

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 auxiliary 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

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) <sup>1)</sup>. 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

<sup>1)</sup> 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<sup>1)</sup>.

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 incorporated 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 psychological 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

<sup>1)</sup> 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 Rafael pictures, Thorwaldsen statues and Paganini music." (l.c. 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 (l.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 "palaeokinesis" which depends on reflexes — as a new possibility given by the development 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." (l.c. 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. 928). "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 rôle 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 neopalium 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 undoubted 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 object 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.'" (25, 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 partnership 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 qualitative 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 men 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 (l.c. 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 fossile 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 singled out one hand as the chief representative for externalizing 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 Ariëns 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 morphological 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, *Fossile Man in China*, p. 134). This cannot be settled until further remains are discovered.

From the cast 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. 128). 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 reconstruction typologique des langues archaïques 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 represent 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 Tcheng-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 <sup>1)</sup> 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

<sup>1)</sup> According to the now generally accepted computations of M. Milankowitch (*Mathematische Klimalehre*) the first ice-period (Günz) existed 600-550,000 years ago, the second (Mindel) 480-430,000 years, the third or penultimate (Riss) 230-180,000 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 Aurignacean, 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 prognathicism 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<sup>1)</sup>. 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-Palaeolithicum, 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

<sup>1)</sup> 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 Neanderthals. 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 sign-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, l.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 cumbersome. 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 representations. 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 civilization 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 progressive 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 mechanics 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 requirements, *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 improvidence, 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 medieval 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 acquisitions 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 consideration 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 development 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!" (l.c. 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