of the pseudoconcept, this stage in the development of the child's thinking acquires a unique *genetic significance*. It serves as a *link unifying complexive and conceptual thinking*. It opens up before us the process through which the child's concepts are established. This complex contains the kernel of the future concept that is germinating within it. Thus, verbal interaction with adults becomes the motive force behind the development of the child's concepts. The transition from complexive to conceptual thinking is imperceptible to the child because his pseudoconcepts correspond for all practical purposes with the adult's concepts.

What emerges here, then, is a genetic situation of a special nature, one that is more the rule than the exception for the whole of the child's intellectual development. It consists in that the child begins to apply concepts in practice and operate with them long before he gains conscious awareness of them. The concept "in itself" and "for others" develops earlier in the child than the concept "for itself." The concept "in itself" and "for others" is already contained in the pseudoconcept. It is a fundamental genetic prerequisite for the development of the true concept.

Thus, the pseudoconcept, viewed as a basic phase in the development of the child's complexive thinking, completes the second stage in the development of the child's thinking and opens the door for the third. It serves as the unifying link between these two stages. It is the bridge that lies between the child's concrete and abstract thinking.

11

The final phase in the development of the child's complexive thinking that we have just described completes this entire epoch in the development of concepts. In examining this stage as a whole, we will not restate the characteristics of each of the various forms of complexive thinking. In our analysis of these various forms, we have outlined complexive thinking with sufficient clarity from both above and below. That is, we have identified the characteristics that distinguish complexive thinking from syncretic images as well as those that distinguish it from concepts.

The absence of unity in its connections, the absence of hierarchy, the concrete character of the connections that underlie it, the relationship of the general to the particular and the particular to the general, the interrelationships of the separate elements, and the laws governing the construction of the complexive generalization have been discussed in all their uniqueness. We have seen how profoundly the complex differs from higher and lower forms of generalization. The logical essence of the various forms of complexive thinking were laid bare with all the clarity that the experiment is able to provide. However, we must reach agreement concerning several characteristics of the experimental analysis that could provide the foundation for erroneous conclusions concerning what has been said above.

The process of concept formation as it is elicited through the experiment is never a perfect reflection of the actual process of development. In our view, however, this is not the weakness but the merit of experimental analysis. The experiment allows us to reveal the essence of the genetic process of concept formation in abstracted form. The experiment provides the key to a true understanding of the actual process of concept development in the child.

Dialectical thinking does not place logical and historical methods for acquiring knowledge in opposition to one another. In accordance with Engels's well known definition, the logical method of investigation is itself an historical method. Logical methods are merely freed from their historical form and from the element of chance in history that interferes with the structure of the scientific account. The logical course of thought and history begin with the same thing. Moreover, the development of logical thought is nothing but a reflection of the historical process in an abstracted and theoretically consistent form. It is a refined reflection of the historical process, but it is refined in correspondence with the laws that historical reality itself teaches us. The logical mode of investigation provides the possibility for studying any aspect of development in its most mature stage and in its classic form (Marx & Engels, *Collected Works*, v. 13, p. 497).

Applying this general methodological position to our own research, we can say that even the basic forms of concrete thinking that we have enumerated are the central features of development in their most mature stages, in their classical and true form taken to its logical limits. In the actual course of development, these forms of thinking are found in complex and confused form. Their logical description, as prompted by experimental analysis, is an abstract reflection of the actual course of concept development.

Thus, we must think of the experimental analysis of the major features in the development of concepts in historical terms. They must be understood as a reflection of the most important stages in the actual development of the child's thinking. Here, historical analysis becomes the key to the logical understanding of concepts. The developmental perspective becomes the point of departure for the explanation of the process as a whole and for the explanation of each aspect of that process.

One contemporary psychologist has noted that in the absence of genetic analysis a morphological analysis of complex mental formations and manifestations will inevitably be incomplete. In his words, however, the more complex the processes being studied, the more their prerequisites will be found in previous experiences and, therefore, the more their analysis will require a clear statement of the problem in methodological comparison and in the conceptual connections concerning the inevitability of development. This is true even where we are concerned with the elements of activity, elements that contain only a slice of consciousness.

This psychologist has demonstrated that a purely morphological study is as impossible as organizing and differentiating mental formations from above. In the absence of genetic analysis and synthesis, the investigation of preceding forms, and the general comparison of constituents, we can never solve this inherently complex and internally interconnected problem. Only a comparative analysis of numerous slices of the genetic process can reveal the actual construction of psychological structures and their interconnections.

Development is the key to understanding any of the higher forms. Gesell' writes that:

The higher genetic law is apparently the following: Any development in the present is based on past developments. Development is not a simple function fully determined by X units of inheritance plus Y units of environment. It is an historical complex that selects at each stage what is included in its past. In other words, the artificial dualism of environment and heredity leads down a false path. It hides the fact that development is an unbroken, self-conditioned process, not a marionette directed by tugs on two threads (1932, p. 218).

On the one hand, then, experimental analysis of concept formation leads inevitably to functional and genetic analysis. Using morphological analysis, we must attempt to bring the major forms of complexive thinking that we have identified through experimental analysis into correspondence with the forms of thinking that are actually found in the child's development. An historical or genetic perspective must be introduced into the experimental analysis. On the other hand, we must attempt to clarify the actual process involved in the development of the child's thinking using data obtained through experimental analysis. Bringing experimental and

genetic forms of analysis together in this way – finding a rapprochement between the experiment and reality – leads us from the morphological analysis of complexive thinking to the investigation of complexes in action, to the investigation of complexes in their actual functional significance and in their actual genetic structure.

What is opening up before us here is the task of bringing together morphological and functional, or experimental and genetic, forms of analysis. The data from experimental analysis must be verified on the basis of data on the child's actual development. Correspondingly, the actual course of concept development must be illuminated through experimental data.

12

We can summarize our study of the second stage of concept development in the following way. When the child is at the stage of complexive thinking, he thinks of the same objects as the adult in connection with a word's meaning. This creates a potential for understanding between the child and adult. However, the child thinks the same thing in a different way, on the basis of different intellectual operations.

The validity of this position can be demonstrated functionally. If we analyze the adult's concepts and the child's complexes in action, the differences in their mental nature will emerge clearly. If the child's complex differs from the concept, *the activity of thinking in complexes will unfold differently than the activity of thinking in concepts*. We will briefly compare our results with psychological data on the characteristics of the child's thinking and with data on the development of primitive thinking. This will permit a functional verification of the characteristics of complexive thinking which we have identified.

The first phenomenon that attracts our attention in what we know of the development of the child's thinking is the purely associative manner in which word meanings are transferred. If we consider the child's first words, study the groups of objects they designate, and study the way that the child forms these groups through the transfer of word meaning, we find something very similar to what we have called the syncretic image and associative complex.

Consider the following example, which we take from the work of Idel'berger. At 251 days, a child uses the word "vau-vau" to designate a porcelain figure of a girl. At 307 days, this child uses the same word to designate a dog lying in the yard, a portrait of a grandmother and grandfather, a toy horse, and a wall clock. At 331 days, he uses the word to designate a fur boa with a dog's head and another boa without a dog's head (in this context, he paid special attention to the glass eyes). At 334 days, the same name was given to a rubber toy man that squeaked when it was squeezed. At 396 days, it was used to refer to a black button on the child's father's shirt. At 433 days, the child pronounced the same word when he saw pearls on a dress as well as when he noticed a bath thermometer.

Analyzing this example, Werner concluded that by using the word "vau-vau" the child is designating a multitude of objects that can be ordered in the following way. First, we have living and toy dogs and small, oblong, doll-like objects (i.e., the rubber doll, the thermometer for the bath, etc.). Second, we have buttons, pearls, and similar small objects. Underlying this unification are the oblong form and bright objects with surfaces similar to the eye.

It is apparent, then, that these concrete objects are united by the child in accordance with the *principle of complexes*. These natural complexes fill the entire first chapter in the history of the development of the word in the child.

To take another example, the child initially used the word "kva" to refer to a duck swimming in a pond. He then used it to refer to any liquid, including the milk that he drank from his bottle. Later, when he saw a picture of an eagle on a coin, he used the same name to refer to the coin. This was sufficient for the subsequent use of the term to refer to all circular objects similar to coins. Here we see a typical example of the chained complex. Each object is included in the complex on the basis of a feature that it has in common with some other link. The result, of course, is that the character of this feature can change indefinitely.

It is because of the complexive character of the child's thinking that a single word can have different meanings and can indicate different objects in different situations. In certain situations which are of particular interest to us, a single word can unite contradictory meanings if they are related to one another in the way that a knife and fork are related to one another.

The fact that the child uses the word “before” to designate the temporal relationships “before” and “after,” or uses the word “tomorrow” to designate both “tomorrow” and “yesterday,” is analogous to the fact that two contradictory meanings are often united in a single word in ancient languages (for example, Hebrew, Chinese, and Latin). In the Roman language, for example, a single word designated both “high” and “deep.” This combining of opposing meanings in one word is possible only on the basis of complexive thinking, because the concrete objects included in the complex preserve their concrete independence rather than merging with other elements of the complex.

13

There is one very interesting characteristic of the child’s thinking that is an excellent means of verifying complexive thinking in functional terms. In children at a somewhat higher stage of development than those represented in the examples we have just discussed, complexive thinking is usually based on the pseudoconcept. Despite its external similarity with the true concept, the pseudoconcept is a complex. The difference between the concept and the complex will be reflected in action.

Researchers have long been aware of an extremely interesting characteristic of thinking that was first described by Levy-Bruhl in primitive peoples, by Shtorkh in the mentally ill, and by Piaget in children. This characteristic of primitive thinking, of thinking in its early genetic stages, is usually called participation. This word designates the relationship that primitive thought establishes between two objects or phenomena that are partially identified, objects that are seen as having a very close influence on one another although no spatial contact or other conceptual causal connection exists between them.

Piaget has made very interesting observations relevant to this kind of participation in the child’s thinking. These observations relate to the child’s establishment of connections between objects and actions that seem incomprehensible from a logical point of view and that have no basis in the objective connections among things.

As an example of participation in the thinking of primitive man, Levy-Bruhl used the following case. According to von den Steinen, a northern Brazilian tribe called the Borora take pride in the fact that tribal members are red parrots called “arara.” According to Levy-Bruhl, this means something more than that tribal members become red parrots after their death and that red parrots are transformed into Borora following theirs. Von den Steinen writes that:

There are Borora who do not want to believe in this but who become convinced because of their categorical assertion. They calmly claim that they are actually red parrots, as a caterpillar might say that she is a butterfly. This is not a name that the Borora have appropriated for themselves. It is a kinship upon which they insist. What they have in mind here is identity of being (Levy-Bruhl, 1930, pp. 48-49).

Shtorkh, who conducted a very careful analysis of archaic primitive thinking in schizophrenia, observed the same phenomenon of participation in this population.

The phenomenon of participation has not, however, been explained sufficiently for psychological purposes. In our view, there are two reasons for this.

First, researchers have generally studied this phenomenon by focusing on content. They have studied the unique connections that are established in this type of thinking while ignoring the functions and forms of thinking and the intellectual operations through which these connections are developed and established. In other words, they have studied the final product rather than the process through which this product emerges. As a result, the product itself has acquired a mysterious and obscure character.

Second, researchers have not sufficiently integrated their knowledge of this phenomenon with the knowledge of the other types of connections and relationships that are established by primitive thinking. The connections characteristic of primitive thinking have generally attracted researcher’s attention only when they are extremely unusual or diverge sharply from the logical forms of thinking to which we are accustomed. The Borora’s assertion that they are red parrots attracts the researcher’s attention because it seems so absurd.

A careful analysis of the kinds of connections that are established by primitive thinking that do not seem, on the surface, to diverge from our own logic, convinces us that the mechanisms of complexive thinking provide the foundation for these connections as well as those characteristic of what is called participation.

If we remember that the child (at a given stage of development) possesses complexive thinking, that the word is for him a means of designating complexes of concrete objects, and that the basic form of generalization or connection that he establishes is the pseudoconcept, it becomes clear that the product of such complexive thinking must necessarily be participation. In this form of thinking, connections and relationships between things will inevitably arise that are impossible and unthinkable from the perspective of thinking in concepts.

From this perspective, we can also understand how a single thing can enter into different complexes in accordance with its various concrete characteristics and how it can, consequently, receive a variety of names in accordance with the complexes in which it is included.

In our own experimental research we frequently observed this type of participation, that is, the process of simultaneously relating a concrete object to two or more complexes and referring to it by multiple names. For complexive thinking, participation is more the rule than the exception. It would be odd if these connections, connections which are impossible for our own logic, failed to arise at every step in primitive thinking.

The key to understanding participation and the thinking of primitive peoples is the fact that this thinking is carried out in complexes rather than concepts. Consequently, in these languages the functional application of the word is entirely different than it is in our own. The word is used in a different manner. It is not a means for forming and carrying concepts. It is a family name. It is a means of naming groups of concrete objects that are united in accordance with some type of empirical kinship.

As in the child, this complexive thinking (as Werner correctly calls it) will inevitably lead to the kind of interweaving of complexes that gives birth to participation. At the foundation of this form of thinking lies a concrete group of objects. Werner's outstanding analysis of primitive thinking convinces us that the key to understanding participation lies in the unique combination of speech and thinking that characterizes this stage in the historical development of the human intellect.

Finally, schizophrenic thinking is also complexive in character. We find many unique motives and tendencies in schizophrenic thinking which Shtorkh believes share the common feature that they are associated with a primitive stage of thinking. The isolated representations that emerge among the ill are connected in a complexive, aggregated manner. From thinking in concepts, the schizophrenic turns to a more primitive stage characterized (as Bleuler has noted) by an abundance of images and symbols. Shtorkh emphasized that the distinguishing feature of primitive thinking is probably the fact that concrete images are used alongside abstract concepts.

Turnvald sees this as the critical characteristic of the thinking of primitive people. In his view, this thinking relies on aggregated and undifferentiated impressions of phenomena. Primitive people think in completely concrete images that retain the form they are given in reality. The concrete, aggregated formations that become predominant and replace concepts in schizophrenic thinking are analogous to the concepts and images that take the place of our logical categorical structures in primitive stages of thinking.

Given all the unique characteristics that differentiate the thinking of the ill, primitive peoples, and the child, it is nonetheless apparent that participation is the common formal symptom of the primitive stage in the development of thinking and that it is a symptom of complexive thinking. The mechanism of complexive thinking, and the functional use of the word as a familial sign or name, always lies at the foundation of participation. Therefore, Levy Bruhl's interpretation of participation seems to us to be mistaken. In his analysis of the assertion that the Borora are red parrots, he consistently operates on the basis of the concepts that are characteristic of our own logic. That is, he assumes that in primitive thinking this kind of assertion indicates identity of being or substance. A more profound mistake in the interpretation of this phenomenon is, in our view, impossible. If Borora thought were mediated by logical concepts, there could be no other consistent interpretation of their assertion. However, since for the Borora the word is not the carrier of a concept but a formal designation for concrete objects, the assertion that they are parrots has an entirely different significance for them. The word "arara" which designates the

red parrot that they relate themselves to is a general name for a complex to which both the bird and the tribe are related. Thus, this assertion does not imply an identification of parrot and people any more than identification is implied by the fact that two people related by kinship have the same family name.

14

If we consider the history of our own speech, it becomes apparent that complexive thinking is the mechanism that underlies its development. According to contemporary linguistics (especially Peterson's thinking), it is important to make the distinction between word meaning and object relatedness, that is, between word meaning and the objects that are indicated by a word or expression.

Meaning may be one and the objects various, or meaning may be various and the object one. Whether we say "the victor at Jena" or "the vanquished at Waterloo," the person to whom we refer is the same (i.e., Napoleon). However, the meaning of the two expressions is different. There is also a word, the personal name, whose entire function is to indicate an object. In this way, contemporary linguistics distinguishes between the meaning and the word's object relatedness.

If we apply this insight to the problem of complexive thinking in the child, we can say that the child's words correspond to those of the adult in their object relatedness; they indicate the same objects. They relate to the same circle of phenomena. They do not, however, correspond in meaning.

We have identified this correspondence in object relatedness and noncorrespondence in word meaning as the central characteristic of complexive thinking in the child. In the development of language, this constitutes the rule rather than the exception. As we have said, the most important finding of our investigation is that, with respect to the meaning of the word, the child thinks in the same way as the adult; he thinks of the same objects. This permits understanding between the child and the adult. However, the child thinks the same content differently, in another mode, and through different intellectual operations.

This same formula can be applied to the history of development and to the psychology of language as a whole. We find empirical support for this position at every step. For words to correspond in their object relatedness, they must indicate the same objects. They can indicate one and the same object in different ways however.

The synonyms that are found in all languages are good examples of this kind of correspondence in object relatedness combined with a noncorrespondence in the thought operations that underlie word meaning. In Russian, the words *tuna* [moon] and *mesiats* [moon] designate the same object. However, they designate that object in different ways, each of which carries the imprint of the word's history. The origins of *luna* link it with a Latin word designating "capricious" or "inconstant." A person using this word to refer to the moon obviously wants to isolate the feature of inconstancy in its form, to indicate the transitions from one phase to another as what distinguishes it from the other heavenly bodies. The word *mesiats* is linked with the meaning "to measure." *Mesiats* means "measuring instrument." A person referring to the moon using this word wants to indicate another of the moon characteristics, that is, that the lunar phases can be used to measure the passage of time.

In the sense that they indicate the same objects, the words of the adult and child are synonyms. They name the same things and correspond in their nominative functions. However, the thought operations that underlie them are different. The mode through which the child and adult arrive at this naming, the operations through which they think of the object and the word meaning, are completely different.

In much the same way, the same objects will correspond in their nominative function in different languages but be referred to with completely different features. The modern Russian word *portnoi* [tailor] has its origin in the Old Russian word "port," a word that referred to a "piece of fabric" or a "shawl." In French and German, the tailor is designated in terms of a different feature, in terms of the idea of "covering" or "cutting."

Thus, in what is commonly called word meaning, we must distinguish two features. These are the meaning of the expression in the true sense of the word and its function as a *name* which relates to a particular object, that is, its *object relatedness* (R. Shor).

We think that this distinction provides the key to the correct analysis of the development of the child's thinking in its early stages. With good reason, Shor notes that the difference between these two aspects of word meaning emerges clearly in the development of the child's lexicon. The child's word may correspond with the adult's in object relatedness, but not in meaning.

If we consider the history of word development or the transfer of word meaning in any language, it becomes apparent that change in word meaning occurs here in the same way as, it does in the child. Earlier, we saw how the child names a whole series of what seem to us to be the most varied objects with the word "vau-vau." Similarly, in the history of the word, we find transfers of meaning based on the mechanism of complexive thinking, transfers of meaning which indicate that the word is applied in accordance with a different mode of thinking than that characteristic of the development of thinking in concepts.

We will take the Russian word *sutki* [a twenty-four hour day] as an example. Initially, the word designated a "seam," the "place where two pieces of fabric are united," or "something woven together." Subsequently, it came to designate a joint of any kind, a corner in a hut, or the place where two walls come together. At a later point in the transfer of meaning, the word was used to designate twilight, that is, the place where day and night are joined. Finally, it came to include the time from twilight to twilight, or the period of time including the morning and evening twilight. That is, it came to designate "day and night," or *sutki* as it is now understood.

In the historical development of this word, these various objects and phenomena (i.e., seam, corner in a hut, twilight, and *sutki*) are unified in a single complex in accordance with the same type of images that unite the child's complex.

Shor points out that anyone who begins to study the problems associated with etymology will discover the lack of content in the expressions used to name objects. Why do "swine" [*svin'ia*] and "woman" [*zhenshchina*] both mean "birth giver" [*rodiashchaia*]. Why are "bear" [*medved*] and "beaver" [*bober*] both called "the brown ones" [*buryimi*]. Why does "measuring" [*izmeriaiushchii*] designate "month" [*mesiats*]. An analysis of the history of these words indicates that neither logical necessity nor connections established among concepts, but image-generated concrete complexes underlie this, that is, connections that are of precisely the same character as those we find in the child's thinking. The object receives its name in accordance with the isolation of some concrete feature of the object.

Korova [cow] means *rogataia* [horned]. In other languages, analogous words have emerged from this same root that also mean "horned" but these words indicate the goat, deer, or another horned animal. "Mouse" means "thief," "bull" means "?howler" [*revyshchii*], "daughter" means "milker" [*doil'shchitaa*], "child" and "maid" are connected with the verb "to milk" and designate "suckling" and "feeder."

If we analyze the law that unites these families of words, it is apparent that new phenomena and objects are referred to by the word in accordance with a feature that is logically inessential, a feature that does not logically express the essence of the phenomena. The name is never conceptual in origin. In logical terms, the name is inadequate because it is both too narrow and too broad. Words like "horned," as a name for cow or "thief" as a name for mouse are too narrow in the sense that the features contained in their names do not exhaust the features of a cow or mouse. However, these words are also too wide in that this name is applied to a whole series of objects. Thus, in the history of language, we find a struggle between conceptual thinking and the more ancient complexive thinking. Having been isolated in accordance with a certain feature, the name of the complex comes into opposition with the concept that it designates. As a result, there is a struggle between the concept and the image that lies at the foundation of the word. The image is erased. It is forgotten and ousted from the speaker's consciousness. The connection between the sound and the concept that is the word's meaning becomes incomprehensible to us. When using the word *okno* [window], the modern speaker of Russian is aware that this word indicates the place to which one looks or the place where light passes through, that this word contains not the slightest hint of the idea of "frame" or "opening." Still, in using the word *okno*, we are generally referring to a frame with glass. We have completely forgotten the link between this word and its original meaning. In the same way,

chernila [ink] initially designated the fluid used for writing by indicating its external characteristic, that is, its black color. In naming this object, then, the complex of black things was included by means of an association. Today, this does not stop us now from speaking of red, green and blue “chernila,” absurd though this word combination may be.

If we consider the transfer of names, then, we see that they are transferred through processes of association, transferred in often ludicrous ways that are based on the similarity of images. They are transferred not in accordance with the laws of logical thinking but in accordance with the laws of complexive thinking. Even today, an analysis of the process underlying the formation of new words will reveal extremely interesting processes involving the relating of the most varied objects to a single group through complexive thinking. For example, when we speak of the neck of the bottle, the foot of the table, the handle of the door, or the branch of the river, we are introducing precisely this kind of complexive relating of the object to a single general group.

Essential to this kind of transfer of names is the fact that the word is not fulfilling a *semasiological function* or a function involving the attribution of meaning. In this context, the word’s function is nominative or indicative. The word indicates or names something. Stated differently, the word here is not a sign of some meaning with which it is connected in an act of thinking. It is a sign of a sensually given thing that is connected through association with some other sensually perceived thing. Since the name is connected with the designated thing through associations, the transfer of the name occurs through diverse associations, associations that can only be reconstructed on the basis of precise knowledge of the historical situation in which the name was transferred.

As is true of the complexes formed in the child’s thinking, it is concrete empirical connections that underlie this kind of transfer. Applying this to the speech of the child, we can say that what happens with the child’s understanding of adult speech is similar to what happened in the examples discussed above. Pronouncing a given word, the child and adult relate it to the same individual or object, to Napoleon for example, but one thinks of him as the victor at Jena and the other as the vanquished at Waterloo.

In Potebniia’s words, language is a means of understanding oneself. Therefore, we must study the function that language and speech fulfill in the child’s thinking. This leads to the need to establish the fact that the child understands himself differently through speech than does the adult through this same speech. The acts of thinking carried out by the child through speech do not correspond with the operations carried out in the adult’s thinking with the pronunciation of the same word.

We have discussed an author who said that the first word cannot be taken as a sign of a concept, that it is more an image, a picture, a mental illustration, or a small tale about the concept. It is a work of art. It has a concrete complexive character. It designates several objects which are related simultaneously to a single complex.

One might more accurately say that in naming an object with this type of illustration-concept, man relates it to a certain complex and links it to a group with a whole series of objects. Referring to the emergence of the word “veslo” [oar] from the word “vesti” [to carry], Pogodin was fully justified in saying that the word “veslo” may have been more appropriately used to refer to a boat as a means of transportation, a pack horse, or a vehicle. All these objects are related to a single complex, a complex of the kind we observe in the thinking of the child.

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Deaf and mute children provide a particularly interesting example of complexive thinking because they lack that which underlies the formation of children’s pseudoconcepts. As we noted earlier, the formation of pseudoconcepts is a function of the fact that the child finds words in adult speech that are already connected with definite groups of objects. The child is not free to form his own complexes by unifying objects in integrated groups. This is why the child’s complex corresponds with the adult’s concept in object relatedness. The child and adult understand each other with the pronunciation of the word “dog” because they relate the word to the same object, because they have the same concrete content in mind. However, one thinks of the concrete complex “dog” and the other of the abstract concept “dog.”

Since verbal interaction with adults is absent in the speech of the deaf and mute, this factor loses its impact. These children are free to form different complexes designating a single object. The result is that the characteristics of complexive thinking are manifested with particular clarity. Thus, in the language of the deaf and mute, the word "tooth" may have three different meanings: "white," "stone," and "tooth." Different names are linked in a single complex. The combination of an indicative and illustrative gesture is required to further define the object relatedness of a particular meaning. These two functions of the word are physically disconnected. The deaf and mute first indicate the tooth. Then, attracting attention to the surface of the tooth or the act of throwing as illustrated by an arm movement, they indicate what type of object the word is to be related to.

An extremely interesting phenomenon can also be observed in adult thinking. Although adult thinking has achieved the formation of concepts and generally operates on that foundation, not all the adult's thinking is based on these operations. In dreams, for example, one can observe the ancient primitive mechanism of complexive thinking, the concrete fusion, condensation, and shifting of images. As Kretschmer has correctly noted, the study of the generalizations that are observed in dreaming is the key to the correct understanding of primitive thinking. It does away with the prejudice that generalization in thinking emerges only with the most developed form of thinking, only with thinking in concepts.

In his research, Jaensch observed that there is a special form of generalization or unification of images in concrete thinking, what might be considered the concrete analogues of concepts, that is, concrete concepts. Jaensch calls these meaningful compositions and fluxes. In adult thinking, transitions from thinking in concepts to concrete complexive thinking occur continually.

The pseudoconcept is not the exclusive achievement of the child. In our everyday lives, our thinking frequently occurs in pseudoconcepts. From the perspective of dialectical logic, the concepts that we find in our living speech are not concepts in the true sense of the word. They are actually general representations of things. There is no doubt, however, that these representations are a transitional stage between complexes or pseudoconcepts and true concepts.

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The child's complexive thinking constitutes only the first of two roots underlying the development of concepts. The second root constitutes a third stage in the development of the child's thinking. Like the second, it consists of a series of separate phases. Thus, the pseudoconcept constitutes a transitional stage between complexive thinking and this second root or source of the development of the child's concepts.

In our account, the development of the child's concepts was represented as it appears under the conditions of experimental analysis. Under these artificial conditions, the process of concept development appears in a logically consistent manner. There is, therefore, some divergence between this and the actual process involved in concept development. The actual development of the child's thinking, the sequence of stages and the phases within each stage, does not correspond fully with our depiction of it.

We have consistently taken a genetic approach to the analysis of our problem. We have, however, attempted to represent the moments of this genetic process in their mature, classic forms. The inevitable result is that we have diverged from the complex and twisting path that characterizes the actual development of the child's concepts.

In turning to the consideration of this third and final stage in the development of the child's thinking, it is important to emphasize the fact that the initial phase of this stage does not necessarily occur later than the final phases of the stage of complexive thinking. We have said that the higher forms of complexive thinking, especially the pseudoconcept, are maintained in our everyday thinking and its foundation in ordinary speech. Indeed, the rudiments of the forms of thinking which we will now describe significantly predate the formation of pseudoconcepts. In their logical nature, however, they are an independent second root of concept development. They have an entirely different genetic function and an entirely different role in the development of the child's thinking than the pseudoconcept.

The critical characteristic of complexive thinking is the establishment of the connections and relationships that constitute its basis. At this stage, the child's thinking forms complexes of

objects that are isolated in perception and it connects them in groups. In the process, it forms the initial foundations for the unification of distinct impressions. This is the first step in the process of generalizing isolated elements of experience.

In its natural developed form, however, the concept presupposes more than the unification and generalization of the distinct concrete elements of experience. It presupposes the isolation and abstraction of separate elements, the ability to view these isolated, abstracted elements independently of the concrete and empirical connections in which they are given. Complexive thinking is helpless in this respect. It is permeated with an over abundance of connections and is characterized by a paucity of abstraction. The capacity to isolate features is extremely limited. The true concept, however, depends equally on the processes of analysis and synthesis. Partitioning and connecting are equally important internal aspects of its construction. As Goethe has noted, analysis and synthesis presuppose one another, just as inspiration and expiration presuppose one another. This is true in the construction of the individual concept and in conceptual thinking generally.

We will not find the development of complexes, and the development of the function which allows the partitioning the whole into its elements in isolation from one another in the actual development of the child's thinking. These two aspects of concept development will be found fused with one another. We present the two lines of development separately only in the interest of scientific analysis and of following the development of each of these two roots of the concept with the greatest possible clarity. However, this separation of these two lines of development is not merely one of many possible modes of analysis. It is rooted in the very nature of things. The psychological natures of these two functions are fundamentally different.

Thus, the genetic function of this third stage in the development of the child's thinking is the development of partitioning, analysis, or abstraction. In this respect, the first phase of this third stage stands very close to the pseudoconcept. A unification of different concrete objects occurs on the foundation of maximal similarity among its elements. Because this similarity can never be total, we have what is in psychological terms an extremely interesting situation here. Specifically, in this situation, the child attends to the various features of an given object differentially. Those features that in aggregate reflect a maximal similarity with respect to the model become the center of attention. In the process, they are isolated or abstracted from the features that remain at the periphery of attention. For the first time, there emerges a *process of abstraction*. This abstraction is frequently poorly differentiated in nature because it is a whole group of inadequately differentiated features that is abstracted (often based only on a confused impression of commonality) rather than sharply isolated features.

Nonetheless, the child's integral perception has been overcome. Features have been differentiated into two unequal groups. The two processes that Kulpe's school called positive and negative abstraction have emerged. The concrete object with all its features, in all its empirical completeness, no longer enters into the complex; it is no longer included in the generalization. As it enters the complex, it now leaves some of its features on the threshold. As a result, it is impoverished. Those features that serve as the foundation for its inclusion in the complex emerge in special relief in the child's thinking. This generalization, created by the child on the basis of maximal similarity, is at one and the same time a more impoverished and a more enriched entity than the pseudoconcept. It is more enriched in that it is constructed through the isolation of the object's more important and essential features. It is more impoverished in that the connections that support it are extremely poor, including only vague impressions of commonality or maximal similarity.

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The second phase in the process of concept development might be called the stage of potential concepts. During this phase, the child operating under experimental conditions usually isolates a group of objects that are unified in accordance with a single common feature. Once again, what we see here resembles what we found with the pseudoconcept. Moreover, like the pseudoconcept, it might be mistaken for the true concept since the same product could result from adult conceptual thinking.

This external similarity to the true concept links the potential concept with the pseudoconcept. However, the potential concept and the pseudoconcept are fundamentally different.

This difference was identified by Groos, who made it his point of departure in the analysis of concepts.

The *potential* concept can be nothing other than a habitual action. In its most elementary form, it consists in that we expect that a similar ground will elicit a *similar common impression*. More precisely, we have an established set that this will be the case. If the potential concept is actually as we have just described it, a set on a habit, then it emerges very early in the child In my view, it is a condition that necessarily precedes the appearance of intellectual characteristics. In itself, however, *it has nothing intellectual in it* (1916, p. 196).

Thus, this potential concept is a pre-intellectual formation arising very early in the development of thinking.

Most contemporary psychologists agree that the potential concept, in the form we have just described it, is found in animals. In this respect, Kroh seems to have been fully justified in opposing the widely accepted assertion that abstraction appears for the first time in the transitional age. He maintains that the isolating abstraction can be found in animals.

In fact, experiments dealing with the abstraction of form and color in chickens have demonstrated that something very similar to the potential concept, something which involves the isolation of distinct features, is found in the early stages of the development of animal behavior.

Defining the potential concept as a set on a usual reaction, Groos is completely justified in rejecting the notion that it is a unique feature of the development of the child's thinking. He correctly ranks it, in genetic terms, among the pre-intellectual processes.

Our initial potential concepts are pre-intellectual. No logical processes need be assumed to understand the action of these potential concepts. The relationship between the word and what we refer to as its meaning can sometimes be a simple association that does not contain true word meaning (ibid, p. 201 ff.).

If we consider the child's first words, it becomes apparent that they are similar in meaning to these potential concepts. They are potential, first, because of their practical *relatedness to a certain circle of objects* and, second, because of the *isolating abstractions* that underlie them. They have the potential for being concepts, but this potential has not been realized.

In this sense, Buhler is fully justified in drawing an analogy between the way that a child uses one of his habitual words with a new object and the way that an ape – in a situation where a stick would be useful – recognizes the similarity between the stick and things that had not previously reminded him of it. Kohler's experiments on tool use among chimpanzees demonstrates that once they have used a stick as a tool, the significance of the tool is extended to other objects that have something in common with the stick and can fulfill its function.

The external similarity to the concept is striking, lending substance to the name "potential concept." Summarizing his findings, Kohler argues that the only interpretation that corresponds with chimpanzee behavior is: 1) that the stick that is sighted is attributed a functional meaning for certain situations, and 2) that this meaning is extended to all other objects which share certain objective features of form and strength with the stick. Kohler's experiments demonstrate that the ape begins to use a shoe, a piece of wire, a straw, or a towel as a stick. That is, the ape begins to use a wide variety of objects that share the stick's elongated form and appear to have the potential of acting as a substitute for it. It is apparent, then, that a generalization of an entire series of concrete objects emerges here.

Groos differentiates this form of generalization from the potential concept. He argues that with the apes we are dealing with similarity of functional significance, while with the potential concept we are dealing with similarity of impressions. The potential concept is developed in the domain of concrete thinking, while with the ape we are dealing with the domain of practical thinking or thinking in action. This type of concept, what Werner calls a dynamic or movement concept and Kohler calls "functional meaning," is present for a rather long time in the child's thinking, right up to the school age. The child's definition of concepts has precisely this kind of functional character. To define an object or concept means for the child to say what it does or, more frequently, what can be done with it.

When the issue is the definition of abstract concepts, it is the active situation, the equivalent of the child's word meaning, that advances to the forefront. In a study of thinking and speech,

Messer gives a typical example of a definition of an abstract concept that was elicited from one of his subjects who was in the first year of instruction. The child said: "Intelligence is when I am thirsty but do not drink from a dirty pond." This type of concrete functional meaning is the sole mental foundation of the potential concept. We should note that this type of potential concept plays an extremely important role even during the stage of complexes and frequently unites with the construction of complexes. As we have seen, in the associative complex as well as in other types of complexes, the construction of the complex presupposes the isolation of a certain feature common to the various elements. In pure forms of complexive thinking, this feature is unstable, giving way very easily to other features. Therefore, it is in no way privileged in comparison with the other features of these objects. This is not the case with the potential concept. Here, the feature that serves as the basis for the object's inclusion in the general group is a privileged feature which has been abstracted from the concrete group of features with which it is empirically connected.

Potential concepts play an extremely important role in the history of the development of the word. Earlier, we introduced examples indicating that a new word arises through the isolation of some single feature that strikes the observer and serves as the basis for the construction of a generalization of a series of objects that are named or designated by a single word. Potential concepts often remain at this stage of development, not making the transition to true concepts. Nonetheless, they play an extremely important role in the development of the child's concepts. It is in the potential concept, in the associated abstraction of distinct features, that the child first destroys the concrete situation and the concrete connections among the object's features. In this process, he creates the prerequisites for the unification of these features on a new foundation. Only the mastery of the processes of abstracting, combined with the development of complexive thinking, can lead the child to the formation of true concepts, that is, to the fourth and final phase in the development of the child's thinking.

The concept arises when several abstracted features are re-synthesized and when this abstract synthesis becomes the basic form of thinking through which the child perceives and interprets reality. As we have said, the word plays a decisive role in the formation of the true concept. It is through the word that the child voluntarily directs his attention on a single feature, synthesizes these isolated features, symbolizes the abstract concept, and operates with it as the most advanced form of the sign created by human thinking.

Of course, the word already has an important role in complexive thinking. Complexive thinking is impossible without the word. It assumes the role of a family name, uniting a group of objects that are related to one another through the child's impressions. In this sense, our position is in opposition to others in that we differentiate complexive thinking as a stage in the development of verbal thinking from the wordless concrete thinking characteristic of animal representations, a form of thinking that Werner and others refer to as complexive thinking because of the tendency toward the fusion of separate impressions that is inherent to it.

These authors are inclined to equate the processes of condensation and shifting manifested in dreaming with the complexive thinking of primitive peoples*, in spite of the fact that the latter is one of the higher forms of verbal thinking, the product of a long historical evolution of the human intellect, and the inherent predecessor of conceptual thinking. Several authorities, including Folkelt, have gone still further. They are inclined to identify the complexive thinking of spiders with the child's primitive verbal thinking.

In our view, a fundamental difference distinguishes the product of biological evolution (i.e., the natural form of thinking) from the historically emerging forms of human intellect. Recognizing the decisive role of the word in complexive thinking does not imply an identification of its role in complexive thinking with its role in conceptual thinking. To the contrary, the primary distinction between complexes and concepts is that these two forms of generalization are the result of different functional uses of the word. The word is a sign and a sign can be used in various ways. There are different ways of applying it. It can serve as a means for different

* Kretschmer writes that "this primitive form of thinking is also referred to as complexive thinking (Price) to the extent that here complexes of images that frequently shift into one another, or fuse in conglomerates, take the place of sharply defined abstract concepts (1927, p. 83)." All authors agree that this type of thinking is a preparatory stage in the process of concept formation.

intellectual operations and the different intellectual operations that are realized through the word underlie the basic differences between complexes and concepts.

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The most important conclusion of our investigation is that it is only in the transitional age that the child completes the third stage in the development of his intellect, *that he reaches the point where he is thinking in concepts*. In experiments with adolescents, it became apparent that the primitive forms of syncretic and complexive thinking (as well as potential concepts) begin to appear less frequently in their thinking and they begin to use true concepts in thinking.

However, these processes of transition are not mechanical processes, where each new phase begins only with the completion of the previous one. The developmental process is much more complex. *The various genetic forms co-exist*, just as strata representing different geological epochs coexist in the earth's crust. This is more the rule than the exception for the development of behavior generally. Human behavior is not consistently characterized by a single higher level of development. Forms of behavior that have emerged very recently in human history dwell alongside the most ancient. The same can be said of the development of the child's thinking. A child who has mastered the higher forms of thinking, a child who has mastered concepts, does not part with the more elementary forms of thinking. In quantitative terms, these more elementary forms continue to predominate in many domains of experience for a long time. As we noted earlier, even adults often fail to think in concepts. The adult's thinking is often carried out at the level of complexes, and sometimes sinks to even more primitive levels. When applied in the domain of life experience, even the concepts of the adult and adolescent frequently fail to rise higher than the level of the pseudoconcept. They may possess all the features of the concept from the perspective of formal logic, but from the perspective of dialectical logic they are nothing more than general representations, nothing more than complexes.

The transitional age, then, is not one of completion but one of crisis and maturation. With the higher forms of thinking that are attainable to the human mind, this age is transitional in all other respects as well. The transitional character of the adolescent's thinking becomes particularly apparent if we look at it in action, that is, if we submit it to a functional analysis rather than taking the adolescent's concept in its developed form. The true psychological nature of this formation is manifested in action, in application. By analyzing the concept in action, we can discover several extremely important psychological laws that underlie this new form of thinking. These laws help clarify the general character of the adolescent's intellectual activity, and (as we shall see later) the general nature of the development of his personality and world-view.

First, we should note the profound *divergence manifested in the experiment between the concept's formation and its verbal definition*. This divergence is not only present in the adolescent. It is found in adult thinking, sometimes in very developed forms of thinking. *The existence of a concept does not coincide with consciousness of that concept either in the moment of its appearance or in its mode of functioning*. The former may appear earlier than the latter and act independently of it. Analysis of reality on the basis of the concept emerges much earlier than analysis of the concept itself.

This is clearly manifested in experiments carried out with adolescents. These experiments bear witness to the most characteristic feature of this age, one that demonstrates the transitional character of these forms of thinking. This feature is the divergence between word and deed in the formation of concepts. In the concrete situation, the adolescent forms the concept and applies it correctly. However, when it comes to the verbal definition of this concept, the adolescent's thinking encounters extreme difficulty. The concept's definition is significantly narrower than the concept as it is actually used. This indicates that the concept arises as the result of processes other than the logical processing of certain elements of experience. Moreover, it comes into conscious awareness and acquires a logical character at a comparatively late stage of its development.

Another feature characteristic of the application of concepts in the transitional age is also apparent here. Specifically, it is in the concrete situation that the adolescent uses the concept. When the concept is not torn from the concretely perceived situation, it guides the adolescent's thinking easily and faultlessly. The application of experience to entirely different domains, the

process of transferring concepts, presents much greater difficulties. These difficulties arise when the features isolated and synthesized in the concept encounter other features in entirely different concrete surroundings and when these features are given in entirely different proportions. Thus, with changes in the concrete situation, the use of concepts becomes much more difficult. As a rule, however, the adolescent becomes successful in making this type of transfer in the first stage of the maturation of thinking.

The process of defining the concept when it is torn from the concrete situation in which it was developed, when it no longer depends on concrete impressions and begins to develop in an entirely abstract plane, is significantly more difficult. That is, the verbal definition of the concept, the ability to attain clear conscious awareness of it and define it, produces significant difficulties. In our experiments, we often observed situations where the child or adolescent correctly resolved the task involved in the formation of the concept. However, in providing a definition of the concept he had formed, the same child sank to a more primitive level and began to enumerate the concrete objects grasped by the concept in a particular situation.

Thus, the adolescent uses the word as a concept, but defines it as a complex. This type of oscillation between thinking in complexes and thinking in concepts is characteristic of the transitional age.

However, the greatest difficulty for the adolescent and one that he overcomes only at the end of the transitional age is the further transfer of the sense or meaning of the developed concept to new concrete situations that he also thinks about on an abstract plane. Thus, the path from the abstract to the concrete is no less difficult for the adolescent than was the path from the concrete to the abstract in its time.

The experiment leaves no doubt that the representation of the process of concept formation commonly accepted by traditional psychology does not correspond to the actual process. In this respect, traditional psychology acted like a slave in following the description of the process of concept formation assumed by formal logic, depicting the process in the following way. First, the foundation of the concept is a series of concrete representations. One psychologist suggests using the concept "tree" as an example. This concept emerges on the basis of a series of representations of "tree" that are similar to one another. The following schema is provided to clarify the process involved in concept formation. First, assume that I have seen three different trees. The representations of these three trees can be decomposed into their constituents, into their form, color, and size. The constituents of these representations that remain are those that correspond to one another. A process of assimilation occurs for each of these constituents, the result of which is a general representation of each feature. Following a synthesis of these representations, we obtain one general representation or concept of "tree."

From this perspective, the process of concept formation parallels the process involved in Galton's collective photography through which he attains a family portrait based on individuals who belong to a single family. The images representing each individual are superimposed on one another such that frequently repeated features, those common to many family members, appear in relief while features unique to a single individual tend to suppress one another. In this way, similar features are isolated. In the traditional view, the concept is the aggregate of these common features, features isolated from a series of similar objects.

It is difficult to imagine a more distorted representation of the actual course of concept development. Psychologists have long noted that *the formation of the adolescent's concepts never takes the logical path depicted by this traditional scheme* and our experiments clearly support this position. Fogel's research, for example, demonstrated that the child does not enter the domain of abstracted concepts by traversing a path that begins with particular species and moves continually higher. On the contrary, the child uses the most general concepts from the very beginning. He reaches the middle level concept not through abstraction, not by moving from below to above, but through definitions, by moving from the higher to the lower. The child's representations move from the undifferentiated to the differentiated, from genus to species and variety.

In Fogel's words, if we consider the pyramid of concepts, we find that thinking almost always moves toward the top and toward the bottom, rarely along the horizontal. At one point, this position represented a complete reversal of traditional psychological theories of concept formation. Rather than involving a simple isolation of similar features from a series of concrete

objects, the process of concept formation came to be understood as *a complex process involving the movement of thinking through the pyramid of concepts*, a process involving constant movement from the general to the particular and from the particular to the general.

Buhler has recently advanced a theory on the origin of concepts. Like Fogel, Buhler is inclined to reject the traditional representation of concept development involving the isolation of common features. He distinguishes two genetic roots in the formation of concepts. The first is the unification of the child's representations in isolated groups and the merging of these groups in complex associative connections that are formed among the groups of representations and among the elements constituting each group. The second is the function of judgment. As a result of thinking or of judgments that have already formed, the child achieves the creation of concepts. Buhler sees proof for this in the fact that the words which designate concepts for the child rarely reproduce ready-made judgments although this is frequently the case with children in the associative experiment. It is obvious that the judgment is something simpler. As Buhler says, the natural logical place of the concept is the judgment. Representation and judgment interact with one another in concept formation.

Thus, the formation of concepts develops simultaneously from two directions, from the direction of the general and the particular.

The fact that the first word the child uses is actually a general designation is an extremely important piece of evidence for this position. Concrete, particular designations arise in the child only later. Thus, the child learns the word "flower" before he learns the names of individual flowers. However, even if for some reason he were to master the name of some particular flower (e.g., the word "rose") before the word "flower," this word would be used to refer not to roses alone but to all flowers. Even here, then, the child would use the particular designation as a general one. In this sense, Buhler is fully justified in saying that the process involved in the formation of concepts is not one of raising the pyramid of concepts from below to above but one that moves simultaneously from both directions like the process of breaking open a tunnel.

Of course, this raises an extremely important and difficult problem for psychology. Recognizing that the child learns the general and more abstract names earlier than the more concrete, many psychologists have begun to reconsider the traditional claim that abstract thinking develops comparatively late, that it develops only in the period of full maturation. Beginning with a correct analysis of the sequence underlying the development of general and concrete names in the child, these psychologists draw the false conclusion that abstract concepts emerge simultaneously with the appearance of general names in the child's speech, that is, extremely early. C. Buhler's theory is a good example. We have seen that this theory leads to the false claim that there are no special changes or significant advances in thinking during the transitional epoch. It holds that if we compare the thinking of the adolescent with the thinking that we encounter in the intellectual activity of the three year old, we will find nothing that is fundamentally new.

We will be able to consider this question in more detail in the following chapter. At this point, we will note only that *the use of the general word does not in any sense presuppose the mastery of abstract thinking*. As we have seen, the child uses the same words as the adult and relates them to the same circle of objects, but he thinks of them in an entirely different way. Therefore, the child's very early use of words that represent the most abstract forms of thinking in adult speech does not indicate the presence of abstract thinking in the child.

We must remember that the words of the child's speech correspond with the adult's words in their object relatedness but not in their meaning. Therefore, the fact that a child uses abstract words provides no foundation for ascribing abstract thinking to him. As we will try to show in the following chapter, the child thinks of the object concretely though he may use abstract words. At any rate, there is no question that the old conception concerning the formation of concepts, the conception that has its analogy in collective photography, fails to correspond with actual psychological observations or with data from experimental analyses.

A second of K. Buhler's conclusions which is supported by experimental data is also beyond doubt. The concept actually does find its natural place in judgments and conclusions, acting as a constituent of them. The child who responds with the word "big" when presented with the word "house" or with the phrase "apples hang from it" when presented with the word "tree" proves

that the concept exists only within a general structure of judgments, that it exists only as an inseparable part of that structure.

The word exists only within the phrase. Moreover, the phrase appears earlier in psychological terms than does the separate, isolated word. In the same way, judgment arises in the child's thinking earlier than separate, isolated concepts. Therefore, as Buhler argues, the concept cannot be a pure product of association. The association of the connections among separate elements is a necessary but insufficient prerequisite for the formation of concepts. In Buhler's view, these two roots of concepts in the processes of representation and judgment are the genetic key to the correct understanding of the processes involved in the formation of concepts.

In our experiments, we actually observed both of these features mentioned by Buhler. However, his conclusion concerning the concept's dual roots seems to us to be false. Lindner attracted attention to the fact that very general concepts are acquired by the child at an early age. There is no question that the young child learns the correct use of general names. Further, there is simply no truth to the notion that the child's concept develops through the ascent of the concept pyramid. In our experiments, the child frequently matched a series of figures to the model and designated them by a single name. In the process, he extended the word meaning to all these objects, that is, he used the word as a very general and undifferentiated rather than a concrete name.

We also saw how the concept arises as the result of thinking and finds its organic place within judgment. In this sense, the experiment provided support for the theoretical position that the concept does not arise mechanically as a collective photograph of concrete objects. The brain does not act as a photographic apparatus producing a collective photograph. Thinking does not operate through the simple combination of these photographs. On the contrary, the processes of concrete and active thinking arise long before the formation of concepts. Concepts themselves are the product of the long and complex process that constitutes the development of the child's thinking.

As we have said, the concept arises in the intellectual operation. It is not the play of associations that leads to its construction. In a unique combination, all the elementary intellectual functions participate in its formation. The central feature of this operation is the functional use of the word as a means of voluntarily directing attention, as a means of abstracting and isolating features, and as a means of the synthesizing and symbolizing these features through the sign.

During the course of the experiment, we frequently saw that what might be called the indicative function is the initial function of the word. In genetic terms, the word indicates a certain feature much earlier than it assumes the signifying function, before it assumes the function of substituting for a series of concrete impressions and designating them. Under the conditions imposed by our experiment, the meaning of what was initially a meaningless word was linked to the concrete situation. As a result, we had the opportunity to observe how word meaning first arises when it is present in this way. We were able to study this process of relating the word to a certain feature in its living form, to observe how that which is perceived is isolated and synthesized, how it becomes the sense or meaning of the word, how it becomes a concept. We were then able to observe how these concepts are extended and transferred to other concrete situations and how the subject gains conscious awareness of them.

The formation of concepts occurs whenever the adolescent is faced with the task of resolving some problem. The concept arises only as a result of the solution of this problem. Thus, the data from our experimental analysis indicate that Buhler did not represent the dual roots of concept formation in a completely accurate manner.

The concept does indeed develop along two different channels. First, we have tried to show how the function of combining or connecting a series of separate objects through a common family name is basic to the child's complexive thinking. This constitutes the first of the two channels. We have also tried to show how potential concepts, concepts which are based on the isolation of several common features, develop in parallel with complexes and constitute the second channel. These two forms constitute the dual roots of concept formation.

What Buhler maintains are the roots of concepts are only their apparent roots. The preparation of the concept in the form of associative groups and the preparation of concepts in memory is a natural process that is unconnected with the word. It is related to the form of complexive

thinking we discussed earlier, the form that manifests itself completely unconnected with the word in concrete thinking.

In our dreams and in the thinking of animals we find a close analogy to these associative complexes of isolated representations. However, as we have pointed out, it is not these unifications of representations that underlie concepts. The foundation of the concept is to be found in the complexes that are created on the basis of the use of the word.

Thus, Buhler's first mistake was that of ignoring the role of the word in the complexive unifications that precede concepts, that of attempting to derive the concept from a purely natural form of the development of impressions. He ignored the historical nature of the concept and the role of the word in its formation. He failed to see the difference between the natural complexes that arise in memory (represented by Jaensch's concrete concepts) and the complexes that arise on the basis of highly developed verbal thinking.

Buhler made this same mistake in his analysis of the second root of concepts, that which lay in the processes of judgment and thinking. On the one hand, Buhler's assertion returns us to the logicalizing perspective, to the view that the concept has its roots in reflection and that it is the product of logical reasoning. We have seen, however, that both the history of concepts in the development of languages and the history of the child's concepts diverge from the path that logic prescribes. On the other hand, when he refers to thinking as the root of concepts, Buhler is once again ignoring the differences between forms of thinking. In particular, he is ignoring the differences between biological and historical, natural and cultural, lower and higher, and nonverbal and verbal forms of thinking.

If, in fact, the concept arises on the basis of judgment or thinking, we might ask what distinguishes the concept from the products of concrete or active thinking in practical contexts. Again, Buhler forgets what is central to concept formation. He forgets the word. He fails to take account of the word in his analysis of the factors that play a role in concept formation. As a consequence, he cannot understand how two processes as different as judgment and the combining of representations can lead to the formation of concepts.

These false premises inevitably lead Buhler to the false conclusion that the three year old child is already thinking in concepts and that the thinking of the adolescent does not constitute any fundamentally new stage in their development. Buhler is deceived by external similarity. He fails to consider the profound difference between the causal-dynamic connections and relationships that stand behind these two types of thinking. Externally, these types of thinking are very similar, yet in genetic, functional, and structural terms they are completely different.

Our experiments have led us to a fundamentally different conclusion. They show how the use of the word acts as a means of forming the concept, how from syncretic images and connections, complexive thinking, and potential concepts there arises that unique signifying structure that we may call a *concept in the true sense of the word*.