

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

Mastery of the conditions of life: by cutting woods, tilling the

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 unfashioned 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 dominion 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 sensitiveness 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 existence¹⁾. Here lies the problem of anthropogenesis; further

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