ANTHROPOGENESIS
PREFACE

The present study on Anthropogenesis was written during the war, in 1944, when through the German occupation of Holland ordinary scientific work was greatly impeded.

Since the German Military Government had forbidden all publication in English and French, the Amsterdam Academy of Sciences decided that all its publications should be in Dutch. So the present study was written in Dutch, and published in that language immediately after the liberation, in the "Verhandelingen" of the Amsterdam Academy. In order to render its results accessible to international science, the English translation has been prepared.

All quotations are given in the text in their English form, and may be found in their original form at the end of the book.
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I. THE PROBLEM

1. The problem of the origin of man cannot be solved by experiment or observation. The appearance of man on earth is a fact of the past of which no report or witness could reach us. The factual data which we have at our disposal are comparisons of man of today with animals, supplemented by extremely rare, imperfect and damaged fragments of fossils of prehistoric man and remains of his stone implements. But they are silent with regard to the forces which have caused the evolution of animal to man.

Where direct empirical data are lacking and indirect ones are so few, a far stronger appeal than is needed in experimental science has to be made to the mental equipment of the scientist. Whereas in the case of plenty of empirical facts that can be increased at will, no more is necessary than arranging and combining them and from them deducing new problems and making new experiments, the scarcity of such facts causes theoretical discussion to play a more important part. What matters here is the logical combination of differing data, the seeking for connexion between what lies far apart, the making of conclusions, and the careful weighing of probabilities.

Here we meet with the difficulty — which cannot be solved but can only be pointed out — that most authors who have dealt with the origin of man, were specialised scholars who approached the problem from one of its many aspects. It may have been that of biology, or anatomy, or neurology, or that of prehistory or ethnology, or that of animal psychology, or linguistics, or philosophy. When, then, there was insufficient acquaintance with the other aspects of the problem, or with important aspects of human life, explanations could only be unsatisfactory. It is not a problem of biology: the biological laws which govern animal life, have with man largely receded into the background. It is not a problem of ethnology: the lowest races which ethnology has made known to us are already a
highly developed human species as compared with Early Man. It is not a problem of prehistorical archaeology or palaeontology, as only so very few hard, imperishable remains of what then lived could be preserved. It is not a problem of comparative psychology, which cannot remove or bridge the deep cleft existing between man and the nearest animals.

A fundamental difficulty is also that it is modern man who is compared with the animal; we use ourselves as the direct and best known object of comparison. This derives from the initial thought that man as such has not changed basically, and that man of the 19th or 20th century with all his habits, ways of thinking, and characteristics may be counted as the normal, natural human being. Consequently, for purposes of comparison, modern man, with his highly developed individualism is placed in comparison beside the animal, whereas original man was entirely a community being. Further for preference the scholar himself is taken for this purpose, who is an intellectual specialised in mental work, and chiefly concerned with abstractions, whereas man has always been first and foremost a practical being, working with his body and his hands. In this way the problem must inevitably present itself in a distorted form. What matters is not the origin of modern man; the development from primitive to modern man, however much of it still awaits research, is generally known as a gradual, natural and comprehensible evolution without any enigmatical breaks. The riddle is the origin of primitive man; the real problem is to understand the transition from animal to primitive man.

2. The problem of anthropogenesis has gone through various aspects. Originally the difference between man and animal was considered to be so fundamental, that each was counted as belonging to an entirely different world, without any relationship. This found its expression in the doctrine of the separate creation of man, gifted with reason and possessed of an immortal soul. As biology developed, the bodily similarity of man and animal became more apparent, and Linnaeus classified man in the animal kingdom as a normal species, *Homo sapiens*, belonging to the class of mammals and, with the apes, forming the order of Primates. Darwin's theory of man's descent from animal ancestors brought about a complete break with the traditional doctrine. A great number of biological studies since then have proved the essential similarity of man and animal as well as refuted any fundamental difference. This was most difficult in the field of mental powers; but in this respect too it has repeatedly been pointed out in Darwinistic publications that the animal also thinks and shows intelligence; that between the mind of animal and man there are no essential differences but only differences of degree, and that it is but a question of more or less.

Thus the problem of the origin of man disappeared, not so much as if it were solved but rather stripped of its character as a special problem, the case not differing from the origin of any animal species from another. Thus, however, the balance had swung too far the other way. There are essential and profound differences, which are not so absolute that they form an unbridgeable cleft separating two worlds, but are so large and so fundamental that one may speak of a difference of quality. Quantitative differences, if only they become large enough, grow into differences of quality. An analogon, a trace, a beginning of every specifically human characteristic is present in the animal world — by which it is rendered possible that by a natural development man could descend from the animal. However these traces had to grow into something entirely new and different, and this stamps anthropogenesis as a special scientific problem.

3. There are three main characteristics which differentiate between man and animal. Firstly there is abstract thinking. Although animals do show a certain measure of intelligence, and though mental processes do take place with them which have their seat in highly developed brains, the capacity for abstract thought is only found in man. This is the thinking in concepts which has elevated him to so high a level of theoretical knowledge and science. Secondly there is speech, there is the use of language. Although animals do produce sounds intended for mutual information, with man alone these sounds have significance as names, and thus are the basis of a high spiritual culture. Thirdly there is the use of tools made by himself. Even though
animals do make use of dead things from their natural surroundings as aids to their own support, with man this has become an habitual use of implements specially made for a purpose and according to a preconceived plan. These implements are the basis of an ever growing technique, and therefore of our entire material civilization. One would add as a fourth characteristic, from Aristotle's designation of man as a zoön politikon, that man lives in social connection. However important this characteristic may be, it does not differentiate man from all animals. Many other animal species live in groups, they form communities, and the characteristic has been inherited by man from the animal world. Similarly it is not permissible to cite the rapid evolution of man in contradistinction to the constancy of other species as a difference; this is not so much a characteristic itself but rather a quality of each of the aforementioned characteristics.

II. TOOLS

4. Franklin called man a tool-making animal. Tool-using would have expressed the same; if he wishes to use them, he has to make them himself, as they are not offered from elsewhere. However as a distinguishing characteristic with respect to the animals the making has to be emphasized, since natural objects are also used by animals. Thus branches and fibres are used for nest building, beavers use trees they have gnawed, and it is said that apes sometimes use sticks and stones. On the other hand the making of the tool signifies a preconceived, planned, appropriate change of natural objects, based on the previous knowledge of the effect.

The tool is taken in the hand and thus made into an appropriate aid in the struggle for life. Combined with the hand it has become a complete unit, a bodily organ, an active power. The hand, together with the tool it grasps, performs the same function which with the animal is performed by the bodily organs, viz. it executes such acts as are necessary towards life. Organon means tool; organs are the animals' tools, attached to their bodies; tools are man's organs, separated from his body. Instead of the manifold organs of the animals, each appropriate to its own separate function, the human hand acts as a universal organ; by grasping tools, which vary for different functions, the combination hand-tool replaces the various animal organs.

The presence of such a grasping organ, therefore, has been essential towards the originating of man. This was an inheritance from the ape-like, tree-inhabiting ancestors who needed strong and at the same time sensitive grasping organs for climbing and moving amongst branches. That is why a tool-using being, such as man, could only descend from ape-like forms. Admittedly, in quite another order of mammals, the elephant's trunk does act as a grasping organ, suitable to manifold purposes; but it cannot compete with the ape's hand for delicacy of structure and powers.

5. From the ape's hand the human hand has evolved to a higher level of perfection, necessary for the universal purpose of handling tools. Nowhere has this perfection of the human hand been described in more striking and enthusiastic words than in Charles Bell's work "The Hand, its mechanism and vital endowments as evincing design", published in 1837. This book was one of the so-called Bridgewater Treatises, a series published with the aim to show the greatness of the Creator in the perfection of His creatures. What mattered here, therefore, was to show the perfection of the hand's structure. First the possibilities of movement are described, defined by the structure of the bones and joints of arm and wrist, always explained by comparison with animal anatomy. Then the power is considered which, at the end of a long, flexible lever, is communicated to the hand by the muscles of chest and back. The position of the thumb, itself supported by a strong muscle, with regard to the fingers causes the firm grip which even from the first weeks of existence is capable of carrying the weight of the body, a question of life and death to treedwellers. Then there is the wealth of more than fifty muscles in the arm and the hand which have to co-operate in the simplest movement, and which in contracting and relaxing are kept under control by the will with extreme precision. At the same time the smaller minor muscles in the hand and fingers render possible an extremely delicately and quickly differentiated movement of the fingers. "... They are the organs which
“give the hand the power of spinning, weaving, engraving; and as they produce the quick motions of the musician’s fingers, they are called by the anatomists *fidicinales*” (p. 141) (i.e. music-makers).

To this must be added the delicate sense of touch for which the fingers, and even more the fingertips have been especially built. These latter are small elastic cushions, supported by shield-like, flat nails and provided with ribs built in the shape of spirals in which, under the epidermis, innumerable finely branched nerve ends almost reach the surface. This sense of touch is an important faculty of the human hand. “We find every organ of sense, with the exception of that of touch, more perfect in brutes than in man.... But in the sense of touch, seated in the hand, man claims the superiority” (p. 185).

This higher perfection in capacity of movement as well as in sense of touch, of the human hand as compared with that of the ape is harmonized by a greater development and differentiation of the nerves concerned. “The differentiation of the cellgroups innervating the fingers, is specially striking in man, even in comparison to the anthropoids” (Ariëns Kappers, p. 177).

The sense of touch is, first of all, a means towards the acquisition of knowledge, through investigation of the environment. But it extends further, “Bichat says that touch is active, whilst the other senses are passive.... We shall arrive at the truth by considering that in the use of the hand, there is a double sense exercised. In touch, we must not only feel the contact of the object; but we must be sensible to the muscular effort which is made to reach it, or to grasp it in the fingers. “It is in the exercise of this latter power that there is really any effort made” (Bell, p. 185—186). Indeed, the active muscular feeling is coupled with the passive feeling of touch in the taking and grasping of things. The organs intended for the passive observation of nature, the senses, have to be sensitive, soft, and impressionable, in order to register the smallest transmission of energy; the organs intended for action on nature, such as teeth, and claws, have to be hard, solid, capable of resistance, in order to transmit great energy; the hand with the tool possesses both characteristics at the same time. Bell does not mention the purpose of this grasping, as technique, the practical life of manual labour is outside his orbit and his interest. Yet it is clear that what is grasped is the tool. The holding, steering, and manipulating of tools is the purpose of the hand, and a refined sense of touch is necessary for their being correctly held, directed, and steered. The muscular feeling and effort are not concerned with the indifferent grasping of just anything, but with the working with tools. In the struggle for life, consisting in the finding of food and resisting of enemies, the handling of tools is a necessity.

6. The use of tools, apart from the hand being available as a grasping organ, is yet further conditioned, in the first place by a certain amount of mental development enabling man to foresee the action of his tool. An animal is not capable of that; “.... even extreme emergency never makes it inventive” (Geiger, p. 61). Even in the worst peril, or when it is starving, the animal does not achieve the use of an available tool or weapon, simply because it lacks the power to visualize what it might do with it. Even more does this apply to the making of tools, for which visualization is required of a future use of something not yet existing, i.e. conscious thought.

The use, and to an even greater degree the development of tools, is only possible in a community. The skill of handling and constructing tools is not congenital, but has to be acquired by the younger generation from the older. With isolated individuals every acquired skill would be lost with their death. A social community is, so to speak, immortal: while the older members die off the younger ones are growing up in it. The knowledge of the use and manufacture of tools in such groups is collective knowledge and a communal richness. The younger generation grows up in this knowledge because of the common practice of life, and each invention, each improvement is preserved and transmitted. This social life, an essential condition of the development of tools and, therefore, of anthropogenesis, is also an inheritance transmitted from the ancestors in the animal kingdom.

7. The tool, grasped and guided by the hand, has with man the same function as the bodily organ with animals, but it
performs it in a better manner. The superiority of the human tool as compared with the animal organ lies in the first place in its replaceability. It is a dead thing, and separate from the body. When it has lost its usefulness or has broken it is thrown away. The bodily organ, on the other hand, cannot be replaced, so that a broken leg usually dooms the wild animal. Indeed, it is not even necessary for the tool to become useless; it may be discarded as obsolete when one more suitable for a given job has been made.

Use of the same tool for various purposes causes its differentiation. Thus the original sharp stone which served all purposes grew into an ever increasing number of sharp stones such as the drill, the arrowhead, the knife, scratcher, saw, or axe, each the most suitable to its use. This process of increasing differentiation continues into the later stages of technical development and, manifest in every craft and industry, becomes the driving force in the great technical development of humanity.

Man, therefore, has not one tool available, but many. Every time he takes another tool in his hand the hand becomes a different organ. Man is an animal with interchangeable organs. According to the need of the moment, to the prey he seeks, to the enemy he faces, to the aim he wishes to achieve he takes a different tool. The animal, by its given special organs, is confined to one mode of life to which it is excellently adapted. Man adapts himself to various modes of life by changing his tools; by availing himself of a different organ he equals another animal. He can burrow like a mole, saw trees like a beaver, crush hard nuts like a squirrel, repel, like a buffalo, a beast of prey, and, as a beast of prey himself, kill and tear up his victim. Whereas every animal is limited to its own habitat, man is adapted to the most varying conditions of life: in the woods he takes the axe, and in the plains the spade. Thus was he able to spread over the whole earth.

The greatest superiority of the human tool over the animal organ lies in its perfectibility. For countless generations the animal has ever had to be content with the same organs, beautifully adapted to its environment. Man, however, outgrows such excellence, by constantly improving his organs, i.e. perfecting the tools. Use and application are conducive to constantly improved adaptation; the improved tool immediately replaces the obsolete one which is discarded, and itself becomes the starting-point of new improvements. Thus in the use of implements a continuous and cumulative development takes place, at first slow, then faster and faster. Roughly hewn, stones replace unfinished ones; then the transition is made to delicately worked stones used probably in conjunction with softer animal and vegetable material which has not been preserved, until at last metal was found to be the strongest and most plastic material. With these tools man was able to secure his domination of nature and his mastery over the earth is achieved, through ever more perfected soil, building houses and stables, hunting or taming animals, by husbandry and cattle-breeding he transforms the wild environment of nature to a safe environment of culture, and a solid basis of existence. Further, through the many crafts which are employed in making the most diverse objects of daily use by means of a great many different tools, an ever more complete mastery over the earth is achieved, through ever more perfected techniques.

Bell sang a hymn of praise to the human hand, as "the consummation of all perfection as an instrument" (p. 249). When enumerating the details of its "superiority" he limits himself to a few examples of the hand's capacity, such as "the provisions for holding, pulling, spinning, weaving, and constructing; properties which may be found in other animals, "but are combined in this more perfect instrument" (p. 249). If, owing to scholars specializing in mental and scientific effort, practical work with tools and the manual labour of the millions producing goods had not been entirely outside his orbit, and if consequently the hand's destination to hold and direct tools had been clear to him, how much deeper a note of world power his hymn of praise would have acquired and how it would have become a saga of mankind's growth to world dominion!

8. Life and the progress of mankind always depended on the tool's development. Weapons too belong to the tools. From the beginning tool and weapon were identical; in fighting beasts of prey and catching game the character of arms dominated. Later they became increasingly differentiated, though even
to-day the knife still bears the double character. Soon the artificial organs, in this form as weapons, began to play a part in men's mutual fight. In this way, world history became a history of wars; endless streams of blood have accompanied mankind's evolution. This was the first "progress" of man compared with the animal. Whereas with nearly all species of animal the struggle for life amongst their kind is no more than a competition as to which will survive in their opposition to the hostile forces of the surrounding world, with man this match has become a real fight, increasing to a battle of annihilation against his fellow man. Direct extermination of his kind as a mass form of the struggle for life only occurs with man. This is also a result of the use of tools, because provided with different, better weapons, he may count as a different species with superior organs. It means that in the evolution of mankind an even fiercer form of selection has been active than in the animal kingdom.

**III THINKING**

9. With the lower animals phenomena and behaviour are observed which imply feeling and sensiveness with regard to the influence of environment. Considering the higher animals we conclude from their actions that they have a certain consciousness, as they display behaviour which we consider to be the result of deliberation and a certain intellectual faculty. However in man alone occurs that form of intelligence which we call abstract thinking, thinking by means of conceptions.

What use is thinking? "The nature of reason is to regard "things not as simply existing but as necessary", Spinoza wrote in his thesis 44 of the second part of his Ethics. "Thinking is "conscious comparison of acquired perceptions, collecting what "is similar into conceptions", thus Helmholtz (p. 341). In his booklet "How we think", a manual on pedagogics explaining how to teach children to think in the right way, Dewey says: "Reflection involves .... a consecutive ordering (of ideas) in "such a way that each determines the next as its proper outcome" (p.2) "Thinking .... is defined as that operation in which present "facts suggest other facts (or truths) in such a way as to induce "belief in the latter upon the ground or warrant of the former" (p. 8). "Demand for the solution of a perplexity is the steadying "and guiding factor in the entire process of reflection" (p. 11). Here is spoken of the kind of thinking which is concerned with facts of the past and future, and which orientates itself in the world by means of the regularity of phenomena. Such thinking acts as an organ of science and philosophy, its immediate aim being to find the truth about the world. This, however, is already a more developed stage of thinking which, although playing an important part in later centuries, particularly with the "thinkers", theorists and scientists, was preceded by the simple thinking of primitive man. Even now for the great majority of men, and even for all of them for much of their life, thinking has an immediate, practical purpose. It does not put or answer the question: "What is truth?" but the question: "What am I to do?" "Perplexity" is too strong a word for the state of mind produced by these daily recurrent problems. Besides much automatic habitual action there is a constant reflection and consideration; it does not involve abstruse problems or seek for "truth", but is a comparison of various possibilities of action from which a choice has to be made. This work of thinking forms a constant essential part of the total effort of keeping alive.

If one wishes to compare human and animal intelligence, in order to learn to understand their interconnection and continuity, one should not take, as the human example, the most recent and highest forms of development, involving the theoretical thought of scholarship and philosophy, but rather the simplest practical thought of the common man of today, and of primitive man. This latter does exhibit the sundry characteristics of abstract thought, though as yet confined to the immediate problems of existence 1). Here lies the problem of anthropogenesis; further

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1) This is a principle of methodology which also applies to other fields of science where interconnexion is sought, notwithstanding fundamental differences or even contrasts of character. Thus it is with regard to the problem of unity and connexion between life and non-life or between consciousness and the unconscious life of the lower organisms. Should one in this case — as is often done — place in juxtaposition the most extreme stages of development and oppose the highest form of human thinking to the automatic reactions of infusoria, or a higher animal to the simple atomic structure of a mineral crystal, this would only lead to a state of perplexed dismay in which the cleft would be seen as unfathomable, as an
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development of the initial human mental activity to the modern level then becomes a series of gradual steps which do not offer any fundamental difficulties.

10. With man as with the animal, mental life starts from the sensation as the simplest element, the sensation being either corporeal, as with hunger and pain, or environmental, as with smell, sight, or hearing. These sensations are the stimuli to which the organism reacts by actions in a manner appropriate to life. The sensations combine into images: one sees an object, such as a fruit, or moving animal, or he hears something. In such an image a great number of successive impressions of colour and light, changing according to the examining movement of head and eyes, or a number of separate sounds rising in succession out of the surrounding noise, have been combined. This is possible because every impression, which does not truly exist but for one indivisible moment, does not disappear with it but continues to exist and fades only gradually. What is called, therefore, an image, an observation, or experience, is already an entire combination of many various impressions covering a certain period.

When over a combination of the same kind is repeated the earlier impressions are evoked as memories. Memory is the connecting together of earlier and later impressions, a relation tying past with present experience. When certain parts of a complex repeat themselves (e.g. a sensation of hunger, or impressions of the environment) the other parts of the image, which earlier were connected with it, are called up — in accordance with the principle of connection-reflexes 1) — so that they are completed and form the entire complex (e.g. food). It then effects the same appropriate reactions of movement, a

1) Pavlov uses this name as an alternative to "conditioned reflexes"

(20)

unbridgeable contrast, as an absolute difference of quality, where it is hopeless to search for scientific explanations. The way of science which looks for unity of the world, trying to find connexion and continuity, consists of the juxtaposition of different kinds of phenomena where they approach each other most nearly; in this case placing the dubious traces of life in virus matter with the chemistry of the highly complicated protein molecules. Here only there is a possibility of building a bridge by scientific research, or of establishing a connexion between life and non-life.

1) In German: Bewuβtsein = bewusstes Sein.

(21)

certain behaviour, the search for, or the taking of food. The increasingly definite stimulation of such behaviour by preceding sensations is of the greatest importance in the struggle for life, and is succinctly called "learning by experience".

From similar observations often repeated and analogous experience complexes, the image created by memory rises up again and again. Such images are not exact reproductions; they are more vague than the observations and experiences themselves. They are a kind of average in which that which is common has remained and the differences have been wiped out. In the struggle for life, what is of importance is not that which happened only once but that which may be expected normally, i.e. the recurrent common element in occurrences. This is, therefore, what is grasped by the imagination, what remains in the perception, and what determines expectation.

These perceptions which render present what has been in the past, form consciousness. Consciousness is conscious being 1), knowledge of being, the most immediate and surest fact of experience. It is said that as to our fellow men we conclude from their actions that with them the same kind of consciousness exists as we experience ourselves. In reality the consciousness of our fellow-men and our own are equally a matter of direct, instinctive certainty to us, a basic fact, already present before we arrive at such conclusions, and is entirely independent of them. With the higher animals we similarly conclude consciousness from their appropriate actions and, even more so, from their active attention towards what approaches them as sensations; but here there is only partial similarity. We lack, of course, a clear idea of their perceptions and their consciousness, since we only know our own and have to take this as a model for others. We try to approach it by assuming that their consciousness is inferior in comprehension as well as in clarity, by comparing it with a state of passive dimness of mind in man which remains as a background when clear-cut conscious thought is lacking. It has been remarked that, if we do not know anything about the consciousness of animals with certainty, it is of no consequence as it is only their reactions and behaviour which are of impor-
tance as the only observable psychical phenomena; an accompanying “consciousness” in this connection is just as irrelevant as the light by which we learn the time from the clock is irrelevant to the time-piece. This may be true, but it omits that “consciousness” here is the name of a conception within which a great complex of acts of behaviour are appropriately combined. The same, moreover, would apply equally to man, in whom consciousness as a psychic phenomenon is certainly present.

II. What difference there is between man and animal must appear in the visible psychic phenomena. With the higher animals we observe that the sensations are immediately connected with the actions and provoke them. The images of observation which blend with the memory of former sensations into a whole of perception, are connected directly with the practical reactions, forming a consecutive chain. Such a chain may be: sensation of hunger, scent and sight of plants, grazing, satiety; or in a more complex form with beasts of prey: scent or sight of prey, following of tracks, stalking, watching, attacking. That is how they maintain themselves in their natural habitat. The observations and perceptions form the introduction to the appropriate action and find their conclusion in it. With man, however, a separation takes place; the chain is broken. Perception and action are no longer consecutive, mutually supplementary parts of a developing complex but are apparently independent. Impressions, observations, and images influence him, but no action or reaction follows. Perceptions are formed but remain unused; they are laid up with the store already available; and new ones are repeatedly added and increase it. The actions of man are not immediate reactions to his last impressions; they appear to be autonomous creations, spontaneously produced at any moment from the total store of available perceptions.

This difference has further consequences. When — in animals — observation and perception find their conclusion in the action, their aim has been achieved, and they may disappear into the depths, as material only for a later memory. If — with man — no action follows, the perceptions, unused, are left to themselves. The vision of a fruit is not conducive to the picking of it; but the chain of perceptions of picking, eating, satiety is still formed.

The series continues to the end, but this end remains so to speak floating in the air without anything on which to fix. In the series of consecutive perceptions each preceding one evokes the succeeding one, but in the opposite direction each succeeding one evokes its predecessor. The series rebounds, one might say, from its freely floating end and may be run through several times. These series themselves become sensations and objects of observation. It is here that what is called thinking, takes place in a higher degree — indeed it is called re-flection — than in the simple presence of perceptions\(^1\). Here perceptions of perceptions appear, which denote a higher degree of consciousness, a knowledge of knowledge, self-consciousness. The perception, a product of preceding experience, becomes a perception of a future occurrence; as an unfinished perception it is a foreseeing of later action.

With man too, life is maintaining oneself as a part of the whole of nature by an interchange of matter and energy with that whole. With man too, action in the last resort is, roughly, determined by the sum-total of sensations, images, and perceptions; thought is an auxiliary to practical action. But there is no longer the simple direct way from the impression on the senses to the action; in its stead the stored-up perceptions form a network of diverging and converging ways, and from this store the inducement to later action is taken. Between sensation and action many links are inserted; various chains of linked-up perceptions form themselves spontaneously, each preceding one evoking the next one. In the process of conscious thinking they are connected into orderly series.

This means that from observation to action thought follows a detour. Linked up with the observation of the fruit are not the perception and the deed of actual eating and satiety, but other, more distantly connected perceptions, such as the change of seasons, a former shortage, the thought of planting and sowing, and the prospect of a future new harvest. Or again, with the detection of a bear or wolf, perceptions of other

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\(^1\) Pavlov mentions as Sechenov's, the Russian physiologist's, opinion: “Thoughts he regarded as reflexes in which the effector was inhibited” (Pavlov p. 5).
connected experiences link up, such as the fetching or preparing of a weapon, the lurking in wait, and the setting of a trap. The detour in thought corresponds to a detour of the action itself. Between the bodily need originally felt and the later deed of satisfying oneself, a series of actions inserts itself which only indirectly leads to the aim. They are preceded by a series of perceptions which consecutively indicate the way as an imagined whole before it is actually taken. In the later development of mankind these detours become wider and wider and more complicated as society becomes more complex.

Moreover, there is not one detour; there are many. According to the greater wealth of modes of life the action can take different ways. For this it is necessary that each series of possible actions exists beforehand as a series of perceptions; it is then possible to compare them and to make a choice. This weighing of the one against the other and this choosing of ways comes to the surface of consciousness as free will. Thought acquires the character of independent activity; the perceptions are not allowed any more to link up passively in producing each other; each one is called up and held attentively and deliberately fitted to the others, until the result of each consecutive action can be foreseen and the series has been carefully built up in all its links.

12. The process of thinking consists of the interconnexion of the perceptions. What at first was an automatic linking up is now a travelling up and down the series of connexion and as such a conscious process. Thoughts are not independent entities, not “Wesenheiten”, but connexion and interrelations. They are not a being but a process of movement, of a continuous linking up and connecting. “Thinking is dynamical, thought is association” (Piéron, p. 28). Moreover, as we have already seen, the perceptions between which they form the relation, are not simple, static things either; each perception is an expansive structure of countless connexions between a number of dissimilar and non-simultaneous sensations. At the simplest thought, at the even simpler perception, e.g. of a fruit, consciousness darts rapidly over the most different remembered images of an earlier and a later date, visual impressions of colour and form, gustatory impressions of appetite and satiety, experiences and desires, the one perception activating and provoking many others; it jumps from one image to another quite different one, each framed by and compared with others; it shoots through the whole world of the mind, hither and thither as the images flash up. Many pages would be needed to describe in detail what darts through the mind with one single thought.

Sensations come flowing into us in a continuous stream. By an automatic process acquired through learning and experience some of them are incorporated and organized into the existing store of images, so as to form an ever increasing wealth filling the consciousness. Others remain unnoticed, sinking away into subconsciousness, and heaping up in the dark depths, gradually smoothing out and amalgamating. They are always present as the basis of one’s personal attitude towards life, determining his instinctive actions — until perhaps a new strong impression or a practical necessity suddenly calls them up, in the form of spontaneous deeds or intuitive judgments, into the daylight of consciousness, and they become conscious perceptions. In the process of thinking the perceptions are arranged, the related elements being assembled and fixed in concepts, and their relations and interconnexion laid down and expressed in rules.

The separation of perception and action brings about what we call autonomy of thought. From the mental stock of collected impressions and perceptions consecutive chains are built up, apparently spontaneously, starting from themselves, without external cause. They are, of course, not without cause; there always is some impulse or occasion which forms the beginning, but it may be so imperceptible that it is not recognized. All these chains of thoughts then form a personal spiritual life which is the source from which all conscious actions spring.

This separation is also the separation between theory and practice, theory becoming independent of practice. Theory is the independent weaving of chains of thoughts into conclusions applicable to practical actions. The observations are the material, and the theoretical rules form the result. The observations become proof and argument, consciously advanced, of the rule, — e.g. ever again after the cold of winter spring came with its growth of plants and animals. From that the rule was built up
as a summary and an expectation: the seasons follow each other in regular rotation. Observation and rule together form knowledge and science. The rules express what happens normally and what, therefore, may be expected, not being concerned with secondary and momentary occurrences but with their general being. They do not speak of the concrete fact, but of the abstract concept: winter is followed by spring. In any particular practical application, a given case is identified with the abstraction: after this winter another spring will come. By applying the rule to each separate case future action is determined.

13. In the abstract conception the general or common factor of a group of phenomena is expressed; the mind is the organ of the generality. “Through thinking things we make them into something general” (Hegel). The endless multiplicity of the phenomena we cannot retain; the mind selects what is permanent and common in it, holds on to it, and abstracts from what is peculiar and different. What is common and lasting is essential for life; it forms itself into a rule and is condensed into a conception. Each succeeding experience recognized as similar is inserted into this structure, or is arranged under the existing rule; by being acknowledged as a special case of the conception or rule already known, each is incorporated and classified, so that the well-known conclusions apply directly to it. Frequently, too, of course, cases of wrong application occur, when there is error by supposed but mistaken insertion, leading to an incorrect conclusion and inappropriate action, which in turn lead to a change in the conceptions, and to transformation and improvement of the rules, i.e. to the development of science.

The abstract character of thinking in conceptions which characterizes man lies not so much in their generality but chiefly in their independence. The former does, in a sense, hold for the animals too, but not the latter. As with man, so with animals images of memory or perceptions exist as the common factor of previous experience, and, similarly, not in the form of precise details of each case, but rather as a smoothed average. In the animal, however, the progression remains an unseparated whole from impression to action, and is not dissolved into its elements. In human thinking these elements acquire independence owing to their being sharply determined as conceptions. As a conception the image is defined, separated from others, and maintained as an independent entity. Thus they are all separately manageable, and as separate links may be arranged, through short causal relations, into series of thoughts in various ways, until in forethought the most effective structure has been obtained.

The animal, too, in its behaviour often follows the indirect way. We speak of cunning with some beasts of prey; but here the detour, involving stealing, hiding, spying, has become a fixed habit, imprinted by the struggle for life. The animal also can make a certain choice, with regard to the moment and the place of attack. But this choice is limited within narrow margins owing to the limitation of the bodily organs, which impose certain habits of life. These special characteristics of human mental life are, therefore, also present in small traces in the animal. Man, again, has not got them in an unlimited degree, and he too is tied in his choice to the technical possibilities. These, however, owing to their continual development, create more and more varied forms of living, with the fulfilment of ever wider possibilities of life, which render possible an ever richer multiplicity of causal relations. Thus the spiritual world of conceptions grows. In the abstract conception as a substantial mental element lies the most special characteristic which distinguishes human thinking from that of the animal.

IV. BRAINS

14. Among the special characteristics distinguishing man from the animal the brains have not been mentioned. This may seem strange as man’s superiority above the animal has to be attributed to his brain. The brains are the organ of the intellect, of the mind, and it is this which as the real basis, as the final factor determines man as the crown of creation, and master of the earth. The apparent contradiction is due to the fact that the difference between the brains of the higher animals and those of man appears as a quantitative one only, and that we cannot indicate a manifest qualitative difference.

The quantitative difference consists in the much higher weight
of the human brain (at an average of 1300—1400 grammes) as compared with that of the most highly developed animals, the anthropoids (400—500 grammes). Of course the mere weight of the brain cannot provide a sound criterion for the mental level, as this also depends on the bodysize. Dubois has shown that with closely related animals of different size the brain-weight changes in proportion to the 5/9th power of the body-weight, almost as the body-surface. By eliminating in this way the influence of the body-weight and by reducing all animals to the same body-weight, a factor known as the degree of "cephalization" remains, which can serve as a measure for the level of development of the brains. Thus Dubois found that, when comparing different animal species, the degree of cephalization for related species always differs by the factor 2. He could explain it by assuming that with the development of a lower animal into a higher a mutation takes place in which all braincells split in two, and thus double their number. Reduced to a body-weight of 100 kilogrammes the brain-weight for anthropoids would be 450, whilst that for man would be 1650, which is nearly four times as much.

It has been possible subsequently to show from a greater mass of data (R. Brummelkamp, Brainweight and Bodysize) that the real rate of increase is not 2 but \( \sqrt[5]{2} \), so that two small leaps take the place of Dubois' one leap. In order to explain this a more complicated sequence of processes has to be assumed. Generally speaking, what has been observed of the mental life of animals agrees rather well with the cephalization found, so that the further one descends in the orders of the mammals, the lower the cephalization (lunugoo 306, lemur 183, wolf and fox 240, cat and lion 200, panther 429, bear 320, elephant 730, horse and ass 270, hippopotamus 120, hare and rabbit 110, mouse and rat 50, mole 47, anteater 170, armadillo 53, all these figures representing grammes reduced to a body-weight of 100 kilogrammes). But there are also strange values amongst them: seal 630, sealion 870, dolphin 1070, which would place such animals well above the anthropoids — a thing one would not, notwithstanding their cunning, deduce from their behaviour. Although no satisfactory explanation of this has as yet been given, we may yet say that the cephalization theory for the first time allows us to express in precise figures the superiority of the human brains as compared with those of the animals.

15. The structure of the brain, of course, is likely to show this too. In very low classes of animals, nervecells are already present, and these, owing to their remarkable length, serve to conduct the stimuli quickly from the one part of the body to the other, where the appropriate movement of reaction has to be carried out. With higher classes of animals centres are formed to which the stimuli received by the various sensory nerves are carried and where they are collected so that the movement necessitated by the collective result is despatched thence to the organs of movement by the motor nerves. With the vertebrates the brain forms the central organ serving this purpose. Here on top of the older, primitive systems new ones have been built so that a structure has come into being, so to speak, in storeys, (une organisation à étages, Piéron, p. 8). "The nerve centers of "the brain, spinal chord, and sympathetic ganglia scattered throughout the body are arranged in 'levels' or hierarchies, each "higher level controlling those below it" (Judson Herrick, 24, p. 119). The lowest stage with the mammals and, therefore, with man too, is formed by the autonomous nervous system, a delicate network permeating all the internal organs, blood vessels, muscles, tissues and glands, controlling and regulating their activity, without any of it coming to the surface of consciousness. Through the nerve-bundles of the spinal cord it is connected to the brains, the central organ which keeps all life processes balanced in harmonious co-operation, receiving all outside stimuli from the senses, and setting the muscles in motion. Their oldest part, the oblongata and thalamus (brainstem), the cerebellum and olfactory centre, whilst forming the chief mass in the lowest vertebrates, the fishes and amphibians, comprise with the mammals less than half. This story is considered firstly to be the seat of the simplest sensations, such as pleasure and grief, pain and emotion, and secondly to perform the delicate regulation, the keeping in good order of the bodily functions, and the balancing in every movement, all usually being outside consciousness.

Superior to these are the new brains which cover the former,
like a mantle (pallium). These are barely existent with fishes, and are small with reptiles, becoming increasingly developed in the series of mammals, and with man forming the main part of the brains. They consist of a white nucleus surrounded by a gray cortex. With man this cortex consists of a gray layer of intertwined single nerve cells, which has an average thickness of 4 mm (0.16 in) with a total surface of about 1100 cm² (169 sq. in) and is folded up in a great many folds in the small space within the skull (internal surface about 700 cm² or 110 sq. in) like a piece of paper crumpled up in one's fist. The thickness of the cortex in the series of mammals is not systematically different and the surface increases equally with the cephalization. So with man it is four times as large as with an anthropoid of the same size; the external surface shows a much greater number of folds and much deeper ones, so that the external appearance gives the impression of a more complicated and, hence, higher organization. Within lies the white brain mass, the marrow-coverings of countless nerve fibres, which are thus separated from each other like insulated wires, and which connect the various parts of the cortex with each other and with the lower centres, the thalamus and the cerebellum. The cortex is the supreme organ which in the last resort dominates all the lower ones; here, via the lower centres, the stimuli of the senses converge, and are combined and integrated — as far as the lower centres have not already been able sufficiently to cope with them — and the result is conducted through the motor nerves to the organs of motion. The cortex is the organ of the deliberate body movements, that is to say, of conscious acting. These processes in the cortex are mostly accompanied by consciousness; they form the material background of mental life.

The structure in storeys appears to be the result of an evolutionary process in the animal world. The primitive mechanisms at higher stages of development have not been substituted by better ones; they remain in use, but on the top of them the more complicated mechanisms are formed as higher resorts, dealing with the more complicated cases of a richer life, which are beyond the control of the original ones. While the external influences reach the cortex via the lower centres and the motor impulses travel via the same paths in the opposite direction, the central regulation of all actions in life rests on a co-operation in which the cortex chooses and decides on the execution or arresting of any action. "The thalamus supplies the emotional "coloring, the agreeable or disagreeable quality, and the simple "impulsive drives; the cortex supplies the intelligent guidance "and rational control" (Judson Herrick, 24, p. 118).

The cortex consists of a dense network of about 9000 million nerve-cells (neurons). From each nerve-cell emerge firstly a number of nerve-threads (dendrites), which at their ends branch out like trees and receive and conduct the stimuli, and secondly a single, sometimes very long, efferent nerve-thread (neurite or axon), similarly split up at the end into fine branches, which abducts the stimuli and nestles against another cell (nervendrite, muscle- or organ-cell). Thus external stimuli (e.g. light falling on a nerve end in the retina, or touch affecting a nerve in the finger-tip) are conveyed to the successive nerve cells which collect them, combine and conduct their action, until via more or fewer intermediate stations they reach the cortex. The same obtains conversely, from the cerebral cortex to the muscles. Originally, there was within the cortex a layer of small nerve-cells (so-called granular cells) below an outer layer of nerve-fibres coming from elsewhere. These granular, or sensorial, cells receive the stimulus and pass it on via short axons to the next layer. This deeper layer of the cortex consists of larger nerve-cells (so-called pyramid cells), the motor cells conveying the motor-stimulus via axons, often very long, to the more deeply situated centres, and in this manner to the muscles. When fully developed, in human brains, there are usually two, and sometimes more of these alternative layers; instead of these simple up and down connections they form an innumerable mass of cross-connections linking together all parts of the cortex. The number of possible connections between 9000 million cells is so immensely large and totally beyond the powers of our imagination, that it can be regarded as being practically infinite. A single two by two connection already results in trillions of possibilities. Thus the total amount of possible connections can offer an adequate directive mechanism for the most complicated relations of life and a sufficient material basis for the most abundant and varied spiritual life. "The known complexity of
“the brain, and especially of the cerebral cortex, is adequate "for any theoretic explanation of cerebral function whatsoever. "There is no dearth of mechanism”. (Judson Herrick, 23, p. 21).

16. The investigation of the whole structure of connections, and the laborious determining of the functions of each of the parts, in their relation to sensations, consciousness and thought, the subject of neurology, is the discovery and disclosure of a new and wellnigh unlimited world. Thereby it appeared that certain areas of the cerebral cortex perform specific functions. The impressions of light on the eyes are conducted by the optic nerves to the optic thalamus, and thence to the occipital lobes of the cortex, the organ of visual perception. The lobes lying against the left and right temples constitute the organ of hearing. Above them, in the side lobes between forehead and occiput, are the centres for the stimuli emanating from the whole body, the skin and muscles, for general bodily sensation; separate detailed sensory areas for the separate limbs, situated side by side can be distinguished here. In front of these and against the frontal lobes the motor centres are situated; these consist of large pyramid cells of which the stimuli control the motion of the various parts of the body.

Now and again one encounters the opinion, and especially in popular writings, that the specification goes still deeper, down to cell-groups and separate cells, and that these are the carriers of images, perceptions and conceptions. Thus Rohracher (p. 60) states that “there seem to be special memory cells”, and he speaks of a “reading centre” (p. 66) in which in the case of civilised persons the letters are fixed. However, he is not quite certain as to the consequences: are there cells particularly intended for combinations of conceptions, such as the quantum theory or housekeeping-money? Larger parts than simple cell-groups may be had in view by W. Hanna Thomson where he writes: “..in a small patch of gray matter not larger than a "hazel nut .... is stored every word that can be spoken" (p. 94), and further on: “We think in words, and for that purpose "we register our word memories in their laboriously prepared "brain places" (p. 190). In another sentence, however, he compares "those speech areas to the shelves of a library with words arranged thereon like so many volumes" (p. 96). Conversely, Piéron states that "it is a childish idea to imagine that "the nerves constitute a warehouse in which little pictures, "photographic images of events which have effected the "sensation, can be stored" (I.c. p. 241). In actual fact the brain cells in the various cortex-areas are identical, composed of the same protoplasmic structure with similar nuclei. Their different functions are determined by their different connections. Mental processes are not distinguished in being borne by particular cells, but in having particular connections. In the same way that ideas are not entities but relations, the material substratum of thought is not the biological and chemical contents of the brain cells, but the structure of their relations, i.e. their connections. One may draw the analogy of a railway traffic apparatus the essence of which does not consist of the structure of wellnigh similar stations, but of the structure of the network of rail connections, and can be recognized by it. There are no special cells or groups of cells in the occipital lobe, in which the correlate of certain letters has been fixed. The visual image of one single letter stimulates many hundreds of thousands of the more than a hundred million cones and rods of the retina. Each of these undergoes changes of light, darkness, and colour during the rapid and involuntary movements of the eyeball and the head, and cause an unlimited whole of nerve-cells and nerve-fibres of the inward and outward tracks to come into action. The correlation of all these processes, determined by the structure of the connections, is projected outwards as the visual image recognised as such.

17. The conveying of the stimulus from one nerve-cell to another takes place in such a way that these cells are charged, as it were, or are under tension, and then are discharged, the tension being released, by the stimulus at the sensitive surface, whereby the potential energy (obtained from the chemical energy of food) is released and becomes available for conveying the message to the next nerve cell. Thus the nervous emotion progresses as a current. "The signal is a brief local depolarization "of the electrically polarized surface-layer of the nerve-thread, "and the signal involves freeing of energy and development of
“a temporary electrical leak which will travel along the fibre
for over the nerve net. By repolarization in the wake of the
signal the transmitting surface is repaired and made ready for
a second signal. . . . These junctional points are often con-
vergence points for several lines from several directions. Arrived
there signals convergent from several lines may coalesce and
may reinforce each other’s exciting power. At such points too
appears a process which, instead of exciting, quells and
precludes excitation. This inhibition, like its opposite process,
excitation, does not travel. It is evoked, however, by travelling
“signals not distinguishable from those which call forth ex-
citement. . . . These two opposed processes, excitation and
inhibition, co-operate at nodal point after nodal point in the
nerve circuits. Their joint operation at any moment settles
what will be the conduction pattern, and so the motor outcome,
of the signalling going forward in the brain.” (Sherrington,
p. 11—13).
The transmission of the nervous current often works as a
relay, whereby a very feeble electric current opens the track
for a stronger current. Each consecutive step in the connected
track increases the available energy. Therefore the cerebral
cortex does not only act as a switchboard with millions of fuses,
but also as an amplifying apparatus through which almost
imperceptible energy impulses coming from outside or from
within the body are increased to great effects. “The whole
“cortical apparatus is wound up and set on a trigger so that
“its latent reserves of motor power and memory patterns may
“be released by the slightest impulse set in motion by some
“external event or some change in the interior of the body.”
(Judson Herrick, 24, p. 122). Herrick quotes the example of a
man on a ship. When this man sees a faint spot of light in the
distance (effecting perhaps only a millionth of an erg on to the
retina) the whole of his brain apparatus comes into action and
thereby the muscle apparatus of his body is set in efficient
motion. This can even cause the great engines of the ship
to function.

During each small fraction of a second the loading and un-
loading continually flashes through the innumerable nerve
fibres, and the currents from the nervous reactions pass through
the conduction tracks, now halted, then amplified, flowing
together or spreading out. It has previously been pointed out
that the extent of the simplest thought would require many
pages to be described. It can be added now that each line of this
description signifies an immense quantity of brain processes
and of specifically determined stimuli currents flowing via
tracks consisting of millions of neurons. So the connection
of mental life and brains surely cannot be described by way of
these processes, but should be sought in the correlation between
the structure of perceptions, conceptions and ideas, and the
structure of the network of the nerve connections. Conscious-
ness itself of course cannot be deduced from the structure and
the processes of the brains.

The brains however do more. The impressions and the stimuli
are not only transmitted and amplified, but are also collected
and stored. The brains are the archives of the entire life-history of the
individual, fixing all past experiences in structural formations.

“This organ is a marvellous registration apparatus. Often a single
“stimulus is sufficient to produce a lasting impression” (G. Bohn,
p. 328). Surely man must manage with the nine milliard neurons
with which he was born, as no new neurons are ever added.
Those which he has, however, develop in a greater or lesser
degree throughout his life. “The extension, the growth and the
“multiplication of the appendices of the neurons, for that matter,
“do not stop at birth, but continue after birth. . . . Excercise no
“doubt is not foreign to these modifications, which probably
“with cultured man are more marked in certain spheres. The
“absence of exercise, on the contrary, must bring about, during
“the period of growth and even at an adult age, in the inactive
“spheres of an educated person as well as in the brain of
“uneducated man these phenomena of resorption. . . . which here
“betray themselves by forgetfulness.” (Ramon y Cajal, p. 188).
Certain connections developed in correlation with habits of life;
in consequence of a more intensive use a larger quantity of
branchings and a greater wealth of connections correspond to a
greater plasticity in behaviour. “The newly created cellular
“expansions do not proceed by chance; they must orientate
“themselves according to the dominating nerve currents, or
“again in the direction of the intercellular association, which
“is the object of the reiterated requests of the will” (ib. p. 189). The nerve-cells themselves also migrate in the direction towards the stimuli entering them (Ariëns Kappers, on neurobiotaxis, passim). Although not all the details are known of the mechanism causing new connections to be made and existing ones to be facilitated or strengthened, it is a fact that it does take place. This then is the basis for learning, for the constant acquiring of fresh knowledge, and also for the spontaneous memory processes, for the later reproduction of the images, and for the formation of conceptions. Since the brains are a plastic organ in which the billions of possible connections and intertwinings of nerve fibres are selected, effected, established and determined by the influences of life, all experiences gained in life can be fixed therein, and thus conduct further on the reactions and determine behaviour. The higher degree of cephalization of the higher mammals, compared with that of the lower ones, signifies a greater wealth of intercortical connections, and therefore more possibilities of reacting differently with regard to the more complicated conditions of life, as well as a greater capacity for learning, in short a greater intelligence.

18. Similarly the cerebral cortex functions with man. Here, however, when compared with the most highly developed animals, a qualitative difference of consciousness becomes apparent, in the form of the autonomy of abstract reasoning, which as the supreme instance controls the mental processes, and thereby the bodily actions. Is there also an organ in the brains corresponding to it, controlling the working of the rest of the cortex in the same manner?

From the earliest times it has been assumed, that the seat of human intelligence was in the forehead. A high forehead was taken to be a sign of a high spiritual level; the more sloping forehead of the lower and less intelligent races was accepted as an indication of an inferior development of the frontal brains, and the difference is still more pronounced in apes. This opinion is expressed in a more scientific form by leading neurologists. Thus Bianchi states: “I hold that abstract thought must of necessity require particular organs and those I find in the ‘frontal brain.’” (p. 70). And further on: “The associative paths

“that unite the sensory cortex with the frontal lobes have a ‘twofold office: first, that of informing the higher consciousness of the modifications of the kinaesthesia and of all the new percepts acquired by the personality by means of the sensory centres; second, that of permitting the higher consciousness to select and recall those images registered in the sensory cortex that, in the vicissitudes of mental and physical life, are reputed necessary for the purposes of the struggle for existence and for higher reasoning . . .” (p. 208). Likewise Tilney says: “The frontal lobe . . . is now credited with such functions as those connected with the regulation of the higher faculties of the mind, the development of personality, the formation of all the associational memories which . . . bespeak the degree of intellectual development.” (p. 789). Correspondingly, from ape-like and from primitive to later man this part of the brains has developed most of all. “Traced through all their intermediate steps upward it is exactly these pre-frontal and frontal regions which manifest the most conspicuous development.” (ib. p. 935).

It is a curious thing, however, that the contention which regards the frontal brains as being the special organ of human intelligence, has not been explicitly supported by neurological research. In cases of disease, when certain other parts of the cortex were destroyed, the capacities of intelligence were lost. The removal of the frontal lobe of apes, on the other hand, produced no change in the effective connection of all actions; what did disappear was the active attentiveness, the careful investigating curiosity, the cunning shining of the eyes, and the control of impulses. Thus Bianchi, on account of these experiments, indicated the frontal lobes as the organ of attention. Goltz had previously stated that intelligence had no more to do with the frontal lobe than is contained in its association with other parts of the brain. Munk put it in this way that intelligence has its seat everywhere in the cerebral cortex and not in any particular part (cf. Bianchi, p. 74—77). Flechsig also held this opinion. He describes how there are certain cortex areas between and besides those for sight, hearing, and general sensations of the body, and that nerve-threads coming from all the surrounding areas meet here, intertwine, and in this manner interconnect those areas. “There are . . . extended areas of the
“cortex whose purpose is essentially to associate the state of
“excitation of the different sensorial spheres” (p. 60). And on
the same subject Judson Herrick says: “The enormous increase
“in the size of the human cortex is chiefly in the association
“fields. Here, then, is to be sought the structural organization
“upon which depend human culture and the progress of civil-
“ization. The feature which most distinguishes these associational
“fields from the rest of the cortex is their greater wealth of
“strictly intercortical associational connections.” (23, p. 265).
Hence, he continues, the much larger wealth of structures in
which previous forms of reaction are fixed and are at hand for
assimilation into ever new combinations: which is capacity for
learning. Hence, further the greater dynamic effect of the stored
tension in the neurons, which is now placed under a deliberate
control of spontaneous thought.

Flechsig considers the function of the large association centre
situated behind the side lobes to be “the forming and collecting
“of perceptions of exterior objects and of sound images, the
“connecting of the one with the other, hence the actual positive
“knowledge, and not less the fantastic activity of imagination.....
“briefly the essential contents of what language denotes as
“intelligence (“Geist”)” (L.c. p. 62). Regarding the frontal lobes
themselves, he says: “It seems to be a fact that positive know-
“ledge does not suffer directly when the frontal lobe is
“destroyed — what does suffer is the adequate use of it, in that
“eventually a complete lack of interest..... asserts itself”
(ib. p. 63).

The growth of the frontal brains from the lower mammals to
the apes corresponds to an increasingly active attentiveness in
all their actions. This is most striking already now and again
with dogs; but “in dogs the frontal lobe has not assumed control
“of the mental life, which revolves mostly in the sensory cortex”
(Bianchi, p. 80). In the case of apes who, just as man, through
the concerted action of their eyes are enabled to see stereoo-
pically and thereby to distinguish position in space, this
results in a much more constant control of actions. The develop-
cement culminates in human thinking which is a process of
uninterrupted intensive attention. “Consciousness is active
“attentiveness over a passive course of perceptions” (Clay, p. 22).

It wellnigh follows, therefore, that the mental processes of
linking together and ordering the series of perceptions in a
designed sequence, of surveying them up- and downward and
automatically commencing or terminating them, and organizing
them into conceptions, must link up with the processes of active
attentiveness, and thus have their organ in the frontal brains.
It should also be noted that what Flechsig calls positive know-
ledge, the combining of different sorts of sensations into images
and perceptions, is not the essential and special property of
the human mind. Such a body of facts is also possessed by higher
animals, though they do not have it in our form of conscious
knowing. One can call this “intelligence”, but it must then be
distinguished from “reason”, the capacity of forming free and
abstract conceptions, which as the organ of theory is character-
istic of the human mind.

One might therefore expect that the human frontal brains
would show a stronger development than the rest, when
compared with the higher apes. Tilney actually asserts that
the human frontal area amounts to 47 % of the entire side surface
(83 out of 178 sq. cm.), whereas this is 33 % with the chimpanzee,
and 32 % with the gorilla. “It is, therefore, in the expansion of
“the frontal lobe, both in the area covered by it and the great
“increase in the complexity of its convolutions, that the human
“brain stands in striking contrast to the anthropoids” (L.c.
p. 783—784). This, however, is contradicted by the accurate
measurements of the surface of the cortex with all its windings
and folds (by Brodmann, by Leboucq, and by Brummerkamp).
These measurements (cf. Brummerkamp, 7, p. 26) show that
the proportion between the frontal part and the other parts is
identical for anthropoids and for human beings, viz 1 : 2.5,
according to the latter. Here “frontal” includes all that is
situated in front of the “central fissure” and therefore also the
motor area. Further there is still the uncertainty as to how
much of the surface within a fold belongs to the one, and how
much to the other part. If we assume this result to be correct,
then the strong growth of the frontal brains relative to the
rest did not accompany the genesis of man, but that of apes or
anthropoids from lower mammals. It follows too that the qua-
drupling of the cerebral cortex at the genesis of man to the
same extent holds good for both the association fields situated more to the rear, in which the combined images and perceptions form themselves and constitute the immense material of practical knowledge, and for the frontal organ where this material is grouped into a world of abstract conceptions, the world of theoretical knowledge.

There is something contradictory in that the qualitative leap in thinking from animal to man should have nothing which corresponds in the organ of thinking, the brains undergoing a merely quantitative enlargement. This then would have to be understood in such a way that the enlargement is to be regarded as a condition, but not as a sufficient or decisive cause for the qualitative leap; it did not necessarily bring with it the new character of human thinking. Besides the biological growth of the brains there must have been other causes through which specifically human thought came into existence.

V. SPEECH

19. Speech is one of the most essential characteristics of man, distinguishing him most strikingly from the animals. This is so true that it is sometimes regarded as the only determining characteristic, in that by definition man starts with the coming of speech.

Speech consists of active production and passive understanding of sounds for mutual communication and understanding. Such sounds, however, also exist in animal communities, with their effects on their fellows. Most of the higher animals are capable of producing throat sounds as expressions of their emotions. These also exist with solitary living animals, and are normally related to their sexual emotions or they may be a means of terrifying a prey. With gregarious animals these sounds likewise are expressions of emotions, of fear in case of danger, of anger, or of contentment. Since the other members of a group react by nature to such sounds, they acquire the character of warning or assurance and become a means of understanding and cooperation which is valuable in their struggle for life.

If sometimes such sounds, in their highest state of development, are called animal language, this term certainly is improperly used, as the comparison is very remote. Human speech differs from animal sounds in that it consists of words. Words are names for things, actions or properties. Words are sound-symbols, sounds serving as a symbol for something else, and signifying something else. Language is an organised system of conventional sounds, serving as symbols for realities.

"Language is a purely human and non-instinctive method of communicating ideas, emotions and desires by means of a "system of voluntarily produced symbols... the essence of "language consists in the assigning of conventional, voluntarily "articulated sounds... to the diverse elements of experience." (Sapir, p. 6 sqq). The similarity of animal sound and human speech as an instrument of communication and mutual intercourse makes it conceivable that the one has developed from the other through a natural process. However, the not only great, but essential difference, and the not merely quantitative but qualitative distinction makes it that human speech must be an entirely new creation. As such an explanation will have to be sought, as part of the entire problem of the origin of man.

The characteristic element in language as a complex of symbols is the arbitrariness. There is no clear connection between the object or phenomenon and its name — apart from occasional examples of onomatopoeia, such as cuckoo. The sound “horse” designates a certain type of animal, but it only has this meaning for those speaking the same language. For that reason language is not innate, but has to be learned by means of imitating. Only the disposition, the ability and the organ of speech are inborn. It is precisely this necessity for learning, for being initiated in the complex of symbols, that demonstrates the artificiality of language. The same thing, for example the same species of animal, will be designated by different peoples by entirely different words: horse, cheval, pferd, equus, hippoc, loshadj, kooda.

This does not mean that they are arbitrary fancies. Language has developed and grown according to its own rules, which are an object of investigation in comparative linguistics. Language has been called a creation of the human mind. That does not mean, however, that its rules are products of intelligence and judgment. The curious origin of the German word “Pferd” from
same extent holds good for both the association fields situated more to the rear, in which the combined images and perceptions form themselves and constitute the immense material of practical knowledge, and for the frontal organ where this material is grouped into a world of abstract conceptions, the world of theoretical knowledge.

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the Latin "paraveredus", a carriage with men and horses requisitioned by the government, illustrates the chance-character of names (cf. Geiger, p. 281). Particularly the languages of the most primitive, least developed peoples, often show the most intricate grammatical rules, far beyond the theoretical understanding of those using them. "The evolution of language shows "a progressive tendency from inseparable irregular conglomerations to freely and regularly combinable short elements." "Primitive language.... has a larger vocabulary than later "languages" (Jespersen, p. 429, 431). That development goes from greater complication to smoothness and simplicity is a proof of spontaneous evolution, and in this respect language and its subject to laws is rather to be considered as a natural product. The science of linguistics traces the human mind in its mysterious hidden and subconscious depths, in which it acts not as conscious intelligence, but as an unconscious force of nature.

20. Information is the main characteristic of speech, though now and again an emotional exclamation may perform the same role. With animals the informative function is to be found in the kind of emotional sound, which effects a special attitude with the others, and stimulates a determinate behaviour as a reaction to the sound. With man the communication, be it a warning, question, answer, or announcement, takes the form of a phrase imparting information with regard to conditions which are of importance in the struggle for life. With the animal a warning cry or an alluring call at most can be considered as a kind of signal. "But are signals the same as words? No, for "words can serve to build up a sentence which expresses more "than a mere summation of words; from signals only a sequence "of signals can be made.... No animal expresses itself in words, "and no animal composes sentences; this is the essential point." (Ammann, p. 9—10). Originally the single word could serve as a communication, and the communication consisted of a single word, a sound. In a later development sentences are formed with different words associated in different relations to one another, such as subject, object, and verb. Thereby the experience and the situation can be depicted in a more precise and detailed manner. Words become relay-pieces as it were which ever again can be included as free links in another context. This opens up the possibility of separating the elements of a complex of actions and of imagining them individually.

Originally a communication, proceeding from a short exclamation, was intended to provoke an action by others, as an immediate reaction to the sound heard. In the further development there appears a separation between hearing and acting. The communication serves as a preparation for action later on. It becomes self-sufficient and an aim in itself. Instead of being a spur inciting action, it becomes a neutral description of the situation, whereby the experience of one becomes the knowledge of others. Then language begins to differentiate and to enrich itself, words increase in numbers and split up into many meanings, and from names of things and actions they become indications of properties and situations, of place, time, and conditions. As a new and living organism develops from a few similar cells into an ever increasing diversity of organs, so language grows into a workable instrument of ever greater power and flexibility.

Speech now is no longer a part of another action, but has become an independent action. The reaction to a communication is no longer an immediate activity action, but a "linguistic action" (as called in the theory of Significa); it is a response in the language itself. Speech now becomes an organ of deliberation, and a medium for the combining and adjusting of personal experiences. Verbal intercourse, consisting of speaking to each other, now becomes an exchange of thoughts, and a special field of human life. It becomes the most specialised and complicated of all expressions of personal life, at a greater distance and through intricate intermediate forms connected with the practical daily life of labour. At this stage the often used definition of speech: that it is an expressing of ideas by means of sound-symbols, is appropriate. It has now developed into a means for transferring the knowledge of an individual to that of a whole community.

21. Speech is a communal organ. Nearly all authors who deal with it have expressed, more or less clearly, this to be its essential basis. "Speech is the great medium through which
“human co-operation is brought about. It is the means by which the diverse activities of men are co-ordinated and correlated “with each other for the attainment of common and reciprocal “ends. Men do not speak simply to relieve their feelings or to “air their views, but to awaken a response in their fellows and “to influence their attitudes and acts.” (De Laguna, p. 19). Speech would have been non-existent if there had not been a community; it would have been useless for isolated beings living outside a community, and could as little have originated as an eye in perpetual darkness.

The community is not an accidental collection of individuals. It was not the individual but the community which, from the earliest times, as with our animal-like ancestors, was the life-element of mankind. This point has been frequently overlooked in modern individualistic ways of thinking. The fact that the group, clan, or tribe, was the all and end for primitive peoples, and the individual next to nothing, had to be rediscovered. However, the significance of the group remains even for our modern times. “The very amount of literature and tradition “about the dangers of the crowd…. has seriously misled us. “The implication has been that only the individual free from “the control of the group is the normal and desirable person. “Nothing could be farther from the truth”, states the American sociologist Herbert Miller (p. 1). Animals, and likewise men, live in communities on account of the great advantages gained thereby in the struggle for life. In the first place it offers reciprocal protection and assistance against enemies; it is known that beasts of prey endeavour to isolate individual members of a herd. Protection is obtained by means of united strength or by warning, sometimes combined with an instinctive division of labour. The entire group profits from the experience of the individual members. A further and very important factor is the protection of the young. Each member of the group thus has a greater chance of becoming fullgrown and of procreating. All the qualities essential for the life of the community are thereby perpetuated.

The most important of these are the social instincts. These social instincts are intensified by selection because the groups where they are weak are more easily destroyed and the groups where they are strong persist, closely united. These special social qualities, such as solidarity, loyalty, courage, the readiness to make sacrifices, known to men as moral sentiments, become dominating features. They become such, not on account of reason or judgement, but instinctively, through an irresistible impulse; hence, since their origin remains unconscious, they are felt to be mysterious and supernatural. They are the cement of the community, moulding it into a firm and unbreakable unity. “Each individual unconsciously postulates his own “existence in the continuity of his group, because in the “struggle for survival there was no other possibility of ex- “istence” (Miller, l.c. p. 5). The deep instinct of self-preservation must make place for, or rather take on the nature of, communal feeling. The interests of the community stand as the supreme commandment over and above personal interests, because the life of each individual is ensured only when the community itself survives.

The community is a life-community, jointly engaged in the struggle for survival. Community action consists of communal or associative work, the common fight against enemies included. The community is a working and fighting community, moulded into a unity by strong social forces. All action is co-operation; so an organ is needed for mutual understanding, for communication and deliberation. Speech is such an organ, and is the mightiest means for binding the community together, the most important and indispensable instrument in the common struggle for existence. “In its primitive uses, language functions as a “link in concerted human activity, as a piece of human “behaviour… narrative speech is primarily a mode of “social action rather than a mere reflection of thought”, thus Malinowski expresses the function of speech with primitive peoples (cf. Ogden and Richards, p. 474—475). Speech is not, as Otto Jespersen conceived it to be with primitive man, a luxurious blossoming and an organ of mere emotion, bursting into song 1). Speech is the indispensable element of the most...

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1) “Thoughts were not the first things to press forward and crave for “expression; emotions and instincts were more primitive and far more “powerful. But what emotions were most powerful in producing germs of “speech? To be sure not hunger and that which is connected with hunger:
important contents of life, namely the work in common, inspiring all thought and sentiment, including also the emotional blossoms of imagination and mysticism in ritual and solemnity, in feast and song. Economic and cultural life are not separated and opposed to each other: they are one. Work and struggle are not distasteful accessories; they are hard reality, as surely they are for each living being that asserts itself, well-balanced and in harmony with its surroundings. That which is necessary and essential to life gives it its contents and significance and becomes the source of sentiment and poetry. As all this action is done in common, organised by, and permeated with, strong social sentiments, language, the binding element, possesses a powerful sentimental value and becomes the bearer of the most profound emotions.

Speech multiplies the strength of the community, as it enables the experience of each member to become the property of the whole. The assembling of all experiences, and the exchanging and adjusting of thoughts in mutual deliberation, result in knowledge becoming a purer, more precise and objective basis for effective actions.

Its significance for the community, however, is even greater than what is gained by mutual information. Speech is also the organ for verbal tradition, the treasure-house of lasting and increasing knowledge. By means of speech the older generation passes on its knowledge to the younger. As stated above, the community is immortal; and its possession of knowledge, which has to accompany and complete as a means for their good use the possession of tools, of technical implements, consists of language and is expressed in words and sentences. The technical apparatus could not continue to develop if knowledge and science did not develop simultaneously. Solely because this fund

"mere individual self-assertion and the struggle for material existence. "This prosaic side of life was only capable of calling forth short monosyllabic interjections, howls of pain and grunts of satisfaction and dissatisfaction ... the source of speech is not gloomy seriousness but merry play "and youthful hilarity." (Jespersen, loc. p. 433). Does not this opinion characterize the modern scholar as being so foreign to the social process of labour that the considers it only an inferior prosaic matter? But it betrays at the same time what a heavy burden, even in modern centuries, labour puts upon man's shoulders.

of knowledge is fixed, retained, and preserved by language, it can continue to increase indefinitely. Thus speech becomes the vehicle of ever higher human progress.

22. Whenever speech and language here are spoken of it stands to reason that both sides, speaking as the active, hearing as the passive side, are included as a matter of course. Hearing and sight are always mentioned together as the highest, most developed and most important senses of man. Yet there exists a noteworthy contrast between these two: whilst sight is primarily an individual organ, hearing is above all a community organ. Sight allows for such a detailed orientation in space and such a wealth of knowledge of the natural surroundings as could never be supplied by hearing. This takes place by means of the direct observation in two dimensions, which becomes a precise localisation in three dimensions through the stereoscopic use of both eyes. With man hearing, on the contrary, is a downright community-sense; it binds him to his fellow-men by means of spiritual intercourse. Sight is the organ and vehicle for objective and passionless knowledge of facts. Hearing is the organ and vehicle of abstract thought and of all inner feelings which pervade the relation of man with his fellow-men. Herein lies the basis for the emotional power of the human voice, and of sound and music in general, in contrast to the cooler beauty of the visual arts.

VI. SPEECH AND THINKING

23. It is at once clear that speech would be impossible without human thinking; whilst language is not an arbitrary product of the intellect, it is, nevertheless, a product of the human mind. When man gives names to things the autonomous, creative power of the mind comes into action. Words are names for conceptions. The perceptions must have been digested into abstract notions when they are designated by words. The free handling of conceptions is necessary when joining words into sentences, which is the upward and downward insertion of different links into the chain of thought, and constitutes the specific character of human thinking. In short, language is a
spiritual phenomenon. Therefore it is understandable that, frequently, the conclusion was drawn that the human mind had to develop first, and that from it speech came forth.

In opposition to this simple opinion Lazar Geiger with great emphasis put forth its antithesis. “It is not reason that has caused speech, but the other way round”, thus he expresses it in the “Contents” of his work. (S. XXI). Thinking in conceptions is not possible without speech — speech always understood in the double meaning of speaking and hearing; — conceptions in the end are nothing but words or combinations of words. Everybody knows, and can verify for himself, that conscious thought consists of deliberating with oneself in a voiceless discussion; we think in words and sentences, without the larynx or tongue coming into action. “How often does it not happen, in the most varied realms, that a greater clarity of thought is suddenly brought about by a happily spoken word! Yes, it needs only a momentary observation of ourselves to convince ourselves that not only the more distinct but also the more intensive our thinking the more we do so with words only... so that present thinking is nothing but silent speaking, talking with or within ourselves... So speech certainly has permeated thinking to such an extent and all its parts have connected themselves so intimately with it, that thinking loosened from this connection, thinking before and without speech, has to be essentially different from our present thinking. Whereas we hesitate to ascribe to reason a determining influence in the construction of language, yet a mutual relation between them cannot be denied, since reason without speech cannot be complete and for the creation of reason speech is not irrelevant.” (Geiger, l.c. p. 12—13). Or to quote a modern author: “There is no thinking in conceptions without speech, and also in silent thinking we are apt to make indicative speech-movements, giving firm supports to the vague fleeting stream of consciousness.” (Müller—Freienfels, p. 184).

From the changing mass of perceptions, partly new sensations and partly memories recalled by them, constantly recurring connections will form themselves as images, press forward, and endeavour to fix themselves. They remain vague, however, and dissolve, as long as they are not fixed by a name, i.e. a word.

Once the nebulous mass in our mind has been fixed in a sensorial perceptible phenomenon, as an audible and pronounceable sound, it becomes a conception, something that can be grasped 1) and handled. Now the group of phenomena is fenced off from the rest of the world by the name which collects and summarizes them (“the word is a fence”). And any further phenomenon of the same sort is placed in this group by denoting it by the same name; for with this name as a label it is recognised, and all further properties and consequences are known at once (“the word is a label”). Thereafter, to recall the perception it is no longer necessary that similar phenomena take place. The mention of the name is sufficient, and the word is now so closely connected with the conception that the whole series of perceptions can thereby at will be brought to the front in our thoughts, as a marshalled, obedient crowd (“the word is a vehicle”, thus Dewey expresses these successive functions of the word).

Language is praised as the “unsurpassable, efficient instrument” of thought. But it is more. The intellect would be incomplete without language, nay, it would not exist at all. Ideas and perceptions have only a shadowy, intangible and spiritual existence. The real world consists of concrete things, which are the phenomena themselves; the abstract conception is merely the expression of what a group of phenomena has in common, and therefore is outside this world of phenomena, with no separate reality. The word, the name, gives it that separate reality, as a physical existence, (although this is only transient) and changes it into a something, which can be described, and with which one can work. The word gives substance to a conception; and only through the word the vague feeling is turned into a precise thought. This is also true for the physical things of the world themselves. The thing also is an abstraction, a summary of all the separate images and impressions of sight, feeling etc., which have been acquired from different angles at different times. The identity which the word, the name, ensures to these changing phenomenal forms makes them a figure in space, a permanent and constantly recognisable object.

1) In German: Begriff = was ergriffen wird.
of which the different perspective aspects can be derived and can be known in advance. The animal too recognizes, through experience and instinct, the identity and similarity of enemy or prey — though here also strongly led by the positionless impression of smell. However, to arrive at a clear picture of shape in the surrounding space, from this recognition, the formation of abstract conceptions attached to the word is necessary.

24. It was seen above that the special character of human thinking lies in the interrupting of the series of perceptions, and in the parts becoming independent, self-sufficient and becoming objects of observation themselves. It should now be added that this is only possible when they can be designated and thereby are fixed. By giving them names they are made, as it were, into things which can be laid hold of, manipulated, and combined. That we can follow the series up and down, and can distinguish the different links, lift them out, exchange them, and compare them with other series, is made possible by constantly calling them by names, and by linking together and joining the names, which then as symbols represent the summarized realities of the world.

Now the realities of the world can be indicated in still another manner than by giving them names, such as by pointing to them, or by a picture. Here the name evokes the picture. But this is impossible in the case of the more abstract ideas; there is the word only. Such conceptions as virtue in ethics, truth in epistemology, adaptation in biology, and entropy in physics, correspond with phenomena so barely outlined and relations so broadly spread that one can scarcely if at all visualize them as images, but can only indicate them by words. The word, the symbol, is their sole tangible and representative form. Speaking of them then frequently seems, and often is, a play on words; but the words do mean something, and because they are understood, this is not a senseless or resultless play. "Almost all "higher intellectual activity is a matter of words, to the nearly "total exclusion of everything else.... The word is always "concrete and sensible, however abstract its meaning may be, "and thus by the help of words we are able to dwell on "abstractions in a way which would otherwise be impossible." (B. Russell, p. 211). Moreover this dwelling on and working with abstractions, not only holds good for information and discussion, but also for private consideration, for personal thought, for the deepening of one's own thoughts, and for the building-up of a theoretical insight. In its most absolute i.e. in its philosophical abstractions, thinking has become working entirely with words, with symbols only.

Thus human thinking and speech, words and conceptions are inseparably bound together. Even if we should call one the cause for the other, the one cannot be imagined without the other. Though we cannot call them identical, because they are different sides of a process, yet they are different aspects of one and the same process, which is the building-up of consecutive series of perceptions and ideas, pictures and symbols, of the world in which we live, and the means for realizing our life in it as a richly varied process. Together they originated, and together they have developed with and through one another to their present height. In the problem of the origin of man they appear as a unity.

25. Speech however is, as we have seen, a product of the community; it could only come into existence in the community, and it could only remain in existence as an organ of the community. "If we had not talked with others and they with us, "we should never talk to and with ourselves." (Dewey, 14, p. 170). This shows how the whole of our capacity for abstraction and thinking is rooted in the community, in spite of the individual form of its appearance. "Speech and reason develop only "in the womb of the community. Just as the word only possesses "sense and meaning for the particular community (because its "mere sound states nothing at all, and it only acquires its con- "tents through all common experiences related to it) so by the "community it must be made to develop in, i.e. be taught to, "the young individual. It enters the sphere of the life of reason "through the acceptance of speech.... The organ of communica- "tion becomes the organ of understanding. The entirety possesses "the understanding, and experiences the urge to pass it on also "to the growing up generation.... Speech is the voice of the "community, its thoughts are necessarily thoughts of the com-
“munity, its earliest contents the activity of the community, its "earliest objects the works of the community. The higher mental "development of the individual must be traced back to the "development of the community, and not the other way round. "Because for the common purpose the community learned to "communicate by means of sounds, therefore the individual "acquired words with which at later stages he could think out "his personal activity and thus could indicate it by names. They "all came forth from the source of the common spirit.” (Noiré, p. 147–148).

Consciousness in man as an isolated being would not have been able to develop beyond the stage of vague perceptions, as we assume to be the case with animals. Speech, and therefore abstract notions, could come into being only through man living in a group, as a member of a community. Living together in a society is the nucleus and foundation for all thinking, for all mental development and for all human culture. This shows the shortcomings of philosophical opinions and systems which start from the individual and from individual consciousness. A philosophy, which considers thinking to be a merely individual process, can only incompletely approximate its essence. Reality is turned upside down when the philosopher proceeds from his own individual consciousness as a basic fact and then, along the way of critical doubt, endeavors to prove logically the existence of his fellow-men. He is not aware that the simplest facts of thought, from which he starts out, already possess a collective character; that in the first abstractions he is dealing with, a society, a human community has already made its deposit; that each word, each conception and each thought, which he experiences in himself and which he accepts as that which is “given”, has been inspired by community life. Each personal consciousness is the individual form through which the mental life of the community, which is its collective process and collective possession, gains expression.

26. Speech is a new acquisition distinguishing man from the animals. Bodily organs must correspond to it and, in fact, do so in a twofold manner, firstly actively, for producing speech, and secondly passively, for hearing it. The human ear does not display any particular development, and the hearing of animals is often much more acute, being for them a weapon in the struggle for life. The build of the organs which produce the voice in anthropoids, the larynx, lungs, tongue and lips, are not very different from those of man, and are capable of producing analogous sounds (cf. Yerkes and Learned, Chimpanzee Intelligence and its vocal expressions). Undoubtedly, however, the muscular system and the innervations of these organs in man developed further in accordance with the higher demands of accuracy and precision of movements.

Far more essential and important, however, are the corresponding changes in the brains. Speaking and hearing are chiefly mental activities. There is nothing peculiar in the fact that certain motor centres in the cerebral cortex conduct the movements of the vocal chords, tongue and lips in a precise mutual correlation to produce the delicate shades in the sound of the voice. Neither is it peculiar that the sound-stimulus is led to the temple lobe of the cerebral cortex and there becomes a conscious fact as an impression of hearing. What is peculiar is that from the whole complex of perceptions and conceptions, or from the free initiative of thought and will, the order is given to the motor centre for just these particular actions of speech to take place. What is peculiar is that the impressions of hearing, of this new world of sound, call up totally different kinds of memory-images and series of thoughts, for which they serve as symbols.

In 1862 Broca discovered that there was a special “speech-centre” in a certain place in the lowest part of the third frontal lobe in the left-hand hemisphere of the brains. If this centre was disturbed, or destroyed, the capacity for speech disappeared. This part of the cortex does not distinctly differ from the corresponding right-hand lobe, which plays no part at all in the function of speech; it is only quantitatively somewhat more developed, and neither is its construction fundamentally different from that of the anthropoid apes. It functions through its connections with the motor centres for throat and mouth, which are situated nearby. Afterwards it has been found that a larger part of the cortex extending farther behind and before, is involved in this function.
Proceeding from the significance of speech for thinking, some investigators have sought for the seat of logical thinking and abstract reasoning in these and the surrounding parts of the frontal brains. It appeared, however, that the loss of speech did not effect the capacity for thinking: "... the functioning of the "intellect does not depend on normal conditions of the cortical "motor organ of language... but on its cortical sensory organs, "auditory and visual...": "the motor area of language does "not exercise any real regulative power on either the formation "or on the movement of thought." It is "the auditory sphere of "language, which is one of the main wheels in the logical "movement of thought." (Bianchi, I.e. p. 119—120). The parts of the cortex in which the connection of words with corresponding thought-series takes place and forms itself, are the association-fields, situated round the temple lobe. When these fields are affected and destroyed by disease, the symptoms of word-deafness and word-blindness appear. The sound is then heard, or the word read, but its meaning is not understood, and the whole process of logical thought, the normal linking of conceptions, is disturbed. From this must be concluded that the heard word is far more closely connected with human thinking than the spoken word. Yet we have to consider that both these functions do not exist independently of each other, but, localized in neighboring fields of the cortex, influence each other powerfully. This is apparent, for instance, in that such mental defects are nearly always connected with the very hemisphere that contains the speech-centre becoming affected. The one-sidedness of the active speech-centre clearly involves an asymmetry in the organ of hearing and comprehending. The anatomical substratum for the connections of speech and thought must be sought for in the countless connections in the fields of association and assimilation alongside and around the sensorial and motor centres, which constitute the huge main part of the human cerebral cortex.

VII. TOOLS AND THINKING

27. We read in Aristotle: "Anaxagoras says that man is the "most intelligent animal, because he possesses hands". Thus the realization of a deep natural connection between the spiritual and the material world already appears in the first philosophical thoughts of antiquity. Later ages receded from this opinion; Aristotle quotes him to reprove him, and here Galen agrees: "Because he was the wisest, he therefore possesses hands, as "Aristotle rightly judged. Because not the hands taught man the "arts, but reason". And also Charles Bell, in accordance with the aim and the purport of his book, holds with this opinion: "the possession of the ready instrument is not the cause of "man's superiority... So, we rather say with Galen, that man "has hands given to him, because he is the wisest of creatures, "than ascribe this superiority and knowledge to the use of his "hands." (Bell, p. 249).

This "use of his hands" is the using of tools. It has been repeatedly stated that the use of tools and human thinking are not independent of each other. Above, in chapter II, attention has already been drawn to the fact that intelligence, i.e. human thought, is required for using and even more for making and inventing implements. For it demands the capacity of reviewing beforehand and imagining the results of what does not yet exist, or rather only exists in the mind.

This connection of course cannot mean that human thought at first spontaneously came into existence, by means of the biological growth of the brains, and that after that tools were invented and handled. Such an opinion overlooks the fact that human thought, compared with animal thought, not only shows a quantitative increase, but also a qualitative change of character. Its coming into existence of its own accord would be a miraculous creation, lying beyond the province of science. Moreover the infinitely slow development of the first stone implements over a period of thousands of centuries contradicts such an opinion; it displays all the features of a laborious growth on its own accord, hence an autonomous development, which is totally different from what an even slowly growing deliberate reasoning would have invented. Intellect is not a given capacity that previously existed in a dormant state; it consists of thoughts, which form and change according to the stimuli and necessities of life. It is well-known how, from a study of later ages which were more highly developed technically, technical imperfections, as experienced in the practical use of tools, had a stimulating...
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effect on the faculty of thinking. The very fact that human reason is needed for using tools, means that thought had to take on such forms as suited and made possible the use of tools. Thus, conversely, the handling of implements acted on thinking.

28. To realize the influence of the implement on thought, we must, as if condensing a long gradual development into a sudden jump, compare the actions of an animal or of man’s tool-less ancestor, and those of a primitive man already possessing tools. When faced with the recurring conditions of its environment, such as hunger and food, prey, or danger, the animal’s reactions, which may be attack, defence or flight, are dictated by its bodily organs, thereby becoming lifetime habits. Even if the animal should have a more developed faculty of thinking and could imagine other reactions, this would still be of no use to it; its bodily build restricts its possibilities. Hence its thinking and its brain-apparatus are and remain just what they are. Its reactions have become fixed along almost stable tracks into permanent habits, taking place as immediate instinctive actions.

Man’s reactions to exterior stimuli are of a different nature, as in between his body and the exterior world on which he must react, the tool enters. Instead of immediately using his bodily organs, by seizing his food between his jaws, gripping the prey with his hands, defending himself with his fists, or fleeing from danger, he takes the appropriate tool or weapon and uses it. With it, as if he were a new being, equipped with a new organ, he manipulates his food, or attacks his prey or enemy. His actions follow a new course; hence his thoughts too have to follow a new course. The actions follow a detour, no longer going directly to the object, but to the implement, and only then from there to the object. Therefore thinking must also follow a detour. The spontaneous impulse to act, belonging to the condition in which there were no implements, has to be restrained; consequently the immediately formed series of perceptions of springing to action or fleeing must also be suppressed and be replaced by another leading to the implement or the weapon. Thus one characteristic element of human thinking, its indirectness, already noted above, appears as a necessary consequence of the use of tools.

The former consecutive series of actions, from the first perception to the attained object, is now interrupted halfway. The implement must be taken, fetched or made ready. All this means a postponement, with a continuing and completing of the action coming about only later on. Therefore the corresponding series of perceptions too is arrested, to be taken up independently later on. Or more precisely, the series of further connected perceptions is formed, but without the accompanying act, existing merely as thought. The process of thinking takes on a new form. It becomes an act in itself and finds an end in itself, viz in an intention or an inference or a suspended plan; it remains spiritual, not producing an actual phenomenon. In this way the use of tools leads to independence of thinking; it is no longer part of a process but a separate process itself. The separation of thought and action, which we learned to recognize as the essential characteristic of human mental activity, manifested in the separation of theory and practice, is induced by the fact that the tool places itself as a new element between the organism and the exterior world.

The chain of brain-processes, therefore, must also change. The cerebral cortex after the same stimulus of the sense-organ must effect a different motor reaction. The stimulus may no longer pass in the former way from the sensory to the motor centres; new connections have to be formed for new co-ordinations with other cortex-fields. Nerve-fibres will have to develop in a new way. The stimulus must follow another route, link itself with memory-images of the implement or weapon, and along this new detour affect the motor centres. At the same time the former course must be checked, and the old connection must be put out of action. — though in cases of panic it momentarily acts again —, and also the result of the new co-ordinations must often be suspended, and hence arrested. What Judson Herrick states of the cortex generally, — “primitively, cortical activity is invoked, not to produce action, but within action, first checking inappropriate reflexes and then amplifying, redirecting, recombining, or otherwise improving upon the “immediate responses” (23, p. 260) — is applicable here too on a higher level. Whilst the old course a — b becomes atrophied,
by being constantly arrested and by disuse, the new indirect routes $a \rightarrow c \rightarrow b$ continue to develop by constant use.

Now man does not have just one tool at his disposal, but different ones, so that he must choose between them. At every sensual perception, whether of food, danger, or a prey, he must not only suppress the old impulse, but also make a choice, and decide which implement he will use, and how to act with it. The implements now become objects which have to be inserted as separate interchangeable links into the series of actions; therefore the conceptions too, as their correlates, become separate mental objects, which must be inserted as interchangeable links into the series of perceptions. The series of perceptions must not only extend to the tool, but proceed to the final action, and again not only for one, but for each of the available implements. It has been said above (in chapter III, § 11) that the series of perceptions continues as if by itself, even though the action may be arrested. It is now apparent why this series must be continued till the end: because the intervention of the implement was the cause of this arrest and this arrest gave rise to a choice. All these series of perceptions must be followed and their results compared, the entire row of possibilities must be considered, and the decision and action take place according to be findings of the result. Where formerly different series of possible actions were spoken of, it now appears that this diversity has its origin in the diversity of implements that can be used.

The stimulus-current now does not follow one single detour in the cerebral cortex, but several; there is not one $a \rightarrow c \rightarrow b$, but an $a \rightarrow c_1 \rightarrow b$, an $a \rightarrow c_2 \rightarrow b$, etc. The nerve routes $c_1, c_2, \ldots$, corresponding to different series of perceptions, singly and still more when combined, form such an extensive complex that a much greater and more intricate profusion of connections with each other and with the sensory and motor areas must come into action and be developed in the relevant extensive fields of the cortex. In the mutual comparison of the routes the function of attention comes into action, whereby active consciousness of thoughts and actions is established. And according as the implements become more widely differentiated and life's possibilities ever more varied, the connections of the

nerve-tracks must become more intricate, the association-tracks must grow into an ever more important part of the central organ, and thinking must develop into a faculty of increasingly greater wealth and independence.

A choice had already to be made before implements were constructed, when man only took in his hand the crude stones and sticks offered by nature. It is possible that then the first dawning of conscious reflection might already have appeared. However, the independence of the process of thinking is only achieved when foresight of the action leads to preparation in advance, hence, when man makes his implements. The further action, involving the use of the implement, must have been thought out in advance, and in consequence prepared for in anticipation, before the needs of the situation or the event caused action to be taken. At this stage the action is divided into two entirely separate parts, each complete in itself. The first is the construction of the implement, as a preparation, which is an independent and for the moment concluded act. Hence at this stage, thinking too must build up its chain of perceptions independently, autonomously, starting from itself apparently without a direct exterior impulse, and fed by the memory-images of former experience. Thus, from the necessity of constructing the implement in advance, a world of thought develops which is man's own mental life, a theoretical compendium of all his experiences, and a source for all his further conscious action.

29. In this way the tool gave a powerful impetus to the development of human thinking from the mental processes of our animal-like ancestors. No one has disclosed the significance of the tool with such a force of conviction as the German scientist Ludwig Noirë in his above quoted book: "Das Werkzeug und seine Bedeutung für die Entwicklungs geschichte der Menschheit" (1880) (The Tool and its Significance for the Development of Mankind). Here he writes: "No moment has been of such a vast 'and incalculable importance for the development and fixing of "thinking as the circumstance that soulless matter took on a "definite shape and, formed and transformed by the hand of "man, had to serve purposes and to perform labour which all
other beings are only able to perform with their innate organs. Its great importance is chiefly situated in two things: firstly in the release or detachment of the causal relation, whereby the latter acquires a great and increasing clarity in human consciousness; and secondly in the objectivation or the projection of the own organs whose action originally existed only in the dimmer consciousness of instinctive functioning. (p. 34). Formerly the causally operative effects of nature are undergone passively; and also when the animal acts actively, its acting is a natural impulse which does not give rise to amazement and, therefore, to thought. "The relation becomes entirely different when the tool places itself as an interjacent link between the 'will and the intended result.... For here the causal conception strikes the eye and imposes itself as if of its own accord. The working object must first be created or at least fetched; the relation between the appropriate means and the intended action is precisely the causal relation itself; here it presents itself to the observing consideration in its simplest tangible embodiment." (I.e. p. 35). That consciousness acknowledges itself as an effective force, as a cause, and thus becomes self-consciousness in objective contemplation of itself, is rendered possible only when in tool and machine the working cause and the resulting effect stand clearly before one's eyes. Therefore, too, the organs of the human and animal body are only understood in their action after the creation of artificial implements and apparatus which can serve as comparative examples. The arm is then explained and understood as a lever, the eye as a camera, the ear as a keyboard, the heart as a pump, the larynx as an organ-pipe, and the nerve system as a telephone network.

For man equipped with implements the world becomes an object, or rather a multitude of objects, on which he reacts in various ways, whereas for the tool-less animal the world remains a whole in which as a part it finds its place and performs its actions of life. "The consciousness of self kindles and illuminates itself only from the objective world; but not from the objective world as such, as it surrounds us and stares at us, as indeed it is also stared at, i.e. looked at without understanding, by the animals, but in so far it is changed, modified, transformed by human will, by human activity, i.e. by the subjective factor" (I.e. p. 61).

30. A new and powerful influence emanates from the handling of tools to the organs of perception and consciousness, and thereby to mental life. It supplies a new experience of the exterior world. The delicate sense of touch vested in the fingers comes into action when gripping and guiding the tool which is used to operate on the outside world by some such action as beating, pressing, rubbing and boring. It is an aggressive operation, attempting to bring about changes. The exterior world reacts, its resistance, which must be broken, is caught up by the hand as the organ of the sense of touch. Since intensity is felt and measured here, this is quite another use of the sense of touch, as it is different from only contacting the surrounding space for the purpose of orientation (a use which, in fact, hardly plays any part at all with adults). "The high importance of the hand as an organ of reason lies in its preponderant activity, that essentially necessary factor, without which no knowledge at all becomes possible." (Noiré, p. 96).

The experience of the use of tools, as an active expression of a vital energy, called up by life's needs, speaks much more intensely and more penetratingly than the passive experience of the impressions of the other senses. As also experimenting, the provoking of answers from the world in reply to our questions, although indeed a much softer way of operating than labour for the needs of life, does work more intensely than mere expectant observing. Apart from the sense of touch, the muscular sense comes into action which, through the innumerable retreating nerve-fibres, informs the organism about its own movements. In the muscular exertion when working with the tool, such as in the blow of the axe or hammer, where the momentum of the moving arm is increased by the handle, the relation between the observed effect of living force and the feeling of accurately balanced applied energy offers a rich source of new experiences of the world.

31. The precise manner in which the tool affects thought, technique affects science, and vice versa, is clearly seen in the
later and modern development of man. This is, however, more difficult if we go back to primitive times, as no data of experience are available. We may then try to understand these relationships, as explained above, by comparing Early Man possessing implements with the animal not possessing them, by comparing Early Man already equipped with the capacity of thinking with the conceptionless animal, and then to compare their reactions. In actual fact, however, it was an extremely slow development and a process stretching over many hundreds, perhaps thousands, of centuries, in which the infinitely small steps are not visible and cannot even be imagined. Is it not possible to fill in this lack of data by bringing the most highly developed animals, the anthropoids who in their brain capacity most of all approach man, into contact with simple implements, and to study their reactions?

Here it is not a matter of apes using such human utensils as a spoon, fork and mug, which is nothing more than a sign of teachability and a greater faculty of imitation than in the case of other animals; and it has still less to do with the fancy that their intelligence could be developed to a higher stage through the use of implements. The real significance of such tests lies in a careful and scientific investigation being made of the mental properties and abilities of these animals, as was expressed by one of the pioneers in this realm of research, Wolfgang Köhler, in the title of his book “Intelligenzprüfungen an Menschenaffen” (Intelligence tests with anthropoids). Here the anthropoids are given simple aids, such as boxes, sticks, pieces of rope and cloth, by which they might obtain the coveted fruits set beyond their reach, to see how they would use them. The animals used were always the chimpanzees, for although gorillas are usually placed above them with respect to their brain capacity, the chimpanzee nevertheless shows a more active intelligence, which is probably due to a more active group-life.

The chief difficulty lies in the interpreting, even in merely describing the results of these tests, because the terms used are always taken from the human spiritual life. The title of the book by the American psychologist Yerkes: "Almost Human", reveals a tendency, in the background of thought, to show how much of human thinking is already to be found with the chimpanzee.

And even Köhler, with his judicious, well-balanced conclusions, now and then includes judgments inserted into the descriptions of a test: “there now, Sultan makes a ‘bad turn’ or more “precisely a shocking stupidity.... Immediately afterwards “comes an action that may be reckoned among the good “errors....” (I.c. p. 90); as if the animal during an examination had to attain to a certain standard, the norm of which was adopted from human thinking. Yerkes states “they have ideas” which can mean much or little, and in his standard work “The Great Apes” he successively discusses the “memory”, the “imagination” and the “indications of abstraction and generalization”. These however are not specific features of human spiritual life. It can be said that each animal generalizes, in that his memory-images are made up of summaries produced by all former and similar experiences. The meaning of his expression "ideational conduct" is that the act is not dominated only by the immediately preceding sense perception. The problem, however, is to what extent, and especially how, considering the resultant actions, different former experiences are assimilated in the perceptions.

What strikes the observer most of all is that, especially after fruitless attempts to get the banana, the animal quietly sits down and “thinks”, and then jumps up to make a new attempt. “The problem is solved, not by fumbling, but by what Köhler ‘calls ‘insight’. We need not assume that Köhler’s chimpanzee ‘reasoned the thing out and formulated his conclusions in ‘logical syllogisms. The average man would not solve the ‘problem that way either. When a man confronted with a ‘simple problem like this does ‘stop to think’, the right way to “do it may come to him all at once in a flash of understanding. “He ‘sees through’ the situation before he makes a move. In the “case of the man his previous experience includes many situations each of which has something in common with the present “problem....” — thus Judson Herrick represents this behaviour (24, p. 225). It should be noted here that logical syllogisms undoubtedly play their part in the case of man, including the savage, even though in simple every day problems they are not thought of in these scholarly terms. In the cases of both man and ape the deposit of former situations emerges and
comes to the fore in the expectant sitting still; and this then determines the action. It does, however, differ in character; with the one it is a simple memory-picture, and with the other an argument clothed in words. By calling both "ideas" their essential character is left uncertain. In the case of the younger animals the stick is used to help get the banana, if both are seen simultaneously; if the animal only sees them in turn, it does not dawn upon him to associate them. The older and more experienced animals however, who have learned a great deal through the experiments, remember the stick and at once go and fetch it or look for it.

An attentive study of the experiences as described by Köhler confirms the thesis that animals are incapable of seeing separately the various parts of a nature-impression in such a manner that they can imagine them in another position and in another context, because they lack the conception and therefore also the perception of separate things; for that reason they cannot use them as tools. At the same time, however, we discern circumstances where this truth begins to find its limits. The highest achievement of these chimpanzees appears to be something which, in spite of Franklin's definition, might be called "tool-making ability". One animal had two bamboo sticks, a thick one and a thin one, both too short with which to reach the bananas beyond the fence. Having worked unsuccessfully with these and other things, it happened that finally, after the observer had left and only the keeper was present, the animal held a stick in each of its hands, playing with them in an indifferent manner. "There it happened that it held out a stick "in each hand, and in such a manner that they lay in one line; it "placed the thin one a little way into the opening of the thick "one, and at once jumped up to the fence, to which it had at "first turned its back, and began to draw the banana towards "itself with the aid of this double stick" (I.c. p. 91). So, by accidentally placing the sticks in this manner, it saw a longer stick there; it now knew the trick, and when the sticks fell apart, applied the new knowledge again and again. Even more striking was the case with one of the other apes, in whose cage there was a shrub with branches, which it had tried in vain to pass through the bars in order to reach the banana. Afterwards, when sitting quietly and looking at the shrub, it suddenly jumped up, went to the shrub, broke off a branch, and made use of it for its purpose. Apparently while looking at it, its attention was drawn so intensely to the branch, that the animal saw it as a separate entity, similar to the sticks it had previously used. More intelligent types at once broke off the branches; perhaps this breaking off of a branch is something that they knew from their state of nature.

Though such experiments are highly important for obtaining a correct insight into the spiritual processes which take place in the highest apes, and though they can teach us something about the dawning reactions of pre-human thinking to the use of implements, yet they have only an indirect significance for the problem of the origin of man. The conditions existing during these investigations and those during the first origin of man differ too much. Here, the animal, the experimental object of the higher intelligence of man, is provided by human design and deliberation with ready made implements thought out for him. There, Early Man's ancestor had in an infinitely slow process to seek for himself the first aids in his heavy struggle for life. Here, the ape is studied as it is now, and how his mind works now. Even though the animal learns all kinds of individual things was just the slow change of the species itself; the development of tool capability and spiritual capacity in a continuous process during hundreds of thousands of years. Here, man as the knowing master experiments with the subjected animal; and only fantastic could imagine something like the recreating of it into an animal possessing higher spiritual capacities. There, man had to create himself, creator and creature at the same time, through his own life-activity.

VIII. TOOLS AND SPEECH

32. "Tool and speech, according to ancient views, belong to "the most human side of man", thus Karl Bühler commences the
Preface to his work on the theory of language. "According to the whole build of his body", thus he approvingly cites Charles Bell, "man is dependent on tools and speech, is adjusted to tools and speech". "Speech is akin to tools; it also belongs to the "implements of life, is an organon just as the material "implement..." (p. III). Here they are put forward as two independent data, side by side, together determining what is special in man, without an indication of any causal relation between them. This relation, however, is clearly stated, though looked at from one side only, by Grace de Laguna: "It is scarcely credible... that the art of chipping stone implements could have been developed by men who had not yet learned to speak. "The belief that the two great human functions are somehow "causally interdependent, is probably held quite widely at the "present time." (p. 218). Still clearer, looked at from both sides, Noire states it in the introduction to his work: "The mutual "dependence, in uninterrupted interaction, of speech and tool, "i.e. of thinking and acting, constitutes the leading thread in "these investigations." (p. VIII).

It has already been remarked several times that an efficient use of implements without speech, i.e. without words to distinguish them, is hardly possible. Conversely this implies that in the process of development of mankind the use of implements must have influenced human speech.

33. The transition from animal sound to human language is the transition from the utterance of emotion to the pronouncing of names which, as symbols, signify and designate things and actions. How did it happen that certain things came to be designated by certain sounds? For the animal the world is a whole, and although it is variable in that certain changes in aspect signifying danger or food force it into action, it is nevertheless a self-evident whole. That the parts, as separate things, are not recognized as such, is demonstrated by the fact that for us too they acquire that individuality only when we distinguish them by names. In the subsequent increase of knowledge, a field of phenomena often remains a vague and unravelled unity until, when the various parts are named and characterised and well-defined conceptions are introduced, clarity, depth, and transparency appear. Similarly, man's own body is a self-evident whole, and the spontaneous actions do not lead to discrimination of its parts; in the whole of the world man discovers himself last of all.

Now in this world, self-evident on all sides, the tool becomes apparent as something extraordinary. At one time it is part of the body, in which it is a lifeless component and bodily organ, and at others cast away it is part of the external world; though ever anew sought for and taken up. "The peculiarity and quite "formidable importance of the tool is to be found in that it is "at the same time part of the subject and is yet an object." (Noire, p. 107). The implement is the changing element, belonging now here, now there; it severs the indivisible units and their self-evidence. Attention is, thus, concentrated on it, because it takes its place outside each of the usual worlds. At the same time it is of primary importance through the role it plays in work and in the struggle for life; it stands in the centre of man's activity. Thus a sound accompanying a given action is associated with the object which is the carrier of the action. The object itself is discriminated because a sound attaches itself to it; it gets a name.

Both Geiger and Noire have expressed the opinion that an initial beginning of language must have existed before the use of implements. "... linguistic study has completely proved "that man already possessed language before he was in posses- "sion of the tool... Right at the bottom of language-life man "appears, not yet distinguishable in this respect from animals, "dependent on the action of his natural organs only." (Noire, p. 108). It may be; but in what he says further on: "As is "speech, so also is the tool a characteristic element of man. "Without exception the world of man and the world of animals "in this respect are opposite." (I.e. p. 109) — the author himself throws doubt on whether the name of man can be applied here. Moreover we may be sure that in spite of this sharp division by sharp definitions there must have been transitional forms and intermediate states of a doubtful labelling. Chimpanzees living in groups also accompany their common activity by manifold noises and sounds; in such instances of the simpler forms of providing for life, however, individual picking and
gathering can hardly be called common work. Noire assumes that in the strenuous conditions of life in the plains the preparing of shelters, the wattling of tree-dwellings, but chiefly the digging of holes created a first necessity for common work; and he supposes that the names for this digging and scratching (krabben, scharren) belong to the oldest roots of language, from which many words of later dates can be derived. If that were the case, then it is quite probable that during such scratching and digging-work bits of stone would naturally come into the hands, and that quite as naturally these were used as aids; a long period of common work without this very first mechanical aid would seem to be rather unlikely.

Work and implement are not yet distinguished from each other in the first sounds having the character of names; the same word acts as a symbol for both. Only at a later stage of development is a distinction made between substantive and verb, and the sentence in which the words form replaceable parts begin to take shape. Of course this first forming of words is a collective process; an indication by name makes sense only in a mutual understanding. Consequently we may say that speech came into existence as a means in common work with the aid of implements.

34. Thus the implement has a further influence, as apart from its immediate one, on human thinking. The implement created speech, and speech, because word-symbols have a meaning, produced the forming of clear conceptions and logical thought. This is what Dewey has expressed as follows: “The invention ‘and use of tools have played a large part in consolidating meanings, because a tool is a thing used as a means to consequences, instead of being taken directly and physically. It is intrinsically relational, anticipatory, predictive.... The most convincing evidence that animals do not ‘think’ is found in the fact that they have no tools, but depend upon their own relatively-fixed bodily structures to effect results.” (14, p. 185). That is to say that the mechanical aid, though at first it was accidentally taken by the hand, thoughtlessly made use of, and thrown away, finally aroused the consciousness of the aim for which it was applied; and thereby the accompanying sound also receives a certain meaning and becomes a symbol. And he continues to explain this: “A creature might accidentally warm itself by a fire or use a stick to stir the ground in a way which furthered the growth of food-plants. But the effect of comfort ‘ceases with the fire, existentially; a stick even though once ‘used as a lever would revert to the status of being just a stick, ‘unless the relationship between it and its consequence were distinguished and retained. Only language, or some form of artificial signs, serves to register the relationship and make ‘it fruitful in other contexts of particular existence.” (ib. p. 187).

Thus abstract thinking, speech and the use of tools are inseparably connected. And they remain joined in the whole of the further development: a differentiation of the tools to special appropriate forms, a differentiation of the language to an ever greater wealth of deduced appropriate words and compound sentences, a differentiation of thought to ever further logical abstractions. The perfecting and refining of the tools to ever more productive methods of working, the perfecting and refining of language into an ever more adequate means of imparting information and of spiritual intercourse, the perfecting and refining of thinking as a means towards an increasing investigation and a higher knowledge of nature and the world around us, together produce an ever greater wealth of modes and possibilities of life.

35. That the use of tools has had a determining influence on the origin of speech, is also betrayed in the anatomical structure of the brains. The speech centre is located in the cerebral cortex at the foot of the third (the lowest) frontal lobe and its surroundings, as an extension of the motor centres of throat and mouth located nearby, and these are situated in the close vicinity of the motor centres of the arm and the hand. This speech centre is present in the left-hand hemisphere of the brain only; the corresponding parts of the right-hand hemisphere are mute. At least, that is the case with the majority of people, who are right-handed. In the case of the left-handed people the reverse obtains, as for them the speech centre is situated in the right-hand hemisphere of the brains (a few very rare exceptions seem to have occurred). It has been known for a long time that,
owing to a crossing of the nerve fibres, the right-hand half of
the body is innervated by the left-hand hemisphere of the brains,
and conversely. These facts clearly show that the speech centre
is connected with and determined by the use of the hands.

Use of the hands is use of tools. Without tools, any asymmetry
in man's actions would be scarcely discernible. As it is however,
a slight asymmetry during the first years of life determines
and actuates further preferential use of one hand or other.
Righthandedness means that the tool whether it is a stick, club,
hammer, spoon, or writing pen, is gripped, handled and
conducted with the right hand; lefthandedness means that all
this is done naturally with the left hand. This practice then
determines the forming of the speech centre in the appropriate
place.

This is not merely a conclusion drawn from static, anatomical
relations; it also appears in dynamic, physiological effects. The
case is cited of a lefthanded child with righthanded brothers and
sisters. "Her left hand was tied in early childhood till she used
"the right hand well, but whereas the other children learned
"to speak early... she was fully six years old before she could
"talk plainly." (W. Hanna Thomson, p. 241). So too, Elliot Smith
states with regard to lefthanded children: "When such children
"are compelled to train the right hand, this involves the educa-
tion, so to speak, of the left cerebral hemisphere.... This often
"leads to a defective control of muscular activities, such for
"example as express themselves in stammering, and a difficulty
"in learning to read and to recognize words." (p. 186). Whereas
speech and the use of hands grow up in a mutual relationship
in the ontogenetic development during the first years of life,
it is probable that also in the phylogenetic development, i.e. in
the origin of man, the new use of the hands and the new
capacity of speech came into existence and grew in close relation.

The close connection between hand and speech is so striking
that it has often been pronounced as causal connection between
both. Sometimes the part played here by the hand as a tentacle
for orientation in space has been brought forward, such as can
be seen with children during their first year of life. But the
hands do not serve man for the purpose of groping in space —
with a child that function is soon taken over by the eyes, and

it has played no part in the origin of man as a species — but to
grasp things and to guide implements, as a working organ.

Or, when technique and manual labour stand beyond the vision
of modern scientists, an attempt is made to make the connection
understandable in this way, that before speech existed there
was a language of gestures residing in the hands, and that these
gestures were made by the right hand in particular. Such is
indicated in the writings of Elliot Smith. First he points out
how very natural one-handedness is: "It must be evident that
"one hand only can be usefully employed in executing the
"consciously skilled part in any given movement. The other
"hand, like the rest of the muscles of the whole body, can be
"only auxillary to it.... the forces of natural selection made
"one hand more apt to perform skilled movements than the
"other" (p. 67). This is then extended into the giving of signs
for the purpose of imparting information. "It is easily compre-
"hensible why one hand should become more expert than the
"other.... and the fact remains that it is the right hand,
"controlled by the left cerebral hemisphere, which is specially
"favoured in this respect.... When the Ape-Man attained a
"sufficient degree of intelligence to wish to communicate with
"his fellows.... the more cunning right hand would naturally
"play an important part in such gestures and signs...." (p. 68).

We may say that all this is not required for the purpose of an
explanation, since the "skilled" movements and the "cunning"
of the right hand can mean nothing but skill in acting and in
grasping things, i.e. in handling tools. The practice of this skill
must already have stimulated the formation of sounds for
imparting information so forcefully, that gestures with the
same hand can barely have played a part. The whole reasoning
remains vague because the tool, in which the skill of the hand
for all practical purpose is realized, is not seen or mentioned.

IX. THE FIRST ORIGIN

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essential characteristics, which distinguish man from the animals
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Use of the hands is use of tools. Without tools, any asymmetry in man’s actions would be scarcely discernible. As it is however, a slight asymmetry during the first years of life determines and actuates further preferential use of one hand or other. Righthandedness means that the tool whether it is a stick, club, hammer, spoon, or writing pen, is gripped, handled and conducted with the right hand; lefthandedness means that all this is done naturally with the left hand. This practice then determines the forming of the speech centre in the appropriate place.

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**IX. THE FIRST ORIGIN**

36. It has become evident from the foregoing that all the essential characteristics, which distinguish man from the animals stand in a close relationship to one another. They depend on each other; each one needs the other as a condition for its
existence and development. The use and the making of tools is not possible without both a mental capacity to handle and to invent them, and speech to represent and to indicate them. Without the driving power of the tool the spirit would have continued to sleep in unconsciousness, and words would never have got their definiteness. Without language a capacity of abstract thinking could not have developed; but the use and development of language presuppose the capacity for thinking.

Whenever some phenomena are mutually dependent for their existence and growth, they can only develop through a continuous mutual action. Each phenomenon, each property in living nature, possesses accidental variations to a certain extent; and with a causal relation existing between them a change in the one produces a corresponding change in the other. Each little improvement in one capacity produces an increase in the other dependent capacities, and this increase reacts again on the first to strengthen it. Thus, under favourable conditions, they must all proceed by little steps, which are continuously following on and propelling each other, each cause and driving force as well as effect and result in a common development. Tools and language were not invented at a certain time; the capacity of thinking was not miraculously created, nor did it spontaneously come into existence. They grew up from little traces recognizable in animal ancestors, in a development which was at first infinitely slow, the beginning of which lies back in the night of primeval times, far away behind those times in which we see the first visible signs. Once the development had started, it continued ever more quickly and more distinctly.

This was, of course, preceded by the formation of the human body, the origin of man as a type of animal, which may be called the biological anthropogenesis. In the paragraph with the title “Anthropogenesis” in the “Handwörterbuch der Naturwissenschaften” (Cyclopaedia of Natural Sciences) only this origin of man as a bodily being is dealt with as being the sole one belonging to the natural sciences: tools or language are not mentioned at all. Klaatsch very emphatically made it clear that man must have sprung forth from the original forms of mammals, since both his teeth and his limbs have retained their primitive forms and were not specialized for a particular mode of life, as was the case in the other orders of mammals. “That man remained an unspecialised form and retained his many-sidedness — in this very fact lies a great deal of the secret of his extraordinary success.... his victory is rooted in this.... “that he retained his hand.... It is not so much the fact of having a hand — there was a time when all mammals had a hand — but rather the circumstance that this organ was retained in its original form, and that it could put itself at the service of an enormous growth of the brains, that is the remarkable thing about it” (p. 47—48). The original form of the organism was four-handed, adapted to a life of climbing. The foot came into existence afterwards through the transformation of the originally hand-shaped hind limbs.

The impulses must presumably have been given by new circumstances of life, as was probably the regular case in the formation of new species. It is usually assumed that a change in the natural environment drove man’s ancestors, who were adapted to living in trees and woods, out into the plains. There the complete differentiation between hand and foot took place, together with the corresponding upright posture. This may have been connected with a change in climate, possibly towards the end of the mild Tertiary Period, when the influence of the approaching ice-period caused the luxuriant woods to disappear. Under these changed conditions of life, with a more difficult food supply and greater dangers, a greater closing of the ranks into groups and a stronger and continuous co-operation in common work became necessary, and this process laid the foundation for the initial use of speech-sounds. Here the gripping hand, which was now no longer restricted to any functions of locomotion, found new employment in gripping bits of wood, stones, or antlers, where they were met with and could be utilised. This was not necessarily bound to a special high degree of cephalisation; it is quite possible that all this already

1) Although Bolk gives his “foetalisation theory” as merely ontogenetic, and not phylogenetic, the view is implied that even among the Primates man has kept the primitive character more than the others, as the central branch in the family tree, and thus has preserved possibilities of development which the more specialised forms of apes have lost.
started with the lower stages of cerebral development, in
between that of anthropoids and man 1).

It is also possible — the causes of mutations are still greatly
unknown — that, conversely, the higher demands put to the
brains acted as a stimulant for greater cerebral development.
Thus the whole of the large amount to be learned and incorpo-
rated in the nerve-connections tended to enlarge the brains,
at first by increasing the nerve branchings, and later by
increasing the number of cortical cells. At any rate the cerebral
development then created a broader basis for the growth of all
those forces, while the sharper struggle of life with its
consequent keener selection, contributed in forcing on this
development.

37. Every investigator is inclined, in the case of mutual
dependencies, to look for the primary cause in the field with
which he is best acquainted. Thus it is quite understandable
that most scientists consider the human mind as the original
source and driving force of the entire development. This is the
more so, as, firstly, this mind depends on a material organ,
the brains, of which the upward growth in the animal world is
taken for granted, and, secondly, as the theory of mutation has
made us familiar with the conception of spontaneous, causeless
leaps. "A last psychical revolution.... is that which is marked
"by the appearance of man on the face of the earth. This
"appearance is surrounded by many mysteries.... This is
"simply one of the recent opinions: the earth was populated
"with a multitude of mammals when man appeared on the

1) In his study "Der Antheil der Arbeit an der Menschwerdung des
Affen" (The role of labour in the transformation of ape into man), a
sketch written probably about 1878, found among his papers after his
death and published 1896 in "Die Neue Zeit" XIV. 2, Friedrich Engels
points out the importance of labour for the formation of the human hand.
"So the hand is not only the organ of labour but also its product. Only
"through labour, through adaptation to ever new activities, through
"inheritance of the thus acquired special development of the muscles,
"tendons and also, over longer periods, of the bones, and through ever
"new application of the inherited refinement upon ever new activities, the
"human hand acquired that high degree of perfection by which it could
"produce Raphael pictures, Thorwaldsen statues and Paganini music." (I.e.
p. 547).

"scene, as a result of a sudden mutation, possessing a hyper-
trophied brain — a kind of monster whose thinking was to
"dominate the animal world.... he discovered the fire, he made
"tools, he employed language.... There is a gap between animal
"and human intelligence; I do not think that we are ready to
"fill in that gap." — thus this conception is stated, strikingly
and slightly ironically, by the French biologist Georges Bohn
(I.c. p. 330). The sudden increase of the cephalisation, and of the
number of brain cells, is thereby often regarded as the moving
force and sufficient reason for the whole development. We
cannot, however, account for the exact brain dimensions required
to bring about those changes: why precisely a brain weight of
1400 grammes (at 70 kilos body weight) was necessary and
sufficient whilst that of 1000 or 700 grammes which already
existed was not, and why precisely 9 billion cortical cells and
not half as many or twice as many was needed to bring about
those qualitative changes in human thought and action whereby
man was so utterly separated from the animal kingdom. There
must have been additional forces which then constituted the
actual causes.

Nothing of such forces is mentioned in the outline given by
Frederick Tilney in his great work "The Brain from Ape to Man". He regards the contrast between the Primates (monkeys, apes and men together) and the other mammals as more essential
than that between the anthropoids and man. He speaks of the
"neokinesis" as the new form of movement through thought and
deliberation — as compared to the "palaeokinetic" which
depends on reflexes — as a new possibility given by the develop-
ment of the cerebral cortex. The other mammals however did
not sufficiently exploit this. "But for all their efforts, they
"were surprisingly unsuccessful in arriving at the desired goal."
(p. 1039). They have merely improved their organs of locomotion
and adapted them to soil, air and water; their development is
constantly terminated in a cul-de-sac. "They accepted the earth
"as they found it and left little behind to change its appearance
"as a result of their own efforts." (p. 1040). Klaatsch expresses
this in a similar manner: "All these lower kinds of mammals got
"into a blind alley from which no return was possible — and
"no forward course either." (I.e. p. 31). With the apes, however,
we are on the right track, Tilney continues; here the development splits up into two branches, of which the one leads to the anthropoids, and the other through special characteristics to man. Of the latter he says, “At least five critical and closely “interdependent specializations determine the status of the “human race: the appearance (1) of the human brain, (2) of the “human foot, (3) of the human hand (4) of the erect posture “with bipedal locomotion, and (5) a terrestrial mode of life” (p. 920). “What the underlying motive of this critical modification may have been is still clouded in obscurity. The increasing “weight of the body appears to have played some role in this “alteration.” (p. 1041). Just like the heavy gorilla moves mainly on the ground. “The factors which have increased the body “weight... are difficult to estimate. It is possible that the “endocrine glands had some part in this alteration.” (p. 1041). It must be remarked that this is not a real explanation, because the problem remains as to why the glands thus came into action. In any case, he continues, a new road was opened thereby: “The ultimate instrument for extending the boundaries “of the neokinetic sphere was at length assured... the neopal- “lium now proceeded to externalize all of those potential “resources which had so long been held in reserve awaiting the “arrival of this ultimate manual equipment.” (p. 1042). The author is merely alluding here to the change-over to the life on the plains, with all its consequences, without apparently realizing that the essential step has still to be taken then.

Yet elsewhere he does show up the significance of the hand: “it has been the achievements of his hands which have carried “man onward.” (p. 775). There are some, he says, who see in the development of the brains, others in the erect locomotion, and again others in speech, the cause of man’s progress. However, for him the main thing is the structure of the body “best adapted “to externalize the neural energies of the brain. Such a flexible “instrument as the human hand seems pre-eminently fitted for “these purposes. With the brain to direct its action, to expand “its usefulness, the upright position to give freer range to its “execution, with speech to make its accomplishments communal, “to introduce the benefits of co-operation, the hand became the “master key opening all the ways leading through the new and “vast domain of human behaviour.” (p. 776). That there still remained another problem, the actual problem of the origin of man, and that the hand could do this only by handling the tool, does not find expression here.

The development of the brains as the essential cause of the origin of man is expressly indicated by Elliot Smith. “I have “attempted... to emphasize the undeniable fact that the “evolution of the Primates and the emergence of the distinctively “human type of intelligence are to be explained primarily by a “steady growth and specialization of certain parts of the brain.” Thus ape and man are taken together here. “Man has emerged “not by the sudden intrusion of some new element into the “Ape’s physical structure or the fabric of his mind, but by the “culmination of those processes which have been operating in “the same way in a long line of ancestors ever since the “beginning of the Tertiary Period.” (p. 70). From this point of view his explanations are full of interesting speculations on the biological foundations that rendered possible man’s coming into existence. “Under the guidance of vision the hands were able “to acquire skill in action and incidentally to become the “instruments of an increasingly sensitive tactile discrimination, “which again reacted upon the motor mechanisms and made “possible the attainment of yet higher degrees of muscular “skill” (p. 152). “This manual instrument... was plastic, and “could be adapted to almost any purpose the brain directed.” (p. 158). “If (the erect attitude)... liberated the hands from “the function of locomotion and so enabled them to attain higher “possibilities of skilled action and tactile discrimination, it must “not be forgotten that... itself was made possible by the higher “development of the brain” (p. 160). “Manual dexterity involves “experimentation and the process of learning the properties of “things and of the forces of the world” (p. 161). What he has to perform by means of the skill and the dexterity of his hands, viz., working, handling tools, is of course not mentioned; once further on (p. 161) cricket, tennis and golf are spoken of. Instead of work for life’s maintenance curiosity appears as a driving power: “this completer vision of objects in the outside world “stimulated a curiosity to examine and to handle them...” (p. 153).
Neither does speech afford a problem. "When... it became "possible for the individual to distinguish sharply one object "from another and to appreciate its manifold properties, the "time had arrived when the process of naming it acquired a "definite biological value... In other words, once it became "possible to recognize a particular it became useful to "invent a label for it. Man's ancestors were already provided "with the muscular instruments for speech and the ability to "use them for the emission of a variety of signals..." (p. 154). "All that was needed to put this complicated machinery to the "new purpose was Man's enhanced powers of discrimination to "appreciate the usefulness of communicating more intimately "with his fellows and to devise the necessary symbolism." (p. 103). In short, when his intellect had increased sufficiently "to realize the benefit of speech, man commenced to speak. "Though one cannot say that this simple statement of the process is "incorrect, yet the amount of truth in it cannot open up further understanding of the problem; the actual operating forces remain out of sight.

By Judson Herrick too, in the lines quoted on page 63, no distinction is made between man and ape in their reactions; both stand together here in contrast to the lower mammals. "In a similar wholly unfamiliar situation an ape and a man must "learn the same way... he is likely to pause and wait for an "'inspiration' to give the necessary orientation. This may come "in a flash... or the man (not sure about the ape) may think "it over systematically, make a mental analysis and 'figure it "out.'" (p. 228). Here a difference is drawn, briefly, as in doubt, more quantitatively than qualitatively. In a brief summary he illustrates the origin of man in the following words: "When "an arboreal primate came down from the shelter of the treetops "he must protect himself by concealment, by acquiring great "strength, or by his wits.... The first two ways were not very "successful under modern conditions. Most of those who tried "them are now extinct.... But wits survived. Out of the partner-"ship of a good brain and a hand fashioned for making and "using tools primitive man emerged" (p. 162). Here the tools are mentioned. Wits in their specifically human form clearly are regarded here as practically identical to the good brain, in

which, as we saw, the neurologist is only able to discover a quantitative progress. If we consider that even now the propaganda and the general acceptance of simple Darwinism, postulating the continuity of the development from animal to man, still meets with difficulties, it can be understood that the attention of biologists is not easily directed towards the fundamental quantitative difference between ape and man, and that the origin of man as a special problem does not come to the fore.

38. Deviating from this neurological way of viewing the matter, the German anthropologist Hans Weinert finds the origin of man in the single, special discovery of fire. "When, why and in "which manner, then, with the commencement of the Ice Period "man originated from this chimpanzee-branch of the stem of the "Primates, can now also be properly explained. Between man "and animal stands, as the only certainly different characteristic "in the development, the conscious use of fire. Once upon a time, "in the dim past, shortly before or during the beginning of the "Ice Period, this discovery must have been made — and that "was the hour of birth of humanity." (49, quoted by J. H. Post). It is well known that fire is now and again, through drought, the striking of lightning or a volcanic eruption, offered by nature itself. Early Man needed only to overcome the timidity and fear inherited from the animal world, to learn how to care for it and use it, at first especially as a means to protect himself against beasts of prey, and as a collecting point for the tribe. "The fire warmed him and protected him against enemies". The other capacities of man then came forth from it, because it demanded a continuous carrying of fuel and attention to keep it burning. "But the fire moreover demanded a watch over "it and care.... Indeed it produced for the first time the formerly "unknown conception of labour.... Labour, however, signifies "also action with the consciousness for what one works." (Weinert, 50, p. 64). A curious opinion; this scientist thus imagined that before fire was known, primitive man merely lazed about and had nothing to do. How far must he stand from the reality of practical life, when here the realization is completely lacking that man could ever only secure his liveli-
hood by constant labour, and that certainly the life of Early Man consisted in one continuous and heavy exertion to seek food and to ward off beasts of prey, especially under the hard conditions existing during the Ice Period. Klaatsch's idyl (i.e. p. 106), in which Early Man is described as walking about amongst the defenceless animals whilst they pressed fearlessly round him — as seamen in 17th century between swarms of dodos or penguins — and picking out and killing as many as he wished, contradicts too much what we know of the life of animals, to be regarded as a scientific statement. What Grosse wrote about the conditions of the "lower hunting peoples" certainly corresponds far more to reality: "The result of hunting and collecting is on the whole so slender and uncertain that it often does not even protect against the most bitter privation" (p. 36).

But there is yet better to come. "But perhaps the Promethean idea really was invented as a new thought only once; so that it could remain in existence, even when the first fire in the hand of man had long since gone out." (Weinert, 50, p. 66). What is meant thereby, appears further on: "... likewise conscious articulated speech remains as a great dividing line between "animal and man. And if we imagine then how a chimpanzee-like troop-leader, who has discovered the meaning of the use of fire, or at least has understood it a little, now has to exert himself to make the value of the discovery clear to the other members of the troop, then this can no longer be done by means of gestures or grimaces. A being, which of itself was already accustomed to make use now and then of his voice, must now arrive at making abstract things, such as surely "dealing with fire represents, understandable to others through "words." (p. 68). It will not be necessary to subject to a detailed criticism this naive application of the Leader-principle to man in primeval times — the leader not only invents the fire, but also invents abstract thinking and language! Even though we might ascribe so much to a short outlining in a semi-popularizing explanation, there is too much lacking here of a scientific realization of the connection of things, and of their gradual development.

The significance of the discovery and conscious use of fire as a stage in the first evolution of the human race above the animals — this is rightly realized by Weinert — can hardly be over-estimated. But it is inseparable from the use of tools. The hands, which for the first time dare to take hold of a piece of burning wood and to carry it elsewhere, had certainly been long accustomed to handle pieces of wood that were not burning, as well as other objects. Even where fire is given by nature, the handling of implements to treat, to keep, or to carry it is necessary, lest it should disappear, extinguished by other natural influences. Thus with many primitive tribes it is customary to use earthen ware pots or hollow sticks of bamboo to carry fire in. Fire only then becomes an assured possession when man becomes capable to make it himself; for this purpose the use of tools was required. It will not be easy to say whether the first artificial fire was brought about by the boring of one rapidly twirling pointed piece of wood into a hollow in another piece (as was for a long time preserved as a priestly ceremony by primitive peoples), or by the flying sparks produced when working pieces of flint. The essential factor here was always the active initiative displayed by man. Also, the development of his other capacities, of speech and thought, was a process of his own actual activity in the exertion and struggle for life. And it makes a great difference as to the intensity of such forces as were displayed then, whether they were called into action by a merely passive use of a means accidentally presented by nature, or through his work proceeding from his personal activity, through the creative power of personal action and personal invention.

39. Naturally, hardly any tangible relics exist of this first period of the origin of man, which could serve as experimental data for our knowledge. They do however exist for subsequent periods of further development, and consist chiefly of stone implements and such fossilized remains of man himself as bones and skulls. The former are lacking for the earliest period of primeval times. There is a difference of opinion as to whether the eolithes of Rutot and of Moir from the Pre-chellean had already been fashioned by human workmanship, or whether they were simply chosen and used as shaped and flaked by
natural causes. Of course a period of stones not worked by man must have preceded the period of worked stones; and it stands to reason that we cannot state with certainty whether they have been used by man.

It is different with the fossil remains of man himself. There are, however, very few remains of forms intermediate between the most highly developed ape-like ancestor (Dryopithecus) and the most primitive human being, which would bridge-over the intermediate four or more stages of cephalisation. Since they were discovered in more recent times only, we may expect more of them from further careful investigations. The earliest will then have to illustrate especially the development of the human body as the biological origin of man. Probably one may regard as such Australopithecus of Taungs and of Sterkfontein, the brain weight of which is estimated to have been 450 grams, a low, hardly more than ape-like cephalisation, whereas the set of teeth already shows human characteristics. On the other hand, Pithecanthropus and Sinanthropus, having a brain-weight amounting to 900 and 990 grams, stand only one small cephalisation-stage below man. Here one should reckon with the possibility of finding the first traces of the essentially human characteristics.

The casts of the inside of the skull remnant of the Pithecanthropus on which the grooves and windings of the brain surface are faintly visible, supply us with a few indications about the structure of the brains. From the strongly developed frontal lobe Tilney deduces an already considerable spiritual development. "The frontal lobe appears as a particularly conspicuous "portion of the hemisphere. It is prominent especially because of its large size and pronounced convolutions." (p. 872). "The "Javan man must have possessed increased powers of adapted "reasoning." (p. 875). The certainty of this conclusion, however, apart from what was remarked in § 18, is reduced by his preceding statement: "The position and disposition of the "Rolandic fissure (the boundary of the frontal lobe) assigned to the brain of pithecanthropus depend more on deduction and "analogy than actual indications on the cast." (p. 871). Further there is an asymmetry in these convolutions. "The left lobe of "the Javan man is slightly larger than the right, which is

"probably indicative of unidexterity" (p. 874). "It is probable that in his manual dexterity he was right-handed; at least the "greater size of his left frontal lobe suggests that his brain had "singly out one hand as the chief representative for externali-"zing activities. This in itself is a distinctly human character." Contrary to this opinion his British colleague Elliot Smith deduced (from the distinct right-hand sulcus lunatus) the exact opposite: "there can be no doubt that this earliest known human "being was also left-handed". (l.c. p. 184).

Of greater importance is the problem raised by Tilney's further conclusion: "But the prominence of his inferior frontal "convolution strongly suggests that he added one supreme "advantage to the motor equipment of animal life. He had "learned to speak — to communicate in verbal language." (p. 875). This opinion, however, is not accepted by more careful neurologists. Thus Arien’s Kappers says: "nothing can be said "about a special development of the left subregio frontalis "inferior of Brodmann (which in man contains the speech centre) "in Pithecanthropus"; and further on: "we have no morphologi-"cal evidence for assuming a specially developed operculum "frontale and speech centre on the left hemisphere." (p. 225, 228). On other grounds, viz from the considerable expansion ("sudden expansion") of the association-field next to the temporal lobes, Elliot Smith thinks that we may deduce an understanding of sound-symbolism, therefore also a capacity for speech. "The most primitive member of the Family had "already acquired some sort of speech" (l.c. p. 172). It does seem permissible to doubt that these proofs have convincing force.

In the case of Sinanthropus, a great number of skulls were first discovered lying together, and this gave rise to theories about ritual ceremonies, which were abandoned, however, when at a later stage other parts of the skeleton were discovered. In the same layer a number of roughly worked stones were found, and also charcoal and other traces of fire. "Traces of artificial "fire... are so clear and abundant that they require only to be "mentioned without any further demonstration." (Davidson Black, 10, p. 109). Some experts, as for instance the French anthropologist M. Boule, have expressed a doubt as to whether these remains of culture and the skulls actually belonged
together, or whether the skulls were too primitive to belong to those who had manipulated the stones and the fire (cf. Davidson Black, Fossil Man in China, p. 134). This cannot be settled until further remains are discovered.

From the casts made of the inside of one of the skulls Black concludes that Sinanthropus was right-handed and had a capacity for speech: “A study of the endocranial cast of Sinanthropus has made it clear that the brain of this form was in all ‘essentials a typically human one. It is further probable that ‘Sinanthropus was right-handed and had evolved the nervous ‘mechanism for the elaboration of articulate speech.”’ (ib. p. 113). “Probable” only, because a few pages back it was said that a detailed discussion from the point of view of “anthropological neurology” had not yet been made known. Although in cephalisation standing on a level with Pithecanthropus, Sinanthropus, owing to the characteristics of the skull, is mostly regarded as being already a transition to the later Neandertal Man. According to the geological layers in which the discovered remains were embedded, the age of Pithecanthropus and Sinanthropus is usually set at anything between 500,000 and 300,000 years ago, which in climatic periods corresponds to the second or first ice-period, or the intermediate and following warmer period.

40. Naturally we do not possess any empirical datum about the other human characteristics of these first forms of man, such as their spiritual life and their language. Of course, the extent of their logical thinking and of their speech in those first hundred thousands of years certainly was of a primitiveness far beyond our realization; we do not possess any point of comparison for this first awakening. It has been thought, especially by philologists, that the lowest types of human races known to us, with their mode of life, their thinking and their speaking, could serve, although with a certain amount of extrapolation, as examples for original primitive man. But against that the French linguist Delacroix has long since uttered a warning: “The linguist has always to deal with highly developed languages, which have a considerable past behind them, about which we know ‘nothing at all.”’ (p. 123). And again “We have abandoned asking “the savages. Their languages have a history. They are no “primitives, their languages are not primitive.” (p. 139).

In later years a particular theory has come into evidence, among others vigorously defended by the Dutch linguist Van Ginneken (La réconstruction typologique des langues archaiques de l’humanité). This theory expostulates that Early Man possessed a language of signs only, and not one of sounds: “the “sign language is….. the first natural language of the human “race” (p. 145). It is based chiefly on the significance and wide extension of the language of gestures, among the most different primitive i.e. uncivilized peoples, as stated by Lévy-Bruhl and others. There are gestures which are instinctively understood by all, and which are used by explorers, as a first means of understanding with foreign peoples. In the case at hand, however, it concerns a far more elaborated system of gestures with the hands and of postures of the body, in which through a combination of signs for simple conceptions a great wealth of ideas can be represented. It serves as a means of intercourse between the natives in Australia and in Africa, while it is also extensively used in America. Red Indians of the various tribes, who did not understand each other’s language of sounds, could in this manner converse for hours with each other. Frank Cushing discovered a system of making gestures for mutual intercourse, in use with the Zunis, which was closely associated with their common work; he represented this by the term “manual concepts”.

Must we conclude, then, from this general concurring together of the language of sounds and that of gestures, that the latter must have preceded the former? That a language of gestures is more primitive than a spoken language does not imply that it was the first language of primitive Early Man. We have to consider here that there are two meanings of the term primitive, which are often confused. Against this confusion Lévy-Bruhl himself has protested vigorously; in his “Herbert Spencer lecture” he calls this term “un mot malheureux”, because it provokes the misconception that by this name men should be indicated “still “near, or at least more near than we are, to the original condition “of the human society and that, in the present world, they repre- “sent our most distant ancestors” (29, p. 26). He does not mean
these ancestors; original man, "primitive" in an etymological sense "is unknown to us, and there are very few chances of us ever "getting to know him". What he means by "primitive" corresponds to what was formerly called "savage": "men who in fact are "not more 'primitive' than we are, but belonging to a society "which is called inferior or less civilised" (29, p. 7). Thus it is rightly stated by Lévy–Bruhl. Of course gestures and sounds both have played a rôle as indications in the earliest times, as they did with animals, and as they do still now with ourselves; but they do not constitute a language. As to the language of gestures: would it not be far more obvious to see in its intensive use a later means of mutual intercourse where, through a far-reaching differentiation of the language of sounds and many thousands of years of migrations, races with the most varied languages were thoroughly mixed together? Instead of the most primitive form it could then be, on the contrary, in this developed form, a product of the development of human speech which was already far advanced. Further, when one points to the many traces of this language of gestures in later cultured periods as remnants of prehistoric times (as e.g. the silent Pythagoreans) then we should consider that these pre-historic times were already an aftermath of many hundreds of centuries of development of culture and of language.

The theory put forward by Van Ginneken, however, has a wider scope. He stated that the first form of the language of sounds consisted of "clicks", produced by drawing in air, that these were afterwards replaced by consonant-words, formed during exhalation, and that these in turn were completed by filling them with a diversity of vowels. Nonlinguists cannot of course express an opinion about this theory. The languages of gestures then are supposed to have preceded the "click" languages. The first reproduction in writing, in hieroglyphics, it says to have originated from the gestures-language. These hieroglyphics are not simply images of things but mainly of postures and gestures. This is clearly recognizable in the original Chinese writing. As is generally known, the Chinese characters (written signs) do not represent words or sounds, but conceptions, so that they are read differently in provinces with different languages, but are understood by all in the same way.

They form a common language for a large cultural area, which can only be written, or rather brushed, and not spoken. Other cultured peoples extending their dominion imposed their language as the common language upon the peoples taken up in their sphere of influence. The ruling mandarins of China, however, were content to have a written means of intercourse. This, though, is differently interpreted by Van Ginneken, in accordance with the Chinese linguist Tchang Tchêng-Ming: the characters in the ancient texts were not pronounced at all! Speech only came about at a much later date. "Until this moment there is "not a shadow of an oral language or even acoustic signs in all "the Chinese characters... if there had been an oral language, "or click-words we should have found some trace of them." (p. 104). At this point one may well ask what these traces would look like?

The same holds good for the written languages in Egypt and Mesopotamia, where at first the signs were hieroglyphics, illustrating things and postures. Only later, in such simplified forms as cuneiform script, did they acquire sound-values and represent sounds, hence becoming syllables or letters. This is explained here in such a way that the spoken language originated in that later period only, and that all human intercourse preceding that time consisted of gestures. "Our review therefore "has given us this rather remarkable result, that all the systems "of writing which are known to us from the earliest days, are "following throughout their first three periods entirely the "model of a language of gestures, which therefore preceded "hieroglyphics. And evidently it was only with the aid and the "support of hieroglyphic languages, which possessed a dictionary "already, a grammar and a syntax, that in the advanced civiliza-
tions with the aid of interjected "clicks" the spoken languages "came about..." (p. 123). "Now our review has shown that "the spoken languages appeared in the history of mankind only "round the year 3500 B.C... at its earliest." (p. 124).

For making such a momentous deduction the argument and the material seem to be rather weak, to put it mildly. There must be far more stringent reasons to make anyone believe that the human race, from its beginning and during its development, remained mute in the sense that it was without any capacity
for speech, for hundreds of thousands of years, and that only quite recently, at the rise of civilization, spoken languages would have come into existence; and this whilst, to judge by the closest animal relatives, our ancestors were capable of producing different sounds. Moreover, if the spoken languages of civilised peoples originated from and through the written language, how then did the many spoken languages of uncivilised peoples originate? We may be sure that the two most opposite opinions — that the Pithecanthropus would have already spoken, and that highly developed man at a later stage could not yet speak until shortly before the rise of civilization — are assertions depending rather on enthusiastic fantasy than on trustworthy proofs.

X. THE PRINCIPLE OF PROGRESS

41. What distinguishes man from the animals, apart from the points already discussed here, is his development, is his progress. He is the only animal species that, from the very moment he came into existence, has been continuously changing and during a continuous process has become a different being. In the animal world too there is development; but here in such a way that new species have made their appearance and old species have disappeared. Each species has always remained practically unchanged throughout its whole period of existence of hundreds of thousands or perhaps millions of years; for an animal species there is a coming into existence and a perishing, but there is no history. Only man has a continuous history. His history is one of a constant advance and unfolding, at an increasingly rapid rate. From a geological point of view it only covers a very short period. “And then, some 80,000 years ago, relatively yesterday, “a new thing, a tool…., a stone shaped by and for the human “hand, and a new animal sound, voices talking.” (Sherrington, p. 18). Expressed in this reduced scale of time a few decades for the evolution of the animal world and a few weeks for the bodily origin of man would have preceded this single day, while civilization would have originated little more than one hour ago, and the industrial transformation of man and earth of the last century would have taken a couple of minutes. With the rise of the animal species Homo sapiens, a new principle came into the world. It introduced instead of a slow biological development through the origin of ever new species, a fast development, increasing in speed exponentially, within this one persisting species.

Whence this new principle? We can immediately perceive that it roots in the possession of tools. The great change was the substitution of the animal organ by the human tool. Both serve the same purpose of enabling the living being to ensure its food and life, and to carry on the struggle for life. Darwin has shown that in this struggle for life the weakest specimens, being unsuited to the environment, were exterminated, and the fittest, being the best adapted, survived and transplanted their better qualities on to their progeny. The fittest are the best equipped; what is selected and what they transplant is their equipment, the apparatus with which they carry on the struggle. They fight with their organs, using the excellence of their noses and their teeth, their eyes and their paws. The struggle is fought out between the organs, and the better organs win. That which is improved and developed in this struggle, through elimination of the less suited, are those essential organs needed for life. In the case of the animal these organs are part of the body; they are subject to biological laws of heredity and variation. Therefore they can alter and improve only with the barely noticeable slowness imposed by these laws. If these organs have altered essentially the entire animal has become a new species.

In the case of man these organs became tools, dead things which are not part of the body, and can be flung aside at any moment and replaced. Man fights the struggle for life with tools (as was previously pointed out, weapons too are tools); the struggle is fought out between tools, and the better tools and weapons win. It is the tool which is improved and developed in this struggle, which selects by elimination of the less suited. This development is not tied to the body, and is not therefore subject to biological laws. The speed of man's development is equal to the speed with which new tools can be invented and made. The body, once it is formed with its brain structure, hand, and organ of speech, thereby remains the same. The slowness of biological development, which reckons with thousands of
centuries, has been replaced by the speed of the technical development, the history of which is written at first with hundreds and with tens of centuries, afterwards with hundreds, at last with tens of years. From the palaeontological and biological point of view, adjusting our gaze to that time scale, we see on earth a gradual growth of the animal and plant life developing into ever newer, richer, higher and more perfect forms, until suddenly the development ends because with stupendous speed this monkey-breed rises to divine power and becomes master of the earth.

Master of the earth indeed, for now possession could be taken of the whole world. Each animal by having certain organs is adjusted to a certain mode of life and natural environment, outside of which it cannot go. Man, by taking in his hand diverse kinds of tools, disposes over every possible kind of organ. With the aid of these he can make himself conform to all modes of life in any natural surroundings. Thus he could adapt himself to all climates, spreading out over every continent; in each place differentiating his tools, weapons, activity, food, clothing, and general mode of life according to local conditions. Bodily he has remained practically unchanged; his adaptability lay in his possession of artificial organs, in the shape of tools, which were adapted without the body being required to change.

The biological development of the preceding millions of years is then indeed closed. Through the differentiability of tools, man becomes the equal in power of any animal; but through the perfectibility of tools he becomes the superior in power of any animal. By improving his tools and weapons he conquers and subjects them all; his higher degree of thinking puts the cunning of the animal, which is otherwise so appropriate, to shame. He can exterminate or spare at will. He can tame and cultivate, and, by the knowledge of biological laws, he can regulate the development of new forms to suit his needs. Which animals and plants in future will exist on this earth, will be decided by his will.

The free, independent biological development on earth has come to an end; the kingdom of nature makes way for the kingdom of culture.

We are accustomed and inclined to see in this above all the power of the human mind. Indeed the spiritual power of man has developed to ever greater heights, together with all the other qualities; and this is especially felt by us as personal active power: the mind governs the tool. However, this should not prevent us from seeing that all his superiority is linked up with the use of tools. Without artificial means, had man only had his natural organs, he would have been bound to one given mode of life, and to one environment. His actions would have been bound always to follow the same pattern and become rigidly fixed by it, as in the same way with animals actions and brain activity are bound and fixed within certain limits. Their limitedness must not be sought for in their brains — though these are less developed, in accordance with their needs — but in their bodies, since they only have bodily organs at their disposal.

42. When we make a detailed study of the prehistoric eras of man's existence, we see that the new technical principle did not at once take the place of the old biological principle. Between them there was an intermediate stage of a mixed character.

For supplying our knowledge of the development during the prehistory we have the two sources of information already mentioned, viz. stone implements and skeletons and skulls which remained from the human beings themselves. Drawings are not included as they are added only in a later period. A gradual development is to be seen in the implements, in which they became increasingly better finished and differentiated; thus they could be classified into different successive culture-periods. These have been, tentatively, identified with the climatic periods\(^1\) by means of the accompanying fossilized remains of mammals; in this various investigators do not, however, agree. The Chellean can probably be put on the same level as the penultimate interglacial period, the Acheulean with the moderate

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\(^1\) According to the now generally accepted computations of Milankovitch (Mathematische Klimalchere) the first ice-period (Güim) existed 600-550,000 years ago, the second (Mindel) 480-430,000 years, the third or penultimate (Riss) 270-180,000 years, each with two separate minima of temperature: whereas the last (Würm) existed from 120,000 until 20,000 years ago with three coldest periods separated by warmer periods. The next ice-period would then have to be expected in about 50,000 years to come.
third ice-period, the Moustierian with the last interglacial and the beginning of the fourth glacial period, the Aurignacian, the Solutrean and the Magdalenian with this last glacial period. In these last three, called the upper-palaeolithic period, we find drawings and expressions of art. This is the end of the Palaeolithic or Old Stone Age, the period of the worked but not yet polished stone implements. With the ending of this ice-period and the beginning of the warmer climate there is first an intermediate period, the Mesolithic Age; and then before long, with the end of the Pleistocene, a new period survenes, the Neolithic or New Stone Age, the cultural stage of the polished stone implements.

Among the human remains — after the older predecessors Pithecanthropus and Sinanthropus — the oldest considered to be a member of the genus Homo is the Heidelberg man, of which we only possess a lower jaw. Then in the Chellean, Acheulean and Moustierian periods the skulls and skeletons of the Neanderthal-man, Homo neandertalensis, are found in considerable quantity. Through special physical characteristics he differs from the later Homo sapiens. These characteristics consist of a heavy and thickset build, thick skull with powerful bone structures above the sockets of the eye (usually taken to serve as a support for heavy muscles), a flat-topped skull, a strong prognathism through projecting jaws and sloping forehead, a less jutting-out chin (somewhat like that of the Australian), which is thought to be connected with a still imperfect capacity of speech 1). But the contents of the skull is as large as that of modern man; hence there is the same degree of cephalization. In the upper-Palaeolithic, in the second half of the last glacial period, this species disappeared to make way for the Cro-Magnon-man, possessing all the exterior characteristics of later man, hence representing a race of Homo sapiens, “a race with a brain capable of ideas, of reasoning, of imagination, and more highly endowed with artistic sense and ability than any

1) Van den Broek sees in the chin especially the place where the mimic facial muscles are attached, which also play a role in the forming of the wordsounds (A. J. P. van den Broek, Over het ontstaan van spraak en schrift (On the origin of speech and writing), Geneeskundige Bladen 32 Reeks, X, p. 289, 1934).

“uncivilized race which has ever been discovered.” (Osborn, p. 272). Through his more highly developed technique, his better tools and weapons — amongst the cave-pictures we see an archer — and the higher spiritual development contingent upon it he probably exterminated the Neandertalers. Besides still other races existed; and later he himself has made way for a new form, that of neolithic man.

Thus in the first primeval age it is not one single biological species in which the development took place. In accordance with biological principles different man-like genera and species (Hominidae) came into existence, a process which took of course periods lasting for hundreds of thousands of years. However during these same periods and in these species the first use of tools appears. In time this developed into a deliberate construction, probably involving also the first forms of speech, a looming self-consciousness, and a beginning of human thinking. These now became means in the struggle between better and less well equipped groups. The species that had been adapted to the harsher conditions of the earliest time by a more powerful build, succumbed to the better technique and the better intellect of the Homo sapiens. When finally there remained, though in different races, this one species as the best equipped, a more rapid development of tools sets in under a fierce mutual struggle, now the pure working of the new technical principle.

Through the technique of polishing the stone implements, in the neolithic period, these acquired a sharpness and strength already comparable with those of later times. Now they differentiate into an abundance of suitable forms, and become more effective for fashioning wood and bone into all kinds of utensils, and into weapons for the hunt and for war. Now man through his axe and his bow and arrow gains the upper hand over bear and lion; now trees can be hewn and dwellings built, now the potteries appear, now thinking expands and becomes more inventive, now animals are tamed and plants are cultivated. Thus the transition from the first to the second stage of culture took place, of the three distinguished by Lewis H. Morgan as savagery, barbarism, and civilization in his book “Ancient Society”. Agriculture and cattle-breeding ensure an easier and more dependable livelihood than hunting and gathering, and
afford a greater physical development and strength; now for the first time it can be said that man has somewhat mastered nature. When then stone as a material for tools is replaced by metal, which is the ideal material for tools, being less brittle than stone and also capable of being formed into an infinite variety of shapes, the future path of unending development has been opened up for technique.

43. As to thinking in these prehistoric stages of culture, a comparison with the present day uncivilized peoples may supply a certain amount of information. Whereas we cannot or can hardly conclude from these peoples anything on the state of Early Man in his first periods of existence, we can learn a lot from them about the conditions which preceded civilization; this transition is the step which they did not take. At once then it is obvious that not only the technique of labour, but equally, and still more so, the social organization, with its strong community-feeling, dominates the spiritual life. For the use of tools operates as a barely conscious force, whereas the social community occupies the entire consciousness. The thinking of primitive people then is not simply a feeble beginning of modern objective rigid logic; it is a different, a subjective kind of thinking, a more fantastic and emotional form of combining the phenomena. Part therein is played by the doubling of the personality in the life of dreams, as well as by the socially bound-up organization of the strong forces of sexual life, and by the community of work which is ensured by a powerful group-sense. Spiritual life takes the form of animism, the humanization of the world; all things are man-like, animated. As long as technique is the subconscious basis, and the social community the conscious basis for the world of man, this manner of thinking, in many embodiments, continues to determine his spiritual life.

Primitive man cannot be content with having his abstract conceptions in the form of spiritual ideas only; too strongly do they affect his life. He has them as word-symbols; and often the word possesses a magic power for him. The need to have them as something more tangible, results in their identification with things as permanent symbols, present besides the fleeting word, which symbols are then supposed to be the source of this power. Thus appear numerous objects of veneration, sacred objects, paraphernalia of rites, sacrificial utensils, totems, images, amulets. These are used in ritual acts, in ceremonies and at feasts, in which the relationship between man and the surrounding world is expressed in symbolical forms. They occupy an important part of his time and thoughts, because in these he asserts himself in an active manner, by means of votive offerings, exorcisms, witchcraft and sorcery, by magic in general, or by other more efficient methods. In this way the relations which control the life of prehistoric as well as of later uncivilized man as mysterious spiritual powers, are transformed into tangible practice.

44. The transition to the third cultural period, that of civilization, is usually assumed to be connected with the origin of writing; the beginning of written history closes the prehistoric period. Language as a means of understanding, deliberation, and co-operation within the community acquires a new and wider form of expression. Besides the spoken and heard word there is now also the written and read word, bridging over distances, and fixing the transitory sound that disappears the moment it has been pronounced, in remaining visible signs-symbols. The hand acquires a new function; besides the tools it handles to replace animal organs, there is now the graver, the writing pen, the drawing brush, which he holds and directs in minutest movements, to replace his own organ of speech.

Now new connections must develop in the cerebral cortex to correlate sounds with visual images. These connections will have to develop between the auditory and the speech centre on the one side, and the optical fields on the other. Yet this is far from being such an important change in the structure of the brains as when speech originated. The optical centres in the cortex already had a many-sided function, inherited from the animal world, of interpreting and digesting the many stimuli which the eye as the most delicate localizing sense-organ received from the outside world, to transform them into efficient acts. Thus sight, hearing and speech were already closely interlaced in the association fields, and the apparatus
for the co-ordination of the visible written signs with the word-symbols was all but ready. Of course it still demanded a special exercise of the small minority of people who had specialized in intellectual functions; but this was comparable to other specializations in the division of work in crafts, such as the training of mosaic workers or lace makers on delicate shadings. It is only in the last few centuries, since the art of printing together with general instruction have made reading and writing a general proficiency, that the exercise and training of visible symbols have come to the fore, and have become equivalent to those of the speech symbols.

The transition from animal to man consisted in the replacing of the natural physical organs of work by artificial tools, which are dead objects and separate from the body. Thereby, apart from the hand and mouth, one bodily organ in particular, the brain, received a new and more extensive task for which, therefore, a bodily development was necessary. The significance of the introduction of writing now consists in the very fact that part of the function of this natural thinking organ, the brain, is also taken over by an artificial tool-apparatus. The brain is no longer needed as a storage place for knowledge, as this task has been taken over by the books. Manual work with implements takes the place of brain work. “One cannot but reflect here on the grand revolution which took place, when language, till then limited to its proper organ, had its representation in the work of the hand” (Ch. Bell, I.c. p. 257 Note). This means a tremendous relief for the brain, through which it was made free for other functions. It also implies, at the same time, that civilized man must have lost proficiencies of the brains, spiritual capacities, which were still possessed by prehistoric man.

45. It is often believed, considering the increase of knowledge and science, of insight in and dominion over nature, that the human brain has been improved to an ever higher state of perfection. This is an illusion; it is questionable whether our brains are better than those of the Cro-Magnon people in the Stone Age. We have only learned to use them more efficiently in conformance with the development of technique and society.

This is also apparent from a comparison with primitive peoples. From the statements made by numerous explorers living amongst wild tribes, we learn that these dispose over an amazing, almost incredible memory, far surpassing that of civilized peoples. Having once made a journey down a river or through a wood they know the way down to the smallest particulars for ever, without any mistake afterwards. They have absorbed the smallest details with the sharpest attentiveness; an European does not notice those things, but makes notes on his map. Natives pass on orally long letter-like messages over great distances after many days accurately word by word. Australians recite long song series, lasting for five nights, in a language unknown to them, exactly identical with the various tribes, which must be therefore stamped in their memory word by word. Many examples are given by Lévy-Bruhl in his book “Les fonctions mentales dans les sociétés inférieures” (The mental functions in lower societies) (p. 116—122). In the same way it is known from the transitional periods which preceded our civilization, how singers stored in their memory the sagas of former times, and how intricate exorcisms and legal formulas were passed on from father to son with verbal precision.

As against this we find with these peoples a lack of logical capacity for abstract thinking. “The slightest amount of reasoning no matter how little abstract, repels them so greatly that they immediately declare to be fatigued, and that they give it up. One must admit then . . . that with them the memory substitutes . . . for such operations which elsewhere depend on the mechanism of logic. With us, the memory is reduced, as to its intellectual functions, to the subordinate rôle of retaining the results acquired by a logical elaboration of the conceptions. For the “pre-logical” mentality, however, the memories are almost exclusively very complex representations succeeding one another in an invariable order.” (Lévy-Bruhl, 28, p. 123). This is the same phenomenon as is also seen in their language; the previously mentioned greater wealth in vocabulary and intricacy of grammar comes down to the rendering of every detail, of every diversity in the special relationships by separate words and forms, where we merely have a few general comprehensive expressions. For our concept “we”, the Cherokees distinguishes tens of cases (I and you; I and a third; I, you and
a third, etc.) and the verb has seventy personal forms of conjugation where Latin has six and we have still less. When we talk of a “tree” or of “going”, such languages do not possess these general names, but many different names for the kinds of trees, the kinds of going. Their speech is completely bound up with the concrete things; the totality is produced by rendering the detailed multiplicity of all the separate cases. This is likewise the case with their thinking. The far more intensive exertion of abstract thinking is avoided by paying the high price of cumber-

omeness. This concrete wealth of detail in thinking and speaking represents an older, less developed stage of the working of the mind, in which its abstracting faculty has only partly performed its task.

46. With the civilized peoples the invention of writing has effected this change into a higher capacity of abstraction. As long as the word as the symbol for the conception had to be preserved in the mind itself, by means of the memory, it had to remain restricted to that which was indispensable for life and work. Knowledge could not be extended indefinitely, because the brains could not retain everything; if the one were to be forced aside by the other in the mind, it would be gone; once forgotten, it was lost. As soon, however, as word and conception could be physically fixed, as remaining tangible, i.e. visible signs, hence could no longer be lost, the mental life acquired a far greater freedom. Formerly thinking remained enclosed within a given circle; then, later on, it could go wandering through unlimited spaces, without any danger of contents being lost. The contrast is indicated by Lévy-Bruhl in this way: “Now in almost all lower societies we find... this fixed mentality, retained and almost invariable not only in its essential traits, “but even in the content right up to every detail of its represen-
tations. The reason for this is that this mentality, although not “subject to a mechanism of logic, or rather precisely because it “is not subjected to it, is not free. Its uniformity is the reflex “of the uniformity of the social structure to which it corresponds “and which it expresses.” (28, p. 115). The latter sentence draws our attention to the fact that the social organisation too stands in close correlation to language and thinking; the rise of civiliza-

...tion shows besides the origin of writing, radical changes in the social structure, which, of course, cannot be treated here.

There is a certain analogy here with the case of the origin of man. Formerly, with the animal, the limitation of its bodily organs kept the actions enclosed within a given circle. When this limitation was removed because they were replaced by tools which can be reproduced and improved indefinitely, a new world of possibilities of development was opened up. As it then was with physical labour, so it is now, at the origin of civilization, with brain-work. Then thinking came about — the perception of perceptions —; now thinking about thoughts comes about, now theory, science is coming forth. Now that the content of thought has become a fixed tangible thing, it can itself become a subject for thought. Then, at the origin of man, the vague, nebulous mass of experiences, a formless complex, took on form in the word; it became a something, it got definiteness as a concept, it could be indicated, imparted as a word symbol. Thus it enabled human thinking to set off on its course. But it did not reach further than this aim of practical life. The fleeting sound disappeared the moment it was pronounced and had achieved its object. Now, however, the conception is fixed in a written image; from being a something only, a sound that was lost, it becomes a solid, a thing that remains, a subject of investigation. Now that the conceptions and statements, which embody our knowledge — or perhaps our lack of knowledge — can be seen by our bodily eyes in written, or later in printed words, we can study them, compare them, reflect upon them, and handle them in various ways. Besides thinking about actions comes thinking about words, concepts, statements. Thinking is no longer simply enquiring: what shall I do? It now faces the question: what is truth? Now knowledge becomes theory. In the absence of writing, neither philology nor logic nor epistemology could have developed. Similarly the knowledge of nature would not have risen beyond the level of a few empirical rules, and could not have developed into a true science of nature.

This theoretical science in time becomes an aid in practical life. The first ordered knowledge of nature arose through technical requirements, or to put it more generally, through labour. In cases where this labour did not directly concern
technique, the knowledge of nature involved was orientation in
the particular natural environment. Thus for instance the need
for transport and travel, for the knowing of the time for hunting
and agriculture gave rise to the first knowledge of astronomy.
Thus also biological and climatological knowledge were obtained
from practical experience in agriculture and cattle-breeding; and
physical and chemical knowledge from the treatment of the
products, from spinning, weaving, and preparing foods, from
the pottery technique and the treatment of metals. With civiliza-
tion as the dominion of the written language, logical thinking
acquires the power to formulate all this knowledge into science
consisting of abstract conceptions and laws of nature, and
moreover to fix the method of science in general forms.

The history of civilization was not one smooth curve of pro-
gressive development. Several times a fresh start had to be
made, first in the early Oriental Antiquity, then in the ancient
Greco-Roman civilization, and again in the Middle Ages, before
a social organization was found which possessed inner strength,
extent, and possibilities of development to a sufficient degree.
Once these obtained, a gradual upward movement started,
introducing the New Age, where the need for a greater product
of labour became the driving force for technical and scientific
progress. The requirements of technique strain the ingenuity of
pondering minds, and the experimental investigation of nature
creates in the 17th and 18th centuries mechanisms and the theory
of heat as a basis for the rise of industry. Under the social forms
of freedom of enterprise and capitalism industrial competition
becomes a battle of tools, in which the better machine wins
and replaces and destroys the less productive small tool. In this
way the machine technique of modern big industry grew rapidly
in the 19th century, borne by an intensive investigation of nature
which was thereby stimulated, and conquered the whole world
— the second conquest after the first made by Early Man with
the early tool — and is now at work organizing the whole of
humanity into one social community.

47. Natural science, which in its development runs parallel
with the rising exponential curve of the development of mankind,
is a living proof of the close connection existing between
tools and thinking. Natural science is rightly considered to be
the field in which human thinking, in a continuous series of
triumphs, has developed its logical forms of conception most
powerfully, and has applied its capacity for abstraction most
purely. Thus it proceeded with a firm tread towards an
increasing certainty of knowledge, and became a guide in the
method of thinking for other fields of thought. Further, it is
clear to anyone that natural science has developed to this height
due to its continual mutual reactions with technical require-
ments, i.e. with labour and trade. On the reverse, as a counter
proof, at the other extreme stands the large field of human
actions and relationships in which the use of tools does not play
an immediate role, and works only in the dim distance as the
deepest unknown and invisible foundation — the field of the
social phenomena. There thought and action are determined
mostly by passion and impulse, by arbitrariness and improvi-
dence, by tradition and belief; there no methodical logic leads
to a certainty of knowledge; there is lacking the firm tread of
recognized unanimous progress; there we see opposing opinions
and systems returning again and again to the same problems.

Among the many who have given expression to this contrast
between these two realms of spiritual life, we may quote here
from the American historian Lynn Thorndike's work on medi-
eval magic and science. "Are there other sides of our life and
thought to-day where magic still lingers and no such march as
"that of modern natural and experimental science has begun"
or progressed so far? We fear that there are. One can well
"imagine that a future age may regard much of the learning
"even of our time as almost as futile, superstitious, fantastic in
"method, and irrelevant to the ends sought, as were primitive
"man's methods of producing rain, Egyptian amulets to cure
"disease, or medieval blood-letting according to the phases of
"the moon.... We might carry our comparison from the world
"of scholarship, which at least displays industry and ingenuity in
"its superstitions, to the cruder and lazier conceptions and
"assumptions of social and civil life. Often enough has the con-
nection of religion with magic been pointed out, but what side
"of life is there that is free from it?.... Or who can marvel at
"past belief in the magic power of words, who hears statesmen
“speak and millions shout of Militarism, Nationality, Democracy, 
Prohibition, Socialism and Bolsheviki? What fears, what hopes, 
what passions, what prejudices, what sacrifices these words 
elicit! And how little agreement there is as to their meaning! 
... let us measure the amount of magic in present civilization 
by Plotinus’ standard.... Measuring our age by such a 
standard, we shall be tempted to cry out; magic of magics, all 
is magic! What else is there to write about? At least one thing, 
and that is experimental science. It always is making acquisi-
tions and never grows less; it ever elevates and never 
degenerates; it is always clear and never conceals itself.” 
(II, pp. 979—982).

The world of conscious logical thought only occupies a certain 
section of modern spiritual life; besides it there is a larger, 
though decreasing section where the impulses and instincts 
inherited from the animal world and the former periods of 
human culture dominate spirit and life. It is not difficult to 
perceive that here too, in modern times, the same contrast 
operates as under primitive conditions: the social relationships 
fill the consciousness and leave only part of the field for the 
technical influences. They find their expression also in theory 
and science. Thus, over and against the method of formation 
of abstract conceptions and their causal connection, recognized 
in natural science, a totally different and own method is claimed 
for and proclaimed by the spiritual sciences. This appears in 
the doctrine that for the history of mankind the combining of the 
multiplicity of phenomena into abstract, general rules and causal 
laws is impossible, since it consists of events which have taken 
place only once. In the world of man it is not the cause but the 
aim which determines the event. It is not causality which rules, 
but teleology; if we speak of a general law here, it is not the 
law of “it must” but the law of “thou shalt”, the moral law. 
This doctrine formulated in the beginning of the 20th century 
chiefly by Dilthey, Rickert and Windelband, has since found, 
under the name of “historism”, a wide adherence. “The kernel 
of historism consists in the replacing of a generalizing con-
sideration of historical-human forces by an individualizing 
consideration.” (Meinecke, p. 2). Thus it appears that where 
tools are not used for labour or experiment, or simply are not 
seen, the consciousness of causal connections as a form of 
thinking remains feeble; that where man is seen acting as an 
apparently free-willed being in society, bound only by the 
weakened ties of ethics to the community, thinking and inference 
also follow other paths. This implies, however, that once the 
social fabric will be linked, directly and visibly to all, with 
technique and labour, this difference loses its basis and the 
method of natural science will be extended over the spiritual 
sciences.

The contrast appearing here, with perfection on the one hand 
and imperfection on the other, means that man controls the 
forces of nature, or is going to do so in ever greater measure, 
but that he does not yet control the forces of will and passion 
which are in himself. “Where he has stood still, perhaps even 
“fallen behind, is in the manifest lack of control over his own 
“nature” (Tilney, l.c. p. 932). This is, clearly, why society is still 
so much behind science. Potentially man has mastery over 
nature. But he does not yet possess mastery over his own nature. 
How is he to acquire this?

48. It would not be astonishing if it should appear to neurologists, 
— because they consider the growth of the brains to be the main 
cause for the origin of man, and because they are familiar with 
the sudden increases of cephalization as a factor in development, 
— that salvation out of this contradiction can be expected only 
through a further growth in the same direction. A further develop-
ment and increase of the brains, which would mean the next 
step to a higher degree of cephalization, with a corresponding 
increase of the mental capacities, will then have to discard the 
imperfection which is harassing humanity. A cautious indication 
of this may be seen in the final consideration in Tilney’s already 
quoted work. “Perceived in this way, it is possible to sense the 
“full force of the impetus in that irresistible momentum which 
“has carried the great vertebrate phylum upward and onward 
“through the ages and may still carry us onward.... Is there 
“still a possibility of further evolving in the developmental 
“process so clearly seen in the brain of the primates, so obviously 
“reaching its present culmination in the brain of man — is there 
“still a latent power in the human brain for the expression of
yet unsuspected potentialities and beneficial progress? This is a question which may not be quickly read or soon forgotten.

There is an undeniable insistency about it as it calls attention to the palpable imperfections in human organization. Answered "in the negative, to what continuing discouragement does it not "commit the race; answered in the affirmative, with what "inspiring expectations may we not look to the future of mankind!" (I.e. 1044—45).

Against this opinion it should be remarked that man as an animal species, Homo sapiens, has only existed for some tens of thousands of years, that his civilization in its first appearance in restricted regions dates back some thousands of years only, that the rapid rise of industrial technique and natural science is merely one or two centuries old, and that hence he is still in the first beginnings of his course. Considered from the point of morphology, in bodily structure, in cephalization, he has not changed thereby; in actual power he has risen more and more quickly to a more and more complete command over his conditions of life. Will this now all at once come to a halt? On the contrary, he is just beginning. There is every reason to regard what up till now he has experienced and done merely as an introduction to his future actual history. The possibilities of his spiritual apparatus, his brain organ, have not yet by far been exhausted; the necessity for a higher degree of cephalization has not yet appeared at all. The crisis through which we are passing, how ever it may have come about, shows the characteristics of being one of the last convulsions in the process of mankind growing together into one self-controlling world community. Lack of capability as yet to organize, master and regulate his own forces in social co-operation, which is recognized as the source of man’s shortcoming, lies in the domain of society. It cannot be done away with by natural science and technique, but only by forces emanating from society itself. Their treatment lies outside the scope of this study, as it would lead us too far beyond the field of natural science.

SUMMARY

There are three characteristics, which, to a great extent, distinguish man from the animals; abstract thinking by means of conceptions, speech, and the use of tools fashioned by himself. The problem of anthropogenesis is to find out how, from the small traces of analogous properties in animals, these qualitatively entirely different human characteristics could develop.

Animals too make use of dead objects to suit their own purposes, but only man shapes them into tools according to a conscious plan. The tool in the human hand performs the same function as the bodily organ of the animal. The grasping hand was a necessary condition for the manipulating of tools and this was inherited from the arboreal life of man’s ancestors. Social life was another condition for the use of tools, because only in communities could it be preserved and knowledge about it thus be transferred to the next generation. Because the tool is a separate and dead object it can easily be replaced when damaged, interchanged for a better one, and differentiated into a multiplicity of forms for various uses. It can be improved upon continually by new inventions, thus raising man into increasing superiority above the animals.

Animals too have consciousness and a certain intelligence. The stimulus of bodily needs and sense impressions induce direct action as a response. In man this direct connection is broken; the impressions are collected in the mind, and afterwards action comes spontaneously. Thinking follows a detour, or rather many detours which must be compared; numbers of images interpose between impressions and actions, forming chains of ideas that are objects of observation by our own consciousness, and take the character of abstract concepts. In the brain the distinction between man and animal appears only as a quantitative difference; the brainweight of man (for the same body size) is four times larger than with the anthropoids, and so is the surface of the cortex. Whether the frontal lobes, usually considered as the organ of abstract reasoning, are relatively larger in man is uncertain.

Animals utter sounds of emotion, which in social groups serve as signals of warning and communication. In man these sounds
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Animals utter sounds of emotion, which in social groups serve as signals of warning and communication. In man these sounds
are words, auditory symbols conventionally designating quite different things, names for objects and actions. They constitute a language, a perfect and complicated apparatus of intercourse serving for co-ordination of action. Speech is an organ of community that can only originate and exist in a community, as a condition of collaborate activity and fight; it embodies and preserves the ever increasing mass of knowledge. It can only exist with a certain faculty for thinking; on the other hand human thinking would not be possible without speech. Concepts can be formed and retained only by expressing them in names and words; conscious thinking is always speaking with one self by means of words.

The use of tools was an important factor in the origin of human thinking. The tool interposes itself between organism and outer world, between stimulus and action. It compels action, and hence thinking, to make a detour, from the sense impression via the tool to the object. Because there are many tools there are many detours, and a choice must be made after following out all of them in the mind before acting. The separation between the construction of the tool beforehand and its use afterwards produces a separation in the mental processes and makes theoretical thinking a distinctive activity. The tool objectivates the previously instinctive action, and by the visible results of its working awakens consciousness of the concept of causality. Speech too was greatly induced by the use of tools. Since a tool was alternately object and part of the subject it struck the attention first of all as a separate object; and by its importance for labour and life some sound, accompanying action which involved its use, became attached to it. These dependencies are shown by the anatomical fact that in the cortex the speech centre is formed only in that hemisphere which innervates and directs the hand holding the tools. For most people this is the left hemisphere, whereas for left-handed people it is the right hemisphere.

Because these three special human characteristics are all dependent on one another they could develop only together. This they did from mere traces, each in common growth mutually strengthening the others, and each by its small increment inducing increases in the others, the whole of this process being supported by the previous growth of the brain. The first impulse came from a change of life conditions that made man's ancestors inhabitants of the plains with an erect posture. Then, in some hundreds of thousands of years, with extreme slowness at first, and afterwards more and more rapidly, the use of tools, the faculty of speech, and abstract thinking developed. The previous development of the animals, because the changes in bodily organs depend on biological processes, took place extremely slowly, and always by the formation of new species. The rapid development of this one species Homo Sapiens was possible because the easily interchangeable and artificial tools had replaced the bodily organs and could be improved increasingly rapidly by the struggle for life. Thus man became master of the earth, and his rising put an end to the development of the animal kingdom. In the last part of his rise, some thousands of years ago, the invention of writing, adding visible and lasting symbols to the passing sounds of spoken language, marks the beginning of civilization. It produced theoretical science as a basis for a continuous technical progress, which is now nearly about to unite all mankind into one self-controlling community.

RÉSUMÉ

L'homme se distingue des animaux par trois caractéristiques principales: la pensée abstraite au moyen de concepts, le langage et l'usage d'outils qu'il a lui-même confectionnés. Le problème que pose l'anthropogénèse, c'est de savoir comment les traces de qualités analogues qu'on rencontre chez les animaux sont développées de façon à devenir des facultés qui diffèrent qualitativement.

Les animaux, eux aussi, se servent d'objets inanimés naturels pour leur desseins; l'homme seul les transforme en outils, à la suite d'une préparation conçue d'après un plan projeté. L'outil qu'on tient à la main remplit les mêmes fonctions que l'organe corporel de l'animal. Pour pouvoir saisir et guider l'outil, l'homme doit donc disposer d'un organe de prémption, la main, qui est pour lui un legs de ses ancêtres siniens habitant les arbres. La vie en communauté est une autre condition nécessaire, parce que la connaissance de l'usage est transmise ainsi à la
génération suivante et qu'elle sera conservée par là. Comme l'outil est un objet inanimé, séparé du corps, il peut être remplacé s'il est détritique, et il peut se transformer sous des formes multiples en vue de buts différents; ainsi on pourrait dire que l'homme est un animal qui dispose d'organes interchangeables. L'outil peut se perfectionner continuellement grâce à des inventions et dépasse à la longue en perfection tout organe animal; c'est ce qui assure à l'homme sa supériorité sur les animaux.

Les bêtes sont également conscientes, possèdent des facultés mentales et une certaine forme de pensée. Chez elles les sensations de besoins physiques et les impressions sensorielles forment une unité inséparable avec l'action qui les suit. Chez l'homme cette unité a été rompue; les impressions s'accumulent dans l'esprit sans qu'elles soient immédiatement suivies de l'action; l'acte vient après comme un fait spontané. La pensée fait un détour en passant de l'impresion sensorielle à l'action, ou plutôt, elle fait bien des détours, parmi lesquels il faut faire un choix. Un certain nombre d'idées s'insèrent entre l'impression et l'action comme des chaînes dont on peut relier les chaîons de diverses façons comme des pièces de rechange indépendantes, qui deviennent des objets de la perception de la conscience et qu'on peut distinguer comme des idées abstraites. La différence entre l'homme et l'animal se manifeste seulement quantitativement dans le cerveau: chez l'homme le poids du cerveau est quatre fois plus grand que chez les anthropomorphes de la même taille et il en est de même de la superficie de la substance corticale. Il est douteux que les circonvolutions frontales, considérées le plus souvent comme l'organe de la pensée abstraite, soient relativement plus volumineuses chez l'homme.

Quant aux animaux, des sons émotionnels fonctionnent comme moyens d'avertissement et de communication chez les animaux qui vivent en commun. Chez l'homme seul ces sons sont devenus des mots, des symboles sonores arbitraires ayant une tout autre signification. Ils forment une langue qui est un mécanisme de communication parfait et compliqué qui sert à coordonner toutes les actions. Le langage est un organe de la communauté et peut naître et subsister uniquement dans une collectivité; elle est la condition même du travail et de la lutte en commun, et elle incarne et conserve le savoir qui va en augmentant toujours. Il faut un certain degré de développement intellectuel pour permettre la construction et l'usage de la langue. Inversement la pensée humaine n'a pu naître que par le langage; ce n'est qu'en exprimant les idées au moyen des noms et des mots qu'elles pouvaient se former et se fixer; penser d'une façon consciente, c'est se parler à soi-même.

L'usage d'outils a exercé une grande influence sur la naissance de la pensée humaine. L'outil s'insère entre l'organisme et le monde extérieur, entre l'impression sensorielle et l'action, et oblige l'action à faire un détour; c'est pourquoi notre pensée est également obligée à faire un détour, allant de la sensation à l'objet en passant par l'outil. La multiplicité des outils, qui implique la multiplicité des détours, oblige la pensée à faire un choix et à comparer préalablement. La distance entre la confection préparatoire et l'usage postérieur de l'outil entraîne également une séparation entre les processus intellectuels et éleve la pensée théorique au rang d'une activité indépendante. L'outil objective l'action qui jusque-là était instinctive, et grâce à ses effets visibles il fait naître le concept conscient de causalité. L'outil a exercé une grande influence sur la première formation du langage; puisqu'il était tantôt objet extérieur, partie inanimée de la nature, tantot organe corporel, partie du sujet, il se différencie de tous les deux et se trouve être un objet à part; et par suite de son importance dans la lutte pour la vie un son accompagnant l'action s'y attache et devient un nom. Cet effet de l'outil se montre aussi dans le fait que dans le cortex cérébral le centre du langage ne s'établit que dans l'une de ses moitiés, dans celle qui innerve la main qui manie et guide les outils, savoir chez la plupart des hommes dans la moitié gauche, chez les gauchers dans la partie droite.

Comme ces trois caractéristiques de l'homme se conditionnent mutuellement, elles n'ont pu se développer à partir des premières traces qu'en formant un tout, s'activant l'une l'autre par leur progrès graduel en croissance commune; tout ce processus s'appuie sur la croissance préalable du cerveau. La première impulsion a été donnée par un changement dans les conditions de la vie, changement qui a fait des lointains ancêtres arboricoles des êtres qui marchent debout dans la plaine. En une
période de quelques milliers de siècles l'usage des outils, le langage et la pensée intellectuelle se sont développés, d'abord lentement, d'une façon imperceptible, ensuite toujours plus rapidement. Le développement préalable dans le règne animal ne pouvait se faire qu'avec une lenteur extrême, créant de nouvelles espèces, parce que l'évolution des organes corporels dépend de lois biologiques. Le développement rapide d'une seule espèce, l'Homo sapiens, s'est effectué parce que l'outil extérieur et rapidement remplaçable a pris la place de l'organe de l'animal, et que cet outil s'est perfectionné de plus en plus dans la lutte pour la vie. C'est ce qui a fait de l'homme le maître du monde et c'est pourquoi son avènement a clos le développement organique du règne animal. Il faut ajouter l'invention de l'écriture dans la dernière phase de ce développement, il y a quelques milliers d'années, ce qui a ajouté des symboles visibles, permanents, aux sons éphémères du langage parlé. Ceci marque les débuts de l'ére de la civilisation, les origines de la science théorique comme base d'un progrès technique ininterrompu qui est à la veille de consolider l'humanité en une unité organisée, maîtresse de sa vie.

ZUSAMMENFASSUNG

Der Mensch unterscheidet sich von den Tieren durch drei wesentliche Unterscheidungsmerkmale: das abstrakte Denken mittels Begriffe, die Sprache, und den Gebrauch von Werkzeugen, die er selbst verfertigt. Das Problem der Menschwerdung, der Anthropogene, ist, wie die Anlagen analoger Eigenschaften bei den Tieren so ausgewachsen sind, dass sie zu qualitativ verschiedenen Fähigkeiten geworden sind.


Bei den Tieren treten Laute als Ausserungen der Erregung auf, die bei in Gemeinschaft lebenden Tieren zu Warnung und Mitteilung dienen. Beim Menschen allein sind diese Laute zu Worten geworden, zu willkürlichen Klangsymbolen, die etwas ganz anderes bedeuten, zu Namen von Dingen und Handlungen. Sie bilden eine Sprache, die als komplizierter und vollendeter Mitteilungsmechanismus zu Koordination aller Aktion dient. Die Sprache ist ein Organ der Gemeinschaft und kann nur in einer Gemeinschaft entstehen und bestehen bleiben; sie ist die Vorbedingung gemeinschaftlicher Arbeit und gemeinschaftlichen Kampfes, und verkörpert und bewahrt die stetig wachsende.
Masse der Kenntnisse. Für die Bildung und den Gebrauch einer Sprache ist eine gewisse geistige Entwicklung erforderlich. Umgekehrt konnte nur durch die Sprache das menschliche Denken entstehen; Begriffe konnten sich nur dadurch bilden und festgehalten werden, dass sie als Namen und Worte ausgedrückt werden; bewusstes Denken ist Mit-sich-selbst-sprechen in Worten.


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ORIGINAL QUOTATIONS

6. "... die äusserste Not macht es niemals erfinderisch" (Geiger).

9. "De natura Rationis non est, res ut contingentes, sed ut necessarii contemplant" (Spinoza).

9. "Denken ist die bewusste Vergleichung der schon gewonnenen Vorstellungen unter Zusammenfassung des Gleichartigen zu Begriffen" (Helmholtz).

12. "La pensée est dynamisme, la pensée est association" (Piéron).

13. "Dadurch dass wir die Dinge denken, machen wir sie zu etwas Allgemeinem" (Hegel).

16. "Es scheint spezielle Erinnerungszellen zu geben" (Rohracher).

16. "C'est une idée puerile que de s'imaginer que le cerveau constitue une magasin où se déposent de petits clichés, images photographiques des événements qui ont affectées les sens..." (Piéron).


17. "L'extension, la croissance et la multiplication des appendices des neurones ne s'arrêtent pas d'ailleurs à la naissance; ils se contiennent au delà...L'exercice est sans doute pas étranger à ces modifications vraisemblablement plus marquées dans certaines sphères, chez l'homme cultivé. Le manque d'exercice doit provoquer, au contraire, durant la croissance et même à l'âge adulte, dans les sphères inactives de l'homme cultivé comme dans le cerveau de l'homme inculcés ces phénomènes de résorption...qui se traduisent ici par l'oubli." (Ramón y Cajal).

17. "Les expansions cellulaires de nouvelle création n'avancent pas au hasard; elles doivent s'orienter d'après les courants nerveux dominants ou encore dans le sens de l'association intercellulaire qui est l'objet des solicitations réitérées de la volonté." (Ramón y Cajal).

18. "Es gibt ... ausgedehnte Rindenbezirke, deren Thätigkeit im
Wesentlichen darin besteht, die Erregungszustände verschiedenartiger Sinnesphären zu associieren." (FLECHSIG).

§ 18. "Die Bildung und das Sammeln von Vorstellungen äusserer Objekte und von Wortklängbildern, die Verknüpfung derselben unter einander, mithin das eigentliche positive Wissen, nicht minder die phantastische Vorstellungstätigkeit ... kurze die wesentlichen Bestandtheile dessen, was die Sprache als Geist bezeichnet." (FLECHSIG).

§ 18. "Thatsache scheint, dass das positive Wissen nicht unmittelbar leitet, wenn das Stirnhirn zerstört wird — wohl aber die zweckmässige Verwertung desselben, indem eventuell eine vollständige Interesselosigkeit ... sich geltend macht." (FLECHSIG).


§ 23. "Wie oft tritt nicht auf den verschiedensten Gebieten eine grössere Klarheit des Denkens plötzlich mit einem glücklich gesprochenen Worte ein! Ja, es bedarf nur einer geringen Beobachtung unserer selbst, um uns zu überzeugen, dass nicht nur je bestimmter, sondern auch je lebhafter wir denken, um so mehr wir nur durch Worte denken ... so dass unser heutiges Denken nichts als leises Sprechen, ein Sprechen mit oder in uns selbst ist. Die Sprache hat also jedenfalls das Denken so sehr durcheinandern und eine so innige Verbindung aller ihrer Teile mit ihm eingegangen, dass ein aus dieser Verbindung gelöstes Denken, ein Denken vor der Sprache und ohne sie, wesentlich von unserem gegenwärtigen verschieden sein müsste: und darum kann, während wir Bedenken tragen, einer Thätigkeit der Vernunft bei der Herstellung der Sprache einen bestimmenden Einfluss zuzuschreiben, doch eine Wechselbeziehung zwischen beiden nicht geleugnet werden, da die Vernunft ohne die Sprache nicht vollständig und für die Herstellung der Vernunft die Sprache nicht gleichgültig ist." (GEGER).


§ 29. "Ganz anders wird das Verhältnis, wenn das Werkzeug als Mittelglied zwischen den Willen und die beabsichtigte Wirkung tritt ... Denn hier ist der Causalbegriff augenscheinlich und sich gleichsam von selbst aufräumend. Das Wirkende ist erst zu schaffen oder doch herbeizuschaffen; das Verhältnis des zweckmässigen Mittels zu der beabsichtigten Wirkung ist eben das Causalverhältnis selbst, es tritt hier der beobachtenden Betrachtung in seiner einfachsten, handgreiflichsten Verkörperung entgegen." (NOIRE).

§ 29. "Nur aus der objectiven Welt entzündet und erleuchtet sich das Selbtsbewusstsein: aber nicht aus der objectiven Welt als solcher, wie sie uns rings umgibt und entgegenstarrt und ja wohl auch von dem Thiere angestarrt d.h. verständnisslos gesehen wird, sondern insofern sie von dem menschlichen Willen, der menschlichen Thätigkeit, d.h. dem subjektiven Factor verändert, modifiziert, umgestaltet wird." (NOIRE).

§ 30. "Die hohe Wichtigkeit der Hand als Vernunft-Organ liegt in ihrer vorwiegenden Activität, jenem durchaus notwendigen Faktor, ohne
welchen überhaupt keine Erkenntnis zu Stande kommen kann.”
(NÖRÖ). § 31. “(da) begeht Sultan einen "schlechten Fehler", oder, deutlicher gesprochen, eine kräftige Dummheit... Gleich danach setzt ein...
unter die "guten Fehler" zu rechnendes Verfahren ein.” (KÖHLER).
§ 31. "Dabei kommt es zufällig dazu, dass er vor sich in jeder Hand ein Rohr hält, und zwar so, dass sie in einer Linie liegen; er steckt das dünne ein wenig in die Öffnung des dickeren, springt auch schon auf ans Gitter, dem er bisher halb den Rücken zugekehrt und begibt eine Banane mit dem Doppelschirm heranzuziehen.” (KÖHLER).
"Die Sprache ist dem Werkzeug verwandt; auch sie gehört zu den Geräten des Lebens, ist ein Organ wie das dingliche Gerät...”
(KARL BÜHLER).
§ 33. "... die Sprachforschung (hat) den vollkommenen Beweis dafür erbracht, dass der Mensch schon Sprache besass, ehe er im Besitz des Werkzeugs war...In den untersten Schichten des Sprachlebens tritt uns der Mensch, in dieser Hinsicht von dem Thiere noch nicht unterschieden, nur auf die Thätigkeit seiner natürlichen Organe angewiesen, entgegen.” (NÖRÖ).

auf dem sie Rafaelische Gemälde, Thorwaldsensche Statuen, Paganinische Musik hervorzuzaubern konnte.” (FR. ENGELS).
§ 37. "Une dernière révolution psychique... est celle qui est marquée par l'apparition de l'homme à la surface de la Terre. Cette apparition est entourée de bien des mystères... Voici simplement une des opinions récentes: la Terre était peuplée d'une multitude de mammifères quand l'homme est apparu, par mutation brusque, avec un cerveau hypertrophié, — sorte de monstre dont la pensée allait dominer l'animalité... il a découvert le feu, il a fabriqué des outils, il a pratiqué le langage... Il y a un hiatus entre l'intelligence des animaux et l'intelligence humaine; je ne crois pas que nous soyons prêts à combler cet hiatus.” (GEORGES BOHN).
§ 38. "Das Feuer wärmte und schützte vor Feinden”..."Aber das Feuer verlangte auch Wartung und Pflege... Es brachte ja zum ersten Male den vorher nie gekannten Begriff der Arbeit... Arbeit, die heisst aber auch Tätigkeit mit dem Bewusstsein, wofür man schafft.”
(WEINERT).
§ 38. "Der Ertrag des Jagens und Sammelns ist im Ganzen so dürftig und unsicher, dass er häufig nicht einmal gegen den bittersten Mangel schützt.” (GROSSE).
§ 40. "Le linguiste n'a jamais affaire qu'à des langues très évoluées, qui ont derrière elles un passé considérable dont nous ne savons rien.” "On a renoncé à rien demander aux sauvages. Leurs langues ont une histoire. Ils ne sont pas des primitives, elles ne sont pas primitives.” (DELACROIX).
§ 40. "Le langage par gestes est... le premier langage naturel de l'humanité.” (VAN GINNEKEN).
§ 40. "encore tout près, ou du moins beaucoup plus près que nous, de la condition originelle des sociétés humaines, et que, dans le monde
actuel, ils représentent ce que furent nos ancêtres les plus éloignés...”
...nous l’ignorons, et nous avons peu de chances de l’apprendre jamais...”... des hommes qui, en fait, ne sont pas plus ‘primitifs’ que nous, mais qui appartiennent à des sociétés dites inférieures ou peu civilisées.” (LEVY-BRUHL).

§ 40. “Jusqu’ici dans tous les caractères chinois il n’y a pas ombre d’une langue orale ou de signes acoustiques... s’il y avait eu une langue orale, ou des mots-clés, nous en avions trouvé quelque vestige...”
(VAN GINNEKEN).

§ 40. “Notre revue a donc donné le résultat assez remarquable, que tous les systèmes d’écriture, que nous connaissions dès leur commencement, suivent dans leurs trois premières périodes entièrement le modèle d’un langage par gestes, lequel est donc antérieur aux hiéroglyphes. Et ce n’est évidemment qu’avec l’aide, et par le soutien des langues hiéroglyphiques qui possédaient déjà un lexique, une grammaire et une syntaxe, que dans les civilisations avancées moyennant les clics interjectionnels les langues orales ont apparu...” “Or notre revue tient de montrer que les langues orales n’apparaissent dans l’histoire de l’humanité qu’environ l’an 3500 av. J. Chr... au plus tôt.” (VAN GINNEKEN).

§ 45. “Le moindre raisonnement tant soit peu abstrait leur répugne tellement qu’ils se déclarent tout de suite fatigués, et qu’ils y renoncent. Il faut donc admettre... que la mémoire supplée chez eux... à des opérations qui dépendent ailleurs du mécanisme logique. Chez nous, la mémoire est réduite, en ce qui concerne les fonctions intellectuelles, au rôle subordonné de conserver les résultats acquis par une élaboration logique des concepts. Mais, pour la mentalité prélogique, les souvenirs sont presque exclusivement des représentations très complexes, qui se succèdent dans un ordre invariable.” (LEVY-BRUHL).

§ 46. “Or, dans presque toutes les sociétés inférieures, nous trouvons... cette mentalité fixe, arrêtée et à peu près invariable, non seulement dans ses traits essentiels, mais dans le contenu même et jusqu’en détail de ses représentations. La cause en est que cette mentalité, qu’elle soumis ou un mécanisme logique, ou plutôt précisément parce qu’elle n’y est pas soumise, n’est pas libre. Son uniformité est le reflet de l’uniformité de la structure sociale, à laquelle elle correspond et qu’elle exprime.” (LEVY-BRUHL).