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The development of thinking and concept formation in adolescence

Lev Vygotsky

Content of the lesson

The theory of the purely quantitative evolution of thinking in adolescence and a criticism of this theory. – Evolution of the form and content of thinking in adolescence. – Theory of the development of higher psychological functions and the problem of intellectual development of the adolescent. – The formation of concepts regarded as the main factor characterizing adolescent psychology. – Methods of studying these concepts. – Ach's and Rimat's studies. – Functional methodology of double stimulation and the investigation of concept formation. – Investigation of the concept formation process. – Three stages in the development of the concept formation process: the stage of syncretic images; the stage of concrete complexes and the stage of potential concepts. – The structure and process of the formation of real concepts. – Changes in the content of thinking in connection with concept formation. – Comparative studies of the thinking structures in children and in adolescents.

Study plan for the lesson

- 1 Read the text and make up a plan and summary of the whole chapter.
- 2 Making use of the concept definition method, compare the answers to the same questions (about a number of different concrete and abstract concepts) given by a pre-school, a school age and an adolescent child and analyse these answers in the light of the account given in this chapter.
- 3 Study the three stages in the formation of concepts in the thinking process of a young child, a pre-school child, a school age child and an adolescent which are described in the text of the project.
- 4 Look for the presence of syncretism in the pre-school child's explanations, of verbal syncretism in the school age child's statement and for the disappearance of these phenomena in the adolescent's answers.

- 5 Think about what conclusions can be drawn, based on the data obtained about the particular features of the intellectual development of adolescents, which might serve as a basis for an educational methodology, from the point of view of thinking content and form.
- 6 Using the method of completion of sentences by subordinate clauses after 'because . . .', 'although . . .', etc., determine at what stage *full* control of logical modes of thinking is achieved.

I

Currently, the history of thought development in adolescence, the age of transition, also finds itself in a somewhat transitional stage between old concepts and a new level of understanding of the process of intellectual maturation which has been formulated on the basis of new theoretical approaches to the psychological nature of speech and thinking, and on the development and functional and structural inter-relation of these processes. At the present time, in an article devoted to the study of adolescent thinking, paedology at the time of puberty is able to overcome the basic and fundamental prejudices and the disastrous misunderstandings which stand in the way of the development of accurate ideas about the crisis accompanying intellectual maturation which makes up the substance of adolescent thought development. This error is generally expressed in the statement that there is nothing fundamentally new in adolescent thinking as compared with the thought processes of the younger child. Some writers even take the extreme view, in defending the idea that puberty does not really mark the appearance of any sort of new intellectual operation in the thinking sphere which cannot already be found in a three-year-old child.

Looking at it from this point of view, the development of thinking has no central place in the maturation process. The vital momentous transformations which occur in literally all parts of the adolescent's organism and personality during this crucial period, the uncovering of new deep layers of his personality and the development of the higher forms of his organic and cultural life – all this, when looked at from this perspective, does not in any way affect adolescent thinking. All these changes occur in other areas and spheres of the personality. The result is that the role of intellectual changes in the overall process of the maturation crisis in adolescence are disparaged and presented as having no significance.

Firstly, if one were to follow this point of view consistently, the very process of the intellectual changes which occur at this age is reduced to a simple quantitative accumulation of the same particular features which are already present in the thinking of a three year old and to a further purely quantitative growth to which, strictly speaking, the word 'development' can not really be applied.

In recent times this point of view has been most consistently followed by Ch. Bühler in her theory of adolescence in which, among others, a continuing, orderly development of the intellect during the period of pubescence is ascertained. This

theory assigns an extremely insignificant role to the intellect within the overall system of these transformations and in the general structure of the processes which exemplify maturation, without recognizing the enormous positive significance of intellectual development for the fundamental and most profound transformation of the whole personality system of the adolescent. 'Generally speaking', says this author,

one can surmise that during puberty a more marked separation of dialectic and abstract thinking from perception occurs. For the belief that any intellectual operation only appears for the first time during the age of puberty belongs to those tales which child psychology has discredited. All possibilities for the later development of thinking are essentially already present in a child of three or four.¹

To support these ideas, the author refers to K. Bühler's study, which pursues the point of view that the most essential features of intellectual development, in the sense of a gradual ripening of the basic intellectual processes, take shape already at a very early age. Ch. Bühler thinks that the difference between thinking in young children and of adolescents is the fact that in the case of the child, visual perception and thinking are generally much more closely affiliated. She says:

A child rarely thinks in purely verbal or abstract terms. Even very talkative and verbally gifted children always proceed from a starting point of some concrete experience, and in cases where they are *just* carried away by a desire to speak, they generally *chatter away* without thinking. The mechanism is being exercised, without seemingly pursuing any other function. Furthermore, the fact that children draw conclusions and make judgments solely within the confines of their own concrete experience, and that their plans, in relation to their own short-term goals, are enclosed in a tight circle of visual perception, is well accepted and has given rise to the false assumption that children are completely incapable of abstract thinking.

This opinion has long since been refuted as it has been possible to establish that, from a very early age, a child perceives, whilst abstracting and selecting, and mentally rounds out with a kind of hazy general content, concepts such as good, bad, sweet, etc., as well as being able to develop other concepts through abstraction, to draw conclusions, etc. However, there can be no doubt that, in large measure, all these things are closely dependent on his visual perceptions and impressions.²

In adolescents, on the contrary, thinking becomes less constrained and less concrete than the sensory source on which it is based. Therefore we observe that the rejection of the idea of any essential changes in the intellectual development of the adolescent, inevitably leads to an affirmation of a process of simple growth of the intellect during puberty and its growing independence from sensory material. One way in which this idea could be formulated is that adolescent thinking acquires a sort of new quality in comparison with the thinking of young children as it becomes less concrete and furthermore, it intensifies and becomes strengthened, it increases and grows when compared with the thinking of a three year old; however, not a single intellectual function has its origin during this entire transitional period and therefore

thinking itself is not of any critical or decisive importance for the adolescent's development in general, and it appears to occupy only an extremely insignificant place in the overall system during this critical period of maturation.

This view has to be considered the most traditional one and, unfortunately, is also the most widespread and the one which is not interpreted critically by the majority of contemporary theories of adolescence. Nonetheless, in the light of contemporary scientific data regarding adolescent psychology, this opinion strikes us as profoundly inadequate; its roots reach way back to old fashioned research, which dealt with nothing but the most external, superficial and obvious features, i.e. the change in the emotional state, among all the psychological changes taking place in a child undergoing the metamorphosis to adolescence.

In this sense, traditional adolescent psychology has a tendency to see the emotional changes as the central core and principal content of the whole crisis and to contrapose the development of the adolescent's emotional life with the intellectual development of a school aged child. It seems to us that when the question is put in this way, everything appears turned on its head, and everything regarded in the light of that theory seems to us to be turned inside out: it is precisely when we see young children as the very emotional creatures which they are, in whose whole being emotion plays a pre-eminent role, that the adolescent appears to us, above all, as a thinking being. The traditional view is expressed most comprehensively and, at the same time, most concisely by Giese. He says: 'Whilst the psychological development of a child before puberty primarily includes the functions of the senses, memory store, intellect and attention, the period of puberty is characterized by the development of an emotional life'.³

The logical course followed by this point of view leads to the banal approach to adolescents which tends to ascribe the entire psychological aspect of maturation to their heightened emotional state, dreaminess, outbursts and other such semi-dream-like products of emotional life. The fact that the period of puberty is a time of striking growth of intellectual development and that, for the first time during that period thinking comes to the fore, not only remains unnoticed when this question is formulated in such a way, but it even takes on a mysterious and inexplicable hue in the light of this theory.

Other writers also hold the same view, for example Kroh who, like Bühler, regards all the variations found in adolescent thinking from that of younger children to be due to the fact that the visual basis of thinking which plays such an important role in childhood, recedes into the background during the period of puberty. This author derogates the importance of this difference even more, when, with good cause, he points out that often, between the concrete and the abstract forms of thinking, a transitional fleeting stage in the development process which is characteristic for adolescence manifests itself. This writer gives the fullest positive expression to this theory, shared by Bühler, when he writes: 'We cannot expect a school aged child to progress to entirely new forms of thinking in the area of judgement. Differentiation, subtlety, a significant degree of self-assurance and awareness in the use of forms of

expression already available at an earlier stage, should also be regarded as most essential challenges of development at this stage'.⁴

Kroh then summarizes the same point of view which brings together the development of the thinking process and the subsequent refinement of the previously existing forms in the following way:

To summarize what has been discussed so far, we can establish that both in the realm of the systems which process perceptions (selection, set, categorical perception and processing classification) and in the sphere of logical connections (concept, judgement, inference, criticism), no completely new forms of psychological functions and actions appear in children of school age. All these are in existence earlier, but during school age they undergo considerable development, which can be seen in their being used in a more differentiated, subtle and frequently even more conscious fashion.

If one is to render the meaning of this theory in one sentence, one could say that the appearance of new shades of nuances, more specialized and cognizant application contributes to the differences found in the thinking process of an adolescent as compared with that of a child.

Essentially the same view is developed in our literature by Rubinstein, who systematically considers all changes in the realm of thinking which occur during adolescence to be a continuation of a journey along a trail which has already been blazed in the thinking of the young child. In this respect Rubinstein is in complete agreement with Bühler.

Whilst rejecting Meumann's stand, who believes that the ability to draw conclusions only fully develops in children at the age of 14, Rubinstein declares that not a single form of intellectual activity, not even the ability to draw conclusions, makes its appearance for the first time in adolescence. This writer claims that the view which proclaims that, in the sphere of mental development, childhood can be differentiated from youth by the fact that the central thinking action, namely the ability to draw conclusions in the true sense of the word, only appears in adolescence, is entirely false. In actual fact, this is entirely untrue. There is no doubt that the central thinking process, including the ability to draw conclusions, is already to be found in children.

The only difference between the thinking of a child and that of an adolescent, is that what we as adults understand to be objectively immaterial, circumstantial and superficial, children interpret as essential qualities. 'It is only in adolescence that the major premises as well as the personal definitions and judgements begin to be furnished with essential attributes and, in any case, the framework of the tendency to find them and not to be simply guided by the first superficial feature, becomes clearly apparent.'⁵

So the whole difference can be ascribed to the fact that among children and adolescents the same modes of thinking are provided with a different content. Rubinstein even talks about an expansion of awareness. In children, these forms are filled with non-material attributes; in adolescents a tendency to fill them with material attributes first appears. Therefore, the whole difference is in the material, in

the content and in the filling. The forms remain the same and, at best, undergo a process of further development and consolidation. Among such new shades and nuances, Rubinstein includes the ability to think to the point, a markedly increased steadfastness in the direction of the thinking process, greater flexibility, a wider scope and mobility of thought and other similar characteristics.

The reason why this theory is of particular interest can easily be seen from the retort which its author directs toward all those who have a tendency to deny that a sharp rise and intensification occurs in the mental development of adolescents and young people. This is how Rubinstein defends the idea that the intellectual development of the adolescent is characterized by just such a marked improvement and intensification:

Observations of fact point to this and theoretical considerations lead us in the same direction, otherwise we would have to assume that the influx of new experiences, of new content and new relationships contributes nothing at all and that the causes remain without effects. Thus, one has to look for typical signs of an intensification of mental development not only in the appearance of new interests and inquiry, but also in the deepening and broadening of old ones, in their range and in the entire reach of life's concerns.

In this speculation Rubinstein exhibits the same internal contradiction which, in equal measure, is present in all the theories which want to deny the appearance of anything essentially new in the thinking process during the period of sexual maturation. However, all writers who deny the emergence of new forms of thinking in adolescence, agree about one thing, namely that the amplification of this process of thinking, its content and the material with which it operates, the objectives towards which it strives, in other words the adolescent's thinking from the point of view of its contents, are undergoing a real revolution.

II

This gap in the evolution of form and content of the process of thinking is very characteristic of any dualistic and metaphysical psychological system incapable of formulating an evolutionary theory of the forms and content in thinking in a dialectically unified manner. This fact is so deeply symptomatic, that the most consistently idealist system of adolescent psychology which is developed in Spranger's book, passes over in complete silence the subject of the development of thinking during adolescence.⁶

Not a single chapter in the book is devoted to this problem, but at the same time the entire book, which is dominated by one prevalent idea, is given over to the discovery of the process which, according to Spranger, forms the basis of maturation and which is called the adolescent's growing into the culture of his time. One chapter after another is devoted to the examination of how the content of adolescent thinking

changes, how this thinking obtains completely new material and how it infiltrates entirely new cultural spheres. For Spranger, the adolescent's penetration into the spheres of law and politics, professional life and morality, science and ideology, all make up the central core of the maturation process, but the adolescent's intellectual functions themselves, the patterns of thought, its composition, structure and the type of activity which is part of his intellectual operations, remain constant and timeless.

When one gives these theories some more careful consideration, it is difficult to get rid of the sensation that they are based on a very rough, simplistic and psychologically elementary concept of form and content in the thinking process. According to this concept, the relationship between the form and the content of thinking are quite reminiscent of the relationship between a vessel and the liquid which it contains: the same mechanical filling of an empty, hollow form, the same prospect of filling up the same unchanging form with ever new content, the same internal incoherence, mechanical contraposition of the vessel and the liquid, i.e. the form and the substance filling it.

From the point of view of this theory, the profound revolution in the content of the adolescent's thinking which is wholly renewing itself at all points, is in no way connected with the development of those intellectual operations which are indispensable for the formation of any sort of thinking process.

According to many writers, this revolution occurs either from the outside, in such a way that the same unchangeable forms of thinking, always duplicating themselves at every new stage of development depending on the level of enriched experience and wider association with the environment, are being replenished with ever new content, or the driving mechanism of this revolution is concealed beneath a veil of thought in the adolescent's emotional life. It is capable of mechanically plugging in this thought into a completely new system and directing it, like a simple mechanism, towards a new content.

In both cases the evolution of the thinking content turns out to be an unbridgeable chasm which keeps the evolution of intellectual forms apart. The fact that, without exception, any theory which consistently strives in this direction comes up against such internal contradictions, can be easily demonstrated by the plain example that not a single one of the above mentioned theories denies – and cannot deny – that a profound and fundamental revolution in the realm of the content of adolescent thinking, and a complete renewal of the entire material composition which fills up the empty forms, does indeed take place.

So, Bühler, who finds all the basic intellectual operations peculiar to adolescents already present in a three year old, confines her statement to the purely formal aspect of the problem in question. As far as the content of thinking is concerned she would, of course, refuse to take seriously any statement which would maintain that, in the realm of content of adolescent thinking, nothing evolves which is significantly new in comparison with what is already present in the thinking process of a three-year-old child.

So Bühler cannot deny the fact that only with the advent of adolescence, a transition to a formal logical thinking process is achieved. She refers to Ormian's painstaking study in this field, who was able to demonstrate that a turning point towards a strictly formal mode of thinking can only be observed at about 11 years of age.⁷ As far as the content of thinking is concerned she, too, like Spranger, devotes a significant part of her work to the elucidation of new layers of ethical contents, religious concepts and the rudiments of ideology in adolescent development.

In exactly the same way, Kroh points out the fact that, along with the new variations which he associates with the development of thinking during school age, it is only in adolescence that the ability to handle logical concepts manifests itself. Referring to Berger's study, which deals with the problem of categorical perception and its pedagogic significance, he comes to the conclusion that the perceiving and regulating function of psychological categories first appears in an explicit fashion in experiences and memories only during puberty.

It seems, therefore, that all the writers agree that, whilst they all deny the presence of any new configurations in the realm of intellectual forms, any investigator is forced to admit that there occurs a situation of complete renewal of the entire content of the thinking process during adolescence.

The reason why we have analysed and criticized this point of view in such detail is that without overthrowing it decisively, without disclosure of this theoretical foundation and without contrasting it with new points of view, we can see no other way of finding a methodological and theoretical key to the whole problem of the development of thinking in adolescence. This is why, for us, to understand the details of the theoretical foundations on which all these different (albeit similar from the point of view of their central essence) theories are constructed is of primary importance.

III

As has been mentioned above, the main cause of this theoretical muddle is the gap between the evolution of form and content of thinking. In its turn, this gap is a result of another fundamental failing of the older psychology and child psychology in particular, namely that until recently child psychology had no real scientific concept of the nature of the higher psychological functions.

The observed phenomenon where higher psychological functions are not seen simply as a continuation of the basic functions and their automatic combination, but as an intrinsically new psychological creation whose development follows very special rules and which conforms to entirely different natural laws, has till now not succeeded in becoming part of child psychology.

Higher psychological functions are the product of the historical development of humanity and its phylogenetic plan, but they also have their special ontogenic record. This history of the development of higher forms of behaviour reveals a direct and close

dependence on the organic and biological development of the child and on the growth of his elementary psycho-physiological functions. But in this instance, association and dependence are not one and the same thing.

It is for this reason that in our study we must demarcate the line of development of higher forms of behaviour in the ontogenetic sphere and trace it along all the stages of its conformity to natural laws, not forgetting for one moment about its association with the general organic development of the child. At the beginning of our course, we had already developed the idea that human behaviour in its present form is not only the product of biological evolution, which has resulted in the creation of a human type with all its existing psycho-physiological functions, but is equally a product of a historical development of behaviour or cultural development. Behavioural development did not stop at the beginning of the history of human existence, but neither did it simply continue along the same road as the biological development of behaviour.

The historical development of behaviour was an organic part of the whole process of human social development and fundamentally it conformed to those natural laws which define the progress of historical human development in general. Similarly, in the ontogeny of the development of a child, we should be able to distinguish both lines of the development of behaviour, albeit represented in an interlocked way and in a complicated dynamic synthesis. However, a study which would fully correspond to the real complexity of this synthesis and which would not, at all costs, strive to simplify the issue, would necessarily have to take into account the whole distinctive framework of higher forms of behaviour which are the product of child development. In contrast to Spranger, serious scientific studies show that during cultural behavioural development not only did the content of the thinking process undergo a change but its form did as well, and new mechanisms, new functions, new operations, new spheres of activity, unknown at earlier stages of historical development, were coming into being and falling into place. In the same way, the process of the child's cultural development does not simply include the process of growing into one or other cultural sphere, and does not only represent the filling up of thought with ever new cultural content, but, alongside the development of the content, involves a step by step development of the form of thinking, as well as those higher forms and spheres of activity which originated in the historical past and whose development makes up the necessary conditions for this process of growing into culture.

In actual fact, any truly serious study brings home to us the reality of the unity and indivisibility of form and content, i.e. structure and function, and it shows how any new step forward in the realm of development of the content of thinking, is also inextricably linked with the acquisition of new mechanisms of behaviour and with the raising of intellectual operations to a higher stage.

Certain contents can only be adequately represented with the help of certain forms. Thus, the content of our dreams cannot be adequately expressed in the form of logical thinking, or in the form of logical connections and attitudes, and it is inseparably linked with pertinent archaic, ancient, primitive forms or ways of thinking. And the opposite is true as well: the content of one or other science, the adoption of a complex

system, for example mastery of modern algebra, does not suggest a straightforward filling up with appropriate contents of the same forms which already exist in a three-year-old child; this new content cannot come into being without new forms. The dialectical unity of form and content in the evolution of thinking is the beginning and end of contemporary scientific theory of speech and thought.

Actually, is it not rather puzzling from the point of view of theories (outlined above) which deny that adolescent thinking reaches a new qualitative stage, that contemporary research has worked out standards for mental development which require, like, for example, in the case of the Binet-Simon tests (in the version of Burt-Blonsky),⁸ a description and explanation of a painting from a child of 12, solutions to some major problems in life from a 13-year old, a definition of abstract terms from a 14-year-old adolescent, at the age of 15 the pointing out of differences between abstract terms, and at 16 years old the ability to grasp the meaning of a philosophical argument?

Is it possible for these empirically established symptoms of intellectual development to become comprehensible from the point of view of a theory which allows for nothing more than new variations arising in adolescent thinking? From the point of view of nuances, how is one to account for the circumstance where the average 16-year-old adolescent reaches the stage of mental development where the understanding of the meaning of a philosophical argument can serve as a significant indicator and symptom?

Only an inability to distinguish between the evolution of elementary and higher functions of thinking and between forms of intellectual activity which are chiefly biologically conditioned and those which are mainly historically derived, could lead one to deny a qualitatively new stage in the development of adolescent intellect. It is perfectly true that new elementary functions do not appear in adolescence. This situation, as has been rightly pointed out by K. Bühler, is fully confirmed by biological data in relation to the increase in weight of the brain. Edinger, one of the outstanding brain experts, has formulated the following general thesis: 'Anyone who knows the brain structure in the animal domain will have become convinced that the appearance of any new skills is always connected with the appearance of new parts of the brain or with the enlargement of existing ones'.⁹

Edinger's thesis, which he developed for the phylogeny of the psyche, is now frequently and readily applied to ontology as well, in an attempt to grasp the parallelism between the development of the brain, as far as this is testified to by its increase in weight, and the appearance of new skills. But it is often overlooked that the parallelism can only apply to elementary functions and abilities which are the product of biological behavioural evolution like the brain itself; but, as it happens, the essence of historical evolution of behaviour is precisely dependent on the appearance of new skills, which are not connected with the development of new parts of the brain nor with the growth of existing ones.

There are good reasons to assume that the historical development of behaviour from its primitive form to the most complex and highest, did not occur as a result of

the development of new parts of the brain or the growth of existing ones. This is the essential characteristic of adolescence, as it is, for the most part, the age of cultural development and the development of higher psychological functions. Blonsky is absolutely correct when he makes the following comment about it: 'The period of the eruption of permanent teeth can be regarded as the child's civilizing age, the era when he acquires a store of contemporary knowledge, beginning with the ability to write and when he comes into contact with modern technology. Civilization is still much too recent an acquisition of humanity for it to be hereditary'.¹⁰

So it would be unreasonable to expect the evolution of higher psychological functions to progress in a parallel manner with the development of the brain, which is mainly brought about by hereditary forces. According to Pfister's findings, the brain doubles its original weight during the first nine months and it trebles it by the end of the third year; however, throughout the entire developmental period, the brain only quadruples in size. 'One of the phenomena of child psychology', says Bühler, 'fully concurs with this finding. The child acquires *all the basic mental functions* during the first three or four years of life, but never again during the rest of his life does he achieve the same sort of mental progress as, for example, during the time he is learning how to speak'.¹¹

We wish to emphasize again that this parallelism can only apply to the maturing of the elementary functions which are the product of biological evolution and which emerge along with the growth of the brain and its parts. It is for this reason that we must agree with Bühler's thesis only to a limited extent when he says: 'We dare to hope that some day we will be able to discover physiological grounds for every major stage of progress in the mental life of a normal child within the development of the structure of the large brain'.¹²

We feel bound to put a restriction on this thesis because it is basically applicable to changes in the development of the psyche which are determined by heredity, but the complex syntheses which take place during the process of a child's or adolescent's cultural development have their roots in other factors, and these, above all, include social relationships, cultural development and children's and adolescents' work activities.

Granted, some people hold the view that the most profound intellectual leaps observed during this transitional period are due to an intensification of the development of the brain which occurs during adolescence. Blonsky's hypothesis states that 'the milk tooth stage of childhood, in contrast to the preceding and the following stages, is not characterized by any intensive development of thought and speech, but rather it is a phase of the development of motor and co-ordination skills and emotions.' Blonsky links this phenomenon with the fact that during the milk tooth stage, intensive growth of the spinal cord and cerebellum occurs, in contrast with the toothless and school age stages, which are mainly characterized by intensive cortical (intellectual) development. Observations of the dramatic transformation of the forehead in the pre-pubertal age, lead this author to the conclusion that during school age the primary site of development is to be found in the frontal part of the cerebral

cortex. However, based on the same evidence which Blonsky relies on and which he, himself, calls shaky and not very reliable, we feel justified in drawing conclusions about the intensive development of the brain only in relation to the pre-pubertal, i.e. primary school age.

But there are no factual data available to support these proposals with respect to the age of puberty or adolescents. It is true that, according to the findings of Vyazemsky,¹³ quite a significant increase in the weight of the brain can be observed at age 14–15, then after a brief pause and slackening, slight new rises at age 17–19 and 19–20 occur. But if we take the latest data into account, we will see that there is only an insignificant increase in the weight of the brain during the whole period of development from age 14–20. So, we have to look for new ways of explaining the intensive intellectual development which takes place during the period of puberty.

As a result, the changeover from research largely based on external phenomena and on phenotypical likeness to a more profound investigation of the genetic, functional and structural nature of thinking for the different age groups, inevitably forces us to reject the traditional view, which tends to identify adolescent thinking with that of a three year old. And that is not all: even that part of those theories which admits the existence of qualitative differences between the thinking processes of a young child and that of an adolescent, makes the mistake of listing first the positive achievement, and only later the really new phenomena which emerge during that period.

As can be seen from new research data, the assertion that the abstract is out of touch with the concrete and the hypothetical with the visual in adolescent thinking is incorrect; the dynamics of thinking during this period are not characterized by the fact that the connections between intellect and its material base where it originates are severed, but rather by the emergence of a completely new form of relationship between the abstract and the concrete aspects of the thinking process, a new form of fusion or synthesis, and we now see such elementary, long since crystallized functions like the child's visual thought, perception or practical intellect in a completely new way.

This is why Bühler's and some other theories prove untenable not only in respect to what they deny, but also in what they affirm, not only in their negative aspect, but in the positive parts as well. The opposite is also true: not only do completely new and hitherto non-existing complex synthetic forms, absolutely unknown to a three year old, appear in the adolescent's thinking process, but even these elementary primitive forms which the child acquires already at the age of three, transform themselves into entirely new principles during adolescence. It is not only that new forms appear during the period of puberty, but it is precisely on account of their appearance that the old ones are transformed according to a completely new principle.

So, whilst summarizing what has been discussed above, we come to the conclusion that the most serious methodological weakness to be found in traditional theory consists of the flagrant internal contradiction between the affirmation of a profound revolution which is taking place in the realm of the content of the adolescent thinking process, and the refutation of any sort of real breakthrough in the evolution of its

intellectual function, in its inability to correlate form and content in the development of thinking.

As we have attempted to demonstrate, this rift is, in its turn, caused by the inability to distinguish between two lines in the development of behaviour, i.e. the line of development of the elementary and that of the higher psychological functions. At the present time we feel we are in a position to formulate the main idea which has constantly guided our critical investigations, based on the conclusions which we have drawn.

We could say that this fatal rift between form and content inevitably stems from the situation that the evolution of the thought content is always considered to be a process of cultural development which, first and foremost, is conditioned by historical and social factors, whereas development of the form is normally looked upon as a biological process conditioned by the level of the child's organic maturation and parallel to the increase in the weight of the brain. When we talk about the content of the thinking process and the changes which it undergoes, we have in mind a historically variable, socially conditioned quantity which originates in the process of cultural development; but when we are discussing the forms of thinking and their dynamics, because of the misunderstandings arising from traditional psychology, we usually mean either metaphysically inert psychic functions or biologically conditioned, organically generated forms of activity.

So a great chasm continues to gape between these two concepts. The historical and the biological aspect of the child's development end up separated from one another and it is impossible to build a bridge of any sort between them, which might help us unite facts and data pertaining to the dynamics of form in the thinking process with the facts or data about the dynamics of the content which fills this form.

It is only with the introduction of the principles of higher forms of behaviour which are the product of historical evolution, and the marking out of a particular line of historical development, or the development of higher psychological function in the ontogeny of behaviour, that it will become possible to fill in this abyss, to throw a bridge across it and to begin to study the dynamics of form and content of the thinking process in their dialectic unity. We can then correlate the dynamics of content and form through their common historical character which, in equal measure, will identify both the content of our thoughts and their higher psychological functions.

Therefore, to proceed from these ideas, which in their totality comprise the principles of the child's cultural development expounded by us elsewhere, we can find the key for a correct formulation and thus a correct solution to the problem of the development of adolescent thinking.

IV

According to a number of research findings, the key to the whole problem of the development of thinking during adolescence is the established fact that an adolescent

masters the process of concept formation for the first time and that he progresses to a new and higher form of intellectual activity, i.e. to thinking in concepts.

This central phenomenon of the entire adolescent period and the underestimation of the significance of the intellectual development of the adolescent, the tendency inherent in the majority of contemporary theories of adolescence to relegate the changes which have an intellectual character to the background, as compared with the emotional and other aspects of this age group, can be explained, firstly, by the fact that the formation of concepts is an extremely complex process which, by no means, can be considered to be analogous to the simple maturation of elementary intellectual functions, and for this reason resists any attempt to explain it by using superficial examples or rough eye estimates. The changes which occur in the thinking process of an adolescent who has mastered thinking in concepts, are to a large extent changes of an internal, intimate, structural nature, frequently not externally visible in any clear way and not always evident to an outside observer.

And if we are to limit ourselves only to such externally observable changes, we will have to agree with those researchers who suggest that nothing appears for the first time in adolescent thinking and that it just grows quantitatively, in a constant and gradual way, filling up with continually new content and becoming ever more accurate, more logical and closer to reality. But one only needs to proceed from a purely external observation to an internal investigation in depth to see this whole teaching crumble to dust. As has been mentioned already, the formation of concepts takes centre stage in the whole developmental process of thinking during the period of puberty. This process is indeed a herald of revolutionary changes to come, both in the realm of content as well as in that of forms of thinking. We have already discussed the fact that from the methodological point of view, the rift between the form and the content of thinking which underpins the majority of theories like an unspoken premise, is untenable. The reality is that form and content in the thinking process represent two aspects of one single integral process, two aspects which are internally bound up with one another by an essential, not an accidental bond.

There exist particular types of thought contents which can be properly understood, assimilated and perceived and are generally conceivable only in certain forms of intellectual activity. But there are also other contents which cannot be adequately reproduced in the same form, but require different forms of thinking which, together, make up one indivisible whole. So, for example, the contents of our dreams cannot be adequately communicated within the system of logically singular verbalization, within the forms of verbal, logical intellect; any attempt to reproduce the content of a dream through imagery in the form of logical speech, inevitably results in a misrepresentation of that content.

The same applies to scientific knowledge; for example mathematics, natural sciences and social sciences cannot be adequately communicated and represented in any other way except in the form of logical verbal thought. Content, therefore, turns out to be closely bound up with form, and when we say that the adolescent achieves a higher level in his thinking process and masters the art of concept formation, we are

certainly pointing out a new domain of forms of intellectual activity and an equally new world of thought content which, at that time, unfolds for the adolescent.

So, by the very presence of the formation of concepts, we find a solution to the contradiction between the abrupt changes in the thought content and the immobility of its forms during adolescence which had inevitably arisen in several of the theories which were examined above. A number of contemporary studies bring us to the incontrovertible conclusion that it is precisely the formation of concepts which constitutes the basic core around which all the essential changes in adolescent thinking congregate.

Ach, the author of one of the most interesting studies on the formation of concepts, whose book dominates a whole era of research related to this problem, whilst attempting to elaborate the complex picture of the ontogeny of the formation of concepts, picks out the age of adolescence as being just such a borderline critical moment which marks a decisive qualitative turning point in the development of the thinking process. This is what he says:

We are able to establish one more swiftly passing phase in the process of the intellectualization of mental development. As a rule, it tends to coincide with the period of puberty. Up to the time of sexual maturity, the child often lacks the ability to form abstract concepts, as, for example, has been demonstrated by Eng's observations. But thanks to the influence of instruction, using educational material which, for the most part, necessarily consists of general concepts which express some sort of laws or rules, attention tends to turn more and more in the direction of abstract associations under the influence of speech and thus results in the *formation of abstract concepts*.¹⁴

As the two basic factors leading up to the formation of abstract concepts, Ach mentions, on the one hand, the influence of the material of assimilated learning and, on the other, the guiding influence of speech on the adolescent's consciousness. He cites Gregor's studies, which have shown the enormous influence of learning on the development of abstract thinking.

This gives us an indication of the genetic role of the new content which is now becoming part of the adolescent's thinking process, and which obliges him to progress towards new forms and faces him with problems which are soluble only with the help of formed concepts. On the other hand, functional changes in the direction of awareness which are achieved with the help of speech also appear. A climax in the development of thinking and the progression to conceptual thinking is thus brought about, both by a change of function, and by the new problems which now face the adolescent's thought process in connection with the necessity of having to master new abstract material.

According to Ach, as a result of the progression to this higher stage, both the process of intellectualization and the progression to conceptual thinking, increasingly narrow down the orbit of visual thinking and thinking in images. This brings about atrophy of the type of thought inherent in childhood, which now the child has to abandon and replace with the creation of a completely new form or type of intellect.

In connection with this, Ach points out a problem to which we intend to return in the next section. He asks whether this reality of the progression from imagistic thinking to conceptual thinking may not be responsible for the circumstance that the eidetic tendency, investigated by Jaensch, is much less frequently encountered in this age group than in childhood.¹⁵

V

Until recent times, the main difficulty in the area of concept investigation was that no proper experimental methods had been devised which could be used for attempting a deeper analysis of the process of the formation of concepts and studies of its psychological nature.

All the traditional methods of investigating concepts fall into two basic groups. A typical example of methodology belonging to the first group is the so-called definition method and all its indirect variations. This method is characterized by the investigation of the child's already functional and formed concepts by verbal definition of their content. It is precisely this method which has been adopted by the majority of test-based research. Despite its wide use, this method suffers from two basic shortcomings which make it impossible to rely on it in cases where a deep investigation of the process is called for.

- 1 It deals with the result of a previously completed process of concept formation, with a finished product, but does not catch the dynamics of this process, its development, nor its course, beginning and end. This is rather an investigation of a product than of a process which has led up to the formation of this product. Because of this, when we define ready made concepts, very often we are dealing not so much with the child's thought process, as with a replica, a reproduction of ready made information and definitions apprehended ready made. When we analyse the definition given by the child for this or that concept, we frequently learn much more about the child's awareness, experience and the level of his speech development than about his thinking in the true sense of the word.
- 2 The definition method operates almost exclusively by using words, forgetting that, particularly for a child, a concept is closely linked with sensory material, from whose perception and reworking process it comes into being; both the sensory material and the word are indispensable features of the process of concept formation, and words which are cut off from this material transform this whole process of the definition of the concept into a purely verbal plan which is not natural for a child. It is for this reason that, when this method is used, one is hardly ever able to establish the relationships which exist between the meaning which the child assigns to the word using a purely verbal definition, and its true, real meaning which corresponds to the word in the process of its living relationships with the objective reality which it signifies.

For all this, the most essential thing for a concept, i.e. its relationship to reality, remains unexplored; we tried to get near the meaning of a word by using another word, and what we get as a result of this operation can sooner be applied to relationships which exist between separate adopted verbal clusters than to a true reflection of childish concepts.

The second group of methods includes those for the study of abstractions which attempt to overcome the shortcomings of the purely verbal definition method, and which try to understand the psychological functions and processes which lie at the foundation of the concept formation process and the sorting out of the visual experience from which concepts arise. They all present the child with the problem of selecting any general feature from a number of concrete impressions, of segregating and abstracting this feature or attribute from a number of others which are merged with it in the process of perception, and to generalize the characteristic which is common to a large number of impressions.

This set of methods has the drawback that in place of the complex synthetic process, they substitute an elementary one which is part of it and ignore the role of words or signs in the process of concept formation, by which means they infinitely oversimplify the very process of abstraction, treating it as if it were outside the special and characteristic relationship which the concept formation process happens to have with words which represent the central distinctive signs of the entire process. So it appears that traditional methods of research into concepts are both equally characterized by a withdrawal of the word from the objective material – they operate either with words but without the objective material, or with the objective material but without words.

A great step forward in the field of research into concepts was the creation of an experimental method which made a successful attempt to reflect the process of concept formation, which includes both these features, i.e. material on the basis of which the concept is developed, and the word, which helps it to come into existence.

We will not dwell upon the complex history of the development of this new method of research into concepts; suffice it to say that when it was introduced, a whole new world opened up for the researchers – they began to study not just ready made concepts, but the very process of their formation. In particular this method, in the form in which it was used by Ach, can justifiably be called a synthetic-genetic method, as it investigates the process of the establishment of the concept, the synthesization of a number of signs which make it up and the process of its development.

The underlying principle of this method is the introduction into the experiment of non-existent words, which are initially meaningless to the subject and which are not connected with the child's earlier experiences, and also of artificial concepts which are specially constructed for experimental purposes by combining a number of features never found in the realm of our normal concepts, and which are given meaning during speech in this particular association. So, for example, in Ach's

experiments the word 'Gazun', which, to begin with, the subject finds meaningless, gradually acquires meaning in the course of experience and begins to carry a meaning which amounts to something big and heavy; or the word 'fal' begins to signify something small and light.

In the process of acquiring experience before the experiment, the whole routine of trying to make sense of the meaningless word, the acquisition of a meaning for the word and the working out of the concept begins. Thanks to the introduction of non-existent words and artificial concepts, this method frees itself of one of the most serious weaknesses which pervade other methods, namely, it does not assume any previous experience or knowledge and therefore, in this respect, it puts young children on a par with adults for the purposes of solving the problem which faces the experimental subject.

Ach applied his method in exactly the same way to a five year old and to an adult, putting them on a par with one another from the point of view of their knowledge. As a result, his method is also applicable to adults and allows the investigation of the process of concept formation in its pure form.

One of the main faults of the definition method is that the concept breaks away from its natural connection and it is examined in a congealed static form, outside its association with real thought processes in which it is normally found and in which it originates and resides. The experimenter takes an isolated word and the child is supposed to define it, but this definition of an extracted, isolated word which is taken in a congealed form does not, in the least, tell us how it is understood in action, how the child manages it in a living situation of problem solving and how he uses it when a real live need arises.

According to Ach, this ignoring of the functional factor is, in essence, a refusal to take into consideration that a concept does not live in isolation and that it does not represent a congealed immovable phenomenon, but on the contrary, it is always found within a living, more or less complex thinking process and it always fulfils either a communicative, an interpretative or a comprehending function, or attempts to solve a problem.

But the new method does not suffer from this shortcoming, as it gives a central place to precisely these functional aspects of concept formation. It approaches a concept in connection with one or other problem or requirement generated by the thinking process, in connection with comprehension or communication, in a direction or problem solving situation which cannot be implemented without concepts being formed. All these things taken together mark this new method as an important and valuable tool for understanding the development of concepts. And even though Ach himself did not devote any special study to the question of concept formation in adolescence, nevertheless, whilst relying on the results of his investigations, he could not have failed to notice the dual revolution, embracing both the content and form of thought, which occurs during the period of the adolescent's intellectual development and signifies the transition to thinking in concepts.

VI

Rimat devoted a special, very thoroughly elaborated study to the process of concept formation in adolescence, which he conducted with the help of a slightly modified version of Ach's method. The basic conclusion reached as a result of this research can be summarized by saying that concept formation appears only with the coming of adolescence and up till that time it is inaccessible to a child. 'We can say with certainty', he writes, 'that only beginning at the age of 12 a marked improvement in the ability to independently form general objective concepts appears. I think that it is important to take account of this fact. *Thinking in concepts which is a function remote from visual experiences, makes demands which exceed a child's psychological capabilities . . . until the 12th year of life.*'¹⁶

We are not going to go into the methods used in carrying out this experiment, nor into any other theoretical conclusions and results which its author was able to draw from it. We are going to limit ourselves to pointing out the basic result which indicates that despite the views of some psychologists, who disallow the appearance of any new intellectual function in adolescence and who maintain that every child of three is already in possession of all the intellectual operations which make up the adolescent's thinking process – despite this assertion, specific investigations show that only after the age of 12, i.e. only at the beginning of the pubescent period and after the end of the primary school age, do the processes which lead to the formation of concepts and abstract thinking begin to develop in children.

One of the basic conclusions we can draw from Ach's and Rimat's studies, is to refute the associative point of view in relation to concept formation. Ach's investigation has shown that no matter how numerous and durable the associative connections among various verbal signs and various objects might be, just this fact alone is an entirely inadequate cause for concept formation to occur. Therefore, the old idea that a concept arises purely by following an associative path due to the greatest reinforcements of certain associative connections which correspond to attributes common to a number of objects, and the weakening of other associations which correspond to attributes in which these objects differ, has not been confirmed by experimental evidence.

Ach's experiments have shown that the process of concept formation always has a productive rather than reproductive character. The concept comes into being and is formed through a complex operation which is directed toward a solution of a problem, and the presence of only external circumstances and a mechanical establishment of a connection between a word and an object is not sufficient cause for it to come into being. Along with the establishment of this non-associative and productive character of the process of concept formation, these experiments have led to another, no less important conclusion, namely the establishment of a fundamental factor defining the whole course of this process in general. According to Ach, this factor is the so-called determining tendency.

Ach assigns this term to the tendency which regulates the course of our conceptions and actions, which originates in our notion of a goal for whose attainment all the striving of this trend is directed, beginning with the problem toward whose solution all the observed activity is directed. Before Ach, psychologists differentiated between two basic tendencies which are subordinated to the flow of our perception, the reproductive or associative tendency and the persevering tendency. The first of these signifies the tendency, in the succession of ideas, to evoke those which were associatively connected with information from earlier experiences; the second points to the tendency of each conception to keep returning and repeatedly to infiltrate the tide of conceptions.

In his earlier investigations Ach has demonstrated that both these tendencies are insufficient grounds for explaining both the purposeful and consciously regulated thinking acts which are directed toward solving problems, and that these are regulated, not so much by reproduction of concepts according to an associative connection and the tendency of each conception to infiltrate the consciousness again and again, but rather by a particular determining tendency which originates from a conception of a goal. In his investigation of concepts, Ach again demonstrates that the central feature without which no new concept can arise, is the regulating action of the determining tendency, which originates from the problem which the experimental subject is presented with.

So, according to Ach's scheme, concept formation is not formed according to a chain of associations, where one link calls up and brings along with it the next one to which it is connected by association, but rather according to a type of purposeful process which consists of a number of operations which play a role of means in relationship to the solution to the basic problem. The learning by heart of words and the association of them with objects, in itself does not lead to concept formation; it is necessary for the experimental subject to be faced with a problem, which cannot be solved any other way except with the help of concept formation, in order for this process to be set in motion.

As has already been mentioned above, Ach made a great stride forward in comparison with former researchers, in the sense that the processes of concept formation were included within the structure of a resolution of a particular problem, and in the sense that the functional meaning and the role of this feature were investigated. However, this is not enough, because the objective which is the problem in itself, of course, makes up the one absolutely necessary feature for the process, which is functionally linked with its solution, to arise; pre-school and primary school children have goals as well, but neither a child from this latter age group nor from the former, nor generally speaking (as has already been said) any child below the age of 12, who is perfectly capable of realizing that a problem exists, is, however, as yet capable of working out a new concept.

And even Ach himself also showed in his studies that pre-school children, whilst trying to solve a problem with which they are faced, differ from adults and adolescents in their approach, not because they apprehend the goal more or less fully or

correctly, but because they go about developing the whole process of attempting to solve the problem in a totally different manner. In a complex experimental investigation of concept formation in pre-school children, which we discuss below, Usnadze has demonstrated that a pre-school child attacks problems in precisely this functional matter in exactly the same way as an adult when the latter is operating with concepts, but the child solves these problems in a completely different way. Just like the adult, the child uses words as a tool; therefore, for him words are linked with the function of communication in exactly the same way as for an adult.

It therefore appears that it is not the problem itself, the goal or the determining tendencies which result from it, that condition the essential genetic differences between thinking in images and other forms of thinking in the adult as opposed to the young child, but some other factors which have not been mentioned by this researcher.

Usnadze drew particular attention to one of the functional aspects which Ach's investigations had brought to the fore, i.e. the instant of communication, of mutual understanding among people with the aid of speech. 'Words serve as a tool for mutual understanding among people', says Usnadze,

It is precisely this circumstance which plays the decisive role in concept formation: when the necessity of mutual understanding arises, a specific sound complex takes on a specific meaning and so it becomes a word or a concept. Without this functional aspect of mutual understanding it would not be possible for any sound complex to become the carrier of any meaning whatsoever and no concept could be formed.¹⁷

It is a known fact that contact between a child and his surroundings is established extremely early; right from the very start the child grows up in an ambient atmosphere of speech and he himself begins to apply the mechanism of speech already during the second year of his life. 'There is no doubt that these are not senseless sound complexes, but real words, and as he matures, he learns how to associate more differentiated meanings with them.'¹⁸ But at the same time we are certain that children reach the stage of socialization of thinking, which is necessary for the working out of fully developed concepts, relatively late.

So, we can see that, on the one hand, the fully fledged concepts which assume a higher level of socialization of the child's thinking process, develop relatively late, while, on the other hand, children begin to use words and to reach the stage of mutual understanding with adults and among themselves by using them relatively early. Therefore, it is clear that words which have not yet reached the stage of fully developed concepts, take over the function of the latter and can serve as a means of communication between speaking individuals. A special investigation of the appropriate age group should tell us how these forms of thinking which have to be interpreted not so much as concepts but as their functional equivalents, develop and how they manage to reach the stage which can be considered to represent fully developed thinking.¹⁹

Usnadze's entire study shows that these forms of thinking which amount to functional equivalents of thinking in concepts, differ sharply (from the qualitative and structural point of view) from the more developed thinking of an adolescent or an adult. At the same time, this difference cannot be based on the factor suggested by Ach, because it is precisely from the functional point of view, in the sense of providing solutions to particular problems, and in the sense of determining tendencies which originate in goal conceptions, that these forms, as Usnadze has shown, amount to equivalent concepts.

So we end up with the following situation: it turns out that the problem and the goal conceptions which arise from it are accessible to a child at relatively early stages of his development; it is precisely because both in a child and in the adult the problems of understanding and communication are principally identical that the functional equivalents of concepts in children develop extremely early; but even though the problems are identical and the functional features equivalent, the forms of thinking themselves which function during the process of problem solving, are fundamentally different in children and in adults, because of their composition, their structure and by the way they operate.

It becomes obvious that it is not the problem, and the goal conception which is part of it, that in themselves determine and regulate the whole process, but some new factor which Ach had ignored; it is also evident that the problem, and the determining tendencies which are connected with it, cannot adequately explain the genetic and structural differences which we can observe in the functionally equivalent forms of thinking among children and adults.

The general goal cannot provide the answer to this. Granted that without the existence of a goal there cannot be any goal directed action, yet the presence of this goal cannot in any way explain the whole process of reaching it in its development and its structure. In Ach's own words, due to earlier actions, the goal and the determining tendencies which it engenders, set the process in motion, but do not regulate it; the presence of the goal and of the problems is a necessary but insufficient cause for goal directed activity to arise; no goal directed activity can arise, without the presence of a goal or a problem which sets this process in motion and gives it direction.

But the presence of a goal and a problem do not yet guarantee that a genuinely goal directed activity will be brought to life and, in any case, it does not possess any magical powers to define and regulate the process and structure of such activity. Both the child's and the adult's experiences are full of numerous incidents where, at certain stages of development, the individual is faced with unanswered questions, unresolved or incompletely worked out problems, or unattained or unattainable goals, without, however, any guarantee of success merely as a result of their being there. As a general rule it seems that we should use the goal as a starting point, but without limiting ourselves to it, in cases where an attempt to explain the nature of the psychological process which leads to problem solving is involved.

The goal, as has already been said, cannot explain the process. The most important and basic problem connected with the process of concept formation and the process of goal directed activity as a whole is the problem of the means used to carry out some psychological operation, to accomplish some goal directed activity.

In the same way as we cannot give a satisfactory explanation of human goal directed activity, labour, by saying that it is elicited by certain goals and certain problems which human beings encounter, and must explain it by referring to tool use and the application of special means without which labour activity could not come into being, in the same way the problem of the means by which man masters the process of his own behaviour is the central problem encountered when we attempt to explain all the higher forms of behaviour.

Investigations, which we are not going to discuss here, have shown that all higher psychological functions are united by one common characteristic, namely that they are mediated processes, i.e. that they incorporate in their structure, as the central and basic part of the process in general, the use of the sign as a basic means for directing and mastering the psychological processes.

In the context of the problem of concept formation with which we are concerned here, this sign is represented by words which play the role of instruments of concept formation and later become its symbols. The only way of ever discovering the key to understanding the process of concept formation, is to study the functional use of words and their development and the varied forms of their usage, multifarious, quantitatively distinct at different ages, but genetically related to one another.

The main weakness in Ach's method is that it does not allow us to explain the genetic process of concept formation, but only confirms the presence or absence of this process. By the way that the experiment is organized, the assumption that the means with whose help the concepts are formed, i.e. the experimental words which play the role of signs, which are given at the very beginning, become a constant quality which does not change throughout the whole course of the experiment and, in addition, the way that they are to be used is stipulated in the instructions beforehand; the words do not appear in the role of signs from the very beginning and they do not principally differ from any other number of stimuli produced by objects with which they are affiliated and which appear in the course of the experiment; for the sake of his critical and polemical ambitions, in an attempt to prove that a simple associative connection between words and objects is insufficient grounds for the emergence of meaning, and that the meaning of a word or concept is not equal to the associative connection between a sound complex and a number of objects, Ach retains the traditional course of the whole process of concept formation in its entirety and he subordinates it to the well recognized scheme which can be expressed in the following way: from the bottom up and from separate concrete objects to a few concepts which embrace their meaning.

However, as Ach himself admits, an experimental course such as this sharply contradicts the real path of the process of concept formation which, as we shall

see below, is by no means constructed on the basis of a number of associative chains. Quoting the now famous statement by Vogel, it is not equivalent to climbing up the concept pyramid and to a transition from the concrete to the ever more abstract.

This is exactly one of the fundamental results to which Ach's and Rimat's investigations had led them; it disclosed the inaccuracy of the associative approach to the concept formation process, pointed to the productive and creative character of the concept, explained the fundamental role of the functional aspect of concept formation, underlined the fact that only where a specific need or demand for a concept exists, only during the course of some intelligent activity directed toward the attainment of a specific goal or the solution of a particular problem, can a concept come into being and take form.

These studies, having once and for all buried the idea of a mechanical conception of concept formation, nevertheless did not manage to disclose the essential genetic, functional and structural nature of this process, and strayed onto the path of purely teleological explanation of these higher functions, which essentially can be reduced to the assertion that the goal itself, with the aid of determining tendencies, creates an appropriate and goal directed activity, and that the problem contains the solution within itself.

As already pointed out, apart from being generally philosophically and methodologically unsound, from the purely factual point of view this kind of explanation leads to insoluble contradictions and to the impossibility of explaining why, even though the functional aspects of problems and goals are identical, the forms of thinking which make it possible for the child to solve these problems, are fundamentally dissimilar at every age.

Looking from this vantage point, the fact that thinking forms undergo development appears entirely incomprehensible. This is why Ach's and Rimat's experiments, which undoubtedly began a new epoch in the study of concepts, have nevertheless left this problem completely open, in terms of its causal and dynamic solution, and an experimental study should have investigated the concept formation process during its development in its causal and dynamic conditionality.

VII

In our attempt to solve this problem, we relied on a particular method of experimental investigation, which can be described as the functional method of double stimulation. The essential feature of this method is that it investigates the development and activity of higher psychological functions using two groups of stimuli, each of which plays a different role in relationship to the behaviour of the experimental subject. One group of stimuli has the function of a task toward which the activity of the experimental subject is directed, whilst the other takes on the function of signs which help to organize this activity.

At this stage we have no intention of providing a detailed description of how this method was applied to the investigation of the process of concept formation, as this has already been done by our colleague Sakharov;²⁰ we will merely limit ourselves to pointing out the basic features which may be of fundamental importance in connection with everything which has been discussed above in a general way. Because the object of this experiment was to discover the role of words and the character of their functional usage in the process of concept formation, in a certain sense this whole experiment had to be designed in the opposite way to Ach's experiment.

The beginning of Ach's study shows the period of learning by heart, which consists of the experimental subject (who has not yet been given a problem by the researcher but possesses all the means, i.e. words which are necessary for the solution of the ensuing problem), memorizing the names of all the objects put in front of him, by picking them up one by one and examining them.

Thus, the problem is not presented at the very beginning but is introduced later, which results in a turning point occurring in the whole course of the experiment. However, the means (words) are given right from the start, but in a direct associative connection with the stimuli objects. As it happens, by using the method of double stimulation, both these aspects are resolved in reverse manner. The problem is fully disclosed to the experimental subject from the very start of the experiment and it remains unchanged throughout every stage of the experiment.

We do this because we proceed from the assumption that the formulation of this problem and the emergence of the goal are necessary prerequisites for the process as a whole to come into being; but the means are introduced into the problem gradually, along with every new attempt on the part of the experimental subject to solve the problem in a situation where the previously provided words prove insufficient; the period of learning by heart is not there at all. So, by converting the means required for solving the problem, i.e. the stimuli signs or words into a variable quantity, and making the problem into a constant quantity, we are able to investigate how the experimental subject uses these signs as means to guide his intellectual operations, and how, depending on the way that these words are used, the process of concept formation as a whole emerges and develops from its functional application.

At the same time we consider one aspect (discussed in detail below) to be most significant and of primary importance within the context of this investigation, namely that when the experiment is organized in this way, the concept pyramid ends up standing on its head. The process of the solution of the experimental problem corresponds to the real genetic process of concept formation, which, as we will see below, is not constructed in a mechanically quantitative way like Galton's collective photograph, by a gradual transition from the concrete to the abstract, but is one where the movement downwards, from the general to the particular, from the top of the pyramid to its base, is just as characteristic as is the reverse process of ascending to the heights of abstract thinking.

Finally, the functional aspect discussed by Ach is also of primary importance; the concept is examined not in its static and isolated state, but within living, thinking

processes and problem solving situations in such a way, that the investigation as a whole breaks up into a number of separate stages, each of which includes the investigation of the concept in action, in one of its functional applications within the thinking process. At the beginning we have the process of the working out of the concept, then the process of transferring the worked out concept to new tasks, then using the concept in the process of free association and, finally, the application of the new concept to the drawing of conclusions [making of judgements] and the definition of newly worked out concepts.

The experimental process proceeds as follows: on a special board divided into separate sections, rows of shapes of different colour, form, height and size are arranged in front of the experimental subject in a random manner. All these shapes are depicted in a schematic way in figure 9.1. Figures, on the reverse side of which the experimental subject reads a meaningless word, are uncovered one at a time in front of him.

The subject is asked to move all the shapes on to the next section of the board which he considers to have the same word written on them; after every attempt by the subject to solve the problem, whilst checking him, the experimenter uncovers a new figure which carries either the same name as one previously uncovered, but different from it in a number of ways and the same in a number of others, or is marked with a different attribute, whilst again being similar to a previously uncovered figure in some respects and different from it in some others.

It can be seen that after each new attempt at a solution, the number of uncovered shapes is increased and along with it the number of attributes which denote them, and, depending on this basic factor, it becomes possible for the experimenter to follow the changes in the character of the solution to the problem, which remains constant at all stages of the experiment. Every word is placed on shapes which refer to one and the same general experimental concept, denoted by that particular word.

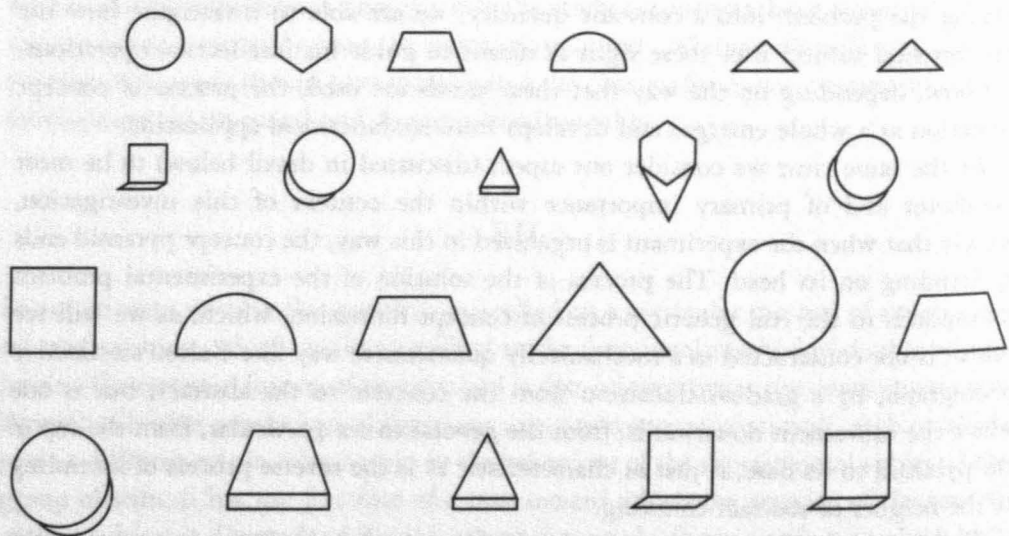


Figure 9.1 Investigation of concept formation.

VIII

In our laboratory, a number of investigations dealing with concept formation were initiated by Sakharov and continued and completed by us in co-operation with Kotelova and Pashkovskaya.²¹ These investigations involved about 300 persons in all, children, adolescents and adults, and also persons suffering from various pathological disorders in their intellectual and speech functions.

The basic conclusions which these investigations have led us to, are directly related to a subject which is presently of great interest to us. Whilst observing the genetic process of concept formation in different age groups, and comparing and appraising this process which takes place under exactly the same conditions in a child, an adolescent child and an adult, based on these experimental investigations we were able to explain the fundamental laws which govern the development of this process.

The basic conclusion of our investigation in the genetic context can be formulated as a general rule, which says that the roots of development of the processes which afterwards lead to concept formation, reach back to early childhood, but they reach maturity only in adolescence, and those intellectual functions which form and develop are the ones which, in their particular combinations, make up the psychological basis of the process of concept formation. It is only when the child turns into an adolescent, that the final transition into the realm of thinking in concepts can occur.

Before this age we find special intellectual phenomena which appear superficially to resemble real concepts, and a cursory analysis may result in this superficial resemblance being taken as a sign of the presence of true concepts already at a very early age. These intellectual aspects really do appear comparable to the true concepts which, in their functional capacity, tend to mature considerably later.

This must mean that they fulfil a similar function to that of concepts in solving similar problems, but an experimental analysis reveals that these equivalents of our concepts, in their psychological nature, their composition, their structure and the type of function they perform, have the same relationship to the latter as an embryo to the mature organism. To identify one with the other would be to ignore the lengthy process of development and to place an equals sign between its beginning and its final stage.

It is no exaggeration to say that to identify the intellectual operations which appear in adolescence with the thinking of a three-year-old child, as has been done by many psychologists, would be just as unsound as to deny that the secondary school age is the age of puberty because elements of future sexuality, the partial ingredients of the future drive, can already be observed in infancy.

Below we will take the opportunity to make a more detailed comparison between true concepts which appear in adolescence and analogous phenomena which can be found in the thinking of pre-school and school children. By this comparison we will be able to establish that which is really new and original in the realm of adolescent thinking, and that which promotes concept formation into the centre of psychological changes which comprise the substance of the completion of maturation. But first we

wish to explain, in the most general terms, the psychological nature of the process of concept formation and to disclose why it is that not until the age of puberty is it possible to master this process.

Experimental investigations of the process of concept formation have revealed that the functional use of words or other signs as means for actively directing attention, the breakdown and apportionment of attributes and abstracting and synthesizing them, is a basic and indispensable part of the process as a whole. The formation of a concept or the acquisition of meaning by a word results from a complex dynamic activity (operation by word or sign), in which all the basic intellectual functions take part in their peculiar combinations.

In view of this we may formulate a basic thesis, to which we are led by this investigation; it shows that concept formation is a particular, distinctive process of thinking and that the most likely factor to shed light on the development of this new kind of thinking, is neither association as supposed by many writers, nor directed attention as suggested by Müller,²² nor judgement and idea working in concert, as Bühler's theory of concept formation suggests, nor the determining tendency which Ach points out; all these factors and all the processes take part in concept formation, but not a single one of them encompasses the determining and essential feature which could adequately explain the appearance of a new form of thinking, which is qualitatively original and not comparable to any other elementary intellectual operations.

We would like to reiterate that not a single one of these processes undergoes any kind of noticeable change during adolescence, because none of the elementary intellectual functions appear for the first time and can be regarded as a really new acquisition in adolescence. As far as the elementary functions are concerned, the opinion of many psychologists discussed above is perfectly justified. They maintain that nothing really fundamentally new makes its appearance in an adolescent's intellect in comparison with what is already present in a child, and that what we are observing is a continuous, regular development of the same functions which were established and matured a lot earlier.

The process of concept formation cannot be reduced to associations, attention, conception, judgement and determining tendencies, even though all these functions are indispensable in order for this synthesis to occur, which, in effect, amounts to the process of concept formation. The most essential feature of this process, as the investigations have disclosed, is the functional use of signs or words as means with which the adolescent takes charge of his own psychological processes, and with whose aid he masters the flow of his own psychological processes and directs their activity for the purpose of solving the problems he is faced with.

All the commonly discussed elementary psychological functions take part in the process of concept formation, but they do so in a completely different form, not so much as independent processes which develop according to the rules of their individual logic, but ones which are mediated by signs or words, processes which are directed toward the solution of a specific problem and which end up in new combi-

nations, a new synthesis, and it is only as part of this synthesis that every one of those partial processes is capable of achieving its true functional significance.

Applied to the problem of concept development, it means that neither the accumulation of associations, nor the development of the range and reliability of attention, the accumulation of groups of conceptions nor the determining tendencies – not a single one of these processes on its own, no matter how far it has progressed in its development, is able to bring about the process of concept formation and, therefore, not one of the processes is a developmental factor which can be regarded as a fundamental and essential agent determining concept formation. Concepts cannot exist without words and thinking in concepts is not possible outside verbal thinking, and the new, essential, central feature of the entire process, which should basically be regarded as the primary cause responsible for concept development, is the specific use of words and the functional application of signs as means for concept formation.

Whilst discussing the methods used in our investigations, we mentioned that just stating the problem and the creation of a requirement for concepts cannot be regarded as sufficient grounds for the induction of this process, because even though such conditions are able to initiate the process, they cannot guarantee its implementation for the solution of the problem. And regarding the goal as the driving force which plays a decisive role in the process of concept formation, also fails to explain fully the real causal, dynamic and genetic relationships and associations which form the basis of this complex process, in the same way as it would be difficult to explain the flight of a cannon ball from the vantage point of its final target.

This final target, in so far as it is consciously taken into account beforehand by he who is aiming the cannon is, of course, part of the general aggregate of features which determine the real trajectory of the cannon ball; in exactly the same way the character of the problem and the goal facing the adolescent, which is attainable only with the help of concept formation, undoubtedly comprise one of the functional aspects without which we would not be able to give a complete scientific explanation of the whole process of concept formation. It is precisely because of the presence of the problems raised, the reality of the created and stimulating necessity and the goals which are being put before him, that the social environment stimulates and encourages the adolescent to make this decisive step forward in the development of his thinking.

In contrast to the process of maturation of instincts and inborn drives, the impelling force which determines the start of any process or initiates any evolving mechanism of behaviour and propels it forward along the path of further development, is not to be found inside, but outside the adolescent and, in this sense, the problems thrown up in front of the maturing adolescent by the society around him, which are connected with the process of growing into the cultural, professional and social life of adults, are extremely important functional aspects which continually depend on the reciprocal conditionality and the organic coherence and internal unity of form and content in the development of thinking.

In our discussion of the general factors connected with cultural development in adolescence outlined below, we will have to consider the long established and scientifically observed fact that where the environment fails to present appropriate problems, does not come up with new requirements and does not stimulate and create development of the intellect with the help of new goals, the adolescent's thinking does not develop according to all the available potential, and it does not reach its higher forms, or only achieves them at an exceptionally late stage.

It would therefore be wrong to ignore completely or even to underestimate the importance of the functional aspect of life's problems as one of the real and powerful factors which fuel and guide the whole process of intellectual development in adolescence; but it would be just as mistaken to perceive in this functional aspect a causal-dynamic explanation, and to treat it as a revelation of the very mechanism of development and the genetic key to the problem of the development of concepts.

The problem facing this investigation is to discover the inner link between these two aspects and to reveal concept formation which is genetically linked to adolescence, as a function of the social and cultural development of the adolescent and which includes both the content and the mechanism of thinking. A new significant use of words, i.e. its use as a means of concept formation – all these things amount to the most likely psychological reasons for the intellectual revolution which takes place on the boundary of childhood and adolescence.

If there is no sign at this time of any new basic functions, which are totally unlike any previously observed ones, it would still be incorrect to conclude that no changes are taking place in these basic functions. They are being incorporated into a new structure, entering a new synthesis and becoming part of a new complex entity as subordinate instances, whose laws also define the fate of each of their individual parts. The process of concept formation entails a mastery of the course of one's own psychological processes with the help of the functional use of words or signs as part of its basic and central substance. This mastery of the processes of one's own behaviour is only able to reach the final stage of its development in adolescence, supported by other factors.

Experimental results have shown that concept formation is not the same thing as the development of any other habit, no matter how complicated. Experimental investigations of concept formation in adults, as well as the light we have been able to shed upon these processes during childhood, and studies of their disintegration in cases of pathological disturbances of intellectual activity, bring us to the conclusion that the hypothesis regarding the identification of the psychological nature of higher intellectual processes with the elementary and purely associative processes of the formation of connections or habits, which has been suggested and developed by Thorndike, is in sharp contradiction with factual data about the composition, functional structure and genesis of the process of concept formation.

Accordingly, these investigations disclose that the process of concept formation, like any other higher form of intellectual activity, is not just an exceptionally more complex lower form quantitatively, and that it differs from the purely associative

activity not by the number of associations, but that it represents a new, basically different type of activity which cannot be reduced to just any range of associative connections qualitatively, and where the fundamental difference can be said to be a result of the transition from indirect intellectual processes to operations which are mediated by signs.

The significative structure (connected with active use of signs) which represents the general rule guiding the formation of higher forms of behaviour, is not identical with the associative structure of elementary processes. The mere accumulation of associative connections can never result in the appearance of a higher form of intellectual activity. It is impossible to explain the real differences in the higher forms of thinking on the basis of quantitative changes in association. In his theory of the nature of intellect, Thorndike maintains that 'the higher forms of intellectual operations are identical to the purely associative activity or the formation of associations and they depend on physiological associations of the same type, but they require a much greater number of them'.²³

From this point of view, the difference between the adolescent intellect and that of a child, can be reduced entirely to the number of associations. To quote Thorndike, 'a person who has a greater, higher or better intellect than another, in the final analysis differs from the latter not by the fact that he possesses a new kind of physiological process, but simply due to a larger number of associations of the most ordinary sort'.

As has already been said above, this hypothesis cannot be confirmed by experimental analysis of the process of concept formation, or by studying concept development, or by the picture presented by cases where they are in a state of disintegration. Thorndike's position which proclaims that 'it appears that both the phylogenesis and the ontogenesis of intellect show that selection, analysis, abstraction, generalization and reflection originate as a direct result of an increase in the number of associations', cannot be confirmed by experimentally organized and carefully investigated ontogenesis of concepts in children and adolescents. This investigation of the ontogenesis of concepts shows that development from lower to higher planes does not follow the road of a quantitative increase in associations, but is achieved by qualitatively new formations; in particular, speech, which is one of the basic features of the higher forms of intellectual activity, is included not in an associative manner like a function with a parallel course, but in a functional way, like a means which is utilized in a rational manner.

Speech itself is not based on purely associative connections but requires a basically different relationship between signs and the structure of intellectual processes, which happens to be very characteristic of higher intellectual operations as a whole. The phylogenesis of intellect, as far as this can be ascertained on the basis of psychological studies of primitive man and his thinking processes, also fails to shed any light on the developmental path from lower to higher forms, as was assumed by Thorndike, through a quantitative increase of associations, at least in its historical part. Following the famous investigations by Köhler, Yerkes and others, there is no reason to expect

that the biological evolution of the intellect will be able to affirm the identical nature of thinking and associations.

IX

If one were to attempt to make any schematic inferences from our research, they would basically reveal that the road which leads to concept development consists of three intrinsic stages, each of which, in its turn, can also be subdivided into several separate parts or phases.

The first stage of concept formation which most frequently can be observed in young children's behaviour, is the appearance of an as yet unorganized and unregulated quantity, an ability to distinguish a mass of random objects, at a time when the child is faced with a problem which we, as adults, normally manage to solve by forming a new concept. This stockpile of objects picked out by the child, which is consolidated without any adequate inner substance, without any sufficient inherent similarity and relationship between its constituent parts, presupposes a diffuse, non-directed dissemination of the meaning of words, or their equivalent signs, to a number of superficially connected, but intrinsically disconnected elements in the child's experience.

At this stage of development, the meaning of a word conjures up a not-fully defined, unorganized syncretic chain of separate objects, connected with one another in certain ways in the child's imagination and perception, and forming one combined image. The decisive role in the formation of this image is played by the syncretism of the child's perception or action, and for this reason the image tends to be extremely unstable.

It is a well known fact that children reveal this kind of tendency to correlate the most diverse and unconnected elements on the basis of a single impression in their perception, thinking and also in their actions, creating from them a closed, consolidated image; Claparède has named this tendency the syncretism of childhood perception, and Blonsky called it the disconnected coherence of childish thinking. Elsewhere, we have already described this same phenomenon as the tendency on the part of the child to replace the lack of objective associations by an abundance of subjective connections, and to take the association of impressions and thoughts for associations between things. Of course, this over-production of subjective associations has an enormous significance as a factor in the subsequent development of childish thinking, as it constitutes the basis for any further process of selection of the applicable realities and connections which can be verified in practice. Superficially, the meaning of some words uttered by children who have reached a certain stage in their conceptual development can, indeed, remind one of the meaning of words uttered by adults.

Children are able to communicate with adults by using words which have certain meanings; within this superabundance of syncretic associations and the unregulated

syncretic stockpiles of themes which have been formed with the help of words, objective connections are also reflected to a great degree, in so far as they correspond to the connections between the child's impressions and perceptions. Therefore, in many instances, the meaning of the words which children utter can partially coincide with the meanings these same words have acquired in adult speech, particularly when they refer to the real objects of the child's surroundings.

In this way children's words often conform in meaning to those of adults or, more precisely, the meaning of one and the same word can often coincide in one and the same real object in the speech of children and adults, and this fact proves sufficient grounds for mutual understanding between them. But the psychological path which leads up to the point of understanding in the thinking of adults and children is totally different, and even in cases where the meaning of a child's words partially coincides with that of an adult, it is due to completely different, unique operations, and it is a product of the syncretic mixture of images which are the source of children's words.

In its turn, this stage in the process of the formation of concepts in children can be divided into three phases, which we had the opportunity to investigate in detail.

The first phase of the creation of the syncretic image or stockpile of objects which correspond to the meaning of a word, fully coincides with the period of trial and error in childish thinking. The child then takes up a group of new objects at random, and this is accompanied by individual trials which replace one another when their inaccuracy becomes apparent.

This phase is succeeded by a second one, where the spatial arrangement of shapes in the staged conditions of our experiment and, what is more, purely syncretic laws of perception of the visual field and the organization of childish perception, play a decisive role. The syncretic image or the stockpile of objects forms, on the basis of space and time, meetings between individual elements, or indirect contact, or some other more complicated relationship arising between them within the process of indirect perception. But what remains essential for this particular period is that the child is guided, not by objective association which he discovers in things, but by subjective connections suggested to him by his own perceptions. The objects begin gradually to line up and are gathered under one general meaning, not because of any prevalent features which are inherent in them or been singled out by the child, but because of the similarities between them in the child's perception.

Finally, the third and leading phase of this stage, one which signifies its end and the transition to the second stage in concept formation; this is the phase where the syncretic image, which is equivalent to the concept, emerges on a more complex basis and is dependent on the ability to gather specimens from various groups, which have previously already become unified in the child's perception, under a single meaning.

In this way, every one of the separate elements of the new syncretic series or stockpile represents some group of objects previously unified in the child's perception, but all of them taken together are in no way intrinsically connected with one another, and they represent the same kind of disjointed connectedness as in the

stockpile, as was the case with the concept equivalents during the two previous phases.

The only difference and complication is due to the fact that the associations which children utilize to form the meaning of a new word, stem not just from one single perception but, it seems, from a two-stage processing of the syncretic associations; first of all syncretic groups are formed, from which individual specimens subsequently emerge and become syncretically united all over again. At this stage it is no longer the plane, the perspective, the double series of associations, or the double structure of the groups which can explain the meaning of the child's words, but these double series and double structures are still unable to rise above the formulation of the unregulated quantity or, speaking metaphorically, the stockpile.

A child who, by virtue of having reached this third phase, completes the entire first stage in the development of concepts, and gives up the stockpile which has hitherto represented the basic form of the meaning of words, proceeds to the second stage which, conditionally, we call the stage of the formation of complexes.

X

The second important stage in the development of concepts includes many types of this generically identical mode of thinking which vary greatly from the functional, structural and genetic points of view. This manner of thinking, as well as all the remaining ones, leads to the creation of associations, to the establishment of relationships between different actual experiences, to the unification and generalization of individual themes and to the regulation and systematization of the child's entire previous experience.

But the manner of the unification of different real objects into general groups, the character of the connections which becomes established during this process, the structure of the affinities which arise on the basis of such thinking, which is characterized by the relationship of each individual object having become part of the composition of the group, to the group as a whole – all this is fundamentally different by its nature and the manner of its operation from thinking in concepts, which only develops at the time of puberty.

There is no more appropriate way in which we could have identified this particular mode of thinking than by naming it 'thinking in complexes'. This means that the generalizations which are achieved with the help of this mode of thinking, by its structure, represent complexes of individual real objects or things, which are already united not only because of the subjective associations which can be established in the child's imagination, but on the basis of objective connections, which actually exist between these objects.

If, as was said above, the first stage in the development of thinking is characterized by the building of syncretic images, which in a child are the equivalent of our concepts, so the second stage is characterized by the building of complexes which

have the same functional significance. This represents a new step forward along the path leading to the mastery of concepts, and a new stage in the development of the child's thought process, which stands head and shoulders above the one which precedes it. Without question it signifies considerable progress in the life of the child. This transition to a higher type of thinking consists of the fact that in place of the 'disjointed connectedness', which lies at the foundation of the syncretic image, the child begins to unify similar objects into a common group and finally to combine them according to the rules of objective connections which he is able to discover in things.

The child who is in the process of evolving this type of thinking, is able to overcome his egocentrism²⁴ to some extent. He gives up taking the connections from his own experience for the actual connections between things and he takes a decisive step forward along the road of rejecting syncretism and along the path of success of objective thinking.

Thinking in complexes is by its nature associative thinking and, at the same time, objective thinking. These are the two essential features which raise it high above the previous stage, but at the same time this connectedness in its turn and this objectivity are still not the connectedness and objectivity which characterize thinking in concepts achieved finally by the adolescent.

The difference of this second stage of concept development from the third and final one, which contains the whole ontogenesis of concepts, lies in the fact that the complexes formed at this stage are built according to entirely different laws of thinking than those which apply to concepts. As has already been mentioned, they reflect objective connections, but in a different form and manner than in concepts.

Adult speech also shows many remnants of thinking in complexes. The best example to illustrate this basic law of the structure of various types of thought complex in our speech is the family name. Every family name, for example 'the Petrovs', includes this kind of complex of individual themes, which is the nearest thing to the complex character of childish thinking. In a certain sense, one might say that at this stage of his development, it is as if a child thinks in family names, or to put it another way, from his point of view the world of individual themes coalesces and organizes itself into groups of separate, but mutually affiliated, family names.

This idea could be formulated in yet another way by saying that the meaning of words at this stage of development can be defined most accurately as the family names of objects which have been combined into complexes or groups.

For the formation of a complex, the most essential underlying feature is a concrete and factual connection between the separate elements which are part of its composition, rather than an abstract and logical one. And so we can never decide whether a certain person has anything to do with the family name Petrov, and whether he can be called by that name, based simply on the logical relationship with the other carriers of the same family name. This question can only be resolved on the basis of a factual affiliation or a factual kinship between people.

The complex is founded on factual associations which can be revealed through direct experience. It is for this reason that this complex represents, first of all, an actual unification of a group of objects according to their mutual actual proximity, and all remaining aspects of this way of thinking are a result of this. The most important of these can be described as follows: as such complexes lie in the realm of concrete and factual thinking and not in the abstract and logical sphere, they do not diverge from the unity of these associations which constitute the support on which their very existence depends.

A complex, like a concept, is a generalization or blend of various real heterogeneous themes. But the association with whose help this generalization is formed, can be of many different types. Any association can result in the inclusion in the complex of a certain element, as long as it is available, and this is the most characteristic feature of the complex building process. Whilst associations of a single type which are logically identical to one another form the foundation of concepts, the ones found at the root of complexes include many varied factual associations, which frequently have nothing at all to do with one another. In a concept, the objects are generalized according to one feature, but in a complex they are based on various factual grounds. Therefore, material and uniform associations and affiliations between objects are reflected in concepts, whilst complexes present factual, random and concrete ones.

The diversity of associations which underpin complexes constitutes their main difference from concepts, which are characterized by the uniformity of the associations which make them up. This means that each individual object incorporated in the generalized concept is included in this generalization on an identical basis with all the other objects. All these elements are connected to the whole by associations of the same type, expressed in a concept and, through it, unified by a single image.

In contrast to this, every element of a complex can be connected with the whole by the most diversified associations, expressed in the complex and with separate elements which make up its composition. Basically, in concepts, these associations represent the relationship between the general and the particular, and the particular with another particular via the general. In a complex, these associations can vary just as much as any factual contiguity and factual semblance of the most diverse objects which are found in any real relationship with one another.

In our investigations we have mapped out five basic forms of complex systems which make up the basis of generalizations which arise in the child's thought process at this stage of development.

The first type of complex we have named the associative one, because any associative connection with any one of the attributes which a child may notice in an object which is part of the experiment, makes up its essence and forms the nucleus of the future complex. The child is able to build a whole complex around this nucleus and to include within it the most diverse objects; some because they have an identical colour to this object, others, because of their shape, still others, due to their size and so on, or perhaps because of some distinctive feature which attracts the child's attention. Any actual relationship which the child discovers, any associative connec-

tion between the nucleus and the element of the complex, is enough reason for the child to include this object in a group selected by him, and for it to be designated by a common family name.

These elements can also exist in a totally disunited state. The only principle guiding the process of their generalization is their factual affiliation with the primary nucleus of the complex. At the same time, their connection with the latter can be any associative link. An element may turn out to have an affiliation with the nucleus of a future complex because of its colour and another because of its form, etc. If one takes into account that this connection can be the most incongruous one, not only because of its attributes, but also because of the character of the very relationship between the two objects, it will become clear how variegated, disorderly, inadequately systematized and not properly unified is the alternation of the multitudes of material features revealed every time in the process of thinking in complexes, albeit it is based on objective connections. And at the roots of this multitude, there can be found not merely a consistent identification of the attributes, but also their similarities and contrasts and their associations by mere contact, etc., but always and without fail, a real association.

For a child, finding himself at this stage of development, words cease to be signifiers of separate objects or proper names. For him, they have now become family names. During this period, to provide a child with a word, means to point out a family of things which are intimately connected with one another according to a great variety of types of kinship. To call an object by a proper name as understood by the child is to relegate it to a specific real complex with which it is associated. For a child, to name an object at this stage means to give it a family name.

XI

The second phase in the development of thinking in complexes is formed by the joining up of objects and actual impressions of things into special groups which, because of their structure, remind one, above all, of what is commonly referred to as collections. Here, various real objects become unified on the basis of a mutual complementing of one another according to some feature, and they form a single whole which consists of different, mutually complementary parts. It is precisely this heterogeneity of their composition and the mutual process of completion and joining together using a collection, which characterizes this stage in the development of thinking.

Under experimental conditions, the child selects other shapes to match a given standard and which differ from the given pattern in their colour, form, size or some other way. However, he does not pick them out in a chaotic and random fashion, but is guided by some attribute marking this difference and a complementary aspect of this attribute which is contained in the model and apprehended by him as grounds for the unification. The collection which comes into being as a result of this assembly,

forms an assortment of various objects which differ according to colour or shape, and represent a selection of the basic colours or the basic shapes which are to be found among the experimental material.

An essential difference between this form of thinking in complexes and associative complexes is that recurring examples of objects with the same attribute are not included in the collection. It is as if individual examples representative of the whole group are selected from each group of objects. It is association by contrast rather than by similarity which is observed here. It is true that this form of thinking frequently goes together with the associative form described above. In such cases we have a collection which is put together on the basis of different attributes. The child does not consistently hold up the principle which he has designated as the foundation of complex formation in the process of putting together the collection, but he combines different attributes by association, and he still puts each attribute at the base of the collection.

This lengthy and persistent phase in the development of childish thinking has very deep roots in the entire range of actual, visual and practical experience of the child. In his visual and practical thinking, the child always deals with specific collections of things which complement each other, as well as with a specific whole. The most frequent form of generalization of actual experience the child learns from his visual experience. It includes the incorporation of individual objects into a collection and the selection of mutually complementary subjects which are significant from the practical point of view and functionally belong together. A cup, a saucer and a spoon make up a unified set, which also includes a fork, a knife, spoons and plates; the child's clothes as well, all these things are examples of natural complex collections which the child comes up against in his daily life.

Because of this, it becomes natural and obvious for the child to construct such complex collections in his verbal thinking, by matching objects and concrete groups according to the attributes of their functional supplementary function. Furthermore, it appears that such forms of complex formations which are structured on collections, can also play an extremely important role in the thinking of adults, particularly in the thinking of nervous and mental patients. Often, when an adult speaks about crockery or clothing, in his actual expressions he has in mind not so much the parallel abstract concept, as the corresponding sets of actual objects which comprise the collection.

If, for the most part, emotional subjective associations between experiences which the child perceives as associations between things, form the basis of syncretic images, and if the recurring and obtrusive similarity of attributes of separate objects is the foundation of the associative complex, then the collection is based on associations and relationships between things which are established by the practical active and visual experience of the child. One could even say that a complex collection is a generalization of things according to their complicity in a single practical operation, on the basis of their functional co-operation.

But, at this moment, all three of these different forms of thinking are of interest to us, not so much for their own sakes, but rather as different genetic paths leading towards one goal – the formation of concepts.

XII

If one is to follow the logic of experimental analysis, one should place the chain complex, which is also an indispensable stage in the process of the child's ascent to mastering concepts, after the second phase in the development of thinking in complexes in children.

The chain complex is constructed according to the principle of a dynamic, temporary unification of individual links into a single chain and of the transmission of meaning along the separate links of this chain. This type of complex is usually represented in an experimental situation in the following way: the child matches one or several objects which have some definite associative relationship with a given model; after that the child continues to select real objects into a single complex, but at this stage following some other peripheral attribute of a previously selected object, an attribute which is not at all present in the pattern.

For example, the child matches several angular shapes to the pattern, which is a yellow triangle, and then if the last of these selected shapes happens to be blue, he matches up other blue shapes, for example half circles or circles with it. And this again proves sufficient reason in order to incorporate a new attribute and to select further objects, now using the attribute of roundness. During the process of complex formation, there is a continuous transfer of one attribute to another.

In the same way, the meaning of words moves along the links of the complex chain. Every link is connected on one side with the previous link, and on the other with the following one, and the most important distinction of this type of complex can be described by the fact that the character of the association or the manner of the connection of the same link with the preceding and the following one can be entirely different.

Yet again we find that associative connections between separate concrete elements form the basis of the complex, but this time the associative connection is not required to connect every individual link with the standard. Each link, whilst becoming part of the complex, turns into the same sort of varied member of this complex like the pattern itself, and whilst following an associative attribute it may again become the centre of attraction for a number of real objects.

Here we can see very clearly to what extent thinking in complexes can have a visual-concrete and figurative character. An object, when it is included in a complex due to its associative attributes, becomes part of it as a given real object with all its attributes, but by no means as a carrier of only one defined attribute by whose virtue it has been accepted into this particular complex. This latter attribute is not segregated by the child from all the remaining ones. It does not play any specific role in comparison with all the others. It does not stand out because of its functional meaning and it remains equal among equals, one amongst many other attributes.

At this stage we can take the opportunity to discover the really tangible and essential peculiarity of the whole realm of thinking in complexes, which differentiates it from concept thinking. This peculiarity consists of the fact that, in contrast to concepts, there is an absence of any hierarchical connections and hierarchical

relationships between attributes in complexes. All the attributes are basically equal in their functional meaning. The relation of the general to the particular, i.e. of the complex to each separate concrete element entering into its composition, and the relationships of the elements to each other, as well as the principles governing the structure of the whole generalization process, differ significantly from all the features found within the concept structure.

In a chain complex, the structural centre can be entirely absent. The individual concrete elements are able to form relationships with each other, whilst bypassing the central element or standard. It is therefore possible for them to have nothing in common with any of the other elements, but they can nevertheless belong to the same complex just on the basis of having a common attribute with some other element, and this other element, in its turn, is connected with a third one, etc. But the first and third elements may not have any other connection between them except that they both, each according to its own attribute, have a connection with the second one.

Therefore, we feel justified in considering the chain complex to represent the purest form of thinking in complexes because, in contrast to the associative complex, where some sort of centre capable of being filled with a paradigm can still be observed, this complex is devoid of any such centre. This means that the connection between the separate elements in the associative complex still comes into being through some element which is common to them all and which forms the centre of the complex, and such a centre is not present in the chain complex. Any connection within it exists only inasmuch as it is viable to bring together any separate elements. The end of the chain may have nothing in common with its beginning. It is enough, in order for them to be able to belong to one complex, to be held and tied together by intermediate connecting links.

So, in attempting to characterize the relationship of the separate concrete elements with the complex in general, we might say that in contrast to concepts, the concrete element becomes part of a complex as a real visible unit with all its factual attributes and connections. A complex does not stand above its elements, like a concept stands above the real objects which are to become a part of it. In fact, a complex blends together with real objects which are becoming part of its composition and which are connected with one another.

This blending of the general and the particular and of the complex and the element, this psychological amalgam, according to Werner,²⁵ constitutes the most essential feature of thinking in complexes in general and of the chain complex in particular. Due to this fact the complex is, to all intents and purposes, inseparable from the actual group in which the objects are unified and which blends directly with this visual group, and frequently can take on a highly indefinite and somewhat diffuse character.

These connections themselves pass from one to another imperceptibly and the very character and type of these associations undergo minute changes. Most of the time a distant similarity or a very superficial point of contact between the attributes proves sufficient reason for actual connections to occur. A coming together of attributes

frequently occurs not so much because of any real similarities between them, but rather because of a distant, vague impression of some common properties which they share. What emerges is what we call the fourth phase in the development of thinking in complexes, or the diffuse complex under the conditions of experimental analysis.

XIII

The essential distinguishing feature of the fourth type of complex is that the attribute itself which unifies separate concrete elements and complexes by means of associations, appears diffuse (becoming less defined), dispersed and vague, and the resulting complex has to unify graphically concrete groups of images or objects by means of diffuse, indefinite associations. For example, to match the given pattern, in this case a yellow triangle, the child will pick up not just other triangles, but trapezium shaped objects as well, as they remind him of triangles, but with their apexes cut off. Later, squares are matched up with trapezia, hexagons with squares, half-circles and, finally even circles, with the hexagons. And in the same way as here, the shape which is perceived as the basic attribute becomes diffuse and indefinite; sometimes the colours run into each other in cases where a diffuse colour attribute has become incorporated into the complex. The child then selects green objects to match up with yellow ones, blue ones are matched with the green, and black with blue.

This form of thinking in complexes, which is so extremely persistent and important in the natural conditions of child development, is of great interest in experimental analysis because it clearly reveals one more very essential feature of thinking in complexes, namely, the vagueness of its outlines and its fundamental lack of any boundaries.

Just like the ancient biblical clan which, whilst representing a perfect family unit, dreamt of multiplying and becoming numberless like the stars in the sky and like the sands of the seashore, in an identical way, the diffuse complex in the thinking of children represents the same kind of family unit of things, which includes boundless opportunities for expansion and incorporation of more and more new, but quite concrete, objects into the original clan.

If the collection complex manifests itself in the natural life of children primarily in the form of generalizations based on functional similarities of individual objects, then the life prototype and natural analogy of the diffuse complex in the development of childhood thinking are seen in the generalizations which the child creates precisely in those realms of his thinking which do not easily submit to practical scrutiny, or in other words, in the non-visual and non-practical realms of thinking. We know what unexpected combinations, frequently incomprehensible to an adult, what fairy tales of thought, what risky generalizations and what diffuse transitions the child can sometimes come up with when he begins to reason or think beyond the bounds of his visual, objective, circumscribed little world and his practical running experience.

At this stage the child enters the world of diffuse generalizations, where attributes shift and oscillate and imperceptibly pass from one into another. There are no hard contours to be found here. This is the domain of limitless complexes, which frequently show astonishing universality in the associations they are able to orchestrate.

Meanwhile, after analysing this complex carefully, one becomes convinced that the principle which guides its structure is the same principle as that which directs the building of limited concrete complexes. Both here and there, the child does not go beyond the limits of real factual associations between individual objects of the visual image. The whole difference lies in the fact that, as this complex unifies things which are found outside the child's practical knowledge, these associations have to form on the basis of unreliable, indefinite and shifting attributes.

XIV

To complete the picture of the development of thinking in complexes, it only remains for us to pause and examine its one last remaining form, which plays an important part in the child's thinking process, both under experimental and under real life conditions. This form throws a shaft of light in both directions as, on the one hand, it illuminates for us all the child's past stages of thinking in complexes, and on the other, serves as a bridge to a new and higher stage, namely the formation of concepts.

We have called this type of complex a pseudoconcept,²⁶ because we have before us a generalization process which comes into being in the child's thinking, which outwardly reminds us of concepts which adults use in their intellectual activities but which, at the same time, inwardly, in its psychological nature, represents something completely different from a concept in the true sense of the word.

If we proceed to analyse with care this last stage in the development of thinking in complexes, we will see that what we have is a complex generalization of a number of real themes which, from the phenotypical point of view, i.e. in their external appearance and the totality of their external features, conform to concepts completely, but which, by no means, can be considered to be concepts because of their genetic nature, the conditions in which they come into being and the development and causal dynamic associations which underlie them. When we observe them from the outside, what we see is a concept, but from the inside they are complexes. It is for this reason that we have given them the name of pseudoconcepts.

Under experimental conditions, a child creates a pseudoconcept every time he picks up a number of objects which could be selected and combined with one another on the basis of some abstract ideas, and matches them up with the given pattern. Consequently, such a generalization could just as easily be a result of a concept, but in reality, in children, it appears as a result of thinking in complexes.

It is only in the final analysis that the complex generalization can be seen to coincide with a generalization based on a concept. For example, a child matches all

the triangles available in the experimental material to the given pattern, i.e. the yellow triangle. This group could have been put together as a result of abstract thinking. But, in actual fact, as our investigations have shown and experimental analysis has confirmed, the child has combined the objects because of their concrete, factual, visual connections, on the basis of simple association. He has only managed to build a limited associative complex; he has arrived at the same point, but all the time he has travelled along a different road.

This type of complex and this form of visual thinking dominate a child's real thinking both from the functional and from the genetic point of view. It is for this reason that we feel compelled to investigate, in somewhat more detail, this central matter relating to the process of conceptual development in children, a chasm which divides thinking in complexes from thinking in concepts and which, at the same time, binds both of these genetic stages of concept formation together.

XV

First of all it is important to note that in a child's real life thinking process, among all the other types of thinking in complexes found in pre-school children, pseudoconcepts comprise the most widespread, dominant and often almost exclusive form. The prevalence of this form of thinking in complexes has a deep functional base and a deep functional meaning. The circumstance which is responsible for this widespread and almost exclusive predominance of this form, is the fact that childhood complexes which correspond to the meaning of words, do not develop freely and spontaneously along the lines marked out by the child himself, but in certain definite directions which have been predetermined for the developmental process of the complex by previously established meanings which have been assigned to the words in adult speech.

It is only under experimental conditions that we are able to liberate the child from this steering influence of words from our language, and to allow the child to instil the words with meaning and to create complex generalizations following his own free judgement. This fact accounts for the enormous significance of the experiment which permits us to reveal a child's own activity involved in the acquisition of adult language. The experiment shows us how children's language might have turned out and to what generalizations the child's thinking might have aspired, were he not guided by the language he hears in the world around him, which predetermines the range of real subjects of which the meaning of a given word can be applied.

Objections could be raised to the effect that our use of the conditional case speaks rather against than in favour of this experiment. For, after all, in reality a child is not free during the process of development of meanings which he acquires from adult speech. But we are able to counter this objection by pointing out that what this experiment teaches us is not limited to that which might occur if the child were free from the guiding influence of adult speech, and were to work out his own

generalizations independently and freely. The experiment reveals to us the real continuing active discipline the child employs in the creation of generalization, which is not easily apparent to a superficial observer and which does not disappear, but only conceals itself and acquires a very complicated means of expression due to the guiding influence of the speech of people around him.

The child's thinking process, directed by an established and constant meaning of words, does not change the basic laws of its activity. These laws achieve distinct expression only in those specific circumstances where the real development of the child's thinking process takes place.

The speech of the people surrounding the child, with its established, constant meanings, predetermines the path which the development of the child's generalizations can take. It limits the child's individual actions and directs them down specific, strictly defined channels. But the child, whilst travelling along this defined predetermined path, continues to think in ways peculiar to the stage of development of intellect where he happens to be at that time. By engaging the child in verbal communication, an adult can influence the further progress of this generalization process, as well as the end and outcome of that journey which will be the result of the child's generalizations. But adults cannot pass on their method of thinking to children. A child assimilates ready-made meanings of words from adults, but he does not have to select actual themes for the complexes himself.

The paths of dissemination and transmission of the meaning of words are given to him by people around him in the process of verbal communication. But a child cannot immediately assimilate the adult's way of thinking and he acquires a product which looks like the adult product, but which is acquired by means of completely different intellectual operations and is reached by a particular method of thinking. This is what we call the pseudoconcept. To all appearances, what one gets is something which practically coincides with the meaning adults ascribe to words, but effectively it is profoundly different.

But it would be a big mistake to view the duality found in this end product as causing any discord or a breach in the child's thinking process. Such discord or breaches exist only in the eyes of an observer who happens to be investigating this process from two different vantage points. For the child himself, complexes which are equivalents of adult concepts, i.e. pseudoconcepts, do exist. After all, we can easily imagine cases of this type where, quite frequently, we have observed the following during the process of experimental concept forming: a child creates a complex with all the features from the structural, functional and genetic points of view which are typical for thinking in complexes, but the end product of this process of thinking in complexes coincides with a generalization which could also have been constructed on the basis of thinking in concepts.

Due to this coincidence of the end result or end product of thinking, it becomes extremely difficult for the investigator to distinguish what he is actually dealing with, thinking in complexes or thinking in concepts. This disguised form of thinking in complexes which arises because of the superficial likeness between pseudoconcepts

and real concepts, is an important obstacle in the way of genetic analysis of the thinking process.

It is precisely this circumstance which is responsible for the fact that many investigators have developed the erroneous idea which we have discussed at the beginning of this chapter. The superficial likeness which can be observed between the thinking of a three year old and that of an adult, the practical coincidences of word meanings used by children and adults which make verbal communication and mutual understanding between children and adults possible, and the functional equivalence of complexes and concepts, have all been responsible for leading investigators to draw false conclusions which proclaim that in the thinking of a three year old there is already present – albeit in a still immature form – the full range of forms of adult intellectual activity and that, consequently, no essential breakthrough or decisive new strides toward the mastery of concepts occurs in adolescence. It is quite obvious where such a mistaken idea originated. At a very young age a child assimilates a large number of words whose meanings for him coincide with the same meanings which adults give him. This ability to understand one another gives rise to the impression that *the end point in the development of the meaning of a word coincides with the starting point*, that the ready-made meaning is given right at the beginning and that, consequently, there is no room for development. Anyone who identifies a concept with the meaning of a word (as Ach does) will inevitably reach this wrong conclusion, which is based on an illusion.

To be able to find the border which divides the pseudoconcept from a real concept promises to be a very difficult task and one which is inaccessible to purely formal phenotypical analysis. If one is to make judgements purely on the basis of external likeness, then the pseudoconcept looks as much like a real concept as a whale looks like a fish. But if one accepts the theory of the 'origin of the species' of intellectual and animal forms, then, without question, the pseudoconcept must be assigned to the realm of thinking in complexes, in the same way as the whale is classified as a mammal.

So, our analysis has led us to the conclusion that an internal contradiction is present in the pseudoconcept, the most widespread concrete form of thinking in complexes in children, which is imprinted on its very name and which, on the one hand, is the greatest problem and obstacle we face in our attempts to investigate it from the scientific point of view, and on the other, underlines its enormous functional and genetic significance as the most important determining factor in the process of development of thinking in children. The essence of this contradiction is the existence of a complex in the form of a pseudoconcept which, from the functional point of view, is equivalent to a concept in so far as an adult who becomes involved in a situation of verbal communication and mutual understanding with a child, is unaware of the difference between this complex and a concept.

Consequently, what we have is a complex which coincides with concepts from the practical point of view and which, in effect, includes the same range of concrete themes as the concept. What we have is a shadow of a concept, its contours. As one

author has expressed it metaphorically, what we have is an image which 'can in no way be understood as a simple sign for a concept. Rather, it is a picture, a mental drawing of the concept, a little story told about it'.²⁷ On the other hand, we have a complex, i.e. a generalization which is based on entirely different laws than those of a real concept.

We have already discussed above how this real contradiction arises in the first place and what conditions it. We have seen that the language of adults who surround the child with its constant definitions, determines the path of development of a child's generalization process and the range of complex systems. A child does not select a meaning for a word. It is given to him in the process of verbal communication with adults. A child does not construct his complexes freely. He acquires them in a pre-fabricated state during the process of interpreting the speech of other people. He is not able to select individual concrete elements freely and to incorporate them in one of the complexes. He receives a number of ready made things which have already been generalized by the given word.

He does not assign a given word to a given objective group spontaneously, and he transfers its meaning from object to object, thus widening the range of the objects which are included in the complex. All he does is to emulate adult speech and assimilates the already established objective definitions of words which are given to him ready made. To put it more simply, a child does not create his speech, but rather assimilates the ready-made speech of adults around him. This about sums it up. It also includes the fact that a child does not himself create complexes which correspond to the meaning by common words and designations. This is the reason why his complexes coincide with adult concepts and this is also why a pseudoconcept or a concept-complex comes into being.

But we have also pointed out already that, whilst conforming in its external form with a concept and in the attainable thinking ramifications and its end product, by no means does a child associate himself with the adults' method of thinking in the type of intellectual operations which help him to arrive at the pseudoconcept. This is the reason why the pseudoconcept achieves such an enormous functional importance, as a specific dualistic, internally contradictory form of the childhood thinking process. Were it not that pseudoconcepts constitute the principal form of thinking in children, their complexes and adult concepts would take off in completely different directions, as tends to happen in an experimental situation where a child is not bound by the imposed meanings of words.

Mutual understanding using words and verbal communication between adults and children would then become impossible. This communication is only possible because, in reality, children's complexes do coincide with adult concepts and are able to make contact. Concepts and mental pictures of concepts turn out to be functionally equivalent, as has already been pointed out, and as a result, a very important circumstance is created which allocates an immense functional significance to the pseudoconcept, in that a child who is thinking in complexes and an adult who is thinking in concepts are able to establish a state of mutual understanding and

verbal communication because, in effect, their thinking is able to make contact in the overlapping complexes—concepts.

We have said already at the beginning of this chapter that the whole difficulty of the genetic problem of concepts in childhood lies in attempting to understand the internal contradiction which is inherent in children's concepts. From the very earliest days of his development, words become the means of communication and mutual understanding between children and adults. As Ach has demonstrated, it is precisely because of this functional factor of mutual understanding by using words, that the precise meaning of words comes into being, and that they become the carriers of concepts. Without this functional factor of mutual understanding, says Usnadze, no sound complex could ever become a carrier of any meaning whatsoever, and no concepts of any kind could be formed.

But it is well known that verbal understanding and verbal contact between adults and children appears extremely early and this fact, as has already been pointed out, causes many researchers to assume that concepts develop just as easily. Meanwhile, as we have stated above whilst citing Usnadze's belief, fully fledged concepts develop relatively late in children's thinking, whilst mutual verbal understanding between children and adults is established very early on.

'It is clear', says Usnadze, 'that words which have not yet reached the stage of fully developed concepts, take over the function of the latter and can serve as a means of communication between speaking individuals.'²⁸ So the researcher is faced with the problem of discovering the principles behind the development of these forms of thinking, which should be regarded not as concepts, but as their functional equivalents. This contradiction between the late development of concepts and the early development of verbal understanding finds its real resolution in pseudoconcepts, as a form of thinking in complexes which synchronizes the processes of thinking and understanding between children and adults.

Thus, we have been able to discover both the causes and the meaning of this exceptionally important form of thinking in complexes in children. Now it only remains for us to comment on the subject of the genetic significance of this final stage in the development of childhood thinking. At this stage, it is perfectly understandable why, in the light of this dualistic functional nature of the pseudoconcept described above, this stage in the development of children's thinking acquires an entirely exceptional genetic significance. It serves as a connecting link between thinking in complexes and thinking in concepts. It connects these two important stages in the development of children's thinking. It reveals to us the process of the making of children's concepts. Owing to the contradiction inherent in it whilst it is a complex, it already contains the nucleus of a future concept which is developing inside it. Thus, verbal communication with adults becomes a powerful moving force and a vital factor in the development of concepts in children. For a child, the transition from thinking in complexes to thinking in concepts is accomplished imperceptibly, because the pseudoconcepts already practically coincide with adult concepts.

So, a peculiar genetic situation is created which is more likely to illustrate a general rule than the exception in the intellectual development of children. The peculiarity of this genetic situation is due to the fact that at this time a child begins to make actual use of, and to operate with, concepts before he becomes consciously aware of their existence. In children, the concept in itself and for others develops before the concept for himself. The concept in itself and for others is already present in a pseudoconcept and is the basic genetic prerequisite for the development of concepts in the true sense of the word.²⁹

Therefore, a pseudoconcept is regarded as a special phase in the development of thinking in complexes in children, and it concludes the whole second stage and leads into the third stage in the development of thinking in children, at the same time serving as a connecting link between them. It represents a bridge which is erected between the realms of concrete visual-figurative and abstract thinking in children.

XVI

By having described this last concluding phase in the development of thinking in complexes in children, we have exhausted a whole epoch of conceptual development. In a general overview we do not intend to reiterate any of its distinctive features which we kept pointing out along the way whilst analysing each separate form of thinking in complexes. We think that in our analysis we have managed to depict sufficiently clearly thinking in complexes from below as well as from above, having discovered the signs which distinguish it from syncretic images, on the one hand, and from concepts, on the other.

The absence of unity of associations, the absence of hierarchies and the concrete visible character of the connections underlying it, the special relationship among the individual elements and the universal law which determines the structure of generalizations as a whole, have passed before us in all their distinctiveness and in all their striking variety, including both lower and higher types of generalizations. We have been able to observe the logical substance of different types of thinking in complexes, with a clarity only made possible by the experiment. For this reason we feel that we have to indicate certain features of our experimental analysis which, if misunderstood, might give rise to incorrect conclusions about what has been said above.

An experimentally elicited process of concept formation is never a mirror reflection of the actual genetic process of development as it occurs in real life. However, we do not consider this to be a drawback, but rather an enormous advantage of experimental analysis. Experimental analysis allows us to discover the very essence of the genetic process of concept formation in a theoretical form. It provides us with the key to a real understanding and insight into the actual process of concept formation as it takes place in a child's real life conditions.

It is for this reason that dialectical thinking does not set the logical and the historical methods of study against each other. According to Engels' famous definition,

The logical method of research . . . is the same as the historical method, except that it is free from the historical form and from interfering accidents. The logical thought process starts at the same point as history and its subsequent development will be nothing more than a reflection of the historical process in an abstract and theoretically consistent form; an adjusted reflection, but one which is adjusted according to the laws which the real course of history itself has taught us, because each moment in the development can be studied at its most mature stage, in its classic form.³⁰

If we apply this general methodological position to our actual investigation, we can say that the basic forms of concrete thinking which we have discussed, represent the most significant moments of development at their most mature stages and their classic form, and in their pure aspect brought to its logical conclusion. In a real process of development, they would be found in a complicated and mixed state and, as is suggested by experimental analysis, their logical description represents a reflection of the real process of conceptual development in its abstract form.

Therefore, the most significant moments in the process of conceptual development revealed by our experimental analysis should be viewed by us from the historical point of view, and should be perceived as reflections of the most significant stages which occur in the actual process of development of children's thinking. At this point, historical evaluation becomes the key to the logical conception of concepts. The developmental point of view becomes the starting point for the clarification of the process as a whole and also of each of its individual moments.

As it has, quite correctly, been pointed out by Krueger, one of the founders of contemporary 'developmental psychology', inevitably a purely morphological investigation of complicated psychological phenomena and manifestations without genetic analysis, is bound to be imperfect. 'Purely morphological analysis', says Krueger,

at best turns out imperfect. The more complicated are the processes being studied, the more likely are they to rely more heavily on earlier experience as their precondition, and the more they require a clear-cut statement of the problem at hand, a methodical comparison and, from the point of view of the inevitability of development, conceptual associations, even in cases where nothing more than the elements of activity which are contained in one single section of consciousness are involved.³¹

A purely morphological study, as Krueger shows, is all the more impossible where there is a higher level of organization and differentiation of psychological phenomena.

Without a genetic analysis and synthesis, without a general comparative study of the previous history of some whole and its constituent parts, we cannot even decide what we

should regard as its elementary constituents and the bearers of essential connections. Only a comparative study of a large number of genetic cross-sections can, step by step, reveal to us the real framework and connections between individual psychological structures.

Development is the key to the understanding of any higher forms of being. 'The highest genetic law', says Gesell,

seems to be the following: each process of development in the present bases itself on a past development. Development is not just a simple function, which can be adequately summed up as the X of hereditary components plus the Y of environmental components. It is rather a historic complex, which at each stage reflects the past which forms part and parcel of it. To put it another way, the artificial duality of heredity and environment is misleading. It conceals from us the fact that development is an uninterrupted, self-conditioning process and not a puppet controlled by the pulling of two strings.³²

So it turns out that an experimental analysis of concept formation inevitably brings us very close to functional and genetic analysis. Therefore, following a morphological analysis, we should attempt to bring closer together the main forms of thinking in complexes, and the forms of thinking which are actually found in the process of development in children which we have discovered. We should attempt to include a historical perspective and a genetic point of view in our experimental analysis. On the other hand, we ought to try to shed some light on the actual process of development of children's thinking, using the data which we have obtained in the process of experimental analysis. Such a gathering together of the experimental and the genetic analyses, and the experimental data and reality, will inevitably lead us away from morphological analysis of thinking in complexes towards an investigation of complexes in action, in their actual functional significance and in their real genetic structure.

The main problem facing us, therefore, is the bringing closer together of the morphological and functional, or experimental and genetic, analyses. Our task is to use the facts observed in the process of actual development to verify the data obtained from experimental analysis and to illuminate the actual process of conceptual development by using these data.

XVII

We might summarize in the following way the basic conclusion to be drawn from our study of the second stage of conceptual development: a child at the age of thinking in complexes thinks about the same things as an adult (the same subjects) from the point of view of the meaning of words, thus making communication possible between

them, but he thinks about the same things in a different way, using a different process and employing different intellectual functions.

If this theory is really correct, then it should be possible to verify it functionally. This means that if we examine adult concepts and children's complexes in action, the differences in their psychological nature should become clearly apparent. If children's complexes are different from concepts, it would mean that the activity of thinking in complexes would manifest itself in a different way than the activity of conceptual thinking. We therefore wish, at this stage, to carry out a brief comparison between the results of our investigation and other data established by psychological research regarding the characteristics of children's thinking, and the development of primitive thinking in general, and by applying an operational test, to subject the properties of thinking in complexes which we have discovered to a functional verification.

The first phenomenon from the history of development of children's thinking which, for our purposes here, attracts our attention, is the well known process of transfer of meaning of a child's first words by a purely associative route. If we can find out which groups of objects are included and how the child combines them during the transfer of meaning of his first words, then we can see a mixed example of what we, in our experiments, have called the associative complex and the syncretic image. We will use an example which we have borrowed from Idelberger.

On day 251, Idelberger's son uses the word 'wauwau' for a china figure of a little girl on the sideboard, which he likes to play with. On day 307 he uses the same word 'wauwau' for a dog which is barking outside, as well as for a portrait of his grandparents, his rocking horse and the wall clock. On day 331, for a fur stole with a dog's head and also for another stole without a dog's head. At the same time his attention is particularly drawn to the glass eyes. On day 334, the same name is given to a squeaky rubber toy manikin and on day 396, to the black studs on his father's shirt. On day 433 the child utters the same word when he sees a string of pearls and also when he looks at a bath thermometer.

After having analysed this example, Werner concludes that the child designates by the word 'wauwau' a great number of objects which can be classified in the following way: firstly, dogs and toy dogs, then small oblong objects which are reminiscent of dolls like the rubber manikin, the bath thermometer, etc., and secondly, studs, pearls, etc., as small objects. This assortment is based on the attribute of an oblong shape or a shining surface which is reminiscent of eyes.³³

Thus we can see that the association of separate concrete objects in children happens according to the complex principle and the entire first chapter in the history of the development of word use in children is filled with such natural complexes.

In a well known example often cited the child, at first, calls a duck swimming in a pond 'quack', then he applies the same name to any liquid substance, including tea and the milk in his own bottle. Then, one day he notices an eagle depicted on a coin, and the coin is also called by the same name, and this proves sufficient reason to call all round objects reminiscent of coins by the same name after that.³⁴ Here we have a

typical example of a chain complex, where each object is incorporated into the complex exclusively on the basis of a known common attribute with another element, but the essential character of this attribute can be subject to endless variation.

This complex nature of children's thinking is responsible for the appearance of one of its peculiar qualities, namely, that the same word can have completely different meanings in different situations, i.e. they can depict different objects, and in exceptional circumstances which are of particular interest to us, a child can use the same word to combine even opposite meanings, if only they can be related to one another in the same way as a knife and fork.

A child who uses the word 'before' to express a chronological relationship of 'before' and also 'after', or the word 'tomorrow' in the sense of depicting both the day after and the day before, is exhibiting a full analogy with the fact, long ago noticed by investigators, that in ancient languages like Hebrew, Chinese and Latin, the same word contained quite opposite meanings. For example, the Romans used the same word for high and deep. This kind of co-existence of opposite meanings in one word can only be possible as a result of thinking in complexes, where each concrete object, whilst being incorporated in a complex, does not, by this very fact, blend with the other elements of the complex, but retains all of its concrete independence.

XVIII

One additional and extremely interesting characteristic of children's thinking exists which may serve as an excellent test for a functional verification of thinking in complexes. In children who already have reached a higher level of development than those discussed above, thinking in complexes may already take on the character of pseudoconcepts. However, because the nature of a pseudoconcept is that of a complex, it should reveal differences in its activity despite its external resemblance to real concepts.

For a long time now, researchers have noticed one extremely interesting characteristic of thinking, first described by Lévy-Bruhl in relationship to primitive societies, then by Storch in mental patients and by Piaget in relationship to children. This characteristic of primitive thinking, which apparently typifies the attributes of thinking in its early genetic stages, is generally referred to as 'participation'. What is understood by this term is the relationship which primitive thought creates between two objects or two phenomena, which are regarded as either being identical or having a very strong influence on one another without, however, the existence of any spatial contact nor any sort of other intelligible causal relationship between them.

Piaget, who accepts the cited definition, himself contributes very profound observations related to this type of participation in the thinking of children, i.e. the establishment of such relationships between different objects and actions by children, which otherwise would seem absolutely incomprehensible from the logical point of view, and which do not have any foundations in any objective relationships between things.³⁵

Lévy-Bruhl cites the following case as the most striking example of this kind of participation in the thinking of primitive man: according to Von den Steinen, the northern Brazilian tribe Bororo prides itself on the fact that members of the tribe can be found among the arara or red parrots. 'This does not only mean', says Lévy-Bruhl, 'that after their deaths they become araras, and not just that the araras are Bororos in metamorphosis . . . the question is about something entirely different. According to Von den Steinen, who did not want to believe it, but who had to make sure because of the categorical confirmation he received from them, "the Bororos coolly confirm that they *indeed are* araras, in the same way as if a caterpillar were to say that it is a butterfly". This is not a name which they have appropriated for themselves nor a kinship on which they insist. What they understand by it, is an essential identity.'³⁶

Storch, who has subjected some of the archaically primitive thinking found in schizophrenia to meticulous analysis, has also been able to disclose the same phenomenon of participation in the thinking of psychotics.³⁷ However, we think that up till now, the phenomenon of participation itself has not received a sufficiently convincing psychological explanation. In our opinion this has happened for two reasons.

Firstly, because whilst investigating the particular association which primitive thinking makes between different things, the researchers have, as a rule, studied this phenomenon exclusively from the point of view of its content, as an independent feature, at the same time ignoring those functions, those forms of thinking and those intellectual operations with which similar associations are determined and worked out. Usually, the investigators have studied the finished product and not the actual process of how the given product has come into being. This is the reason why the product of primitive thinking itself has taken on a mysterious and nebulous character in their eyes.

The second complication which arises in connection with attempts to provide a correct psychological explanation for this phenomenon, must be considered to be the fact that the researchers do not bring these participation phenomena in close enough contact with all the other associations and relationships which are established by primitive thinking. As a rule, these associations only ever fall into the researchers' field of vision as a result of their exclusive nature, when they happen to deviate blatantly from our habitual logical mode of thinking. The Bororos' assertion that they are red parrots, seems so absurd from our usual viewpoint, that it immediately attracts the attention of the investigators.

Meanwhile, a careful analysis of those associations created by primitive thinking and which do not outwardly deviate from our logic, reaffirms that the same essential mechanism of thinking in complexes lies at the foundations of both types of associations.

If one takes account of the fact that a child at a given stage of development has mastered thinking in complexes, that words for him are means for the designation of complexes containing concrete objects, and that the pseudoconcept is the basic form he uses for generalizations and associations which he is in the process of establishing, then it will become absolutely clear that, with logical inevitability, participation is

destined to be the product of such thinking in complexes, i.e. associations and relationships between things must arise in this thinking process which would be impossible and unthinkable from the point of view of conceptual thinking.

In actual fact, we understand perfectly well that identical things can be incorporated into different complexes according to their own different actual attributes and that, consequently, they may end up having the most varied names and designations depending on which complex they belong to.

On several occasions during our experimental investigations we have had the opportunity to observe this type of participation, i.e. the simultaneous allocation of some actual object to two or more complexes, thus resulting in one object ending up with several names. In such cases not only is participation not exceptional, but rather it becomes the rule for thinking in complexes, and we would consider it a miracle if such associations, impossible from the point of view of our logical thinking and which are given this name, did not become apparent at every step of the way in the process of primitive thinking.

In equal measure, the key to the understanding of participation in the thinking processes of primitive people should also be seen in the fact that this primitive thinking is not carried on in concepts, that its character is of the complex type and that, consequently, in these languages, words have an entirely different functional application and are used in different ways, and are not simply a means for the creation and carrying of concepts, but that they play a role similar to that of a family name used for the naming of groups of real objects which have been combined according to a known factual kinship.

This type of thinking in complexes, as it has quite rightly been called by Werner, just like in children, should inevitably result in such an interweaving of complexes which would then generate participation. At the foundation of this thinking process lies a visual group of real objects. Werner's excellent analysis of this primitive thinking process has convinced us that the key to the understanding of the phenomenon of participation is to be found in the peculiar combination of speech and thinking which characterizes a given stage in the historical development of human intellect.

Finally, as Storch has convincingly demonstrated, schizophrenic thinking also has such a complex character. In the thinking of schizophrenics, we see a multitude of peculiar motives and tendencies, about which Storch remarks that 'they all have one feature in common, namely that they can be related to the primitive stage of thinking . . . The individual notions in the thinking of these patients, are combined in *complex aggregate attributes*'.³⁸ The schizophrenic regresses from conceptual thinking to a more primitive thinking stage which, according to Bleuler, is characterized by an abundant use of images and symbols. 'It may well be', says Storch, 'that the most distinguished feature of primitive thinking is that in place of abstract concepts, the *full concrete images* are used.'³⁹

It is precisely in this that Thurnwald sees the basic characteristic of the thinking of primitive people. 'The thinking of primitive man', he says, 'makes use of aggregate

global impressions of phenomena . . . They think in entirely concrete images as they are presented by reality.⁴⁰ These visual and collective formations which replace concepts in the forefront of the thinking process in schizophrenics, are images analogous to concepts which substitute for our logical categorical structures in the primitive stages (Storch).

Therefore, it seems that participation is a general formal symptom of the primitive stage in the development of thinking, as observed in the thinking of psychotics, primitive people and in children, specifically a symptom of thinking in complexes, even when the exceptional singularity which differentiates each of these three types of thinking is taken into account, and that the mechanism of thinking in complexes and the functional use of words as familial insignia or names always underpins this phenomenon.

It is for this reason that we do not think that Lévy-Bruhl's interpretation of participation is correct, because whilst analysing the meaning of the Bororos' assertion that they are, in effect, red parrots, Lévy-Bruhl constantly uses concepts taken from our own logic, and he assumes that this assertion signifies the identical nature or sameness of beings in primitive thinking. In our opinion, no more profoundly erroneous interpretation of this phenomenon is possible. If the Bororos really did indeed think in logical concepts, then their assertion could not be understood in any other way than in this sense.

However, since words are not carriers of concepts for the Bororos, but only represent familial designations of concrete objects, then, for them, this assertion must have a completely different meaning. The word *arara*, with which they designate red parrots and under which they classify themselves, is a common name within a certain complex to which both birds and people relate. This assertion does not signify an identification of parrots with people, in the same way as the assertion that two people go under the same family name and are related to one another does not indicate the sameness of these two beings.

XIX

But if we turn to the history of the development of our speech, we will see that the mechanism of thinking in complexes, with all its inherent characteristics, is the basis of the development of our language. The first thing that we can learn from contemporary linguistics is that, according to Peterson,⁴¹ it is essential to distinguish between the meaning of a word or expression and its objective reference,⁴² i.e. the objects which this word or expression indicates.

There can be one meaning and various objects and, vice versa, there can be various meanings and only one object. Whether we say 'the victor at Jena' or 'the vanquished of Waterloo' the person we are talking about (Napoleon) is one and the same in both cases. But the meaning of the two expressions is different. Some words, for example personal names, have only one function, namely to denote an object. So contemporary

linguistics does make a distinction between the meaning and the objective reference of words.

If we apply this to the problem under scrutiny, of thinking in complexes in children, we could say that children's words coincide with adult words in their objective references, i.e. they indicate the same objects and refer to the same range of phenomena. But they do not coincide in their meaning.

This coincidence in the objective reference and the lack of it in the meanings of words, which we have discovered to be the most essential characteristic of thinking in complexes in children, can again be said to be the rule and not the exception in language development. We mentioned above, whilst summing up the most significant result of our research, that from the point of view of the meaning of a word, children think the same as adults, i.e. about the same objects, and that as a result mutual understanding becomes possible, but that they think about the same content in a different way, using a different method and different intellectual operations.

The same formula, in its entirety, can also be applied both to the history of the development and the psychology of language in general. Here, at every step of the way, we find factual confirmation and proof which convince us of the validity of this proposition. In order for words to be able to coincide in their objective reference, it is necessary for them to denote the same object. But they may denote the same object by different means.

A typical example of such a coincidence of the objective reference co-existing with a non-coincidence of the thought operations which are at the basis of the meaning of the word, is the presence of synonyms in every language. In Russian the words 'luna' ['moon'] and 'mesjac' ['moon'] depict the same object, but they depict it in a different way which is contained in the history of the development of each of the words. 'Luna' is by its origin connected with a Latin word, which means 'capricious', 'changeable', 'whimsical'. The person who gave the moon this name obviously wanted to emphasize the inconstancy of its form, its transition from one phase into another, as the most essential difference from the other heavenly bodies.

The meaning of the word 'mesjac' is connected with the meaning of 'izmerjat' ['to measure']. 'Mesjac' means 'measuring instrument'. The person who gave the moon this name wished to refer to it by emphasizing another property, namely, that by means of the measurement of the lunar phases, one can calculate [the passage of] time.

In a similar fashion, as regards the words used by children and adults, one could say that they are also synonyms in the sense that they depict the same object. They are names for the same things and thus they coincide in their nominative function, but the thought operations underlying them are different. The manner in which a child and an adult arrive at this naming of things, that operation by which they think about a given object and the meaning of the word which is equivalent to this operation, turn out to be essentially different in the two instances.

In exactly the same way, the same objects in different languages coincide in their nominative function, but in different languages the same object may be named after completely different features. In Russian the word 'portnoj' ['tailor'] developed from

the old-Russian 'port' – a piece of tissue, cloth, coverlet. In French and German the same subject is referred to after a different feature – the word 'to cut'.⁴³

'So' – to formulate this proposition – it is important to differentiate two aspects of what is commonly referred to as the meaning of a word: the meaning of the expression in the proper sense of the word and its function as a *name*, [which] relates to this or some other object, its *objective reference*.' From this it becomes clear that when the meaning of a word is being discussed, it is necessary to differentiate the meaning of a word in the proper sense of the word from the denotation of an object which is inherent in this word (Schor).

We think that the differentiation of the meaning of a word and its relationship to certain objects, the distinction between the meaning and the name of the word, provides us with the key to the correct analysis of the development of thinking in children in its early stages. With good reason Schor observes that the difference between these two aspects, the meaning or content of an expression and the object which it denotes in the so-called meaning of a word, manifests itself clearly in the vocabulary of children. Children's words can coincide in their objective reference with adult words and fail to do so in their meaning.⁴⁴

If we turn to the history of the development of words in every language and to the transfer of the meaning of the word, we will see, as strange as this may appear at first glance, that in the process of development words change their meanings in the same way as they do in the case of children. Just like in the example we cited above, where a large number of the most varied, and from our point of view, not comparable objects were given the same name 'wauwau' by the child, we find similar transfers of meaning occurring in the history of the development of words, which indicates that they are based on a mechanism of thinking in complexes, that words are used and applied here in a different manner than in mature thinking using concepts.

Let us take the history of the Russian word 'sutki' ['24 hours'] as an example. Originally it signified a 'shov' ['seam'], the place where two pieces of tissue are united, something woven together. Then it began to signify every junction, a corner in a cottage, the place where two walls come together. Further, it acquired the metaphorical sense of 'sumerki' ['twilight'], the junction of day and night, and after that, it covered the period from twilight to twilight or the time period that includes morning and evening twilight. It began to signify a day and a night, that is, 'sutki' in the real sense of that word. Thus we see that in the historical development of this word such diverse phenomena as a seam, a corner in a cottage, twilight and 24 hours, are combined into a single complex according to the same visual characteristic used by the child to combine different objects into one complex.

'Anyone who begins to investigate the questions of etymology for the first time is struck by the vapidness and triviality of some of the expressions which are tied to the name of certain objects', says Schor. Why do both 'svin'ja' ['swine'] and 'zhenshchina' ['woman'] mean 'one who gives birth', why are both 'medved' ['bear'] and 'bober' ['beaver'] called 'buryimi' ['brown'], why should 'izmerjajuschij' ['the measuring one'] refer to exactly the moon, 'revushcij' ['howler'] to a 'byk' ['bull'], 'koljuchij' ['thorny']

to a 'bor' ['forest']? If one were to investigate the history of these words, it would become apparent that it is not logical necessity and not even associations which have become established in concepts which have given rise to them, but purely imagistic concrete complexes and associations of the very same type we were able to observe in children's thinking. Some sort of concrete feature is singled out, after which the object gets its name.

'Korova' ['cow'] means 'rogataja' ['horned'], but in other languages analogous words emerged from the same root which also mean 'horned', but indicate the goat, the deer or other horned animals. 'Mysh' ['mouse'] means 'thief', 'bull' means howler, 'doch' ['daughter'] means milkmaid, 'ditja' ['child'] and 'deva' ['maiden'] are connected with the word 'doit' ['to milk'] and designated a 'sucker' or a 'wet nurse'.

If we examine the laws which govern the coming together of families of words, we will see that new phenomena and objects are named after one attribute which is not an essential feature from the point of view of logic, and which does not logically express the essence of the phenomenon in question. It never happens that a name which is only just emerging becomes a concept. Therefore, from a logical point of view, on the one hand, the name proves inadequate as it turns out to be too narrow, and on the other, it is too wide. Thus, for example, 'the horned one' as a name for a cow or 'thief' for a mouse are too narrow, in that the ideas of a cow and a mouse are not exhausted by the attributes which are contained in these names.

On the other hand they are too wide because the same names may be applicable to many other objects as well. It is for this reason that, in the history of language, what we observe is a constant, uninterrupted struggle between conceptual thinking and primordial thinking in complexes. The complex name chosen because of a certain attribute, contradicts the concept it depicts and, as a result, a struggle between the concept and the image which underpins the word ensues. Then the image becomes erased, is forgotten and effaced from the speaker's consciousness and the connection between the sound and the concept as the meaning of the word becomes incomprehensible to us.

For example, nowadays no speaker of Russian who uses the word 'okno' ['window'] knows that it signifies the place to which one looks or the place where light passes through, and that it does not include any suggestion not only of a frame, etc., but not even the concept of an aperture. Still we commonly use the word 'okno' to denote a frame with glass panes and completely forget the word's etymological connection with the word 'oko' ['eye'].

In the same way 'chernila' ['ink'] once denoted writing fluid and indicated its external attribute – the black colour.⁴⁵ The person who called this substance 'chernila' included it into the complex of black things in a purely associative way. But nowadays this in no way prevents us from talking about red, green or blue ink, forgetting that from a perceptual point of view such a word combination is absurd.

If we turn to the transfer of names, then we will see that they are transferred by association, by contiguity or by similarity in reverse, i.e. not according to logical

thinking, but according to the laws of thinking in complexes. Even now, whilst creating new words, we observe a large number of extremely interesting processes of such complex allocation of a wide variety of objects to one single group. For example, when we speak about the neck of a bottle, a table leg, a door handle or the arm of a river we are carrying out precisely this kind of complex allocation of objects to one general group.

The essence of this kind of name transfer is that the function carried out by the word is neither semasiological nor interpretative. Here, the word fulfils a nominative or indicative function. It denotes, names a thing. In other words, in this case a word is not a sign for some meaning with which it is bound up in the act of thinking, but a perceptually given thing which is associatively connected to another perceptually given thing. And in so far as the name is bound up with the thing which it designates by association, so, as a rule, the transfer of the name takes place according to various associations, which it would prove impossible to reconstruct without intimate knowledge of the historical circumstances of the act of the transfer of this name.

What this means is that entirely concrete factual connections underpin such transfers as the complexes which are created in the thinking of children. If we apply this idea to children's speech, we could say that when a child understands adult speech, something occurs akin to what we pointed out in the examples cited above. Whilst pronouncing the same word, a child and an adult are referring to the same person or object, to Napoleon for example, but one of them thinks of Napoleon as the victor at Jena, whilst the other, as the vanquished at Waterloo.

According to Potebnya's wonderful statement, language is a means for understanding oneself.⁴⁶ It is for this reason that we must study the function which is carried out by language or speech in relationship to children's own thinking, and we should point out here that, aided by speech, a child understands himself differently than he understands an adult through the same speech. This means that the thinking operations which a child carries out with the aid of speech do not coincide with the operations carried out in the thinking of an adult when he pronounces one and the same word.

We have already cited the opinion of one writer who says that the first word cannot be viewed as a simple sign for the concept. Rather, it is an image, a picture, a mental drawing of the concept, a little story told about it.⁴⁷ In actual fact it is an artistic creation. Because of this it has a concrete complex character and it can, simultaneously, depict several objects which can well be related to one and the same complex.

It is more correct to put it in the following way: when a person names an object with the aid of such a picture/concept, he allocates it to a certain complex, combines it into a single group with a large number of other objects. Pogodin⁴⁸ is fully justified in saying about the origin of the word 'veslo' ['oar'] in the word 'vesti' ['to lead/drive'] that 'veslo' might have been more appropriately used for a boat, as a means of transportation, or a pack horse, or a carriage. We see that all these objects belong as it were to a single complex [of the kind] we also observe in the thinking of the child.

XX

The language of deaf and dumb children, for whom the basic motive which leads to the formation of children's pseudoconcepts is absent, presents an extremely interesting example of pure thinking in complexes. We have pointed out above that the circumstance which is the determining factor in the formation of pseudoconcepts in children, is that a child does not create his complexes freely, by combining objects into integral groups, but that he finds words already tied to definite groups of objects in adult expressions. This is the reason why a child's complex coincides with concepts in adult thinking in its physical affiliation. A child and an adult who understand one another when they utter the word 'dog', relate this word to the same object, having in mind the same real content, but at the same time one of them is thinking of the concrete complex of dogs, whilst the other's thought is the abstract concept about a dog.

In the language of deaf and dumb children this situation loses its impact because they are deprived of the possibility of verbal contact with adults and, left to themselves, they are able to form complexes which are freely designated by the same word. Thanks to this context, it is in their thinking that the characteristics of thinking in complexes come to the fore with particular distinctness and clarity.

Thus, in the language of the deaf and dumb, a tooth can have three separate meanings. These are white, stone and tooth. These different names are combined in one complex which requires the addition of another demonstrative or figurative gesture in order to define the objective reference of the given meaning. These two word functions in the language of the deaf and dumb are, as it were, separate. The deaf and dumb person shows a tooth and then either points to its surface or makes a throwing gesture with his hand and thus indicates which object the word has to be related to.

We also observe an extremely interesting phenomenon at every step of the way in the adult thinking process. It is that even though the formation of concepts and their use is accessible to the adult thinking process, most of this thinking is not devoted to such activities.

If we examine the most primitive forms of human thinking as they appear in dreams, there we will see this primeval, primitive mechanism of thinking in complexes, expressed in visual fusion, condensation and transfer of images. Investigation of the generalizations which can be observed in dreams, as is rightly pointed out by Kretschmer, provides the key to the proper understanding of primitive thinking and does away with the prejudice that generalization in thinking only appears in its most developed form, i.e. in the form of concepts.

We could point to Jaensch's studies, which have shown that particular generalizations or combinations of images do exist in the sphere of purely visual thinking, and which can, as it were, be regarded as concrete analogues of concepts or visual concepts, and which Jaensch refers to as meaningful compositions and fluxion. In adult

thinking we often observe a transition from conceptual thinking to concrete, complex and transitional thinking.

Pseudoconcepts are not the sole and exclusive property of children. Our own everyday life is very frequently dominated by thinking in pseudoconcepts. From the point of view of dialectical logic the concepts which appear in our ordinary speech cannot be seen as concepts in the strict sense of the word. They rather represent general ideas about things. However, there is no doubt that they exemplify a transitional stage which leads from complexes and pseudoconcepts to a real concepts in the dialectical sense.

XXI

The process of thinking in complexes as observed in children, described above, represents only the fountainhead of the history of conceptual development. But the development of concepts in children also has a second source. This second source comprises the third major stage in the development of children's thinking, which, like the second one, can, in its turn, be divided into several separate phases or steps. In this sense, the pseudoconcept which we examined above, constitutes a transitional stage between thinking in complexes and the second source or root of the development of concepts in children.

We have already mentioned that the process of development of concepts in children is presented in our account in the way in which it has been revealed in the artificial conditions of experimental analysis. These artificial conditions show the process of conceptual development in its logical sequence and, therefore, this inevitably deviates from the actual process of conceptual development. This is the reason why the sequence of individual stages and separate phases within each stage do not coincide in the actual process of children's development of concepts and in our depiction of it.

Whilst examining the question which concerns us here, we have attempted to follow its genetic route at all times, but we have also tried to present some of the individual genetic aspects in their most matured and classical form, and this has sometimes made it necessary to deviate from the complicated, twisting and, at times, zigzagging road along which the actual development of children's concepts has to meander.

So, once again, whilst passing on to the description of the third and last stage in the development of children's concepts, we have to point out that, in reality, the first phases of the third stage do not necessarily start immediately the moment thinking in complexes has completed its full cycle of development. On the contrary, we have seen that the higher forms of thinking in complexes, in the guise of pseudoconcepts, represent such a transitional form, where our everyday thinking, based on ordinary speech, often lingers.

Meanwhile, the primary elements of these forms, which we will now describe, predate the formation of pseudoconcepts considerably, but from the point of view of their logical essence, they represent, as has been said above, the second and, as it were, independent source in the history of conceptual development and, as we shall now be able to see, they fulfil a completely different genetic function, i.e. they play a different role in the process of conceptual development in children.

The most characteristic feature of the process of thinking in complexes which we have described above, is the milestone of the establishment of associations and relationships which constitute this type of thinking. At this stage a child's thinking assembles the individual perceived objects into complexes and assembles them into specific groups, in this way laying the foundations for the integration of uncoordinated impressions and taking the first steps along the road towards generalization of the uncoordinated elements of experience.

But a concept in its natural developed state presupposes not just the unification and generalization of separate concrete elements of experience, but also postulates the segregation, abstraction and isolation of the individual elements and the ability to regard these segregated, abstract elements outside the framework of the concrete and factual associations which they are given by experience.

Thinking in complexes turns out to be inept in this respect. It is totally imbued with an excess or an overproduction of associations and a dearth of abstractions. The process of the segregation of attributes in thinking in complexes is exceptionally ineffectual. Meanwhile, as we have said, an authentic concept is dependent on the processes of analysis to the same extent as on the processes of synthesis. Both stratification and assembly, in equal measure, are indispensable internal factors in the building of a concept. Analysis and synthesis, according to Goethe's famous words, assume the existence of the other, like breathing in and breathing out.⁴⁹ All this applies in equal measure not just to thinking in general, but to the building of each individual concept as well.

If we wanted to analyse the actual process of development of thinking in children we would, of course, be able to find neither a separate isolated line of development of the function of complex formation, nor a separate line of development of the function of stratification of the whole into its separate elements.

In actual fact both are seen in a combined, intermingled state and it is only in the interests of scientific analysis that we are presenting these two lines as separate, in an attempt to examine each of them with the greatest possible degree of accuracy. However, this distinction of the two lines should not simply be viewed as a conventional method used in our analysis, which we could replace at will with any other method. On the contrary, it is rooted in the very nature of things, because the psychological nature of each of these functions is fundamentally different.

So, it can be seen that the genetic function of the third stage in the development of children's thinking is the development of stratification, analysis and abstraction. In this respect the first phase of this third stage is strikingly close to the pseudoconcept. The unification of different concrete objects is accomplished because of the maximum

similarity between its various elements. But because this similarity can never be complete, we end up with an extremely interesting situation from the psychological point of view, namely, that where his attention is concerned, the child may well create unfairly auspicious conditions for the various attributes of a given object.

These attributes, which in their entirety reflect maximum resemblance to the model which has been provided, tend to attract the focus of the child's attention and, as a result, undergo the process of segregation and abstraction from all the remaining attributes, which remain on the periphery of his attention. Here, for the first time, we can observe, with some degree of clarity, the appearance of that process of abstraction whose nature is often difficult to discern, due to the fact that what has been abstracted is an entire, insufficiently intrinsically stratified group of attributes, which sometimes is nothing more than a product of a vague impression of the presence of common characteristics, and not a clear-cut segregation process of individual traits.

But, at least, a breach in the realm of children's integral perception has been opened. The attributes have been divided into two unequal parts, and the two processes, which Külpe's school has named positive and negative abstraction, have been identified. The concrete object no longer enters the complex and becomes part of the generalization with all its attributes and all its factual completeness intact, but on entering the complex, it leaves part of its attributes outside the door and thus becomes impoverished; however, on the other hand, the attributes which have served as the basis for its inclusion in the complex, stand out particularly boldly in the child's thinking. This generalization which the child creates on the basis of maximum likeness, can, simultaneously, be considered to be a more impoverished and a more enriched process than the pseudoconcept. It is richer than the pseudoconcept because it is constructed on a selection of what is important and essential from a general group of perceived traits. It is poorer than the pseudoconcept because the associations upon which this construction rests are extremely poor, and they can be reduced to nothing more than a vague impression of the presence of common characteristics or of maximum likeness.

XXII

The second phase in the same process of development of concepts is the phase which could be called the period of potential concepts. Under experimental conditions, a child who finds himself in this phase of his development, as a rule, picks out a group of objects which have been generalized by him according to one common attribute. Yet again, we have before us a picture which, at first glance, is very reminiscent of pseudoconcepts and which could, judging by its outer appearance, be taken for a proper concept in the real sense. An identical product might have been obtained by an adult thinking in concepts. Its deceptive appearance and its superficial resemblance to a real concept show that the potential concept and the pseudoconcept are related. But they are essentially dissimilar by nature.

It was Groos who first introduced to psychology the distinction between real and potential concepts, and he made this distinction the starting point for his analysis of concepts. 'A "potential" concept', says Groos,

need not be more than an effect of habit. As such, in its most elementary form, it amounts to the fact that we 'expect', or to be more precise, we '*set our minds*' on similar causes eliciting *similar general impressions* . . . If a 'potential' concept really is anything like what has just been described, namely a 'set' to focus on what is routine, then one can say that it can already be observed in children at a very early stage . . . I believe it to be an indispensable precondition for the formation of intellectual judgements, but on its own it does not contain *anything intellectual*.⁵⁰

So this potential concept can be considered a pre-intellectual phenomenon, which makes its appearance in the history of development of thinking at a very early stage.

From this viewpoint, the majority of contemporary psychologists agree that the potential concept in the form in which we have just described it, can already be found in the thinking of animals. In this sense, we fully agree with Kroh, who rejects the generally accepted opinion that abstraction can only be observed for the first time in adolescence. 'Isolating abstraction', he says, 'is a tendency already observed in animals . . .'

And, indeed, special experiments with domestic chickens to investigate abstraction processes of shapes and colours have revealed that, if not the potential concept as such, then something very much like it, which includes the isolating or separating off of individual attributes, takes place at very early stages in the behavioural development of animals.

From this point of view, Groos is quite right when he interprets the potential concept as the tendency to react in a habitual manner and refuses to see in it any sign of development in children's thinking, and reckons that, from the genetic point of view, it is just one of the pre-intellectual processes. Our first potential concepts, he says, are pre-intellectual. The activity of these potential concepts can be explained without taking any logical processes into account. In this case 'the relationship between a word and what we call its meaning, can sometimes be a simple association which does not contain any real semantic relations'.⁵¹

If we examine a child's first words, we see that indeed, in their meaning, they approach potential concepts. These concepts can be seen to be potential, firstly, because of their practical relation to a certain range of objects, and secondly, because of the process of isolating abstraction which makes up their fundamental characteristic. They are concepts of probability which have not yet realized this probability. They are not yet a concept, but are something that can become one.

In this connection, Bühler points out a perfectly valid analogy between a child's use of one of his usual words at the sight of a new object, and an ape's recognition that many things resemble a stick if they are found in circumstances where a stick proves to be useful and which, in different circumstances, would not remind him of it at all.⁵² Köhler's experiments with tool using chimpanzees have shown that once the ape has

used a stick as a tool to achieve his goal, he will extend the function of the tool to other objects which have something in common with the stick and are able to carry out its function.

The superficial resemblance to our concepts is striking. Such a phenomenon does, indeed, deserve the name of a potential concept. Köhler interprets the relevant results of his observations of chimpanzees in the following way. 'If one were to maintain', he says,

that the stick in the visual field acquired a specific functional value for certain situations, and that this meaning will extend to all the other objects, whatever they might be, but which have, from the point of view of form and texture, certain objective traits in common with the stick, this leads us to the only view consistent with the behaviour observed in the animals.⁵³

These experiments have shown that an ape begins to use the brim of a straw hat, shoes, a piece of wire, straw or a towel as a stick, i.e. the most varied objects, which have an oblong shape and which, in their external appearance, may serve as a substitute for a stick. So, to a certain extent, we can see that here, too, a process of generalization of a whole range of concrete objects occurs.

But the difference between this and Groos's potential concept lies in the fact that the latter talks about similar impressions, whilst here we are concerned with similar functional meaning. There, the potential concept is worked out in the realm of visual thinking, here, in the sphere of practically functional thinking. It is a well known fact that, according to Werner, these types of motor concepts or dynamic concepts, and according to Köhler, such functional values, can be observed in the thinking of children for a long time, right up to school age. It is known that the definition of concepts in children carries this kind of functional character. For a child, to define an object or a concept is tantamount to assigning a name to what the object does or, more often, what one can do with the aid of this object.

All the same, when the question concerns the definition of abstract concepts, this definition emerges as a concrete, usually active situation looming in the foreground, equivalent to the child's conception of the word in question. In his investigation of thinking and speech, Messer provides a strikingly apt definition of this kind of abstract concept, formulated by a child who had just started going to school. 'Reason', said the child, 'is when one is very hot and doesn't drink water'.⁵⁴ This type of concrete and, at the same time, functional meaning forms the natural psychological foundation of a potential concept.

It should be mentioned that, already at the stage of thinking in complexes, these types of potential concepts play an extremely important role, and they frequently merge during the formation of complexes. So, for example, as we have demonstrated above, in the associative complex and in many other types of complex, the building of the complex presupposes a selection of a certain attribute which is common to various elements. Granted, the fact that this attribute is highly unstable and is soon

replaced by another attribute and that it, in no way, can be considered to be some privileged trait in comparison with all the remaining ones, is characteristic for pure thinking in complexes. This is not characteristic of potential concepts. Here, the given attribute which serves as the basis for the object's inclusion in a certain common group, is viewed as a privileged attribute which has been abstracted from the concrete group of attributes with which it is bound up in practice.

Let us remember that similar potential concepts play an extremely important role in the history of development of the words we use. Above, we gave many examples of how each new word comes into being on the basis of the segregation of some single attribute which has attracted our attention, and which then serves as a foundation for the construction of a generalization of a number of objects called or designated by the same word. Frequently, such potential concepts remain permanently at a given stage of their development and never progress to a real concept. But, in any case, they do play an extremely important role in the process of development of children's concepts. The significance of this role can be demonstrated in the fact that here, for the first time, by abstracting different attributes, the child transcends the physical situation and the concrete association of attributes, and by so doing creates the necessary precondition for a new combination of these attributes by applying a new principle. It is only by mastering the process of abstraction, together with the development of thinking in complexes, that the child is able to reach a stage where he can form real concepts. And it is this ability to form real concepts that constitutes the fourth and last phase in the development of thinking in children.

The concept is reached when a number of abstracted attributes are re-synthesized and the newly acquired abstract syntheses become the basic form of thinking, and when the child then applies this to the comprehension and interpretation of surrounding reality. At the same time, as has already been pointed out above, our study shows that the decisive role in the process of real concept formation belongs to words. It is precisely by using words that a child is able to focus his attention on certain attributes in an arbitrary manner, to synthesize them with the aid of words, and also to symbolize the abstract concept with words and to use it like a sign, on a higher level than any of the others which human thought has ever created.

It is a fact that the role of words is already prominent at the stage of thinking in complexes. Thinking in complexes, in the sense in which we have described it above, is impossible without words, which play the role of family names which unify groups of effect-related objects. In this respect, in contrast to a number of other writers, we are making a distinction between thinking in complexes as a given stage in the development of verbal thinking and that wordless, visual type of thinking which characterizes animal perceptions and which other authors, such as Werner, also designate as belonging to the complex type because of its tendency to amalgamate separate impressions contained within it.

In this sense, these writers tend to put an equals sign between the processes of condensation and transference as they appear in our dreams, and the thinking in complexes of primitive people,⁵⁵ which is one of the higher forms of verbal thinking

and a product of a long standing historical evolution of human intellect and the definitive predecessor of concept thinking. Some authorities, among them Volkelt, go even further and tend to identify the complex, emotion-like thinking observed in spiders with that of the primitive verbal thinking of the human child.⁵⁶

From our own point of view, there is a fundamental difference between these two phenomena, which separates the natural form of thinking, a product of biological evolution, from the historically evolved form of human intellect. However, by acknowledging that words also play a decisive role in thinking in complexes, we are not, in any way, obliged to identify the role that words play in thinking in complexes with their role in concept thinking.

On the contrary, first and foremost, we see the very distinction between complexes and concepts to be due to the fact that one generalization is the result of the use of words, whilst in the other it comes into being as a result of an entirely different functional application of the same word. A word is a sign. One can use this sign in different ways, it can be applied in a different way. It can serve as a means for various intellectual operations and it is precisely these different functional methods of using words, the different intellectual operations which are carried out with words, which are responsible for the fundamental distinction between complexes and concepts.

XXIII

In relation to the subject which concerns us, the most important genetic conclusion to be drawn from our whole investigation is the basic thesis which states that it is only in adolescence that a child is able to reach the stage of concept thinking and to realize the third stage in the development of his intellect.

During the course of experiments designed to investigate adolescent thinking, we had the opportunity to observe how, along with the intellectual maturation process, the primitive forms of syncretic thinking and thinking in complexes progressively recede into the background, how potential concepts are observed less and less frequently in thinking and how, sporadically at first, then more and more frequently, the subject begins to create real concepts in his thinking process.

However, one must not imagine this process – of changeover of the various forms of thinking and separate phases in its development – as a purely mechanical process, where each new phase ensues only when the previous one is entirely over and has been accomplished. The picture of this developmental process turns out to be much more complicated. Various genetic forms exist just like strata of diverse geological epochs exist inside the Earth's crust. This situation is not the exception but rather the rule for behavioural development as a whole. We know that human behaviour does not constantly function only at the upper or highest levels of its development. The most recent forms of human behaviour, which have made their appearance in human history only in recent times, live side by side with the most ancient ones, and the daily variations of the different forms of behaviour, as Blonsky has so beautifully

demonstrated, essentially reproduce the history of behavioural development throughout the ages.

The same is true in relation to the development of thinking in children. Here, too, a child who is in the process of mastering a higher form of thinking in concepts, by no means just abandons the more elementary forms. For a long time they still continue to be the dominant forms of thinking, both from the quantitative and the steering points of view in the whole range of his experience. As we have mentioned above, even an adult does not always think in concepts. Quite commonly, his thinking is carried out on the level of complexes, and sometimes it even descends to more elementary and more primitive forms.

But often the concepts themselves as well, both in adolescents and adults, do not rise above the level of pseudoconcepts, particularly where their use is limited solely to the realm of everyday experience, and even though they have all the attributes of concepts from the formal logical point of view, nonetheless they cannot be considered as concepts from the perspective of dialectical logic and they amount to nothing more than general ideas, i.e. complexes.

Therefore, adolescence cannot be said to be the age of culmination, but rather the age of crisis and maturation of thinking. Just as in all other respects, this age is also one of transition as regards the higher forms of thinking accessible to the human mind. This transitional character of adolescent thinking becomes particularly obvious when we observe its significance, not so much in a finished state, but in action and when we subject it to a functional test, for it is in action and in their application when these phenomena reveal their true psychological nature. At the same time, whilst investigating concepts in action, we have also uncovered a certain extremely important psychological rule, which underpins this new form of thinking and which sheds light on the character of intellectual activity in adolescence in general, and on the development of the adolescent's personality and his view of the world, as we hope to demonstrate below.

In this respect, the first thing that should be mentioned is the profound discrepancy which this experiment revealed between the formation of a concept and its verbal definition. This variance remains in force not only in adolescent thinking, but also in that of adults, sometimes even during the most highly elaborate thinking process. The presence of the concept and the awareness of it do not concur either in respect to the moment of its appearance, nor in respect to its activity. The former may appear earlier and function independently of the latter. The ability to analyse reality with the aid of concepts comes into being much earlier than the ability to analyse the concepts themselves.

This has been graphically demonstrated in experiments with adolescents, where, more often than not, the divergence between words and actions in the formation of concepts is the most characteristic feature of the age group, which points to the transitory nature of this thinking process. The adolescent forms a concept and is able to apply it correctly in a specific situation, but as soon as a verbal definition of the concept is required, this same thinking encounters the most serious problems and the definition of the concept ends up much more limited than its living

application. In this we see direct confirmation that concepts do not arise simply as a result of logical processing of some elements of experience, or that the child does not think up his concepts himself, but that they come into being by a different route, and it is only later on that he becomes aware of them and subjects them to logical treatment.

At this stage another characteristic feature of the application of concepts in adolescence comes to light. The essence of this characteristic is that the adolescent tends to use concepts in a visual situation. At the time when this concept has not yet become detached from the concrete, visually perceived situation, it is able to guide the adolescent's thinking perfectly. The process of transferring the concept, i.e. applying it to other, completely different things, proves to be a lot more problematic, as when the segregated signs which have been synthesized into concepts, meet up with other signs in an entirely different concrete environment, and when they themselves are given in entirely different concrete proportions. When the visual or specific situation changes, the application of a concept which has been worked out in a different situation can become extremely problematic. However, as a rule, in the end the adolescent does manage to accomplish this transition even during the first stage of the maturation of his thinking.

The process of defining such a concept presents a much more complicated problem, when the concept breaks away from the specific situation in which it has been worked out and when it completely ceases to be guided by concrete impressions and begins to operate within a completely abstract scheme. At this stage the verbal definition of the concept and the ability to become conscious of it and to define it, presents marked difficulties and in the course of the experiment it can be observed very frequently how the child or adolescent who has, in effect, already managed to solve the problem of concept formation, regresses to a more primitive stage when he attempts to define the ready formed concept, and begins to list various concrete objects which this concept includes in this specific situation whilst attempting to define it.

So this is how it happens that an adolescent can use a word as a concept and define it as a complex. This is an extremely characteristic form of thinking found in adolescence, which oscillates between thinking in complexes and thinking in concepts. But the greatest problems encountered by the adolescent and which he is usually only able to overcome towards the very end of adolescence, is the further transference of the sense or meaning of the worked out concept to ever new concrete situations, which he also contemplates within an abstract scheme.

This road from the abstract to the concrete proves to be no less difficult than the ascending road from the concrete to the abstract had been in its own time.

XXIV

By now the experimental results leave us in no doubt whatsoever that the usual picture of how concepts are formed, as traditional psychology had drawn it (having

slavishly reproduced this depiction from the formal logical description of the concept formation process), bears no resemblance to reality. The concept formation process as traditional psychology depicts it could be summarized in the following way: a number of concrete ideas form the foundation of a concept.

Let us take an example, says one of the psychologists – the concept of a tree. It arises from a number of similar ideas about a tree. 'A concept comes into being from the ideas of single similar objects.'⁵⁷ He continues by introducing a scheme which explains the concept formation process and presents it in the following way. Let us assume that I had the chance to observe three different trees. The notions I have of these three trees can be broken up into their constituent parts, each representing the shape, colour or size of each tree. The remaining constituent parts of these images turn out to be the same.

Assimilation should now take place between the like parts of these ideas and as a result, a general idea about the given attribute will be formed. Then, because of the synthesis which occurs among these ideas, one general idea or concept of a tree comes into being.

So it can be seen that looking from this point of view concepts are formed in the same way as in Galton's collective photograph, where we get a family portrait of various individuals who belong to the same family. We know that the technique of this photograph is based on the fact that images of individual members of the family were printed on a single plate. These images are superimposed upon one another in such a way that similar and frequently recurring features, common to many members of the family, stand out in sharp, marked relief whilst random, individual features, which are different among the various members of the family, obliterate and suppress one another by this overlaying process.

In this way segregation of similar features is achieved, and it is the totality of these segregated common attributes of a number of similar objects and features which, according to traditional views, results in a concept in the true sense. One cannot imagine any claims more false from the point of view of the active process of development of concepts than this logicized picture, drawn with the aid of the scheme described above.

As a matter of fact, as has been noted by psychologists a long time ago and as our experiments demonstrate with crystal clarity, the adolescent's concept formation process never follows the logical route of the process of concept formation which this traditional scheme has described. Vogel's investigations have revealed that a child

obviously does not enter the realm of abstract concepts from a starting point of individual species and rising to higher ones. On the contrary, at first he uses the most general concepts. And he reaches those which are in the middle ground, not by the path of abstraction from below upwards, but by determining them from above. A child's idea develops by passing from the undifferentiated to the differentiated, and not the other way round. Thinking develops by passing from genus to species variety, and not the other way round.⁵⁸

According to Vogel's illustrative representation, thinking almost always moves up and down within a pyramid of concepts but only rarely in a horizontal direction. At one time this thesis was considered to be revolutionary by the traditional psychological science of concept formation. Instead of the former idea, according to which concepts came into being as a result of a simple process of segregation of similar attributes from a number of concrete objects, the process of concept formation was now presented to the researcher in its real complexity, as a complicated process of the movement of thinking within a pyramid of concepts, which was shifting continually from the general to the particular and from the particular to the general.

Recently, Bühler also formulated a theory of the origin of concepts,⁵⁹ in which, just like Vogel before him, he tends to reject traditional ideas about the development of concepts by means of the segregation of similar attributes. He distinguishes between two genetic sources in the formation of concepts. The first source is when the child assembles his ideas into segregated groups, and then the groups blend with each other into complicated associative bonds, which form between the various groups of these ideas and between their separate elements which make up each group.

The second genetic source of concepts Bühler considers to be the function of judgement. As a result of thinking and the already formed judgemental process, a child arrives at the stage of being able to form concepts, and Bühler sees weighty evidence for this in the fact that words which define concepts are able to reproduce the child's ready made judgement which refers to these concepts very easily, as we ourselves have quite often had occasion to observe during associative experiments involving children.⁶⁰

Obviously, judgement turns out to be something very elementary and the natural logical place for the concept, according to Bühler, is judgement. The idea and judgement co-operate in the process of concept formation. Thus the process of concept formation develops from two directions – from the general and the particular – more or less simultaneously.

The fact that the first word which a child utters is indeed a general designation and it is only much later that particular and concrete designations tend to appear in the speech of a child, strongly confirms this. Of course, a child learns the word 'flower' earlier than the names of individual flowers and even if, due to some particular circumstances affecting his speech development, he should learn some particular name earlier and he comes across the word 'rose' before the generic name 'flower', then he will use this word and apply it not just in relation to a rose, but to all flowers, i.e. he will use this particular name as if it were a general one.

In this sense Bühler is quite right when he says that the process of development of concepts does not consist of the ascent of the pyramid of concepts from below, but that the process of concept formation proceeds from two directions, like the method of cutting a tunnel.⁶¹ One must admit that all this poses an extremely important and difficult problem for psychology. This problem is, that by accepting the fact that a child learns the general and the most abstract name earlier than the concrete one, many psychologists have found it necessary to re-evaluate the traditional view

according to which abstract thinking develops comparatively late, namely at the time of sexual maturation.

These psychologists, who have based themselves on the quite correct observation of the succession of general and concrete names in the child's development, have come to a wrong conclusion by assuming that at the same time as general names appear in children's speech, i.e. very, very early, the existence of abstract concepts can also be ascertained.

For example, such is Ch. Bühler's theory and we can see that this results in an erroneous view according to which adolescent thinking does not undergo any special changes and does not boast any great achievements. According to the theory nothing principally new, in comparison with what we already observe in the intellectual activity of a three-year-old child, appears in adolescent thinking.

In our next section we shall take the opportunity to discuss this question in more detail. For now, let us say only that the use of general words does not yet in any way presuppose an equally early mastery of abstract thinking because, as we have already demonstrated throughout the present chapter, a child uses the same words as the adult and applies these words to the same range of objects, but nevertheless thinks about that object totally differently, in an unrelated manner, to that of an adult. Therefore when, at a very early age, a child applies these words, which in adult speech signify abstract thinking in its most theoretical forms, they do not, by any means, signify the same thing in the child's thinking.

Let us remember that words heard in children's speech coincide with words used by adults according to their physical affiliation but not according to their meaning, therefore we have no reason to assume that abstract thinking is present in a child's mind just because he makes use of abstract words. As we will attempt to demonstrate in our next section, a child who uses abstract words at the same time thinks about the corresponding object in a decidedly concrete way. One thing, at least, is certain, namely that the old idea about concept formation, analogous to the story of how the collective photograph was made, does not in any way correspond either to any actual psychological observations or to any data obtained from experimental analysis.

Bühler's second conjecture which has been fully confirmed by experimental data is also beyond doubt. Concepts do, indeed, have their natural place in judgements and conclusions, and they function as constituent parts of the latter. A child who reacts by answering 'big' when the word 'house' is mentioned, or when he hears the word 'tree' answers 'apples grow there', is really providing proof that the concept exists only as an integral and inseparable part of the general framework of a judgement.

Just as the word can exist only as part of a whole sentence and just as, from the psychological point of view, sentences appear in a child's development earlier than separate isolated words, so, in the same way, judgement also appears in the thinking of a child earlier than individual concepts which have been set apart from it. It is for this reason, according to Bühler, that the concept cannot simply be a product of association.⁶² Associative connections of separate elements constitute a necessary prerequisite, but at the same time one which is inadequate for the formation of

concepts. It is this double root of concepts, both in the processes of ideas and the processes of judgement which, in Bühler's opinion, is the genetic key to the correct understanding of the processes of concept formation.

In our experiments we did, indeed, have the chance to observe both of these aspects which Bühler mentions. However, we do not agree with the conclusion he draws about the double root of concepts. Already Lindner noticed that the most general concepts are mastered by children relatively early.⁶³ In this sense, there is no doubt that very early in life a child learns how to use these same general names correctly. It is also true that the development of his concepts is not accomplished as a result of a successful ascent of the pyramid. In our experiments we were frequently able to observe how a child, when given a model, proceeds to match up with it a number of figures provided for him and which bear the same name as the model and, by doing so, he widens the supposed meaning of the word, and uses it in a very general sense and not, by any means, as a concrete or differentiated name.

We have also seen how a concept can come into being as a result of thinking and finds its organic natural place in the judgemental process. In this sense, the experiment completely confirmed the theory, according to which concepts do not arise mechanically, like a collective photograph of concrete objects; in this case, the brain functions like a camera which makes collective snapshots, and thinking is not included in the simple arrangement of these snapshots; and the reverse is true, the thinking processes, both visual and practical thinking, appear a long time before any concepts are formed, and the concepts themselves are the product of a long and complicated process of development of thinking in children.

As we have said above, a concept arises during a process of an intellectual operation and it is not formed by the action of a play of associations. A special blend of all the elementary intellectual functions take part in its creation and the crucial aspect of this whole operation is the functional use of words as means for the voluntary control of attention, abstraction and segregation of individual attributes and their synthesis and symbolization by the use of signs.

On many occasions, during the course of our experiment, we had the opportunity to observe how the primary function of words, which could be called the indicative function as the word is depicting a definite object or a definite attribute, appears to have an earlier genetic origin than the significative function which supersedes many of the visual impressions and signifies them. As in the conditions of our experiment the meaning of the initially senseless word referred to the visual situation, we could then observe how word meaning develops when such a meaning is made available. We were able to study this relationship of the word to specific attributes in a living situation, and to observe how once it is perceived, segregated and synthesized, it acquires the sense and meaning of a word, becomes a concept, and then how these concepts are elaborated and transferred to other specific situations and finally, how they are consciously grasped.

Concepts are always formed during a process of finding a solution to some problem facing the adolescent's thinking process. The creation of the concept is dependent on

a solution to this problem being found. Therefore the question of the double root in the formation of a concept has not been presented by Bühler in a sufficiently precise manner. In actual fact, the development of concepts tends to move along two main channels.

We have attempted to demonstrate how in its development, the function of complexing or associating of a number of separate objects by a family name which is common to the whole group, is the basic form of thinking in complexes observed in children and how, in parallel fashion, potential concepts which are based on the process of segregation of certain common attributes, form a second channel in the development of concepts.

Both of these forms represent real double roots in the process of concept formation. But we do not consider the roots of concepts described by Bühler to be real, but merely apparent ones, and this is the reason why. In fact, the prototype of a concept in the form of associative groups, and the design of concepts in the memory is, of course, a natural process which has no connection with words, and is related to that thinking in complexes which we discussed above, and which manifests itself in visual thinking which is in no way connected with words. We can find detailed analogies of these associative complexes of individual ideas in our dreams or in the thinking of animals, but as we have already demonstrated above, it is not these amalgamations of ideas which form the basis of concepts, but complexes which are formed on the basis of word applications.

So we think that Bühler's first mistake consists of ignoring the role of words in these complex amalgamations, which are the forerunners of concepts, as well as the attempt to deduce the concept from the purely inborn natural form of processing of impressions, disregarding the historical nature of the concept, ignoring the role of words and a reluctance to acknowledge the difference between a natural complex, which arises in the memory and has been represented in Jaensch's visual concepts, and other complexes which arise as a result of a highly developed verbal type of thinking. Bühler, too, makes the same mistake by ascertaining the presence of a second root for concepts which he discovers in the judgemental processes found in thinking.

This statement of Bühler's, on the one hand, brings us back to the logisizing point of view, according to which a concept is formed on the basis of reflection and is a product of logical judgement. But we have already seen to what extent both the history of concepts in our everyday language and the history of children's concepts deviate from the road which has been prescribed by logic. On the other hand, whilst designating thinking as the root of concepts, Bühler once again ignores the difference between various forms of thinking, and in particular between the biological and the historical, the natural and the cultural elements, the lower and the higher non-verbal and verbal forms of thinking.

In fact, if a concept develops from a judgement, i.e. from an act of thinking, then the question about what distinguishes a concept from a product of visual or practical-functional thinking comes to mind. Yet again, the subject of words which are crucial to the formation of concepts is passed over in silence by Bühler and is excluded when

factors which contribute to concept formation are being analysed, and as a result it becomes incomprehensible how two such different processes as judgement and the complexing of ideas can lead to the formation of concepts. It is inevitable that Bühler ends up drawing a wrong conclusion from such wrong assumptions, which, as we have already pointed out on several occasions, says that concept thinking is already present in a three-year-old child and that therefore nothing basically new, as far as the development of concepts is concerned, occurs during adolescence as compared with a three year old.

This researcher, deceived by external appearances, fails to take into account the profound dissimilarity, despite their superficial resemblance, of the causal-dynamic connections and associations of two types of thinking so completely different from the genetic, functional and structural points of view.

Our own experiments have led us to an essentially different conclusion. They show that a concept develops from syncretic images and associations, thinking in complexes and from potential concepts when, based on the use of a word as a means of concept formation, a particular significative structure comes into being which we feel justified in calling a concept in the true sense of the word.

XXV

So, as a result of our investigations, we have found that an adolescent makes an extremely crucial stride on the road of his intellectual development during the period of sexual maturation. He passes from thinking in complexes to thinking in concepts. The formation of concepts and the ability to operate with them constitute the essentially new acquisitions of this age. And the adolescent intellect finds something more than a simple continuation of the former lines of his behaviour in concepts.

A concept is not just an enriched and internally joined associative group. It represents a qualitatively new phenomenon which cannot be reduced to more elementary processes which are characteristic of the early stages of development in the intellect. Concept thinking is a new form of intellectual activity, a new mode of conduct, a new intellectual mechanism.

The intellect is able to find a new and unprecedented *modus operandi* in this particular activity and a new function becomes available within the system of intellectual functions which is distinctive both in its composition and structure as well as in the way it functions.

The traditional view which tends to deny the appearance of any essentially new phenomena in the intellectual sphere during adolescence, and which attempts to regard adolescent thinking simply as an ongoing, amplified and deeper version of the thinking of a three year old, as can best be seen from Ch. Bühler's remarks, essentially fails to notice the qualitative difference between concepts and complexes and syncretic images.

This view is based on a purely quantitative conception of the development of intellect, surprisingly near to Thorndike's theory, according to which the higher forms of thinking can be distinguished from elementary functions only quantitatively, according to the number of associative connections which form part of their composition. It is precisely because such a view dominates traditional adolescent psychology, that we have found it necessary to trace the whole process of development of thinking with great care and to show the three different qualitative milestones which this road has to pass.

Throughout this study we have borne the primary subject in mind, that of adolescent thinking. However, we used continuously the method of genetic cross-sections whilst investigating thinking, in the same way as a research anatomist takes cross-sections at various stages of development of an organ and is able to determine the process of development from one stage to the next by comparing these cross-sections.

According to Gesell's correct observation, the method of genetic cross-sectioning is becoming the predominant method of studying behaviour and its development in contemporary child psychology.⁶⁴ The previous method – the description of some particular features of behaviour at various ages – has generally resulted in a static characterization, a mere listing of a number of peculiarities, attributes and distinguishing features observed in the thinking process in the given stage of development.

This resulted in a situation where the static characterization usually supplanted the dynamic examination of the age period in question. The idea of development was being lost sight of and the given form which may have been characteristic for a given age, was assumed to be stable, immutable and always equal to itself. Both thinking and behaviour at every age were being examined more like a thing than a process, at rest and not in motion. Meanwhile, the essence of every form of thinking can only reveal itself when we begin to interpret it as a distinct organically necessary moment in the complicated and integrated process of development. The only adequate technique for uncovering its essential qualities is the method of genetic cross-sectioning, to be used in comparative genetic studies of behaviour at different stages of its development.

This is exactly what we have tried to do in our attempts to elucidate the peculiar nature of adolescent thinking. We were not merely interested in compiling a list of the peculiar features of adolescent thinking, or an inventory of expressions of intellectual activity found in adolescents, nor in a simple enumeration of the forms of thinking in their quantitative relationships with one another. First and foremost we wanted to establish what is essentially new in adolescence in the development of thought and what it brings with it; we were interested in adolescent thinking in the making. Our objective consisted of trying to capture the process of crisis and maturation of thinking which makes up the basic content of the whole age period in question.

In order to achieve this we have had to describe adolescent thinking and to compare it with earlier stages in the development of thinking, to discover transitions

between one form and another and by using comparisons to establish the nature of the decisive change, the fundamental reconstruction and radical reorganization which takes place in adolescent thinking. For this purpose we had to take cross-sections, as it were, at various stages of the process of development of thinking and, all the time following a comparative genetic path, to attempt to establish connections among these cross-sections and to restore the actual dynamic process which takes place when thinking passes from one stage to another.

And in future we intend to proceed in exactly the same way, as the comparative-genetic approach to investigation and the genetic cross-section method is the basic and principal method of carrying out studies in child psychology.

It is true that when we subjected the results of our comparative study to a functional test, we always made use not only of data referring to the ontogeny of thinking, but also of its phylogenetic development and its disintegration and involution in disease. In this we were at all times guided by the principle of the unity of higher forms of intellectual activity, regardless of the variety of processes in which it may find its actual expression. We have made the assumption that the basic laws governing the structure and activity of thinking and the basic patterns which control it remain the same in both the normal and the pathological state, but that these patterns manifest themselves in different forms of concrete expression depending on the different circumstances.

Just as contemporary pathologists regard disease as life in particular changed circumstances, so we feel we have the right to regard any thinking activity which is affected by various disorders as a manifestation of the general patterns of thinking in special circumstances brought about by the illness.

Modern psychoneurology is now firmly convinced that development is the key to the understanding of the loss and involution of psychological functions, and that investigations into the loss and disintegration of these functions is the key to the understanding of their structure and development. So general and pathological psychology can shed light on one another providing both are built on genetic foundations.

The comparison of ontogenetic and phylogenetic data has not, for one moment, led us to accept the idea of biogenetic parallelism, or to suppose that we would be able to find in the history of child development a repetition and recapitulation of those forms of thinking which were dominant during past stages of human history. Throughout, we were guided by the same comparative method, about which Groos has quite rightly said that its goal is not just in finding similarity, but also in establishing differences. 'Just like everywhere else', he says, 'in this instance the word "comparison" does not only imply the segregation of coincidental features, but even more so, looking for variations in the similarities.'⁶⁵

This is why we have never identified the process of concrete thinking in children with the process of concrete thinking in the history of the development of the human race. What we were concerned with throughout this study was to reach as full an explanation as possible of the nature of the phenomenon which was the main

objective of our investigation. And it is precisely this nature which manifests itself in the multifarious associations and forms of essentially the same kind of thinking.

To say that logical thinking appears at a certain age in the development of human history and that it appears at a certain stage of a child's development, only amounts to a confirmation of an incontestable truth, but at the same time, it does not, in any way, mean that the person holding these beliefs is accepting the point of view of biogenetic parallelism. In the same way, a comparative analysis of thinking in complexes in its phylogenetic and ontogenetic aspects does not, in the least, assume the idea of a parallelism between various processes, nor the idea of the sameness of different forms.

We have made a special attempt to underline one aspect of the phenomenon under study, and this aspect stands out in the best possible way in this type of comparative study of various manifestations of the same form of thinking. This aspect is the unity of form and content in concepts. It is because the form aspect and the content aspect are united in concepts, that the transition to thinking in concepts signifies a real revolution in the thinking process of a child.

Notes

This text formed part of chapter 10 of Vygotsky, L. S. 1931: *Pedologija podrostka* [*Paedology of the Adolescent*]. Moscow-Leningrad: Uchebno-Pedagogicheskoe Izdatel'stvo. Paragraphs five to 24 were with slight alterations republished in his *Myslenie i rech'* [*Thinking and Speech*] (1934). As can be seen from its general format the book was intended to be used as a textbook for the (correspondence) courses at Moscow University. For a textbook *Pedologija podrostka* was surprisingly lopsided: the chapter from which this text is taken, for instance, covered no less than 130 pages, whereas other chapters totalled a meagre 15 pages. It seems, then, that Vygotsky used the textbook to publish the results of those investigations that were in the focus of his scientific interests at that time. A large part of the empirical work which is at the basis of his chapter was carried out by L. S. Sakharov, to whose memory the book was dedicated. Its theoretical orientation owes much to the work of Groos, Werner, Ach and others as Vygotsky himself acknowledges.

- 1 Refers to p. 126 of Bühler, Ch. 1929: *Das Seelenleben des Jugendlichen* (5th edn). Jena: Fischer.
- 2 Ibid., pp. 126-7.
- 3 See p. 389 of Giese, F. 1922: *Kinderpsychologie*. In G. Kafka (ed.) *Handbuch der vergleichenden Psychologie* vol. 1 (pp. 323-518). München: Reinhardt.
- 4 This and the other quotes from Kroh are probably from Kroh, O. 1922: *Subjektive Anschauungsbilder bei Jugendlichen*. Göttingen: Van den hoek & Ruprecht. Vygotsky may also have used a Russian translation of one of Kroh's articles. See Kroh, O. 1931: *Intellektual'noe razvitie v period sozrevanija*. In I. Ariamov (ed.), *Pedologija junosti*. Moscow.
- 5 Rubinstein, Moisej Matveevich (1878-1953). This and the following quote were probably taken from Rubinstein, M. M. and Ignat'ev, V. E. 1926: *Psikhologija, pedagogika i gijena junosti*. Moscow: Mir. Vygotsky recommended this book for further reading.

- 6 Refers to Spranger, E. 1927: *Psychologie des Jugendalters*. Jena: Fischer.
- 7 See p. 127 of Ch. Bühler (1929).
- 8 Sir Cyril Burt's version of the Binet-Simon test was adapted for Russian use by P. P. Blonsky.
- 9 Refers to p. 522 of Edinger, L. 1911: *Vorlesungen über den Bau der nervösen Zentralorgane der Menschen und der Tiere*. Leipzig: Quelle und Meyer.
- 10 This quote and the other reference to Blonsky were probably taken from Blonsky, P. P. 1925: *Pedologija*. Moscow: Rabotnik Prosveshchenija.
- 11 Refers to p. 17 of Bühler, K. 1918: *Die geistige Entwicklung des Kindes*. Jena: Fischer. Bühler mentions Pfister's findings.
- 12 Ibid., p. 15.
- 13 We have not been able to locate N. V. Vyazemsky's book.
- 14 Refers to pp. 338-9 of Ach, N. 1921: *Über die Begriffsbildung. Eine experimentelle Untersuchung*. Bamberg: C. C. Buchners Verlag.
- 15 Ibid., pp. 339-40. The reference is to Jaensch, E. R. 1923: *Über den Aufbau der Wahrnehmungswelt und ihre Struktur im Jugendalter*. Leipzig: Barth.
- 16 Refers to pp. 96-7 of Rimat, F. 1925: Intelligenzuntersuchungen anschliessend an die Ach'sche Suchmethode. *Untersuchungen zur Psychologie, Philosophie und Pädagogik*, 5, 1-116.
- 17 Refers to p. 139 of Usnadze, D. 1930: Die Begriffsbildung im vorschulpflichtigen Alter. *Zeitschrift für angewandte Psychologie*, 34, 138-212.
- 18 Ibid., p. 139.
- 19 Ibid., p. 140.
- 20 See chapter 6 of this reader.
- 21 The empirical results of the investigations carried out by Sakharov and (later) Kotelova and Pashkovskaya were never independently published and the present chapter is the most detailed description we have.
- 22 Refers to Müller, G. E. 1913: Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufes. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane. Ergänzungsband* 8. Leipzig: Barth.
- 23 Vygotsky suggests that this and the following quotes come from Thorndike, E. L. 1911/1965: *Animal Intelligence. Experimental Studies*. New York-London: Hafner Publishing Company. Unfortunately, these quotes cannot be found in that book, nor in several other books by Thorndike which we checked. Very similar ones, though, abound in several of Thorndike's books.
- 24 It is interesting to see that Vygotsky assumes some role for the concept of childhood egocentrism. In his preface to the Russian edition of two of Piaget's books he severely criticized the concept and its theoretical background in psychoanalysis. See Vygotsky, L. S. 1932: Foreword. In J. Piaget, *Rech i myslenie rebenka* (pp. 3-54). Moscow-Leningrad: Uchpedgiz.
- 25 See pp. 44-7 of Werner, H. 1933: *Einführung in die Entwicklungspsychologie*. Leipzig: Barth.
- 26 The term 'pseudoconcept' - as well as many other of the stages in concept formation and the names attached to it in this chapter - is not original with Vygotsky. The term is used by the Sterns ('Scheinbegriff' or 'Pseudobegriff') and the idea dates back to at least Ament. See Stern, C. and Stern, W. 1928/1981: *Die Kindersprache*. Darmstadt: Wissenschaftliche Buchgesellschaft.
- 27 We have been unable to establish the identity of this author.
- 28 Repeats the quote given earlier. See p. 140 of Usnadze (1930).

- 29 The terms 'concept in itself', 'concept for others' and 'concept for himself' were inspired by Vygotsky's reading of Hegel.
- 30 Refers to Engels' (1859/1964) review of Marx's 'Zur Kritik der politischen Ökonomie'. See p. 475 of *Marx Engels Werke*, vol. 13. Berlin: Dietz Verlag.
- 31 Refers to pp. 99–100 and 149 of Krueger, F. 1915: Über Entwicklungspsychologie, ihre sachliche und geschichtliche Notwendigkeit. In F. Krueger (ed.) *Arbeiten zur Entwicklungspsychologie*, vol. 1. Leipzig: Engelmann.
- 32 Refers to p. 218 of Gesell, A. 1932: *Pedologija rannogo vozrasta*. Moscow-Leningrad: Giz.
- 33 Idelberger's example and Werner's discussion of it can be found on pp. 245–6 of Werner, H. 1933: *Einführung in die Entwicklungstheorie* (2nd edn). Leipzig: Barth.
- 34 The 'well known example' dates back to an example given by Darwin and Romanes and was indeed frequently quoted in the 1920s. See, for example, p. 187 of Stern, C. and Stern, W. 1928/1981: *Die Kindersprache*. Darmstadt: Wissenschaftliche Buchgesellschaft.
- 35 See especially chapter 4 of Piaget, J. 1926: *La représentation du monde chez l'enfant*. Paris: Alcan.
- 36 Refers to pp. 77–8 of Lévy-Bruhl, L. 1922: *Les fonctions mentales dans les sociétés inférieures* (5th edn). Paris: Alcan.
- 37 See pp. 31–4 of Storch, A. 1922: *Das archaisch-primitive Erleben und Denken der Schizophrenen*. Berlin: Julius Springer.
- 38 *Ibid.*, pp. 8–9.
- 39 *Ibid.*, p. 9.
- 40 The lines are taken from two different papers by Thurnwald published in the journal *Antropos* in 1917/1918 and 1919/1920 respectively. Vygotsky is quoting them from p. 9 of Storch (1922).
- 41 Refers to Peterson, M. N. 1930: *Sintaksis russkogo jazyka*. Moscow: Bjuro Zaochnogo Obuchenija pri Pedfak 2-go MGU.
- 42 With 'objective reference' (*predmetnoe otnesenie*) Vygotsky indicates what is now technically called the 'extension' of a concept. The 'meaning' (*znaczenie*) of a word in Peterson's sense would now be called 'intension'.
- 43 The French and German words are 'tailleur' (from 'tailler') and 'Schneider' (from 'schneiden'), respectively.
- 44 We have been unable to identify this author.
- 45 In Russian the root of the word 'chernila' is connected with the word for black ['chernyj'].
- 46 Refers to Potebnya, A. A. 1922: *Mysl' i jazyk*. Odeassa: Gosudarstvennoe Izdatel'stvo Ukrainy.
- 47 See note 27.
- 48 Pogodin, A. L. (1872–1947), Russian historian, linguist and psychologist. Vygotsky apparently makes use of his 'Jazyk kak tvorcestvo' ['Language as creativity']. This information is taken from the first volume of Vygotsky's Collected Works where it is added: 'After 1919 he was an emigrant'. Until recently such lapidarian statements served to brand people as ideological enemies.
- 49 Refers to Goethe's words 'den nur beide zusammen, wie Aus- und Einatmen, machen das Leben der Wissenschaft'. See p. 56 of Morris, M. (ed.) (MDCXL) *Goethes sämtliche Werke. Bnd. 39. Schriften zur Naturwissenschaft 1*. Stuttgart-Berlin: Gotta'sche Buchhandlung Nachfolger.
- 50 Refers to pp. 196–7 of Groos, K. 1921: *Das Seelenleben des Kindes* (5th edn). Berlin: Verlag von Reuther & Reichard.

- 51 Although this text covers Groos' discussion very adequately, it doesn't seem to be a literal quote. See especially p. 202 of Groos (1921).
- 52 See p. 57 of Bühler, K. 1929: *Abriss der geistigen Entwicklung des Kindes* (4th and 5th enlarged edn). Leipzig: Quelle und Meyer.
- 53 Refers to p. 26 of Köhler, W. 1921: *Intelligenzprüfungen an Menschenaffen*. Berlin: Springer.
- 54 Refers to p. 204 of Groos (1921) where Messer's example is given. It was taken by Groos from Messer, A. 1900: *Kritische Untersuchungen über Denken, Sprechen und Sprachunterricht*. Berlin: Reuther & Reichard. The assumption is that it is unhealthy to drink (cold) water when one is hot.
- 55 'This type of primitive thinking', says Kretschmer, 'is also called *complex thinking* (Preuss), to the extent that complexes of images which merge and become blended into conglomerates do still represent the sharply demarcated and abstract concepts'. Accordingly, all writers agree that what they are seeing in this type of thinking is 'a first, imagistic stage of the concept' [original footnote]. The quotation is from p. 79 of Kretschmer, E. 1922/1950: *Medizinische Psychologie* (10th improved and enlarged edn). Stuttgart: G. Thieme Verlag.
- 56 Refers to Volkelt, H. 1912: *Über die Vorstellungen der Tiere. Ein Beitrag zur Entwicklungspsychologie*. Doctoral dissertation, Leipzig.
- 57 We have been unable to establish the identity of this psychologist.
- 58 Refers to p. 27 of Vogel, P. 1911: *Untersuchungen über die Denkbeziehungen in den Urteilen des Kindes*. Doctoral dissertation, Giessen.
- 59 Refers to pp. 260–70 of Bühler, K. (1918). See also pp. 135–45 of Bühler, K. (1929).
- 60 See pp. 264–5 of Bühler (1918), where he argues that concepts cannot be solely based on associations, but form and depend upon a comprehensive system of knowledge. Thus, the concept 'house' is not just the invariant part of all houses the child has seen, but forms part of an interconnected system of judgements. Children will, for example, often react to the word 'house' with the words 'they are big', that is, each concept leads to a number of judgements or propositions. Concepts, then, are embedded in a system of propositions. This is even more true in Bühler's view of scientific or academic concepts such as 'mammal'.
- 61 Ibid., p. 137.
- 62 Ibid., pp. 264–5. The examples in the preceding paragraph concerning the house and the tree can be found on p. 265.
- 63 Refers to p. 341 of Lindner, G. 1882: *Beobachtungen und Bemerkungen über die Entwicklung der Sprache des Kindes*. *Kosmos*, 6, 321–42.
- 64 Refers to Gesell, A. 1930: *Umstvennoe razvitie rebenka*. Moscow-Leningrad: Giz; or to Gesell, A. 1932: *Pedologija rannogo vozrasta*. Moscow-Leningrad: Giz.
- 65 Refers to p. 7 of Groos (1921).