IS MAN AN ANIMAL?

THE BIOLOGICAL AND BIBLICAL DIFFERENCES BETWEEN MAN AND BEAST

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Editor's Notes:

In the preface to *Evolution or Creation?*, a book that summarized his thoughts on the physiological and eternal purpose of the human body, and from which the present work was taken, Dr. Custance wrote, "Truly we are far too wonderfully and fearfully made for any blind evolutionary process to prove a sufficient explanation."

Custance based this statement on more than an awe for the presence of intricately designed machines in Nature, an awe upon which the proponents of Intelligent Design rest their case. Instead, he describes the purpose of the human body as being designed not only to function in a physical environment, but to serve as a the vehicle through which our spirits can worship God, and our God, through the Lord Jesus Christ, could redeemed us from sin.

In this work, Custance demonstrates that the human body is far more than an evolved animal—it is an entirely different creation that stands in striking contrast to any physiologically, anthropologically, psychologically, or sociologically advanced species of animal. In fact, if we were to extrapolate the most highly evolved ape-like creature to beyond its present state, it will never evolve into man. Why? As Custance shows with scientific and theological precision, humans and animals serve very different purposes. Describing humans as evolved animals, what theistic evolutionists insist to be true, misses the whole point for the existence of man.

Custance concludes by stating, "It is useless to ignore the Fall and try to discuss what man is. It is useless to ignore the Incarnation and try to discuss why man was made as he was. It cannot be done."

After reading this work, we believe that you will agree with this bold statement of truth, and will be fortified in your faith that salvation through the Lord Jesus Christ is both a spiritual and physical reality.

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The Theme: **IS** Man An Animal??

The question What is man? is probably the most profound that can be asked by man. . . .

I do not mean to say that the biological study of man or even that the scientific study of man in terms broader than biological can here and now, if ever, provide a satisfactorily complete answer to the question. . . .

The other, older approaches . . . theology . . . and other non-biological, non-scientific fields can still contribute, or can now contribute anew.

George Gaylord Simpson,
in *Biology and Man*

INTRODUCTION

IS MAN *really* an animal? To many people the answer must seem obvious. To ask the question at all is naive. Of course he is! Yet there are many informed people who would say with more caution, "Yes, man is an animal, but he is far more than an animal."

When it is asked in what ways he is more than an animal, it is customary to list such things as his possession of culture, his powers of abstract reasoning, his use of language, and possibly his self-consciousness: and then to add a few important anatomical differences, such as his permanently erect posture, and his possession of truly opposable thumbs combined with wide-angle stereoscopic vision. By reason of these man becomes a unique creator of culture.

Yet for all this, the feeling persists that such specialized features single man out as unique not so much because he is the only animal which has them, but because he has them in forms so much more highly developed than other creatures do. As we shall see, animals can communicate with one another by a kind of language; they learn from one another and *use* tools—which gives them a sort of culture. Some animals seem to be self-conscious at times. A few animals can stand erect, and some apes can even run erect for short distances. And a few species are able to oppose their thumbs in grasping things. So it could be said that man is, after all, only quantitatively different, different in degree but not *essentially* different in any classificatory sense.

But even a quantitative difference can reach such proportions as to constitute a new order of life, and it is recognized today that man really is in a category by himself for this very reason, as Dobzhansky put it:

> Perhaps the most satisfactory way of describing man's status is to say that he is unique in having a unique combination of abilities, rather than in the possession of any single unique ability.
>
> In this way, quantitative differences, when they grow very large, become qualitative differences.[1]

Yet Dobzhansky would still be the first to deny that man had anything other than an animal origin. If he is qualitatively different now, it is because of the accumulation of special abilities. But this accumulation was a quite natural process, to be explained ultimately in neo-Darwinian terms, Natural Selection acting upon random mutations. There is nothing supernatural about man's uniqueness.

On the other hand, the Bible clearly sets man apart in the final analysis not by pointing to his achievements, but by constantly emphasizing the fact that he is a fallen creature with a capacity for redemption, a redemption which involved the Incarnation. The answer to the question "What is man?" cannot be found without taking into account the fact that God Himself came into this world as Man and "visited him" (Psalm 8:4) in the person of His Son, the Lord Jesus Christ, in order to secure his redemption. God "objectified" Himself as a Man, in human form, as Oken put it.[2] Humanity was uniquely designed for this purpose, not merely for God's pleasure, but for His Self-expression; and this design involved not only his spiritual capacity, but his physical form and his intellectual endowment as well. This is what makes man unique and something quite other than animal in nature.

1. Dozhansky, Theodosiua: quoted by Herman K. Bliebtrue, "Some Problems in Physical Anthropology," in *Biennial Rev. Anthropology*, Stanford Univ. Press, 1967, p.255.

2. Oken, Lorenz, *Lehrbuck der Naturphilosophie*, no publisher,1810, p.26: as quoted by A. O. Lovejoy in *The Great Chain of Being*, N.Y., Harper Torchbooks, 1960, p.321.

If the Bible is correct in saying that man is a fallen creature (and it never says this of any animal), that sin has affected not merely his spiritual nature, but also his mental faculties, so that he can neither be wholly right in his motivations nor completely sound in his thinking, it must be clear that man cannot define true humanness by studying himself as he now is. Just as the man whose vision is faulty cannot fit himself with corrective glasses unless he has the help of someone who is not similarly afflicted, so if man's perceptive abilities are at fault he cannot obtain a true picture of himself either—without outside help. He requires some yardstick external to himself, some standard of reference with which to compare himself, and thus to correct his definition of what humanness really is. Or, alternatively, such knowledge must come to him through Revelation. It cannot stem from his own reflections upon himself. But we believe that in Jesus Christ we have a dual revelation, a revelation of what God is like (John 14:9), and also a revelation of the nature of true manhood.

Sherrington's justly famous little book *Man on His Nature*[3] may give us useful leads, but it can only speak to us about what man is now. It cannot tell us what he was *unfallen*. Yet it is unfallen man whom we see in Jesus Christ, with powers humanly expressed, both of a spiritual and a physical nature, which we no longer possess in our present state. He perceived things we do not perceive. He claimed spiritual powers (and demonstrated them) that are totally beyond us. He used His body in ways entirely outside our capabilities—when walking on the water for instance. He had dominion over the forces of Nature beyond our wildest dreams—as when He stilled the wind and storm for example, or multiplied the loaves and fishes. He healed diseases by a mere command and thus utterly negates our finest medical skills by a

3. Sherrington, Sir Charles, *Man on His Nature*, Cambridge University Press, 1963, 300 pp. Sherrington himself falls into the trap of "nothing-but-ism." Man's mind, he said, "is nothing more than the topmost rung continuous with related degrees below" (p.156).

simple act of will. And He did these things as Man in a human body, and He promised His disciples that they should do even greater things (John 14:12).

God's definition of what it really means to be a man is not our definition. God's design for man was not the creature we now see in ourselves. All we see in ourselves is but a pale shadow of true manhood, a marred spirit in a diseased body inadequately informed by a mind suffering from the noetic effects of sin. Man is a fallen creature, fallen not merely in spirit, but in mind and in body also.[4] His body is no longer the same body which God designed and created for him. We cannot know this except by revelation, but that revelation is explicit enough in stating that in crucial ways man's body is not now like Adam's. It suffered permanent damage in its organization in Eden, and it will not recover its proper constitution until the resurrection. It looks like a reasonable facsimile, but it received a mortal wound in the Fall, which has made it a shambles of its original stature even though its potential is still truly remarkable. It has not altogether lost its uniqueness in many significant ways, as we shall see in the next chapter. But in the meantime man is not really man any longer. C. S. Lewis put it so well:

> The process [of the Fall of Adam], was not, I conceive, comparable to mere deterioration as it may now occur in a human individual; it was loss of status as a species. What man lost by the Fall was his original specific nature [...]
>
> This condition was transmitted by heredity to all later generations, for it was not simply what biologists call an acquired variation. It was the emergence of a new kind of man; a new species,

4. On man's body as a fallen organism: see "The Nature of the Forbidden Fruit," Part II in *The Virgin Birth and the Incarnation,* vol.5 in The Doorway Papers Series, Zondervan Publ. Co.

> never made by God, *had sinned its way into existence* [emphasis ACC] [...]. It was a radical alteration of his constitution.[5]

The fact is that we are faced with an anomaly in the natural order, for man is a creature who seems in many ways to be bound within its framework and yet is alien to it, lording it over the rest of the created order as though he were its acknowledged crown and yet clearly quite unequipped to conduct this lordship successfully. He has a potential and an inclination for the exercise of dominion which he somehow cannot fulfill. The climax of the supposed evolutionary process has been the production of a creature which has none of the in-built wisdom that has made the rest of the created order such a successful web of life. *Homo sapiens*, man the wise, is the greatest fool among God's creatures and demonstrates his lack of perception in the very classification which he has given himself as *sapiens*.

It is all very well to attribute this disastrous failure to some over-complexification of his central nervous system, as is sometimes done.[6] If man arrived on the scene by some evolutionary process, this might be the explanation except that it is without logic since natural selection, which is the driving force in evolution, supposedly operates to eliminate every venture in Nature which is not in some way an improvement over the existing order, as Wood Jones put it:

> If, in the ordering of Nature, life on Earth was destined to flourish and multiply, to outfold its forms and increase its variety, it must be recognized as a tragic failure of its destiny that, so

5. Lewis, C. S., *The Problem of Pain*, Macmillan, N.Y., 1948, pp.70,71.
6. Over-complexity of the central nervous system: E. J. Holmyard, "The Future of Man," *Endeavor*, January. 1946, p.2.

> far, it has merely achieved the emergence of the arch-destroyer of life and of the sources of food and shelter necessary for its maintenance.[7]

The appearance of man as he is, is more logically explained by supposing that he is indeed the crown of creation, and ought to have proved himself to be its prime benefactor, but instead, something then went wrong which turned all his potential for good into an equal potential for evil. He is in fact sick in a way that none of the other animals are ever capable of being. But he is also redeemable in a way that none of the other animals are. In the final analysis, he is a creature unlike any other, not so much because he has certain faculties which are superior to theirs, but because he is capable of sin and of being redeemed, which no other animal ever is. There is, therefore, something about him which places him in a class entirely by himself. His destiny is different: his spirit goes upward to God (Ecclesiastes 12:7) who gave it whereas the spirit of the beast goes downward to the earth (Ecclesiastes 3:21). And in keeping with this fact, his origin is also different, not because he was created (for the animals were also created), but because he was created in the image of God (Genesis1:26).

Moreover, as we have seen, man had to be redeemed by a method which would allow God Himself to enter physically within the framework of His own created order and become Man in a form appropriate to His deity and without doing violence to His own Person as Creator.[8] No animal form below man would have sufficed for such an extraordinary event as the Incarnation of God Himself. Only a special creature, special both as to his spirit and as to the body which housed that spirit, could appropriately serve such a plan. Thus, man stands midway

7. Jones, F. Wood, *Trends of Life*, Lon., Arnold, 1953, p.18.
8. See "The Virgin Birth and the Incarnation", Part IV in *The Virgin Birth and the Incarnation,* vol.5 in The Doorway Papers, Series, Zondervan Publ. Co.

between the angels, which have no bodies and are not therefore redeemable by such a mode of redemption, and the animals, which have no spirit capable of sin and are not therefore in need of redemption. Man is both more than an animal by reason of his creation, yet less than an animal by reason of his Fall. He is, in fact, something unique to which the term "animal" is not really applicable at all.

This Paper is a study of man's assessment of himself apart from revelation, and then a consideration of the light we have from revelation, the revelation of true man in the person of Jesus Christ.

Chapter 1

The Uniqueness of Man

Once man is put together, everything else falls into place.

Ana Maria O'Neill
Scientific Monthly
(February, 1946)

Western Man's assessment of himself in relation to the animal kingdom has passed through several phases. Within the context of the Christian view, man saw himself as so unique that it did not occur to him to enquire into the possibility of a relationship with the animals in any derivative sense; he merely shared God's world with them. But toward the end of the 17th century, western philosophy became enthralled with the idea that all living things were directly related in the form of what was called a Great Chain of Being.[9] Between each link in this chain, the distance was infinitesimally small, so small as to be really non-existent. Just as Nature abhorred a vacuum in the physical order, so equally did Nature abhor discontinuity in the stream of life.[10]

At first it was not a question of the evolution of one thing out of another, but rather the feeling that God, of necessity, could not but fill out the chain with no missing links, since His creation would otherwise have been incomplete and imperfect by reason of the gaps it would contain. The chain was believed to begin

9. Lovejoy, Arthur 0., *The Great Chain of Being: A Study of the History of an Idea*, N.Y., Harper, 1960.
10. *Ibid.*, p.181.

with the minerals, merging into plant life, then on into animal life, thence to man, and then, logically, on into angelic forms, and up to God Himself. There were no missing links, nor were there any jumps. The universe was a smooth incline from nothing up to God, not a ladder with steps. Even the concept of species was denied. Only our ignorance led us to suppose that the chain was not complete.

During the 18th century, the idea that each successive form could have emerged or evolved without discontinuity from the form below it, rather than being directly created, began to be tentatively proposed. In the 19th century the concept of evolution, much as we find it today, was crystallized. What Darwin contributed more specifically was the provision of a mechanism by which the evolutionary process was carried forward progressively by natural means, without the need for supernatural intervention at any stage.

And so man passed from his superior position as a unique creation to the lesser position of being only a link in a chain, a link which was not essentially of any greater importance than any other link. He had become part and parcel of the natural order, made of the same stuff, accountable in the same terms, obedient to the same physical laws, and destined to the same end.

But there is now some evidence of a change in sentiment, a reaction to this over-simplification. Man still seems to be a part of the chain, and yet he is not a part of it. Something new seems to have emerged with the appearance of man that has almost the quality of a break in the chain. Let us look at man's present assessment of his own position and the growing tendency to abandon the view that he is really "nothing but" a link in the Great Chain of Being, though admittedly the most complex link to emerge so far.

As an example of nothing-but-ism carried to its extreme, we have a statement such as this one quoted by Viktor Frankl:

> Man is nothing but a complex biochemical mechanism powered by a combustion system which energizes a computer with prodigious storage facilities for retaining encoded information.[11]

Today, the practice of reducing man to mere physics and chemistry is not quite so popular as it was. Even so, one may still find authorities who delight in over-simplification and seem determined to reduce man's self-esteem by saying that he is nothing but "a made over ape," as Montagu and Brace do.[12] G. Gaylord Simpson objected on principle, and quite rightly, to the tendency to reduce man by such a simple formula to a mere descendant of some other animal:

> These fallacies arise from what Julian Huxley calls "the-nothing-but" school. It was felt or said that because man is an animal, a primate, and so on, he is nothing but an animal or nothing but an ape with a few extra tricks. It is a fact that man is an animal, but it is not a fact that he is nothing but an animal.[13]

Let us assume for the moment that man is an animal but with some highly significant extras, and see what these extras are, according to the experts.

One of the earlier lists of this nature was composed by Linnaeus.[14] He recognized in man six aspects in which he was a unique mammal—theological, moral, natural, physiological,

11. Frankl, Viktor, "Reductionism and Nihilism" in *Beyond Reductionism*, Arthur Koestler, Lon., Hutchinson, 1969, p.403.
12. Brace, C. L. & Montagu, Ashley, *Man's Evolution,* N.Y., Macmillan, 1965, p.53
13. Simpson, G. G., *The Meaning of Evolution*, Yale Univer. Press, 1952, p.283.
14. Linnaeus: quoted by Raymond Pearl, *Man the Animal,* Indiana, Principia, 1946, p.4.

dietetic, and pathological. This is an interesting list because it anticipates some areas of investigation which his immediate successors tended to neglect, namely, the dietetic and pathological ones. Raymond Pearl in his book *Man the Animal* [15] in fact ignored these two aspects even though he referred to Linnaeus' listing. Pearl thought that man's uniqueness is especially reflected in his habitually upright posture, his large brain, his capacity for articulate speech, and his longer life span.

Ales Hrdlicka in his monumental work on *The Skeletal Remains of Early Man* argued that man branched off from some primate predecessor and became truly human as soon as he developed the ability to shape stones and other objects, adopted a habitually upright posture thus completely liberating his hands, experienced a reduction both of the canine teeth and of the jaw itself, developed a relatively large brain, employed articulate language, experienced a dawning self-consciousness, and increasingly refined his social relationships.[16]

Ashley Montagu in his *Introduction to Physical Anthropology* listed 21 features in which man differs from *all* (his emphasis) other primates. These features have reference to anatomy, as follows:

Fully erect posture
Bipedal locomotion
Legs much longer than arms
Comparatively vertical face
Great reduction in projection of jaws
Great reduction of canine teeth

15. Pearl, Raymond, *ibid.,* p.4ff.
16. Hrdlicka, Ales, *The Skeletal Remains of Early Man*, in Smithsonian Miscellaneous Collections, vol.83, Smithsonian Institute, Washington, D.C., 1930, Publ. No.3033, p.l l.

Absence of a bony diastema in upper jaw for the reception of the tip of the canine tooth
Prominent nose with elongated tip (i.e., elongated beyond the nasal bone)
Outward rolled mucous membrane of lips
A well marked chin
A forward lumbar convexity or curve
Non-opposable great toe, set in line with other toes
Foot arched transversely and from front to rear
Relative hairlessness of body
Absence of tactile hairs
Brain more than twice as large as the largest nonhuman primate brain.
The occiput projecting backwards
Highly rolled margin of the ear
Absence of pre-maxillary bone from the anterior aspect of the face
Iliac fossae or blades of pelvis facing one another.
Longer growth period [17]

He then remarked about this list: "There are, of course, many other features in which man differs respectively from the prosimiae [pre-monkeys], the monkeys, and the apes. With respect to more qualitative features man differs from the non-human primates in the following potentialities or traits: (1) the capacity for symbolic thought, (2) articulate speech, and (3) the development of a complex culture."[18] He commented: "It is in the possession of these [...] potentialities, and in their active realization and transmission, from generation to generation, that man qualitatively differs so very greatly from all other primates,

17. Montagu, Ashley, *Introduction to Physical Anthropology*, Springfield, Ill., Thomas, 1945, p.43.
18. *Ibid*., pp.43f.

and the possession of which enables him to become a human being."

In one of his essays, Julian Huxley also made a list of the characteristics which he believed to be unique to the human species:

Language and conceptual thought
Transmission of knowledge by written record
Tools and machinery
Biological dominance over all other species
Individual variability
The use of the forelimb for manipulating purposes only
All year round fertility
Art, humour, science, and religion [19]

It will be noted that there are differences in emphasis in these lists. Raymond Pearl had a particular interest in problems relative to man as a creature who is now beginning to crowd the world with his numbers, and such factors as fertility and longevity especially concerned him. The list composed by Hrdlicka, who spent much time in field work, not unnaturally singles out those marks of humanness which would appeal to the eye of the archaeologist/anthropologist. The list of the more strictly physical anthropologist, Ashley Montagu, reflects his interest in total anatomy. The list proposed by Huxley begins to place more emphasis upon the cultural aspects of manhood. It was not that Huxley was disinterested in physical anthropology, for he did draw up a table of comparative bone lengths for man and the man-like apes, with the intention of showing that man falls within the range of these apes and to demonstrate that the apes often differ more from one another than some differed from man. His table is shown as follows:

19. Huxley, Sir Julian: quoted by Arthur Koestler, *The Ghost in the Machine* , Lon., Hutchinson, 1967, p.297

Limb/Spinal Column Proportions
of Man and Man-like Apes

	Spinal Column	Arm	Leg	Hand	Foot
European Man	100	80*	**117**	26*	35
Gorilla	100	115	96	36	41
Chimpanzee	100	96	90	43	39
Orangutan	100	**122**	88*	**48**	**52**

All figures are in percentages, the spinal column
in each case being 100 percent.
*Asterisks mark minimum values, **bold face** maximum.[20]

Commenting on this, A. L. Kroeber remarked:

> If such a relationship held for all or most traits, it would tend to suggest that man should be classified in the group of the apes rather than alongside of it, much as the reconstructed family trees have already suggested.
>
> However, what Huxley in the ardor of his argument did not note is that, in the proportions cited, man is regularly at one end of the ape scale at either the maximum or the minimum of the joint range.
>
> This gives us pause, because it seems to suggest that man does after all stand off on one side by himself.[21]

20. Huxley's table is taken from A. L. Kroeber, *Anthropology*, N.Y., Harcourt & Brace, 1948, p.56
21. Kroeber, A. L., *Anthropology*, *ibid*., 1948, p.56.

To these anatomical differences, Weidenreich in his *Apes, Giants and Man* added certain others:

1. The long bones of the lower limb, especially the thigh bone, are longer in man than the long bones of the upper limb, especially the humerus, while in anthropoids the conditions are reversed.[22] It is this fact which makes the gait of man attempting to walk on all fours so completely different from that of other animals. (Fig.12) Other quadrupeds stand higher at the shoulder than at the seat but when man attempts this posture his stance is almost ludicrously difficult—even in the infant.

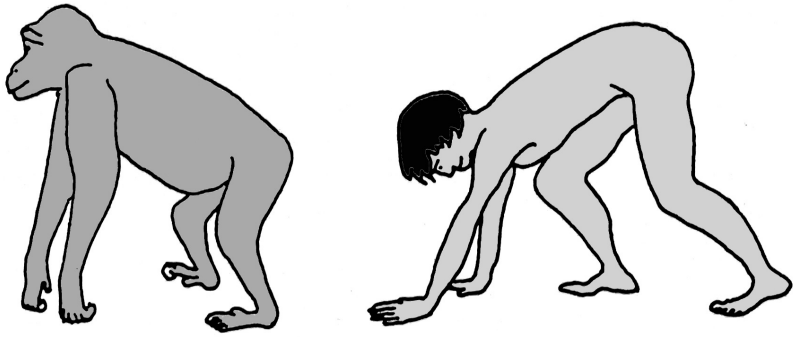

Fig. 12. Difference in posture between ape and man on all fours.

2. The human trunk is short in proportion to the lower limb while, here, again the conditions are reversed in anthropoids.

3. The human vertebral column is curved in a complex way alternately forwards and backwards while in anthropoids it is

22. This reversal of limb proportions does not apply to the prosimians: see A. H. Schultz "Primatology in Its Relation to Anthropology," *Current Anthropology,* ed. W. L. Thomas, Univer. of Chicago Press, 1956, p.49

either straight or uniformly curved backwards.[23] (Refer to Fig. 19, p. 45)

Such features as these, as we shall see in Chapters 2-4, contribute enormously to the flexibility of the human body and its ready adaptability to many different postures which can be maintained for long periods with comparative ease. For a culture-bound "animal" whose activities both at work and at rest are tremendously varied, such features play an important role.

There are a few other anatomical differences which these particular authorities have not mentioned but which are of great significance to man as a creator of culture. All animals other than man have either four feet or four hands. The primates use the two hind hands habitually as feet, supporting only part of their weight on the fore hands. In spite of unknown centuries of supposed "natural selection," these hind hands have never become re-organized into true feet. The anatomical form of the human foot is significantly different as we shall see, thereby making man unique in this respect in the possession of two perfectly functional feet and two amazingly adept hands.

Another anatomical uniqueness in man is what has been called a wasp waist, a waist which not only provides him with greater trunk flexibility but also allows him (and her) to wear clothing as adornment in an extraordinary variety of designs, supported from the waist as readily as from the shoulders. The chimpanzee at the circus may be dressed like a person but severe limitations are placed upon the chimpanzee clothing manufacturer by the fact that everything must be hung from the shoulders. In terms of self-expression, clothing is capable of adding a whole dimension to the cultural life of man. And as Julian Huxley was wise enough to note, nudity does not become adult man except on rare occasions and for a short time in life, whereas clothing tremendously enhances his stature and adds grace in an infinite variety of ways. It is as though he were designed to allow for this.

23. Weidenreich, Franz, *Apes, Giants and Man*, Univer. Chicago Press, 1948, p.6.

Though many animals have very graceful necks, those animals which are supposed to be man's nearest relatives do not. The structure of man's neck is such that by balancing the head centrally, the foramen magnum being well forward, the demand for powerful muscles which make the neck massive and indeed almost non-existent as a flexible junction between head and shoulders, is largely eliminated: so the head can move freely on the shoulders in a way which is quite foreign to the head movements of most of the other primates.

There are some highly significant differences between man and all other animals in the degree of dependency of the newborn both in terms of the achievement of physiological maturity and in terms of individual safety against attackers. The young of virtually all other species can fend for themselves in a remarkably short time whereas the extended period of human dependency results in a situation where a number of members of a single family will continue as a family, even when the age spread is quite extensive. In terms of interpersonal development, and combined with the very slow rate of maturing of the brain itself in man (by contrast with animals), there is a greatly prolonged period of educability which is entirely missing in all other species. All these are actually related and in a unique way have a combined effect upon individuation.

Man has a temperature regulating system which is truly unique and has rendered him a completely ubiquitous creature without the territorial restrictions which seem to apply to all other species. And perhaps, not unrelated in a sense, is the fact that he alone is omnivorous while other creatures are naturally (that is, except under special stress) either herbivorous or carnivorous. Man can live equally well on a purely carnivorous diet if necessary as the Eskimo has done, or equally well on a herbivorous diet as many Eastern people have done who are virtually dependent upon cereals such as rice.

In terms of social organization, there are a tremendous number of highly significant differences between human and animal societies, human societies being essentially organized along cultural lines and animal societies along biological lines. And one very significant difference which lies at the root of the structure of these two contrasting types of social organization is the great importance which the male assumes in human society. In virtually all animal societies the role of the male is exceedingly limited, and in many cases the male is scarcely a part of the society at all, being either ejected by it or voluntarily withdrawing.

Such, then, are some of the clues that we are to pursue and explore in greater detail in the following chapters. Many books written for popular consumption seem to delight in reducing man and his society to the terms of animal life, and these books have undoubtedly contributed greatly to the blurring of the fundamental lines of distinction which actually put the two into very different categories. Relating man to animals might look promising, but actually at one time such a comparison greatly hindered fruitful research by blinding even the experts to these critical differences. The distorting effect was recognized by cultural anthropologists in due time, and it has since been almost everywhere acknowledged as an unfortunate mistake.

Let us then examine these differences with care, that the significance of them in answering the question "What is man?" may become apparent.

Chapter 2

The Human Brain: Its Size and Its Complexity

If individual features of human anatomy and physiology are considered separately, and are compared separately with parallel features found in the animal world, a fairly good case might be made out for the derivation of man by evolution from some animal, presumably among the primates. But if the features of man's anatomy and physiology are taken as a whole, viewed in relation to each other and seen as an integrated unity, the situation is rather different. Virtually every one of the anatomical and physiological features listed in the previous chapter are found singly in rudimentary or developed form somewhere else. And even some of man's characteristic social and cultural forms of behaviour are reflected, randomly distributed, among different species also in rudimentary forms.

What I am particularly anxious to make clear, however, is that no single animal, nor any single species, exhibits these features as a whole. Individuals and species can be found which have one or several of these features, but not all of them. An awareness of these facts will help us to avoid attaching importance to differences in structure, etc., beyond what is proper in the light of the evidence. At the same time, it will help us to see more clearly that it really is the combination of features which has made man such a unique creature.

If the same Designer and Architect formed the animals as formed man, it should surely not be at all surprising to find that successful "solutions" to problems faced by all living things are

used over and over again in different contexts. And this is precisely what we do find.

All living things are chemically organized according to a single basic pattern involving the same nucleic acids, peptides, and amino acids, though not necessarily making the same selection. In his contribution to the symposium published under the title *The Origins of Prebiological Systems*, Peter T. Mora suggested that the amazing similarity in the biochemical processes of living systems implies that life originated only once.[24] There is, however, an alternative implication: namely, that having designed a perfectly effective biochemical process, the Creator thereafter employed it as a basis for every living form that He created. Uniformity in this respect would therefore just as likely be evidence of a single Architect at work, as evidence of the evolution of a single chance product. In the same vein it should be pointed out that all striated muscle is also built on an almost identical pattern in all living things. In this connection, J. D. Bernal draws the same kind of conclusion that Mora drew: viz., that such "an ingenious device," to use his term,[25] can surely have been invented only once and must therefore have been inherited by all the different phyla from the first prototype, "probably to perform ciliary motion." As in the previous case, it may just as well be evidence of a master design being re-employed many times.

When we look at the anatomy and physiology of man, we see plenty of evidence of this re-employment of successful design features already used elsewhere. The similarity of many of the vital organs of living organisms is in no way necessarily evidence of descent. The appearance of almost identical eye structures in the octopus and in mammals should be sufficient demonstration of this fact. Consequently, certain design features in one species

24. Mora, Peter T., "The Folly of Probability," in *The Origin of Prebiological Systems*, ed. Sidney W. Fox, N.Y., Academic Press, 1965, p.45.

25. Bernal,J. D., "Molecular Matrices for Living Systems," in *The Origin of Prebiological Systems*, *ibid*, p.79.

that serve a particular purpose may be found in another species in very similar form, yet serving a somewhat different purpose. When we compare man with the animals which are structurally most like him, and are therefore presumed to be most nearly related, we are driven by some compulsive thought process of the human mind to arrange the structures in some kind of ascending or descending order and to assume that this order represents degrees of relatedness. We may tend to do this even when we do not accept the theory of evolution. We make the assumption that a larger brain is a later brain because we recognize that this happens as the infant grows into the adult. We also tend to assume that anything which looks more complex is more complex, because in most man-made products this is the case.

And so in considering the relationship between man and the primates from which he is supposedly evolved, it may be well to look into a critical organ (the brain) and a critical anatomical feature (the ability to stand erect), and see to what extent the differences are important. And it may be said, in anticipation, that although we do not yet know exactly why the size of the human brain is so much larger than that of the ape brain, we have a somewhat better idea of why man's erect posture is of such great importance. The two combined, however, make all the difference in the world in terms of the potential of man by contrast with that of his supposed nearest relatives.

The feeling that brain size or surface complexity is of crucial importance in terms of intelligence or mental capacity and that man excels in both, has plagued anthropological research for almost a hundred years. Indeed, so compelling is this conviction that anthropologists are guilty not infrequently of either doctoring or distorting the evidence in order to close the gap between man and ape, by raising the cranial capacity or brain size of potential missing links, or reducing the cranial capacity of very early man.

It will be helpful to have some basic figures, drawn from a number of sources, which will give an overall picture of size ranges of primate brains. Zuckerman gave the following cranial capacities:[26]

Female Chimpanzee	366 ± 6.5 cc.
Male Chimpanzee	399 ± 7.0 cc.
Female Gorilla	466 ± 10.4 cc.
Male Gorilla	543 ± 4.3 cc.
Pithecanthropus erectus	1026 ± 34.2 cc.

The *Australopithecines,* represented by a number of supposedly separate genera (Paranthropus, Pleisianthropus),[27] which were hailed as missing links but are now believed to come a little too late in the geological time scale as currently held, were of particular interest to evolutionists. Their cranial capacity was believed to be between 450 and 550 cc., which, combined with their much debated erectness of posture, seemed to fit rather well between other primates and man.

Modern man shows an extraordinarily wide range of cranial capacities. There are records of capacities as low as 800 cc. in individuals of normal size[28] though only found among idiots; and it is commonly agreed that man is not mentally normal with a cranial capacity of less than 900 cc. This figure is sometimes referred to as the Cerebral Rubicon for *Homo sapiens*.[29] Human

26. Zuckerman, Solly, " *An* Ape or *The* Ape," *Journal of the Royal Anthropological Institute*, vol.81, parts 1 & 2, 1952, p.63

27. *Australopithecines*: J. T. Robinson, "The Origins and Adaptive Radiation of Australopithecines," in Part V in *Human Evolution,* ed. N. Korn & F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, p.296.

28. *Ibid*., p.284.

29. Cerebral Rubicon: This phrase was used by A. N. Whitehead, "The distinction between man and animals is in one sense only a difference in degree. But the extent of that degree makes all the difference. The Rubicon has been

dwarfs are known with brain volumes which may not exceed 300-400 cc. These are not normal dwarfs but are known as nanocephalic or "bird-brained" dwarfs. Their smaller brain of course means far fewer functioning brain cells even than in many chimpanzees, yet they are quite capable of learning language and although usually mentally defective, their behaviour is still quite specifically human. In referring to these individuals, David Pilbeam remarked, "This clearly underlines the important point that it is brain structure rather than brain size which is so important in species-specific behaviour."[30] I think there is some reason, as we shall see, to question whether even brain structure is important in any specific way, though it may be that the protein composition of the brain substance itself is species-specific.

Occasionally one sees the cranial capacity of the gorilla given as 685 cc.[31] which comes close to the minimum for *Homo sapiens* (although idiotic). It should be noted, however, that this was one single gorilla measurement, and though the figure has been quoted many, many times and often taken as a norm for gorillas, to my knowledge it has never been duplicated. The use of the figure illustrates how strong the temptation is to fill out the series from animals to man. Weidenreich placed the gorilla's cranial capacity at only 620 cc., and he gave the average for the whole anthropoid group as being "only 415 cc."[32]

As we have said, brain weights among human beings vary enormously. In giving measurements of brain size for

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crossed" (*Modes of Thought*, CUP, 1938; as quoted by W. H. Thorpe, *Animal Nature and Human Nature*, Lon., Methuen, 1974, p.11). See also P. V. Tobias, "Olduvai Bed I Homine with Special Reference to Its Cranial Capacity", *Nature,* vol.202, 4 Apr., 1964, p.3.

30. Human dwarfs: David Pilbeam, *The Evolution of Man,* Lon., Thames & Hudson, 1970, p.202.

31. Clark, W. E. LeGros, "Bones of Contention", *Human Evolution,* ed. N. Korn & F. Thompson, Holt, Rinehart & Winston, 1967, p.305. In fairness, Clark gives this figure for *a*, not *the* gorilla.

32. Weidenreich, Franz, *Apes, Giants and Men,* Univer. of Chicago Press, 1948, p.10, 11.

contemporary man, it is customary to use grams rather than cubic centimetres, but for reasons which it is not necessary to enter into here, the two forms of measurement in this case are virtually the same. The average for the adult European male is about 1375 gm. whereas the brain of Turgenev, the Russian novelist, weighed 2021 gm. It was exceeded by that of only two others so far recorded: one was an imbecile. Then there is the record of a labourer whose brain weighed 1925 gm. and a bricklayer, 1900 gm. The brain weight of Gambetta, the famous French statesman, was only 1294 gm., or less than the average European. A woman's brain is slightly smaller than man's, and the largest woman's brain recorded was 1742 gm.—she was insane. Another woman's brain of large size weighed 1580 gm., and she also was insane.[33] It is some evidence of the unimportance of brain size that the brain of Anatole France weighed only 1017 gm. while the brain of Bismark weighed 1807 gm.[34]

When we come to review fossil man, we meet with some surprises. While certain of the supposedly earliest fossils fall nicely into place, some of them do not do so. As we have seen, *Pithecanthropus erectus* was given a capacity of 1026 cc. by Zuckerman but somewhat lower (900-1000 cc.) by William Howells.[35] The same authority gave a figure for *Sinanthropus* of 1150 cc.[36] This seems to be in the right kind of ascending scale. But then Solo Man,[37] who was placed only just above *Pithecanthropus*

33. Various brain sizes: George Dorsey, *Why Behave Like Human Beings*, N.Y., Blue Ribbon Books, 1925, p.11. See also Franz Weidenreich, "The Human Brain in the Light of Its Phylogenetic Development", *Scientific Monthly,* vol.67, Aug., 1948, p.103-109.

34 Bismark: Stanley Cobb, "Brain and Personality," *American Jrl. of Psychiatry,* vol.116, no.10, 1960, p.938.

35. Howells, William, *Mankind So Far,* N.Y., Doubleday, 1944, p.138. Throughout this section, values given by different authorities vary, since measurements often involve certain imponderables such as skulls distorted out of shape by the ground.

36. *Sinanthropus*: *ibid.*, p.144.

37. Solo Man: *ibid.*, p.179.

erectus in the evolutionary scale by Howells, had a cranial capacity of 1300 cc. which is essentially modern man's. Once again the order seems to be "satisfactory," but then something goes wrong. For Solo Man is considered to have been contemporary with Neanderthal Man, and Neanderthal Man had a cranial capacity which in several specimens was in excess of 1625 cc., which is far above modern man.[38] Two other primitive fossil skulls, Wadjak and Boskop, had cranial capacities, respectively, of 1550-1650 and 1800 cc. which is even higher.[39]

Because we happen to have some cultural remains of his which are in every way remarkable, Cromagnon Man is generally considered the high point in the development of ancient *Homo sapiens*. Yet Cromagnon had a slightly larger brain capacity than Neanderthal 1590-1660 cc. which is 15 percent larger than ours.[40] It might be doubted therefore (if we are guided merely by cranial capacity) whether modern man is really an advance on his ancestors. Cromagnon could be the high point of modern *Homo sapiens*, too.

The actual significance of brain size is being called into question, and so also is its structural form or surface complexity. Consider these facts. Julian Huxley was satisfied that the evidence demonstrates that a larger brain is a better learning organ than a smaller one, though the learning process may take longer.[41] In a nutshell, his argument is that an absolutely larger brain (i.e., not larger relative to the body itself) will have a relatively as well as an absolutely larger number of cells in its cortex. A larger number of cortical cells makes more elaborate learning possible. The experiments upon which Huxley based this were conducted by the German biologist, Rensch. The data apply equally well not only to higher animals like birds, but even to beetles. By contrast,

38. Neanderthal Man: i*bid*., p.166.
39. Wadjak and Boskop Man: *ibid*., p.192.
40.Cromagnon Man: Ashley Montagu, *Introduction to Physical Anthropology*, Springfield, Ill., Thomas, 1945, p.92.
41. Huxley, Sir Julian, *Evolution in Action*, Lon., Chatto & Windus, 1953, p.99.

Zeuner reported that brain size becomes smaller with domestication, in spite of the fact that domestication almost certainly is accompanied by some enrichment of the environment, at least for the dogs which were the subject of his report.[42] He explained this as being the result of atrophy of some senses which become less important. Mention is made of an enriched environment here because Rozenweig found that in rats, at least, an enriched environment leads to cortical enlargement as well as increased convolution.[43] Leakey, as though to confuse the issue even further, reported the finding that some notable scientists have smaller cranial capacity than some notable pugilists.[44] Is it possible that the pugilist's brain enlarges in some area that has to do with his fighting capacity whereas the scientist's brain diminishes without duly compensating for the loss in some other area related to thinking?

Actually, it appears now that there is less certainty than previously even about the validity of "localization theories" i.e., the idea that certain parts of the brain are set aside for certain functions. Years ago, Ralph Gerard, in attempting to localize in the brain such functions as the faculty of speech, etc., wrote: "It remains sadly true that most of our present understanding of mind would remain as valid and useful if, for all we know, the cranium was stuffed with cotton wadding."[45] This was written in 1946. Similarly, R. E. D. Clark noted that according to K. S. Lashley, no part of the upper brain is vital, but one part may take over the functions of another with relative ease.[46] The debate

42. Zeuner, F. E., "Domestication of Animals," in *A History of Technology*, vol.1, ed. Charles Singer, E. J. Holmyard, A. R. Hall, Oxford Univer. Press, 1954, p.348.
43. Rosenzweig, Mark R., *et al.*, "Brain Changes in Response to Experience," *Scientific American*, February 1972, p.22.
44. Leakey, L. S. B., a panel on "Man as an Organism," *Evolution After Darwin*, vol.3, ed. Sol Tax, Charles Callender, Univer. of Chicago Press, 1960, p.168.
45. Gerard, Ralph, "The Biological Basis of Imagination," *Scientific Monthly*, June, 1946, p.487.
46 Lashley, K. S.: quoted by R. E. D. Clark in *Science and Religion*, vol.1, no.5, 1948, p.223.

continues and even a symposium on localization of function in the cerebral cortex held in Oxford in 1954 came up with no altogether clear cut evidence of such area specificity, except that language seems to be organized in the left hemisphere in those who are congenitally right-handed, and vice versa. *Science News* reported in 1966 that a man suffering from brain cancer had his entire left cerebral hemisphere removed and, contrary to all medical expectations, regained some ability to speak, write, comprehend speech, and move his right limbs.[47] The report said, "The brain may have a much greater capacity to reorganize itself than was believed." There are neural connections between areas of the brain and bodily functions, but if these areas are damaged or destroyed, other areas seem to take over. One of those who took part in the case (Dr. J. A. B. Bates) showed that even though such connections do seem to exist, precisely the same responses are obtained by stimulation of the white fibres of the cortico-spinal column as by stimulation of the gray matter itself. It was felt that the position Bates took on this implied a radical break with the traditional doctrine of the hierarchical organization of function in the central nervous system.[48]

A. Irving Hallowell, in a contribution to a Darwin Centennial Symposium, made this significant remark:

> So far as integrative functions are concerned, the present weight of evidence appears to focus upon the influence exercised by the masses of nerve cells in the upper part of the brain stem upon the more recently evolved cortical areas. An older notion that the cortex itself was of prime significance because it was somehow "the seat of

47 *Science News,* vol. 90, December 24, 1966, p.555.

48. Bates: referred to by O.L. Zangwill, "Localization in the Cerebral Cortex," *Nature*, October 16, 1954, p.719.

> consciousness" no longer seems to make complete neurological sense.[49]

He then added this footnote:

> Popular tradition, which seems to be largely shared by scientific men, has taken it for granted that the cortex is a sort of essential organ for the purposes of thinking and consciousness, and that final integration of neural mechanisms takes place in it.
>
> Perhaps this is only natural since there has been an extraordinary enlargement of the cortex in the human brain, and, at the same time, man seems to be endowed with intellectual functions of a new order.
>
> However, the whole anterior frontal area, on one or both sides, may be removed without loss of consciousness. During the amputation the individual may continue to talk unaware of the fact that he is being deprived of that area which most distinguishes his brain from that of the chimpanzee.[50]

The most complete study in condensed form of which I am aware, of the relationship between brain size, both absolute and relative, and surface complexity was written by Weidenreich in a paper entitled "The Human Brain in the Light of Its Phylogenetic Development." It is difficult to summarize such a compact statement of the facts of the case, but we shall make an

49. Hallowell, A. Irving, "Self, Society and Culture in Phylogenetic Perspective," in *Evolution After Darwin*, ed. Sol Tax, Charles Callender, Univer. of Chicago Press, 1960, vol.2, p.344.
50. Hallowell: quoted by W. Penfield and T. Rasmussen, *The Cerabral Cortex of Man*, N.Y., Macmillan, 1950, pp. 204-206, 226.

attempt. As a kind of introduction to his analysis of the data, Weidenreich observed:

> Some time ago I came across a pamphlet published in 1934, which was written by an English physician. In the author's opinion, the only factors that determined man's evolution since his beginnings as a primitive primate are environment and natural selection.
>
> But his starting point is the premise, "Cranial capacity is a fairly accurate measure of the mental status from the most primitive primates to *Homo sapiens*." The self-confidence with which this statement is made is typical.[51]

Weidenreich then admitted candidly that we do not know of any fact which proves that mere increase in size of the brain is tantamount to an advance in mental ability. Indeed, increase of body size is normally accompanied by an increase in brain size, so that the elephant has a brain that weighs almost 5000 gm. and the brain of a whale may reach 10,000 gm. And yet for all that, in proportion to the weight of the body, the whale has a much smaller brain than man. This might seem to give man the edge, until it is discovered that the dwarf monkeys of South America, the marmosets, far surpass man in this respect, having 1 gram of brain per 27 gm. of body substance, whereas man has 1 gram of brain to 44 gm. of body substance.[52] And man is surpassed even more in these proportions by the capuchin monkey with one

51. Weidenreich, Franz, "The Human Brain in the Light of Its Phylogenetic Development," *Scientific Monthly*, vol.67, August, 1948, p.103.
52. The fact is well known: see Adolph Schultz, "The Specializations of Man and His Place Among the Catarrhine Primates," in *Cold Spring Harbor Symposia on Quantitative Biology*, vol.15, 1951, p.45. Also Sir Solly Zuckerman, "Myths and Methods in Anatomy," *Jrl. of the Royal College of Surgeons* (Edinburgh), vol.11, no.2, 1966, p.92.

gram of brain substance for 17.5 gm. of body substance. It is as Weidenreich observed, "Therefore, neither the absolute nor the relative size of the brain can be used to measure the degree of mental ability in animals or in man."[53]

He then turned to the discussion of the surface pattern of the hemispheres and noted that primates and man do not differ from other mammalian orders with regard to the presence and abundance of the wrinkle system:

> We are lost again if we suppose that the number or complexity of the wrinkles is co-related with progress or perfection of mental faculties.
>
> The Capuchin monkey, which many experimental psychologists regard as equal in docility (i.e., educability) to any highly gifted chimpanzee, possesses an almost smooth brain surface, whereas the chimpanzee has a wrinkled one that comes close to that of man.
>
> The whale and its relatives, however, again steal the show. They have the greatest number and finest wrinkles all over the hemispheres, and the most intricate arrangement in the whole animal kingdom.[54]

He thus concluded that all the recorded facts indicate that neither the size nor the form of the brain, nor the surface of the hemispheres nor their wrinkled pattern in general or in detail, can possibly furnish a reliable clue to the amount and degree of general or special mental qualities. So there it is. Weidenreich said:

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53. Weidenreich, Franz, "The human Brain in the Light of Its Phylogenetic Development", *Scientific Monthly*, vol.67, Aug., 1948, pp.104, 105.
54. *Ibid*., p.106

> In the face of all these facts, it is hard to understand why people cannot get rid of the idea that mere size or configuration of a special convolution or fissure must give a clue to the mental qualities in general and to those of certain individuals in particular ... [55]

From the anatomical point of view, it must be rather obvious, therefore, that the uniqueness of man cannot be tied to the organ of brain, though there is no question that it is related to his capacity of mind, as K. A. Yonge observed:

> It is in the ability to think about thinking that man regards himself as unique in the animal kingdom. It is not simply in his ability to think, that he can claim uniqueness, although he is vastly superior. Animals show their ability to associate one past experience with another and, as a result, to arrive at some plan of action. The rat learning his way through the maze, the chimpanzee figuring out a means to obtain the food out of arm's reach, the dog herding sheep[...]. This, for purposes of this Paper, is evidence of thinking. But man can think about thinking.[56]

Thus it is easy to confuse the brain of man with the brain of the animal, and say that in this respect man is merely a superior animal.

But it is not possible to compare the mind of man with the mind of the animal, for they appear to be in different categories. Konrad Lorenz wrote:

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55. *Ibid.*, p.106, 107.
56. Yonge, K. A., "Of Birds, Bats and Bees: A Study of Schizophrenic Thought Disorders", *Can. Psychiatric Assoc. Jrl.*, vol.3, no.1, 1958, p.1.

> The central nervous system of animals is constructed differently from ours, and the physiological processes in it are also different from what happens in our brain. These qualitative differences are sufficient to make us conclude that whatever subjective phenomena may correspond to neural processes in animals must be considerably different from what we, ourselves, experience.[57]

In summary, then, there is no precisely definable way in which man's brain can be considered anatomically superior to the brains of animals below him. Neither in its size nor in its surface complexity does its uniqueness seem to lie. That there is a qualitative difference, however, is almost universally agreed. But to define this qualitative difference is in a sense an impossible task. Where is the decisive point at which the uniqueness of any "different" thing becomes determinate? Who can really tell?

Most assuredly, man's mind is vastly different, no matter how similar his brain cells may be to animal brain cells. So, somewhere, some other factor has added a dimension which is missing in the animal world. We can see the effects of this dimension at once. And in a small way we can also discern some of the reasons why this added dimension was effective in man where it almost certainly could not have been effective in any other animal. A certain combination of anatomical features in the design of his body as a whole has allowed the special potential of his mind to express itself in unique ways These features, anatomical though they are, have effects far removed from any mere biological advantage. They have permitted not merely the creation of a superior technology—for some animals build houses and construct dams, which are forms of technology of a sort—but a whole series of cultural phenomena: language and art, social

57. Lorenz, Konrad, *On Aggression,* N.Y., Bantam Books, 1967, p.202.

organization in which the individual may consciously sacrifice himself for the good of others, philosophy and science, ceremony and worship ... And above all, and most significantly of all, these features have provided an entirely appropriate channel for the revelation of God in Christ by incarnation in a truly human form.

Chapter 3

The Erectness of Man

It has often been said that man's hands are an extension of his mind. When we come to deal with speech we shall see that this is profoundly true. In the meantime, let us consider the fact that his hands are what they are anatomically, and serve the purposes they serve culturally, because of man's erect posture. And here, again, it would be easy to suppose that his erectness is not essentially different from that of a number of other creatures, except that he retains it as a normal posture, whereas animals adopt it only for short intervals. The situation is, however, more complex than this, with many factors being involved—among which are the structure of his feet, the structure of his spinal column and pelvis, the relative proportional length of his limbs, the structure of his neck, and even the configuration of his windpipe and voice box.

In an attempt to minimize the significance of man's erectness, it is well known that Thomas Huxley falsified a diagram in which he showed four skeletons, three of the primates of increasing size standing in line behind a skeleton of a man.[58] His object was to indicate that man was not the only creature who could stand upright. But in order to emphasize his point, he posed the animal skeletons in an unnaturally upright position—as Weidenreich points out, a position which is not at all characteristic of them—whereas man was put in an equally unnatural position with slightly bent knees (Fig.13a). Although some of the primates do maintain an upright position for a short time, it is generally held

58. Huxley, Thomas: see Franz Weidenreich, *Apes, Giants, and Man*, Univer. of Chicago Press, 1948, p.6; Huxley's Epilogue, see *Dawn*, Sept., 1931, p.267.

that no animals (other than birds) remain erect for more than a total of 25 percent of their waking life, and this 25 percent is made up, for the most part, of brief interludes lasting only a few minutes at any one time. And the primates stoop forward even when erect (Fig.13b), whereas man is truly vertical.[59]

A great deal more is involved in sustained erect posture than merely a decision to stand up. Animals which are forced to remain in an upright position for an undue length of time may lose consciousness. The classical experiments on this were carried out by Leonard Hill in 1895.[60] Or, if they do not actually faint due to the fact that their circulatory mechanisms are not adjusted for this kind of change, then they very quickly become fatigued and will fight to regain a normal horizontal position. F. G. Parsons, writing in the *Encyclopedia Britannica* observed, "There is a greater gap between the musculature of man and that of the other primates than there is between many different orders, and this is usually traceable either directly or indirectly to the assumption of the erect posture."[61] But in his *Descent of Man*, Darwin did not appreciate this.[62] To him the change from quadrupedal to bipedal gait presented no difficulty. He wrote, "We see[...]in existing monkeys a manner of progression intermediate between that of a quadruped to a biped." What Darwin was not giving adequate recognition to is the fact that the other primates do not actually have feet to walk on. They walk on their hands. As we have already noted, animals have either four hands or four feet, a fact which gave rise to the older term quadrumana, as opposed to quadruped. The feet of the apes are very poor feet: they are really hands, with opposable thumbs and quite capable of grasping.

59. Schultz, Adolph, "The Specialization of Man and His Place Among the Catarrhine Primates", *Cold Spring Harbor Symposia on Qualitative Biology*, vol.15, 1951, p.38.
60. Hill, Leonard: reported in *Jrl. of Physiology*, vol.18, Lon., 1895, p.15f.
61. Parsons, F. G., in *Encyclopedia Britannica,* 1953 ed., vol. 15, p.990.
62. Darwin, Charles, *The Descent of Man*, N.Y., Merrill & Baker, revised ed., 1874, p.59.

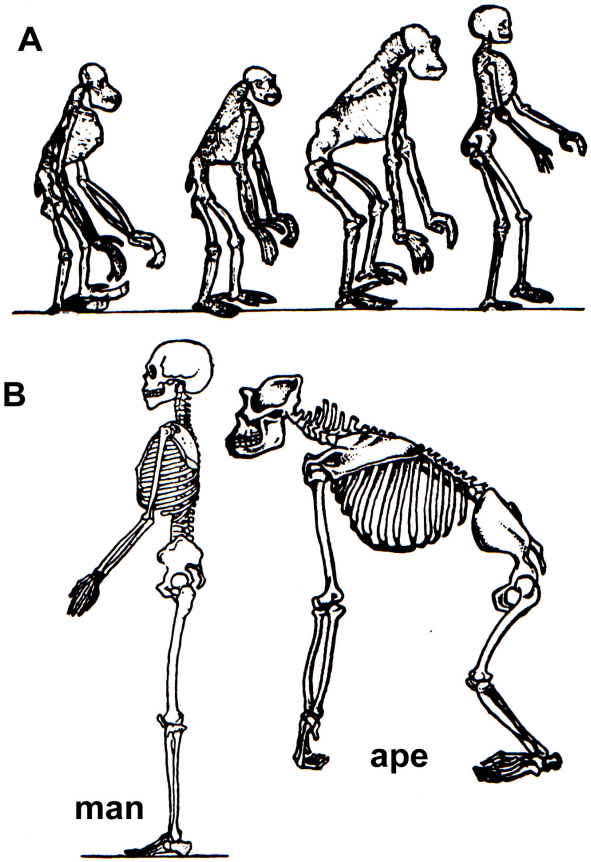

Fig. 13. (A) Thomas Huxley's doctored diagram; (B) the true posture of man and ape.

Fig. 14. The human and ape "foot" contrasted.

Man's feet are very different in structure, so different in fact that Dudley J. Morton, in a paper "Human Origin," observed:

> In so far as my own studies would enable me to judge, I endorse Wood Jones' statement to the effect that "if missing links are to be traced with complete success, the feet, far more than the skull or the teeth or the shins, will mark them as monkey or man."[63]

As will be seen in Fig. 14, the foot of man and of the orangutan (which was given its name because it looked so much like an old man) are quite different in outline, and—which is even more important—quite different in their anatomical structure (see also Fig.15) . In man the great toe is bound in by a ligament to the other four toes. In the apes the four toes are bound together, but the big toe is strictly a thumb. Moreover, with respect to maintaining an erect posture at rest, it is important to notice that there is an arrangement of muscle associated with the linear aspera in the human lower limb by which, in conjunction with a special knee joint, man is able to lock his leg in a permanently straight position, more or less restfully. The ape's lower limb does not have this feature and must therefore maintain truly erect posture only by considerable muscular effort. S. L. Washburn, in a paper entitled "Analysis of Primate Evolution," remarked, "Changes from a foot of such a sort (as the ape foot) to the human foot would not involve any major evolutionary changes. After all, the joining of the first metatarsal to the second by a ligament may well account for a great many of the features which differentiate the foot of men and apes."[64] It seems to me that this is naive, for a "thumb" such as we see in Fig. 16 to be suddenly bound by an

63. Morton, Dudley, *Amer. Jrl. of Physical Anthrop.*, vol.10, 1927, p.195.
64. Washburn, S. L., "Analysis of Primate Evolution," in *Cold Spring Harbor Symposia on Quantitative Biology*, vol.15, 1951, p.72.

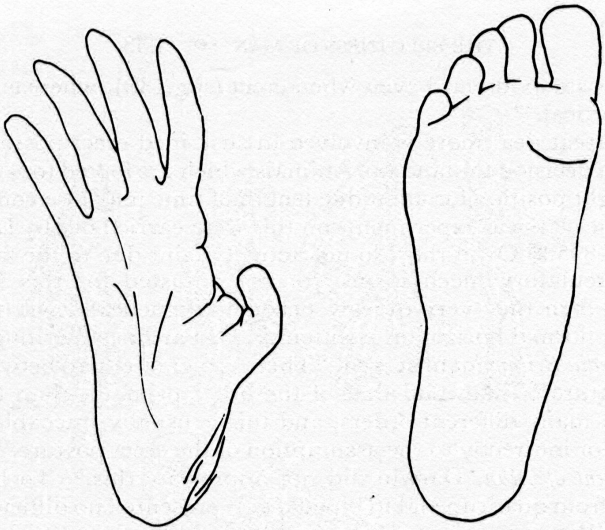

Fig. 15. The plantar aspect of the ape and human foot, the former belonging to an adult orangutan, and the latter to a nine-year-old girl.

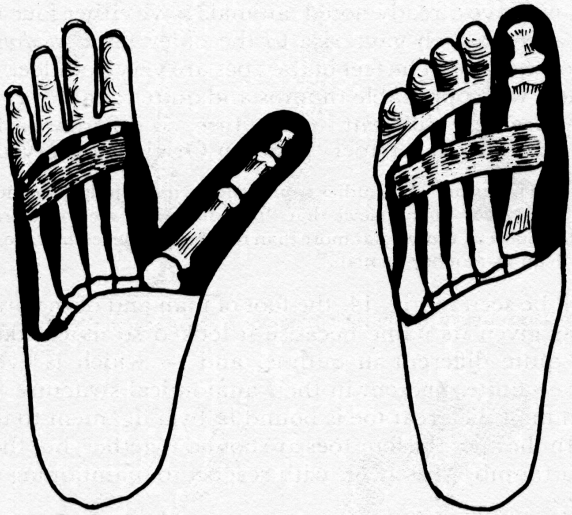

Fig. 16. Oversimplified diagram of the ape and human foot, showing the difference in transverse metatarsal ligament. After Wood Jones, *Man's Place Among the Mammals* (Fig. 147).

entirely new structure to the rest of the toes, thus converting a hand into a foot, is just as difficult to imagine occurring by a series of stages as any other of the major evolutionary changes which the same writer would undoubtedly admit—for example, the balancing of the head on the shoulders in man. It is a completely transforming change with tremendous cultural significance for man, for it allows him to be completely free to use his hands for manipulative rather than balancing or locomotive purposes. The contact of the two feet with the ground is entirely different.

In this connection, Vallois wrote:

> In spite of the existence of some transitional grades of structure observed in certain monkeys and man, all these characters are practically so definite that there can be absolutely no confusion between the most highly developed of living monkeys and the lowest of men.[65]

The genuine importance of erectness of posture for man is witnessed by the almost desperate effort on the part of physical anthropologists, such as Le Gros Clark, to prove that hominoid forms such as the *Australopithecines* actually walked erect. The controversy over this question has raged for twenty years. And, to my mind, the greatest antagonist to the idea, Sir Solly Zuckerman, has also been the most thorough in his analysis of the data.[66] In paper after paper he has shown, simply by the presentation of factual data, that Le Gros Clark and those who have followed him are guilty of wishful thinking. The very title of one of Zuckerman's papers on the subject, "Myths and Methods

65. Boule, Marcellin and Henri V. Vallois, *Fossil Man*, trans. by M. Bullock, N.Y., Dryden Press 1957, p.76.

66. Zuckerman, Sir Solly, "An Ape or The Ape", *Jrl. of the Royal Anthropological Institute*, vol.81 (parts I and II), 1952, pp.57-68: with an adequate bibliography of W. E. Le Gros Clark's papers on the subject.

in Anatomy," is an indication of what he feels about Clark's interpretation of the data.[67]

One of Zuckerman's strongest arguments is the analysis which he made of the relative position of the foramen magnum in the *Australopithecines* skulls which are complete enough to allow for its location. For the non-expert, Fig. 17 will show how this point of connection between the spinal column and the base of the skull is found to be increasingly more forward, i.e., more centrally located, as one moves from the dog (A), to the chimpanzee (B), to man (C). The *Australopithecines* show a foramen position which is essentially ape-like as in (B). Moreover, careful measurements show that the plane in which this opening lies faces toward the back in the *Australopithecines* but toward the front in man, a fact which shows that the spinal column meets the ape skull from slightly behind (see Fig. 18). But it meets the human skull from slightly forward by taking a curve in the neck or cervical region, which is not found in the apes, but which contributes to the flexibility of the human neck. This fact relates to the difference in configuration between man's spinal column and that of all other animals below him.

Fig. 19 shows that man's spinal column is complex, compounded of several curves reversed; the ape spinal column is either almost a straight line or a simple backward curve as shown. As we have noted in the first chapter, this compound form allows man to assume a restful condition in a remarkably wide variety of physical postures. He can sit, stand, and lie in an almost infinite number of ways and maintain these positions for a remarkable length of time, a fact which has great importance to man as a culture-bound creature.

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67. Zuckerman, Sir Solly, "Myths and Methods in Anatomy", Struthers Lecture, *Jrl. of the Royal College of Surgeons*, Edinburgh, vol.11, 1965, pp.87-114; the basis of his chapter, "The African Cousins" in *Beyond the Ivory Tower: The Fortress of Public and Private Science,* N.Y., Taplinger Publ. Co., 1970, pp.75-94.

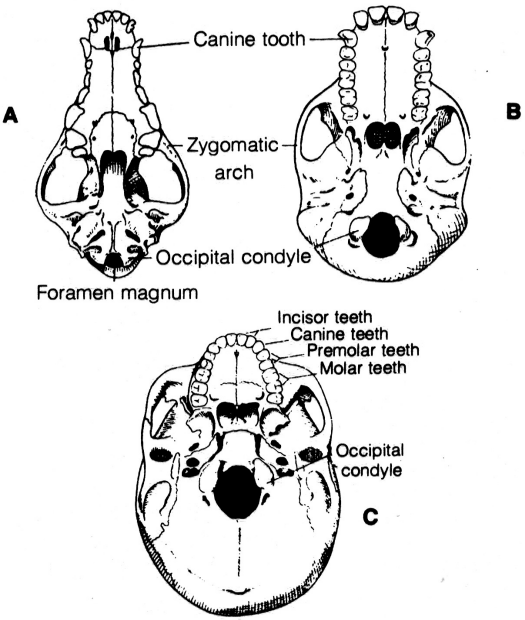

Fig. 17. Basal aspect of skull of dog (A), chimpanzee (B), and man (C). The darkened area is the opening into the skull termed the "foramen magnum." In man it is almost centrally located, the spinal column thus balancing the head with least stress in a vertical position.

Fig. 18. A companion drawing to Fig. 17, showing how the spinal column supports the skull in man, ape, and dog.

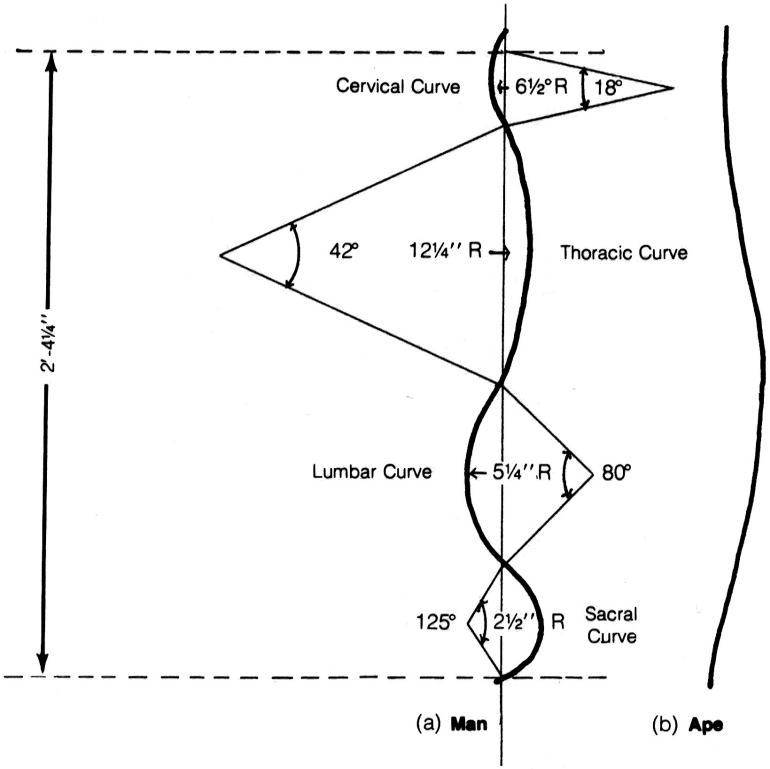

Fig. 19. The data given are from actual measurements. (From lectures of Prof. George Huntington.)

In any case, the *Australopithecines* are no longer considered as ancestral to man, and the possibility that they actually achieved any culture is felt by many authorities to be very slim indeed. The finding of flint weapons of a very crude kind with their remains is equivocal, for archaeologists have actually found pieces of pottery among the bones of some extinct lemurs, perhaps the very pots they were cooked in—but hardly the handiwork of the lemurs themselves. Since we know that the hunter may leave some at least of his weapons beside his prey, the *Australopithecine*

apes may have been the prey of truly human hunters in view of the fact that even by conventional evolutionary standards of dating they were probably contemporary.[68]

Pre-occupation with the determination to find some intermediary creature between the apes and man that walked with a stoop was responsible for the tremendous number of reconstructions of Neanderthal Man, which are still to be found in popular and serious books and museums. In these he is shown brute-like, slouched, and often (appropriately, of course) hairy and carrying a club. It is a curious fact of history that the first Neanderthal man to have been discovered did, indeed, walk with a stoop. Later on other Neanderthal specimens were found who walked as completely erect as modern man does. The first of these was reported in 1939 in *Science* under the name of Sergio Sergi.[69] Since then, more careful examination of the bones of the first Neanderthal has revealed that he was a pathological specimen, afflicted with osteoarthritis, which forced him to walk with a stoop.[70] But because Neanderthal Man was thought to be a kind of missing link and because in the popular mind he is still looked upon in this guise, even the best scholars yield to the temptation to picture him in this way. Carl O. Dunbar, in his 1966 edition of an oft quoted *Historical Geology*, has a full page illustration of "old man Neanderthal" with a note reading: "Note the slouched posture and compare with Fig.386."[71] Fig.386 reinforces the slouch by being juxtaposed to a skeleton of modern man. Concession is made to the reader, however, as follows:

> Although Neanderthals stood upright, their carriage was more like that of a great ape than that

68. *The Living World of Animals*, ed. L. Harrison Matthews, Lon., Reader's Digest Publication, 1970, p.214
69. Sergi, Sergio, *Science,* vol.90, supplement, 4 Aug., 1939, p.12.
70. Neanderthal Man and osteoarthritis: C. S. Coon, *The Story of Man,* N.Y., Knopf, 1962, 2nd edition, revised, p.40.
71. Dunbar, Carl O., *Historical Geology*, N.Y., Wiley, 1966, 2nd ed., p.450.

> of living man, because the spine lacked the fourth or cervical curvature and the thigh bones were sigmoidally curved in compensation.[72]

That healthy Neanderthals maintained a truly erect posture is now almost universally accepted by physical anthropologists. Moreover, Neanderthal Man is sometimes found in association, as contemporary, with modern man. Sometimes modern man is even found preceding Neanderthal Man at the same site [73]

In view of the tremendous importance of his truly erect posture to man as both a culture-creating being and a creature with spiritual aspirations, a word needs to be said about the claim which is often made that he achieved his erectness by an evolutionary process which is still incomplete, and that he suffers considerably, physiologically speaking, as a consequence of this incomplete process of development.

To my mind, the most thorough single paper on this question was written by F. A. Hallebrandt and E. B. Franseen, entitled "Physiological Study of the Vertical Stance in Man."[74] The following brief extracts will give a useful summary of this paper that runs into some thirty-six pages. The authors stated in introducing their subject:

> Many clinical papers in the current literature on posture indicate that stance defects may result ultimately in a variety of malfunctions including lessened respiratory efficiency, prolapse of the abdominal viscera, impairment of digestion, pressure and derangement of the pelvic organs,

72. *Ibid.*, p.449.

73. Neanderthal Man preceded by modern man, notably in the finds at Fontechevade: G. W. Lasker, *Evolution of Man*, N.Y., Holt, Rinehart, & Winston, 1961, pp.118, 119.

74. Hallebrandt, F. A. & Franseen, E. B., "Physiological Study of the Vertical Stance in Man," *Physiology Review*, vol.22-23, 1943, p.220-225.

> dysmenorrhea, haemorrhoids, varicose veins, constipation, cyclic vomiting, foot strain, backache, neuritis, and arthritis. Barring orthopedic disabilities, few of the etiologic associations are based on demonstrable fact [...].
>
> Almost from their first enunciation these now firmly entrenched concepts have been questioned. Many observations throw doubt on their validity.[75]

The authors then proceeded to examine the evidence pro and con for each of these supposed consequences of man's having adopted a supposedly unnatural animal posture. That some of these ailments result from minor skeletal malalignments they found difficult to believe on the basis of evidence as tenuous as that usually presented.[76]

They then give some thought to the question of the supposed increase in energy cost which is assumed to be involved in maintaining a vertical position. Figures are given for the actual increase in oxygen consumption when a test subject changes from a horizontal to a vertical position and their conclusion was that the cost is very small indeed: "From this point of view, normal standing on both legs is *almost effortless*" [my emphasis].[77] In summing up this aspect of the study they said," Standing is cheap in terms of metabolic cost [...]. The remarkable indefatigability of relaxed standing has not been fully explained."[78] Perhaps the explanation is that God made us this way. . . .

Even with regard to circulation, some rather surprising findings have been reported, including the fact that stroke volume is significantly reduced in the vertical stance but heart rate

75. *Ibid.*, p.221.
76. *Ibid.*, p.223.
77. *Ibid.*, p.231.
78. *Ibid.*, p.248.

increases, thus compensating for the reduced venous return flow from the lower extremities due to gravitational effects.[79]

The authors reported extensive evidence that both erect posture and prolonged recumbance are equally conducive to the formation of kidney stones, so it cannot be argued that man's excretory system has been upset by a presumed subsequent assumption of erectness. And provided that free postural sway is allowed, gastric secretory curves are indistinguishable in the vertical body from those in recumbancy.[80]

Although in an erect posture man finds himself at a disadvantage in terms of gravity, since the base upon which he stands is quite small, yet apparently compensatory mechanisms of various kinds automatically cancel mechanical disadvantages of the vertical position, so that gravitational stresses are counteracted easily in the majority of normal men.[81] The phenomenon of standing is elaborately protected by a multiplicity of co-operating reflexes.

I think it is also worth noting in passing that a careful study of factors involved in the size of man, made by F. W. Went, led him to the conclusion that man is actually the tallest creature which could reasonably walk upright on two legs.[82] Any creature larger would be in grave danger of upset, with serious consequences to himself. A man approximately six feet tall, if he trips, will have a kinetic energy upon hitting the ground of anywhere from twenty to one hundred times greater than a small child learning to walk. If a man were twice as tall as he is now, his kinetic danger in falling would be so great (thirty-two times greater than it now is) that it would not be safe for him to walk upright at all. Larger animals can become taller because they are more stable on their four legs. Interestingly enough, Went also showed that if man were much smaller, his cultural attainments would have been

79. *Ibid*., p.232, 234.
80. *Ibid*., p.237.
75. *Ibid*., p.247.
82. Went, F. W., "The Size of Man," *Amer. Scientist*, vol.56, no.4, 1968, p.400-413.

tremendously limited due to his greatly reduced striking power as a craftsman. His analysis of the total situation suggests that man is, indeed, "an optimum size."

The consequences of man's orthopaedic capabilities are tremendous. Some of them are very obvious. Some of them are not so obvious but are, if anything, even more important. The importance of the freedom of his hands needs little labouring, though we shall explore this further in dealing with man as a creator of culture, in which his hands become in a very real sense an extension of his mind. Sir Charles Bell wrote eloquently about the refinements and the potential of the human hand.

> [...] it is in the human hand that we perceive the consummation of all perfection as an instrument. This superiority consists in its power, which is a combination of strength, with variety, extent, and rapidity, of motion; in the forms, relations, and sensibility of the fingers and the thumb; in the provisions for holding, pulling, spinning, weaving, and constructing; properties which can be found in other animals but are combined in this more perfect instrument.[83]

Bell might have mentioned such complex exercises as those involved in typing at high speed or, even more remarkably, in playing the piano. The close association between mind and hand in both is evident from the fact that skill enables the individual to forget about the hands entirely. You will know, if you type by touch, that one will have no immediate picture, in reflection, of the actual position of letters on the keyboard. One has to "discover" them, as it were, in one's imagination if one is not in the presence of a typewriter by acting as though one were typing

83. Bell, Sir Charles, The Hand: Its Mechanism and Visual Endowments As Evincing Design, *Bridgewater Treatises* , 4th treatise, Lon., Pickering, 4th ed. 1837, p.249.

a word, and if a typographical error is made, it may be several words on before some subconscious part of the mind signals to one that an error has been made. The message passes straight from the copy to the typescript through the mind and the fingers as though mind and hand were really a single transfer channel. This nervous connection, which accompanies the liberation of the hands by reason of man's erectness, has been recognized as one of the most important aspects in the total situation. William L. Straus has said:

> Any further studies of posture and locomotion—whether bipedal, bimanual, or quadrupedal—must necessarily be physiological as well as anatomical. Too often have posture and locomotion been thought of in terms of skeleton and muscle alone. Yet these are essentially effector organs, for it has been clearly demonstrated that the central nervous system is the prime controlling agent.[84]

In the first chapter we listed, among other things, man's possession of truly opposable thumbs combined with wide-angle stereoscopic vision. The point has often been remarked upon by others. Sir Solly Zuckerman, in an article dealing with man's social evolution, wrote:

> According to many authorities, the one unique character which was most prominently concerned in our prehuman development, and without which we should not have evolved to the human level, is our dual possession of stereovision and

84. Straus, William L., "Primates," in *Anthropology Today*, ed. A. L. Kroeber, Univer. of Chicago Press, 1953, p.83.

> fully opposable thumbs. This combination exists in no other animal.[85]

Kenneth Oakley underscores the combined effect of these two features:

> Man owes much of his skill to his visual powers, and yet apes and many monkeys have eyes capable of refined stereoscopic and colour vision. Man is, however, psychologically distinguished by his capacity for close visual attention and for prolonged *co-ordination of eye and hand* [my emphasis].
>
> These are reflections of cerebral rather than ocular functions. Convergence of the eyes upon handwork is largely dependent upon conscious concentration—in other words, it is under the control of the cortical motor areas, which act in response to coordinated impulses from the eyes.
>
> It has been reported that chimpanzees can learn to use their hands under the direction of their eyes for long enough to thread a needle, but in general the attention that an ape can give to manipulating an object is very fleeting. Furthermore, the erect posture of man, and the fact that his skull is poised above the top of his spine instead of being slung in a forwardly projecting manner as in apes, make it easier for him to pay close attention to any point over a wide field of vision.[86]

85. Zuckerman, Sir Solly, "The influence of hormones on man's social evolution." *Endeavour,* April, 1944, p.80

86. Oakley, Kenneth P., "Skill as a Human Possession," in *A History of Technology*, eds. Charles Singer, E. J. Holmyard, A. R. Hall, Oxford Univer. Press, 1954, vol.1,p.12

It is not without significance that among the very earliest artifacts of man are to be found needles of quite refined design (see Fig.20), and Genesis 3:7 indicates that the very first cultural activity of man after the Fall was to sew clothing for himself.

One of the less well recognized results of truly erect posture in man is its effect upon his powers of communication. The neck structure allows a certain configuration of the windpipe and vocal organs which permits men to talk easily to one another while maintaining the natural and normal position of the head. Both speaking and singing are possible for man without any such straightening out of the head and neck as must occur in other animals when they give voice.[87] One only has to observe the mooing of a cow, or the howling of a dog to realize that considerable change of head position from the normal is required before they can vocalize. Adolph Schultz, in a paper entitled "The Physical Distinctions of Man," remarked upon the fact that the human head does not have a position relative to the spine similar to that in all non-human primates: "The profound phylogenetic change in this relation between head and spine in man can be understood only as an ontogenetic specialization. . . ."[88] I would omit the word only. After all, this is surely the way God made man in the first place, for very good reasons. In passing, it might be noted that the other class of animals which maintain a normal erect posture, namely, the birds, can also sing without changing their head position.

Furthermore, the refined jaw structure of man may also contribute to his ability to speak. In the apes (as in man) the chief stress placed upon the bone structure of the jaw in chewing hard substances or cracking nuts on one side of the mouth only is concentrated at the chin. The very powerful jaw muscles in the gorilla are met with a corresponding mechanical strengthening of the jaw at the crucial point of stress by a "flange" of bone which

87. Kahn, Fritz, *Man in Structure and Function*, N. Y., Knopf, 1960, vol.1, p.73.
88. Schultz, Adolph "The Physical Distinctions of Man," *American Philosophical Society Proceedings*, vol.94, 1950, p.445.

penetrates inwards toward the throat as shown in Fig. 21. It is widely accepted that this so-called simian shelf, which I believe occurs in all the apes, has the effect of considerably reducing the freedom of movement of the primate animal tongue by restricting the area available for muscles.[89] The number of sounds which the apes can make is therefore more restricted than in man. In a paper on cultural evolution, Julian H. Steward, while agreeing that the origin of language is still quite unexplained, nevertheless saw it as significant that man is capable of speech not only because of the speech and auditory centres of his brain, but also "thanks to his jaw and tongue structure."[90]

Fig. 20. Some bone needles found by Karl Absalon at Vestonice, Moravia, "dated" 30,000 years old.

Fig. 21. The so-called simian shelf in the ape jaw, contrasted with the human chin.

89. Howells, William, *Mankind So Far*, N. Y., Doubleday, 1944, pp.78,79.
90. Steward, Julian H., "Cultural Evolution," *Scientific Amer.*, May, 1956, p.72.

The same need for strengthening exists, of course, on the human jaw but in this case the flange projects outward away from the throat leading to the characteristic formation of the human chin. This anatomy allows considerably more freedom for the tongue. Man's powers of vocalization are, as a consequence, far greater than in the primates, and he makes full use of this capacity both to share his ideas and to express his emotion.

It has been argued that by balancing the head on top of the vertical column, optimum conditions exist for removing waste products of metabolic activity in this most important area. It is also customary to equate the enlargement of the brain with the assumption of erect posture in man. While I am personally persuaded that God made man upright in the first place, I think it is not at all unlikely that in some way to be yet clearly demonstrated, the size and complexity of man's brain is related to the position of that organ with respect to the rest of his body. S. W. Britton, reflecting the evolutionary view of man's supposed biological history, wrote:

> Man alone stands erect with little or no functional disturbance [...] contemporaneous with development of orthograde progression, the human brain showed its greatest growth and differentiation. The force of gravity exerted linearly through the body significantly influenced conformation and growth.
>
> Delicately balanced arterial reactions, better oxygenation, and enhanced venous removal of metabolic products became possible in the head end. Special sensory and cerebral mechanisms have probably benefitted, particularly through improved circulatory conditions.[91]

91. Britton, S. W., *Science*, vol.11, 1950, p.445; under Abstracts of the National Academy of Sciences.

The erectness of man is therefore of tremendous importance as an extension of his mental capacities and to give those mental capacities freedom of expression.

It seems also that man is a creature who, by habit, in a way "looks up," and he does this to an extent that few if any other animals do. Their vision seems bent upon the ground; man's is directed otherwise. It is as though his very structure is a reflection of the fact that his spirit "shall return unto God who gave it" (Ecclesiastes 12:7), whereas the spirit of the beast "goeth downward to the earth" (Ecclesiastes 3:21). His very physical posture itself in some way corresponds to his spiritual nature. Man was truly upright as God made him (Ecclesiastes 7:29), but in the end he becomes bowed down (Psalm 37:3,6), with the weight both of years and sin. The Lord encouraged His people to "straighten up" as they saw the day of their redemption approaching (Luke 21 :28), for such is the meaning of the original, as though the very position of the body could symbolize the posture of the soul—as indeed it does!

It is perhaps significant that in grief, sorrow, and crying, man tends to double forward, using muscles which bow him down; but in joy and laughter and praise, he straightens up, indeed even bends over backwards, using muscles which more than straighten him up. His very worship, as John R. Howitt pointed out, bows him before his Creator in contrition, but then leads him to lift up his head in praise.[92]

92. Howitt, J. R., "Man the Upright," *Creation Research Society Annual,* 1968, pp.46-48.

Chapter 4

The Ubiquity of Man

Comparative Defencelessness of Man

Man is surely the most defenceless of all creatures, unless armed artificially.[93] He appears to have no dependable instincts for self-protection.[94] What natural defences he can muster from within himself are puny compared with those of animals. And there is no evidence that early man was very different from ourselves, so that we cannot blame this deficiency altogether on a cultural heritage which tends to supply us with substitute defences. The strength of animals relative to human strength is tremendous. A chimpanzee, for instance, has something like three to five times the strength of man, though considerably less weight (120 lbs.).[95] The fact of man's helplessness in terms of self-defence has been remarked upon by many writers, not a few of whom have seen in it, quite rightly, one of the reasons for his ability to exercise dominion over the rest of Nature. For in lieu of natural equipment he has been granted superior intelligence and learned to arm himself

Years ago Sir William Dawson made this statement:

> It is, in animals below man, a law that the bodily frame is provided with all necessary means

93. It is possible that honours in this respect may have to go to the koala bear which, I have read, is completely without defences.
94. Animals appear to know when to stand and fight, and when it is wiser not to do so. This is particularly true of birds, as noted by Alexander F. Skutch, "The Parental Devotion of Birds," *Scientific Monthly*, April, 1946, p.369.
95. Noted by R. A. Gardner, *Science*, vol.165, 1969, p.664.

of defense and attack, and with all necessary protection against external influences and assailant.

In a very few cases, we have a partial exception to this. A hermit-crab, for instance, has the hinder part of its body unprotected; and has, instead of armor, the instinct of using the cast-off shells of mollusks; yet even this animal has the usual strong claws of a crustacean for defense in front. There are only a very few animals in which instinct thus takes the place of physical contrivances for defense or attack, and in these we find merely the usual unvarying instincts of the animal. But in man, that which is the rare exception in all other animals becomes the rule. He has no means of escape from danger compared with those enjoyed by other animals, no defensive armour, no effective weapons for attacking other animals.

These disabilities should make him the most helpless of creatures, especially when taken with his slow growth and long immaturity. His safety and his dominion over other animals are secured by entirely new means, constituting a new departure in creation. Contrivance and inventive power, enabling him to utilize the objects and forces of Nature, replace in him the physical powers bestowed on other animals.

Obviously, the structure of the human being is related to this, and so related to it as to place man in a different category altogether from any other animal.[96]

96. Dawson, Sir William, *The Story of Earth and Man*, Lon., Hodder & Stoughton, 1903, p.365.

The evidence from antiquity, from the study of fossil man and his cultural remains, indicates that man has always had to depend upon his intellect rather than his physical strength or natural defensive weapons. If man had not fallen, it is my belief that he would not have had to defend himself against other animals at all, but would have achieved dominion over them by a kind of power akin to moral force. Even yet there are among us individuals who seem to have retained something of this power over animals. It would be an interesting question for debate to ask whether many of the defensive instincts of animals would have been necessary if sin had not entered into God's creation, and therefore whether they were conferred upon them by God as soon as man's sin began to disrupt the natural order. Fabre, with the true insight of a devout naturalist, recognized animal instinctual behaviour as "inspired activity."[97]

But returning to the subject of early man, Vere Gordon Childe, a keen student of civilization, wrote:

> Man is now, and was apparently even at his first appearance in the Pleistocene, inadequately adapted for survival in any particular environment. His bodily equipment for coping with any set of conditions is inferior to that of most animals. He has not, and probably never had, a furry coat like the polar bears for keeping in the body's heat under cold conditions. His body is not particularly well adapted for escape, for self-defense, or hunting.
>
> He is not, for instance, exceptionally fleet of foot, and would be left behind in any race with a hare or an ostrich. He has no protective coloring

97. Fabre Henri: quoted by W. R. Thompson in a Convocation Address: "The Work of J. Henri Fabre", in *Can. Entomology*, vol.96, nos.1 & 2, 1964, p.70.

> like the tiger or the snow leopard, nor bodily armor like the tortoise or the crab. He has no wings to offer escape and give him an advantage in spying out and pouncing upon prey. He lacks the beak and talons of the hawk, and its keenness of vision. For catching his prey and defending himself, his muscular strength, teeth and nails are incomparably inferior [...].[98]

As Kipling said, man is indeed "a poor naked frog."

And yet man has a vast superiority, for all his weakness and in spite of the Fall. He did not entirely lose in Eden the power to obey the command to have dominion over the earth. The processes of civilization are really only exhibitions of this ability expressed in terms of fallen man. During World War II, C. E. M. Joad, a man who thought deeply about the events of his day, wrote a little pamphlet entitled *For Civilization*. His opening paragraph reads as follows:

> Wherein are to be found the distinctive characteristics of our species? In what, that is to say, do men differ from and excel the beasts? In swiftness or ferocity? The deer and the lion leave us far behind. In size and strength we must give way to the elephant and the whale; sheep are more gentle, nightingales more melodious, tortoises longer-lived, bees more cooperative, beavers more diligent. The ants run a totalitarian State much better than any Fascist.
>
> The truth is that our bodies are feeble and ill-adapted to survival; they are the prey to innumerable diseases, their enormous complexity

98. Childe, Vere Gordon, *Man Makes Himself*, Thinkers Library, Lon., Watts, 1948, p.23.

> means that things can go wrong in a vast number of ways, while so poorly are they equipped against the vagaries of the climate that it is only by clothing ourselves in the skins of other animals that we can survive.[99]

All these things are true, but not the whole truth, and Dawson, Childe, and Joad from their different points of view would at once acknowledge this. It is true that man is not supplied with natural defences against potential enemies, but he does have a brain and hands which allow him to design vastly superior weapons for himself. It is true that he is naked, but these same hands and brain allow him to devise clothing which gives him the ability to live where other animals cannot live, except under his protection. He may indeed be slow to move, yet these same hands and brain have made him more mobile and faster than any other creature. And though he may apparently be ill-protected against the vagaries of climate, he is nevertheless, physiologically speaking, quite uniquely equipped to maintain his deep body temperature within remarkably narrow limits over an extraordinary wide range of external conditions of temperature, pressure, and humidity. And as we shall see, in his diet he is further exceptionally fitted to live in any part of the world.

Many years ago Alexander Macalister, Professor of Anatomy in the University of Cambridge, wrote a paper entitled "Man, Physiologically Considered," in which he was careful to note that there are many features of man's anatomy and physiology which contribute to the use he has made of his superior brain:

> While it is thus power of mind, not power of body, which gives to man his supremacy, yet, in all respects, man's bodily organization is fitted to

99. Joad, C. E. M., *For Civilization*, Lon., Macmillan War Pamphlets, 1940, p.3.

> enable him to use to the best advantage his mental endowments.
>
> If he conceives in his mind the plan of making a weapon, his prehensile hand with its sensitive skin and its independently moving and opposable thumb can fabricate it. His sinuous backbone and completely extensile lower limbs enable him to stand upright with perfect stability, with an ease and perfection competent to no other animal; and thus his forelimbs, relieved from all necessity to act as organs of progression, are perfectly disengaged for work [...][100]

His very weakness has in the providence of God served to enhance man's chief glory—his power to think things through. But man's superior mental abilities had to be supported adequately to find expression through the other members of his body, and his body needed to be organized in a number of ways uniquely to make this possible. It was God's intention that man should fill the earth and govern it, and in order to fulfil this task, God knew that man had to be designed to face climatic extremes that would exist as they do now. God must therefore have designed man, to begin with, with the capability of making the necessary physiological adjustments in order to occupy these different climatic zones. No other animal was designed, it seems, for such ubiquitousness.

Next, let us just consider: 1) the nature of territoriality of animals other than man; 2) the significance of man's uniformity of physical type in spite of his wide dispersal and often long isolation; 3) man's unusual dietary requirements compared to those of animals; and finally 4) the complex mechanisms by which man maintains his deep body temperature at the optimum

100. Macalister, Alexander, *Man Physiologically Considered*, vol.7, no.39 in Present Day Tracts, Lon., Religious Tract Society, 1886, pp.6, 7.

level to allow the exercise of his full potential as a thinking creature within an exceptional range of external conditions. Temperature regulation in man is, in certain fundamental respects, quite different from the mechanism which serves somewhat the same purpose in animals, and this difference will underscore at the same time the fact that it is easy for the inexpert to suppose that because the mechanisms look alike they are the same when, in fact, they differ.

1. Man the Free-roaming Creature

Consider the extent of animal territories. Every increase in our knowledge of this subject only tends to confirm that all animals have limited territories, which they mark out rather specifically. Often more than one species will occupy a single area, but each species marks out its territorial boundaries in defiance of other members of its own species.

In the case of social animals, the territory owned by the individual may be quite small. Birds, especially sea birds, may claim only space sufficient to land upon and lay their eggs. But other animals, like some of the large cats, may dominate territories covering a number of square miles. Just as an illustration of the kind of spread involved, the weasel may claim from two to nine acres, a male stoat up to eighty-five acres, martens about one square mile, a waterbuck anywhere from forty to five-hundred acres, some bears, ten square miles or more, and a pride of fifteen lions, thirty or more square miles.[101] The territory of animals which migrate should not strictly include their corridors of migration which they merely pass through, but must be limited to their range of wintering or summering. The primates nearest in form to man claim territorial rights over far less territory, the proportion working out to about two and one-half

101 *The Living World of Animals*, ed. L. Harrison Matthews, Lon., Readers Digest Publ., 1970, pp.56, 58, 59, 101, 106.

chimpanzees per square mile, for example. [102] The Sifaka monkeys in Madagascar occupy about three acres each.

Social animals that live in colonies seem to crowd their environment, but apparently, except under stress, they do not actually compete severely for the food supply. Herds of animals may live with herds of another species, serving as sentinels for one another but not competing for the available food because their diets are different. I think it is amusing that evolutionists who believe that Nature has advanced itself by the very fact of competition are also able to turn around and show that evolution has often had the reverse effect, i.e., limiting competition. So we have a situation in which competition leads to evolution upwards while evolution tends towards the elimination of competition. Thus a magnificent volume, *The Living World Of Animals*, under the editorship of L. H. Matthews and others, has this enlightening paragraph:

> This concentration of animals (in Africa) does not lead to the severe competition between species for food that might be expected, because each has his own preferences even when several different species graze upon the same plant. Red Oat grass, for instance, is eaten by the zebra, the wildebeest, and the topi, but each feeds upon it at a different stage of the plant's growth. This limited competition, the *result of evolution* [my emphasis], has permitted a great variety of animals to fit into the environment; every species has its niche, from the smallest insect to the elephant.[103]

Not only are animal territories rather precisely defined, but the geographic distribution of species tends to be equally well

102. *Ibid*.: Chimpanzees, p.198; Sifaka monkeys. p.215.
103 *Ibid*., p.96.

defined, except where man has interfered and taken domesticated animals with him. Of the primates, the gorilla is confined to a small tract of West Africa about the size of France. The chimpanzee, although ranging over a larger district of Equatorial Africa, still does not extend beyond the region limited by the parallels 12 degrees north and south latitudes, and in this belt is only found between the sea coast on the west and the meridian of Lake Tanganyika on the east. The orangutan is limited to the islands of Sumatra and Borneo.[104]

Washburn and Lancaster, in a paper on the evolution of hunting, remark upon the difference between the territory occupied by men who hunt as opposed to animals which hunt:

> Social groups of non-human primates occupy exceedingly small areas, and the vast majority of animals probably spend their entire lives within less than 4 or 5 square miles. Even though they have excellent vision and can see for many miles, especially from the tops of trees, they make no effort to explore more than a tiny fraction of the area they see.
>
> Even for gorillas the range is only about 15 square miles, and it is of the same order of magnitude for savanna baboons; they refuse to be driven beyond the end of their range and double back. The known area is a psychological reality, clear in the minds of the animals. Only a small part of even this limited range is used, and exploration is confined to the canopy, lower branches, and bushes, or ground, depending on the biology of the particular species [...]

104. Macalister, Alexander, *Man Physiologically Considered*, vol.7, no.39, Present Day Tracts, Religious Tract Society of Lon., 1886, p.5.

> In marked contrast, human hunters are familiar with very large areas. In (one) area studied [...] eleven water holes and several hundred square miles supported a smaller number of Bushmen than the number of baboons supported by a single water hole and a few square miles in the Amboseli Reserve in Kenya. The most minor hunting expedition covers an area larger than most non-human primates would cover in a lifetime. Interest in a large area is human.[105]

It is not unusual for a single Eskimo family to occupy for hunting purposes a territory stretching for 200 to 300 miles. Moreover, unlike any other species, man seems by nature a wanderer and an explorer, to whom no part of the globe does not have an appeal in one way or another. Man is truly ubiquitous.

2. Comparative Absence of Physical Variability

For all his ubiquity man has not, even in those earlier periods of history in which population was thin and tribes were often isolated for centuries, developed varieties of the *species Homo sapiens* to anything like the extent that animals have. It is true that in one area of the world, Africa, we do have Pygmies whose average height is perhaps four feet six inches, and Nilotic Negroes whose average height may be around seven feet, but in terms of body mass the difference between the Nilotic Negroes and the Congo Pygmy is far less than, for example, the difference between the St. Bernard and the Chihuahua. Moreover, this apparent limitation in terms of variability within the family of man has made it possible for all races to interbreed freely. In the case of the St. Bernard and the Chihuahua, for example, interbreeding is not

105. Washburn, S. L. & Lancaster, C. S., "The Evolution of Hunting," in *Human Evolution*, eds. N. Korn , F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, p.73.

successful for physical reasons unless artificial means are used. And if the mother is the Chihuahua, she apparently cannot bear her pup sired by a St. Bernard because of its size at full term.

Within the animal kingdom other factors may result in psychological blocks to successful mating—the time of heat of varieties of a single species too-long separated may not be in register; sometimes the block is apparently due to unacceptable body odour caused by a difference in diet. The inflexibility of the period of heat among species, an inflexibility which is governed by their need to bear their young at an appropriate time in the year, is said by some authorities to be responsible for the extinction of at least some species in early Pleistocene times when it is held that great climatic changes were taking place.[106]

Experience shows, by contrast, that none of these barriers exist between members of the human species, though they may be brought together from the ends of the world for the first time in human history. Mankind as a species has not a restricted "season of heat," such as characterizes all other species. And this fact has tremendous importance, as we shall see in the next chapter. The potential for interbreeding successfully seems to me to indicate that, unlike other animals, man was uniquely designed from the beginning to be able to go anywhere in the world without becoming a genetic isolate.

Although I cannot find myself in agreement with Teilhard de Chardin, he is certainly correct in underscoring the importance of this fact for man:

> By climatic and geographical influences, varieties and races (of animals) come into existence. Somatically speaking, the fanning out (of man) is present continually in formation and

106. Slaughter, W. H., "Animal Ranges as a Clue to Late-Pleistocene Extinctions," in *Pleistocene Extinctions*, vol.6 of the *Proceedings of the 7th Congress of the International Association for Quaternary Research*, eds. P. S. Martin & H. E. Wright, Yale Univer. Press, 1967, p.155.

> perfectly recognizable. Yet the remarkable thing is that its divergent branches no longer succeed in separating.
>
> Under conditions of distribution which in any other initial phylum would long ago have led to the breakup into different species, the human vertical as it spreads out remains entire, like a gigantic leaf whose veins, however distinct, remain always joined in a common tissue. With man we find independent (interfertility) on every level [...]
>
> Zoologically speaking, mankind offers us the unique spectacle of a species capable of achieving something in which all previous species had failed. It has succeeded, not only in becoming cosmopolitan, but in stretching a single organized membrane over the earth without breaking it.[107]

It is clear, then, in a way which has never been demonstrated for animals, that every variety of man is "made of one" (Acts 17:26, where the word "blood" is probably not part of the original text). And this true unity of such a far-flung race guarantees that throughout history One Man could always be recognized as a true representative of all men, without exception.

Another notable circumstance with respect to animal populations is the interesting fact that according to our present understanding, animal species remain remarkably stable in terms of the number of individuals constituting each particular species.

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107. Teilhard de Chardin, Pierre, *The Phenomenon of Man,* Lon., Collins, 1955, p.241. A more "orthodox" authority, G. G. Simpson, has remarked upon the same circumstance: "Regardless of the diversity of races, it is obvious that all men resemble one another much more than any of them differ from each other. They all share the basic quality, anatomical, physiological and psychological, that make us human, *Homo sapiens*, and no other species that is or ever was" (*Biology and Man*, N.Y., Harcourt, Brace & World, 1969, p.87).

Were it not so, of course, their territories would have to increase or they would have to become progressively more crowded. Darwin saw that all organisms possess the potentiality for increase, a potentiality not merely for arithmetical multiplication but geometric. It was this belief that led him to assume that Malthus' essay on human population growth must also apply to animals. He therefore postulated an unending struggle to survive, with the triumph of the fittest. We know now that this was an entirely erroneous extrapolation from human to animal population growth. Sir Julian Huxley himself underscored the fact that for various reasons this population growth does not materialize, and so he observed, "In spite of the tendency to progressive increase, the numbers of a given species actually remain more or less constant." Subsequently, he wrote:

> With our much greater knowledge of ecology, we know today that many species undergo cyclical and often remarkably regular fluctuations, frequently of very large extent in their numbers.[108]

At this point, he referred to the work of Charles Elton, and although I do not have the work he refers to, I do have a similar work by that author in which he underscored this interesting finding, and after giving some specific illustrations, concluded:

> All this goes to support the idea that there is some important principle involved in the stability of the total number of species in an animal community.[109]

108. Huxley, Sir Julian, *Evolution: the Modern Synthesis*, N.Y., Harper, 1942, p.15.
109. Elton, Charles, *The Ecology of Animals*, Lon., Methuen, 1950, p.20. See also his "Animal Numbers and Adaptation" in *Evolution: Essays on Aspects of Evolutionary Biology*, ed. Sir Gavin de Beer, Oxford Univ. Press, 1938, p.127-137.

Elton was speaking in this case not of the number of individuals in a species but the number of species in a given area. This is a fact which has been recognized for a long while: namely, that when any particular species dies out, some other species will move in to fill the ecological niche which has thus become vacant. But they do not over-populate it. So the web of life is preserved intact, and the total number of animals as a consequence remains remarkably constant. The pattern of human population growth is quite otherwise. Were it not so, man would never finally "fill the earth." But did those constraints against animal population growth not exist, it could very well be that the animals, rather than man, would have usurped his dominion long before this.

In the meantime, evidence has recently come to light that, again, unlike human beings, animals are somehow able to control their own numbers, not by killing off unwanted children as it were, but by producing fewer offspring. This has become apparent, for example of the elephant population in the Murchison Falls area of Western Uganda in Africa.[110] Where one section of this particular population has had its territory reduced by the extension of farming, the elephant population has somehow diminished by a change in the birth rate. The normal spacing for calves is four years; in this potentially over-crowded area it has risen to nine years. No one knows the mechanics of this, though it has recently been recognized that the same thing may happen in other parts of the world. In an English woodland, if the number of great-tits doubles, in the next season the egg clutch size will be reduced by two. In an Iowa marshland, if muskrat numbers rise too high, then the mother muskrat produces fewer embryos or re-absorbs them.

110. Animal population stability: Robert Ardrey, in a series of two articles on the subject in *The Globe and Mail,* Toronto, Sept. 30 & Oct. 1, 1971.

3. Man the Omnivorous

Another factor which contributes to man's unique ubiquity is his willingness and ability to accept a vegetarian or meat diet with equal ease. There are millions of people who for centuries have been to all intents and purposes vegetarian, such as those in the Far East who depend upon cereals (rice, etc.). By contrast, there have been branches of the human race, such as the Eskimo people, who were not completely but almost entirely meat eaters. At certain seasons of the year they probably had some fruits in the form of wild berries. The human body, therefore, can be nourished equally well by either form of diet.

By contrast, as Loren C. Eiseley says, "All of the existing great apes are essentially vegetarian, and indeed the arboreal bracchiators have no other consistent source of food."[111] Whether these creatures could successfully adopt a carnivorous diet without completely changing their character, or at least becoming no longer inter-fertile with members of their own species who remain vegetarian, it is difficult to say. It is known that in at least one branch of the primates, a number of animals have changed their diet from a herbivorous to a carnivorous one due to man's disturbance of their natural environment. Eugene Marais pointed out that up until about 1860 the wild baboons in Africa fed on insects and roots.[112] In a manner of speaking, they were therefore already omnivorous, though insects as part of a diet do not usually qualify the eater as a carnivore. But the drying up of the continent due to man's bad farming management, forced these animals to look for liquid to drink from new sources, and they started killing goats just to suck the milk from their udders. In time they began attacking all kinds of domestic animals and eating them for food.

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111. Eiseley, Loren C., "Fossil Man and Human Evolution," in *Current Anthropology*, ed. W. L. Thomas, Univer. of Chicago Press, 1956 , p.73.
112 Marais, Eugene, *My Friends, the Baboons*, N. Y., Methuen, 1939, p.1.

This is an exceptional circumstance, not a natural one. And the fact remains that virtually no other animal bearing some similarity to man is equally capable of living on either a vegetarian or a meat diet. This is of great importance to man, for there are areas of the world where vegetables are simply not available (for example, desert areas and the high Arctic) unless they are imported. The settlement by man of such areas would therefore have been altogether impossible unless he had been omnivorous by nature. Man's constitution is therefore such that in this also he is uniquely equipped to fill the earth and subdue it in a way that no other creature is.

We come, then, to one further aspect of human constitution which is easily overlooked but is of equally profound significance for man in the light of his original commission. This has to do with the means by which he maintains his body temperature.

4. Man the Supreme Homeotherm

Although all animals, whether cold-blooded or warm-blooded, must have some temperature regulation in order to sustain life, there are ascending degrees of regulation as we move up the scale of complexity in animal form. The cold-blooded animals are not strictly cold-blooded. They are so constituted that within certain limits their body temperature floats with the environmental conditions, and the amount of energy they have fluctuates accordingly. They are sluggish and virtually defenceless when the environmental temperature falls below a certain level, because energy is derived in the animal body by the "burning" of food stuffs and this burning process becomes very inefficient at low temperatures. Obviously, such creatures must be able to prevent a fall below a certain point, otherwise they would lack energy even for digestion and other vital processes. They can, however, sustain a fall in deep body temperature far below that of warm-blooded animals. This is an advantage to them in terms of

survival where they are not in danger of attack from other animals, but it severely limits their potential for accomplishment. The next level seems to be found in those animals which, although they are able to maintain their body temperature quite close to that of man, nevertheless have the ability to allow their temperature to fall everywhere in the body except in certain vital organs. There are animals which can hibernate. They reduce the demand of their body for energy to an absolute minimum for long periods of time and pass into a state of dormancy. But when the external environmental temperature rises above a certain point some mechanism awakens them and they become as active as any other warm-blooded animal, thereafter maintaining their body temperature throughout the season of warm weather as other warm-blooded animals do throughout the year.

There is a third class of animals, among which man *seems* to be but one among many, which have an in-built thermoregulatory system. Except under very extraordinary circumstances and with extreme rarity, this system maintains the body temperature as a whole within a degree or two of some norm—in mammals around 98 degrees F. and in birds a few degrees higher.

I have emphasized the word *seems* in connection with man, because in point of fact his thermoregulatory system is quite unique and involves several mechanisms which are not found in other animals in spite of appearances to the contrary. [113] Briefly, the system works somewhat as follows: When the human body is threatened with a fall in temperature, the first line of defence is what is called peripheral vasoconstriction, in which the circulating blood is prevented from flowing through the tiny capillaries immediately at the skin surface and is short-circuited back into the venous return flow system through special channels (anastomoses). As a result, it does not reach the surface where it would be chilled by radiation loss and by conduction to the cold

113. As Douglas J. H. & K. Lee put it, "Man is supreme as a Homeotherm." See "Heat and Cold," in *Annual Review of Physiology*, vol.10. 1948, p.368.

surface. The effect is that the skin turns white. At the same time, this white skin acquires approximately the insulating value of cork by the reduction of its fluid content and correspondingly lowered conductivity.[114]

If this first line of defence proves insufficient, the body initiates a second defence mechanism, namely, the tightening up of skeletal muscles, especially in the limbs. This muscle tension generates heat metabolically and can actually double the resting metabolism of the body. It also, of course, accumulates waste from the breakdown products of the metabolism and results in the feeling of stiffness and ache that is experienced after exposure to the cold for a sufficient length of time. Muscle tension is maintained by the asynchronous firing of nerve impulses to the muscles.

If this second line of defence mechanism still proves inadequate, then the asynchronous firing of nerve impulses is synchronized and the muscles begin to contract in unison. We experience this as shivering. And if shivering is allowed (one should not try to suppress it), metabolic heat generated within the body may be increased threefold.

We therefore have a dual mechanism for maintaining the body temperature against a fall which involves muscular activity and a shift in circulation. Animals shiver, but it does not appear that they have the human defence of a closed-down peripheral circulation to reinforce its effect. It should be understood that the circulation of the blood is of crucial importance in the matter of temperature regulation, acting rather like a hot or cold water system in a house, the fluid itself forming the heat reservoir and by its circulation providing a highly efficient heat exchanger.

When the body is threatened with a temperature rise, a threat which incidentally is far more dangerous to man, a somewhat

114. E. F. DuBois gives the specific conductivity of epidermis, subcutaneous fat, and muscle tissue when not bathed in sweat water and in a condition of vasoconstriction as 0.00047 to 0.00050 gm. cal/sec./cm2/cm., compared with the specific conductivity of cork, which is 0.0007.

different mechanism is set in motion. The first line of defence is, again, a change in the circulation of the blood at the periphery. In this instance, miles of tiny capillaries are opened up and the blood floods through them very close to the skin surface. This is known as vasodilatation, and the visual effect is that the skin reddens. It happens in the cheeks very rapidly under emotional stress (i.e., blushing). Certain drugs like alcohol will also produce the same effect of reddening in the face and neck. A rise in body temperature due to an increase in environmental temperature is immediately counteracted by this peripheral vasodilatation. The mechanical effect is now to allow the blood to cool at the surface. Deep body heat is thereby transported and eliminated by radiation and conduction from the skin surface.

If this should prove insufficient, a second line of defence is at once initiated, a line of defence which, contrary to popular opinion, is believed to be unique in man. This is technically known as thermogenic sweating. The thermostat in the body appears to be situated in the hypothalamus which is bathed in blood and responds to minute changes in blood temperature.[115] A rise of 0.01 degrees C in hypothalamic temperature is sufficient to initiate sweating when the set point has been reached.[116] During sweating, the body surface becomes bathed in a watery fluid expressed to the skin surface via some two million sweat glands, where it evaporates. The evaporation of water occurs only where the ambient air is able to absorb the water vapour. When this can be 100 percent effective, the amount of heat removed from the body under certain circumstances can be extraordinary since the body has the ability to sweat copiously. In our own experiments, we have not infrequently observed that men can lose five or six

115. Custance, Arthur C., "The Existence, Nature, and Behaviour of the Set-point in the Human Thermostat," DREO Report 622, Defence Research Board, Ottawa, 1970, 36 pages.

116. For a fuller discussion: T. H. Benzinger, "The Human Thermostat," in *Temperature: Its Measurement and Control in Science and Industry*, vol.3, no.3, N.Y., Reinhold, 1963, pp.637-665.

pounds (up to three litres) of body water by this means within a single hour. This is under extreme conditions of heat stress, but it can be sustained for a surprising length of time without ill effect provided that the water is replaced. Very little rise in body temperature will occur under these conditions. The moment sweating is prevented by the use of drugs which suppress it [117] or is made valueless because the water expressed to the skin surface cannot evaporate, deep body temperature will begin to rise precipitously—and with fatal results.

These two mechanisms of handling heat and cold contribute fundamentally to man's ability to live in the Arctic or in the tropics with comparative ease. On the whole, he sustains the thermal stress better when it is negative, i.e., when there is a threat to the reduction of his body temperature.[118] He is better in the cold than in the heat, though not always as comfortable. Being such a creature as he is, man prefers to feel warm. But in point of fact, he is in much greater danger from heat and is likely to be much less energetic both physically and intellectually. He therefore tends to over-compensate against the cold by heating his buildings more than he really needs to do, thus reducing his acclimatization to the cold, a circumstance which only increases his sensitivity to it and his distaste for it. Nevertheless, he is uniquely equipped to maintain the temperature of his vital organs, especially his brain, at an optimum level for fruitful and energetic employment.

His body is exceptional in this regard. Many animals have sweat glands, some of them in the mouth (like dogs), some of them over the whole body surface (like horses), but in Nature no animal has the ability to prevent a temperature rise in times of heat stress which is comparable to man's. In spite of appearances

117. Custance, Arthur C., "A Method of Measuring the Effect of Drugs on Sweating as a Function of Time," *Canadian Medical Association Jrl.*, vol.95, 1966, p.871-874.

118. Custance, Arthur C., "Stress-Strain Relationship of Man in the Heat," *Medical Services Jrl. Canada*, vol.23, no.5, 1967, p.721-726.

to the contrary, the sweating of horses is initiated for quite other reasons and serves a cooling function only by accident and with nothing like the efficiency that it serves in man.[119] Physiologically, the sweating of horses is not thermogenic at all, that is to say, it is not initiated by a rise in temperature in the animal but is due to the increase in adrenaline in the animal's bloodstream as a result of violent exercise. In Nature the animal would not sweat, because it would not exercise itself as man exercises it. In addition to this, the circulatory adjustments of which the human body is capable in response to temperature fluctuation is not known in any other animal.[120] Thus man has clearly been built to maintain his body temperature against challenges with which no other species is likely to be faced in Nature. These circulatory adjustments involve a tremendously complex neuromuscular activity for which the human body seems to be expressly designed, and one can only suppose, therefore, that God knew what would happen to man after he fell and made provision beforehand for just such a contingency, a provision which He did not have to make when He designed all the other creatures which were to share his world but not share his ubiquity.

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119. Sweating of animals: see, for example with respect to horses, Stephen Rothman, *Physiology and Biochemistry of the Skin*, Univer. of Chicago Press, 1955, p.166. Also, H. M. Frankel *et al.*, "Effects of Type of Restraint upon Heat Tolerance in Monkeys," *Proceedings of Experimental Biology and Medicine*, vol.97, 1957, p.339-341; C. H. Wyndham, "Role of Skin and Core Temperatures in Man's Temperature Regulation," *Jrl. of Applied Physiology,* vol.20, 1965, p.36; J. D. Hardy, "Summary Review of Heat Loss and Heat Production in Physiological Temperature Regulation," NADC-MA-5413, U. S. Naval Air Development Center, Johnsville, Pa., October 1954, p.12; and "Control of Heat Loss and Heat Reduction in Physiological Temperature Regulation," Harvey Lectures Series, 49, N.Y., Academic Press, 1953-54, pp.247-252; Sir Charles Lovett Evans, "The Autonomic Nervous System" *British Medical Bulletin*, vol.13, no.3, 1957, p.154,199.

120. Circulatory adjustment in man: see on this, for example, R. H. Fox and O. G. Edholm in "Nervous Control of Cutaneous Circulation," *British Medical Bulletin*, vol.19, no.2, 1963, p.110-114.

Conclusion

The whole body of man has, therefore, clearly been designed to support and enhance the uniqueness of his mind. Mind, tongue, and hand have somehow been structured in a very remarkable way to give coordinated expression to the sum total of human potential to the power of reflection, of communication, and of creation; in fact; at one and the same time, of having dominion over the rest of God's creation and yet of worshipping the Creator.

But it is not merely the structure of his brain and the anatomy of his body which have made these things possible. Man's uniqueness goes deeper than this. In some not yet clearly understood way, his whole physiological organization and the very special quality of his spirit have together played a part in leading inevitably to the kind of culture that he creates as a framework for his own self-expression and restraints, and—in the final analysis—the kind of redemption he needs and is capable of apprehending by faith.

We next look first at the kind of culture man has created and why it has almost inevitably taken the form it has. Then we look at man’s combined need for and capacity for salvation, a truly unique need and capacity which apparently has never applied to any other of God's creatures, whether angel or animal.

Chapter 5

Man the Culture Maker

A few years ago, it was held that in the assessment of the fossil remains of man-like forms, the crucial question to ask was, Did these creatures use tools or weapons? The use of such artifacts was a kind of cultural Rubicon. If the answer was Yes, the fossils were said to be human regardless of the morphology. The crucial test in the minds of many physical and social anthropologists was a cultural one, because it was held that man was the only culture-creating animal, and tools and weapons are cultural artifacts.

Now, in this context, Culture is defined as "learned behaviour" by contrast with the patterned behaviour of animals in their natural state, which is instinctive. This definition breaks down where birds have learned, for example, to open milk bottles —as they are still doing in England—which is clearly not instinctive behaviour. But the definition is still essentially correct. Ruth Benedict pointed out that an ant colony reduced to a few members would automatically reconstruct its whole system of patterned behaviour with virtually no loss, whereas the human race, similarly reduced, would lose 99 percent of its culture. For ant behaviour is instinctive, whereas human behaviour is learned.[121] Let us look at some of these elements of culture which have been considered diagnostic of true humanness and see to what extent these are really determinative.

121 Benedict, Ruth, *Patterns of Culture*, Boston, Houghton Mifflin, 1958, p.12.

Man the Toolmaker

Early in the history of anthropology it had been claimed that the use of tools was limited to *Homo sapiens*, but it soon became increasingly apparent that a remarkable number of animals also used tools of one kind or another, both of stone and of wood. It had been known for a long time that birds used sticks to pry out insects in cracks in wood, but since birds were never candidates as precursors of man, the fact was not considered to conflict with proposed markers of humanness. One of Darwin's finches, for example, uses cactus spines to pick out insects in crevices in tree trunks.[122] It is also known that the burrowing wasp, *Ammophila*, uses a small pebble as a hammer to pound down the soil over its nest of eggs.[123] But insects are not precursors of man either. More recently, an Egyptian vulture, *Neophron percnopterus*, has been observed to break open ostrich eggs by throwing a stone held in its beak at the egg shell.[124] The bird's aim is quite good.

But in some mammals even more complex tool-using has been observed. For example, floating on its back in the water, a sea otter will place a slab of rock fifteen or twenty cm. in diameter, collected from the sea floor, on its chest. Then, holding a small mollusk shell in both forepaws, it repeatedly strikes it on the stone with full swings until it is able to break it open.[125] Polar bears apparently have been reported using quite large stones or blocks of ice as weapons. According to Reclus, in an early issue of *Nature* (1883), J. Rae reported seeing a polar bear Iying in wait on

122. Darwin's finches: David Lack, "Darwin's Finches," *Scientific American*, April, 1953, p.68.
123. Burrowing wasps: Kenneth P. Oakley, "Skill as a Human Possession" in *A History of Technology*, eds. Charles Singer, E. J. Holmyard, A. R. Hall, Oxford Univer. Press, 1954, vol.1, p.2.
124. Vultures: Jane & Hugo van Lawick-Goodall, "Use of Tools by Egyptian Vulture, *Neophron percnopterus*," *Nature*, Dec. 24, 1966, p.1468.
125. Sea-otter: Kenneth P. Oakley, "Skill as a Human Possession" in *A History of Technology*, eds. Charles Singer, E. J. Holmyard, A. R. Hall, Oxford Univer. Press, 1954, vol.1, p.5.

an elevated point for an unsuspecting walrus or sea calf gambolling on the beach immediately below. When one came within range, the polar bear hit it on the head by aiming his weapon very skillfully.[126] Coming a little closer to man, morphologically speaking, baboons are known to use natural implements such as stones or sticks which happen to be at hand[127]

It is therefore quite possible, for example, that the *Australopithecines* with whose fossil remains there was evidence of stone tools or weapons of a simple design, usually referred to as "pebble-tools," could have been using these as baboons use stones and quite by chance have fractured them so that they appear to have been consciously worked whereas in fact the working of them might have been accidental. On the other hand, it is also possible that these associated simple weapons were manufactured deliberately by hunters for whom the *Australopithecines* were the prey. Man may have killed these apes for food or in self-defence, or in taking over their territory.

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126. Polar bears: Elie Reclus, *Primitive Folk: Studies in Comparative Ethnology*, Contemporary Science Series, Lon., Scott, no date, p.17.

127. Baboons: on this see panel discussion on "Physical Anthropology and the Biological Basis of Human Behaviour," in *An Appraisal of Anthropology Today*, eds., Sol Tax, Charles Callender, Univer. of Chicago Press, 1953, p.263. An excellent study has been published by Philip Street, *Animal Weapons*, Lon., MacGibbon and Kee, 1971. See also on this, K. R. L. Hall, "Tool Using Performances as Indicators of Behavioural Adaptability," in *Human Evolution*, eds., N. Korn, F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, p.128. Wilbert H. Rusch ("Human Fossils," in *Rock Strata and the Bible Record,* ed., Paul A. Zimmerman, St. Louis, Concordia, 1970, p.149) mentions that chimpanzees may sometimes crush leaves and use them as a sponge to soak up water from a cavity. It has recently been argued that chimpanzees in the wild may actually manufacture tools. But R. L. Holloway held that "the fashioning of termiting sticks and other reported tool-making activities on the part of chimpanzees do not represent the imposition of arbitrary forms on the environment," by which is meant actual creation of tools out of raw materials (see "Culture: A Human Domain," *Current Anthropology*, vol.10, 1969, p.395-407).

So the mere employment of tools is not decisive. If birds by experience learn to use the right kind of sharp instrument to flush out insects, deliberately choosing this piece of wood and rejecting some other piece that is too large, it is hard to see why an intelligent ape might not also choose a piece of stone which already happened to have a cutting edge. There is also some question in the minds of anthropologists about the basis of judgment of a very simply worked flint in determining whether it has accidentally come by its form or been deliberately worked. Many of the eoliths found in France and elsewhere by such early archaeologists as Lartet and others were later rejected as purely accidental, though to a predisposed eye they appeared convincing enough.[128]

So the issue has now been refined a little, and humanness is not considered to be established merely by the presence of tools, but only by determining whether the tools are genuinely man-made. But there are times when this is very difficult to do. Of course, tools with symmetry or complex working are almost certainly man-made and not the work of other primates below man. But, so equivocal can very simple tools be in this regard that some authorities would attach very little significance to them unless there is also evidence of fire. Thus the search is made for other lasting evidences of the presence of man, such as charred remains that signify the use of fire. Coon held that "the use of fire is the only open-and-shut difference between man and all other animals."[129] And there seemed little likelihood of this being disputed.

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128. Lartet: see A. S. Barnes in *American Anthropologist*, vol.41, 1939, p.99; and more recently, Marcellin Boule & Henri V. Vallois, *Fossil Man,* trans. M. Bullock, N. Y., Dryden Press, 1957, pp.95-109, for a discussion. At the time when the issue was a very live one, a paper entitled "Eolithic Implements " illustrated with a number of plates (some even in colour), was presented by R. A. Bullen, which appeared in *Transactions of the Victoria Institute*, vol.33, 1901, p.191-225.
129. Coon, C. S., *The Story of Man*, N. Y., Knopf Press, 1962, p.63.

Man the Fire-maker

The use of the evidence of fire as proof of the presence of man is not really confused by the fact that we know now that animals may use fire just as they use tools. For example, apes may go to a human hearth after its native maker has left it and warm themselves by it.[130] Whether any ape has ever thought to poke the fire to improve its heat output, is a moot question. Negatively speaking, we do not have any record of a dog, lying beside the fire in an English home, getting up and putting another log on it to maintain it. And it seems even safer to say that no animal ever deliberately lit a fire to keep warm by. It seems clear, therefore, that the presence of a hearth is absolute evidence of the presence of true man.

Nevertheless, the absence of any evidence of fire is not unequivocal evidence of the absence of man, since some primitive people, even in recent times, apparently never learned or had forgotten how to make fire for themselves. According to Radcliffe Brown, the Andaman Islanders did not make fire when he studied them between 1906 and 1908,[131] and somewhat more recently Patrick Putnam around 1940 found that the Pygmies of the Ituri Forest could not make fire for themselves.[132] Almost certainly man alone makes fire, though man is not alone in using fire.

Man the Speechmaker

We turn, therefore, to another aspect of culture which is considered to be diagnostic, but even this proves to have its limitations for prehistory. This is the use of language; and as

130. Greene, John C., *The Death of Adam*, Iowa State Univer. Press, 1959, p.180.
131. Radcliffe Brown: quoted by Ashley Montagu, *Man: His First Million Years*, N.Y., Mentor Books, 1958, p.158.
132. Patrick Putnam: quoted by C. S. Coon, *A Reader in General Anthropology*, N.Y., Holt, 1948, p.327.

Herskovits rightly observed, "Language (is) the vehicle of culture."[133] One can nicely juxtapose two observations by well-known authors here. Von Humboldt wrote, "Man is man only by means of speech, but in order to invent speech he must be man already."[134] One may couple this with the following statement by A. L. Kroeber: "Culture, then, began when speech was present, and from then on the enrichment of each meant the further development of the other."[135] While some people use only the most primitive of tools which, if found in isolation, would barely be recognized as such, and while some whole tribes lack the ability to make fire and must continue without it until they can obtain it from some neighbour, no tribe or people has ever been known which did not have a language. And, as it turns out, often the more primitive the tribe, the more complex the language.[136] As a matter of fact, in the light of present knowledge, it seems that language more often proceeds from the complex to the simple and not in the reverse direction.[137] Thus we can say unequivocally that any creature that uses speech to converse is clearly a human being.

But this raises two open questions. The first is, Do animals actually have language, which we have not recognized because we don't happen to speak in the same way? Or to put it in another

133. Herskovits, Melville, *Man and His Works*, N.Y., Knopf, 1950, p.440 ff.

134. W. von Humholdt: quoted by Charles Lyell, *The Antiquity of Man*, 4th ed., 1873, p.518.

135. Kroeber, A. L., *Anthropology*, N.Y., Harcourt & Brace, 1948, p.225.

136. A. L. Kroeber remarks in this connection, "Dictionaries compiled by missionaries or philologists of languages previously unwritten run to surprising figures. Thus the number of words recorded in Klamath, the speech of a culturally rude American Indian tribe, is 7,000; in Navaho, 11,000; in Zulu, 17,000; in Dakota, 19,000; in Maya, 20,000; in Nahuatl, 27,000. It may safely be estimated that every existing language, no matter how backward its speakers are in their general civilization, possesses a vocabulary of at least 5,000 to 10,000 words. Kroeber then adds this note(!): "Jesperson, who allows 20,000 words to Shakespeare, and 8,000 to Milton, cites 26,000 as the vocabulary of Swedish peasants" (*Anthropology*, N.Y., Harcourt & Brace, 1948, p.225).

137. Kluckholm, Clyde, *Mirror for Man*, N.Y., McGraw-Hill, 1949, p.148, 149.

way, Is speaking a uniquely human faculty? The second question is whether there is any way in which we could tell for certain whether a particular fossil cranium belonged to a speaking creature or a dumb one. Unless we can tell this, the use of speech diagnostically for true man doesn't help us in dealing with prehistory.

When Broca in 1865 discovered, as a result of war wounds, that damage in a specific area of the brain results in disturbance of speech, he "localized" a speech area in the brain. As a consequence, it was hoped that an endocranial cast of sufficient refinement should provide evidence of the ability to speak or otherwise on the assumption that the impression would adequately reflect the formal configuration of the brain itself and thereby allow accurate assessment of its potential by indicating the full development of this area. There was confidence that such studies would give some evidence of the owner's powers of speech. Added to this, it was believed that a careful analysis of the inside of the jaw should provide further confirmation of the adequacy and refinement of the tongue muscles used in speaking. Between the two, it was felt that fairly firm statements could be made: "This individual probably had the power of speech, but this individual did not." Analysis of many of the more famous fossil remains of early man or proto-man was at once undertaken along these lines, and whether Neanderthal Man or Cro-Magnon Man could speak or not was energetically discussed at the time.

For example, the absence of a little process of bone in the middle of the lower jaw to which some of the muscles of the tongue are attached was believed to prove that the Canstadt Race could not speak. Cro-Magnon Man, however, was more advanced since he had this little process and therefore could. We were taught this in university courses in the early 1930s. It seemed to reinforce the validity of the usual lineup of primitive men from ape-like to *Homo sapiens*. What we, as students, did not know at that time was that the whole idea had long since been shown to

be without foundation. By 1888, Sir William Dawson of McGill University had already shown the fallacy of this argument. After consultation with Wesley Mills, Professor of Anatomy in that university, he appended this note at the appropriate place in one of his works dealing with early man:

> Though the muscles attached to the genial tubercles (the Genio-hyoid and Genio-hyo-glossi) are the most important in the greater movements of the tongue as when it is protruded from the mouth, yet many minor movements, such as those concerned in speech, are possible in the absence of the functional activities of these muscles.
>
> The clearest evidence that the tongue itself is neither the sole organ of speech nor even an essential organ of speech, is derived from the fact that after the removal of the tongue, as complete as may be, speech is so far possible as to be intelligible though not perfect, the dentals especially being indistinct; yet there is good utterance.
>
> I myself, many years ago, followed a case of excision of the tongue, and was surprised at the degree of perfection of utterance attained even in a few weeks after the operation.
>
> A comparison of even a few lower jaws of man shows that these genial tubercles vary very much in size, in some cases being but indifferently marked [...] So that, altogether, I should myself hesitate to infer that men in whom these tubercles were absent had been without the power of speech [...].[138]

138. Dawson, Sir William, *Modern Science in Bible Land*, Montreal, Dawson & Brothers, 1888, p.225, footnote.

Today, the point is seldom, if ever, discussed. The argument simply has died for lack of evidence. Even at the time of our course of lectures, Wilson D. Wallis was reiterating that "the anatomist cannot tell from an examination of the skull of modern man whether or not the possessor had speech; much less from fossil skulls."[139] Or more recently, in 1948, Weidenreich wrote:

> The claim of paleo-anthropologists to the effect that Neanderthal or Peking Man was right handed or left handed, was able to speak, or write, or could only stammer, all deduced from shallower and narrower, or deeper and broader impressions on the inside of the brain case, have no scientific basis [...]. [140]

Furthermore, it is now known that man-like apes such as the chimpanzee are not prevented from speaking because they lack the necessary tongue muscles. They ought to be able to speak, if it is merely a matter of these particular muscles. As early as 1916, W. H. Furness, in attempting to teach articulate speech to both the orangutan and chimpanzee, he observed, "I found that the first difficulty to be overcome is their lack of use of lips and tongue in making their emotional cries."[141]

Now, there are several things that must be said to qualify this observation. And the crucial importance of speech for man requires that we look at the subject a little more carefully. In the first place, Furness would be the first to agree that one cannot

139. Wallis, Wilson D., "The Structure of Prehistoric Man," in *The Making of Man,* ed., V. F. Calverton, Modern Library, N.Y., Random House, 1931, p.65.
140. Weidenreich, Franz, "The Human Brain in the Light of Its Phylogenetic Development", *Scientific Monthly*, Aug., 1948, p.107.
141. Furness, W. H., "Observations on the Mentality of Chimpanzee and Orangutan," *Proceedings of the American Philosophical Society*, vol.55, 1916, p.281-284. On lip form see E. H. Lenneberg, *Biological Foundations of Language*, N.Y., Wiley, 1967, especially pp.37-52.

speak usefully of "teaching articulate speech" in this context. For thus far the most elegant and imaginative programs have only reinforced at every turn the fact that non-human primates do not and probably cannot speak. They can communicate in remarkable ways, as we shall see, but the power of speech is not, apparently, within their reach. They are dependent upon the use of signs, just as other animals have elaborate means of communication by the use of signs, the only difference with these primates being that they can evidently be taught to use a large number of signs deliberately—which they would never use in their own natural environment—in order to communicate with man. But they do not speak, apparently because they cannot speak. Let us look at the evidence.

A number of attempts have been made over the past forty years to bring up a chimpanzee from infancy in a home environment, treating it precisely as though it were a member of the family, subjecting it to the same disciplines as other children, the same encouragements, and as far as possible the same stimuli. Every attempt was made to induce speech as is normally made to induce speech in a human child. The best known of these experiments were those made first by the Kelloggs[142] (1933), by the Hayeses[143] (1951), by the Gardners[144] (1967), and finally by Premack[145] in 1969.

The Kelloggs named their chimpanzee Gua. Essentially, for our purposes in this Paper, their findings may be summed up by saying first that although in the wild and when domesticated the chimpanzee may be very vocal and give expression to a number

142. Kellogg, W. N., and L. A. Kellogg, *The Ape and the Child: A Study in Environmental Influence on Early Behavior*, N.Y., McGraw-Hill, 1933, re-issued by Hafner.
143. Hayes, K. J., and Hayes, C., *The Ape in Our House*, N.Y., Harper, 1951.
144. Gardner, R. A., and B. T. Gardner, reported in "Teaching Sign Language to a Chimpanzee," in *Science*, vol.165, 1969, p.664-672.
145. Premack, David, "Language in Chimpanzee?" *Science*, vol.172, 1971, p.808-822.

of emotional cries when angry, excited, or in need, it is a remarkably silent animal otherwise. In an experimentally controlled environment in which the home-raised chimpanzee is given the same linguistic and social advantages as a human baby, the chimpanzee displays no evidence of vocal imitation. Despite its generally high level of imitative behaviour, it never spontaneously copies or reproduces human word sounds. W. N. Kellogg noted that neither in their own previous experiments, nor in those undertaken by R. M. Finch, nor in those undertaken by N. Kohts (Moscow), was there the slightest evidence of any attempt on the part of these animals to imitate speech or to reproduce any human vocalizations:

> Moreover, no ape has ever been known to go through the long period of babbling and prattling which, in the human baby, seems to be the necessary prerequisite to the subsequent articulation of word sounds. Vocalized play of this sort was absent in (our) chimp, who made no sounds "without some definite provocation which in most cases was obviously of an emotional character."[146]

The end result of the Kelloggs' experiment was that they succeeded in getting Gua to signal to them by sign language what she wanted. For example, pushing away her cup meant "enough;" holding the genitalia meant the need to go to the toilet; biting or chewing at the clothes or the fingers of the experimenter meant "hungry;" removing the bib from her neck meant "finished eating;" hanging on the hand of the experimenter meant "swing me;" and so forth. Of speech, that is, the use of words for communication, there was no evidence whatever.

146. Kellogg, W. N., "Communication and Language in the Home-Raised Chimpanzee," *Science*, vol.162, 1968, p.424.

The Hayeses had better success. They were able to teach their chimpanzee, Vicki, to say *mamma* by manipulating her lips as she said *ah*. It took a long while to achieve this and she still persisted in putting her own forefinger on her upper lip. Later the words *papa*, *cup*, and possibly *up* were added to her repertoire. In 1916 Furness had, by a similar means, succeeded in training an ape (this time an orangutan) to say *papa* and *cup*, also by manipulating the lips.

The facial mobility of man has often been remarked upon. It is quite tremendous. Few animals can alter their features except to snarl. Chimpanzees have considerable facial expression, but appearances may be deceiving. What looks like a smile may not indicate pleasure at all. At any rate, the effect of the muscles in the chimpanzee face may seem to be similar to man's, but the functions of these muscles are actually quite different.[147] The lack of adequate control of lip movement evidently contributes to the chimpanzee's inability to mimic the sound of words.

Kellogg summed up his impression of the work of the Hayeses by saying:

> The most important finding of the Hayeses was perhaps not that their chimp could enunciate a few human sounds. It lay rather in the discovery

147. Weinert, H., in *An Appraisal of Anthropology Today* (eds., Sol Tax & Charles Callender, Univer. of Chicago Press, 1953) p.25. See also William Howells, *Mankind So Far,* N.Y., Doubleday, 1944, p.79. R. J .Andrew has a very helpful paper on this subject entitled, "Evolution of Facial Expression." His title is odd in a way because what he succeeds in doing, to my mind, is demonstrating clearly that "facial expression" in man, even when it approximates quite closely to that of apes or monkeys, conveys a completely different message and is an expression of entirely different inner feeling. Andrew's paper carries the blurbs "Many human expressions can be traced back to reflex responses in primitive primates and insectivores." But this is surely presumption. If muscles serve an absolutely different function in so far as, in his own showing, Andrew traces the human smile (an expression of good will) to the animal's snarl (a preparation for battle), can one properly speak of causal connections at all? ["Evolution of Facial Expression", *Science*, vol.142, 1963, p.1034f]

> that these sound patterns were extremely hard for the ape to master, that they never came naturally or easily, and that she had trouble afterwards in keeping the patterns straight.[148]

Of their own experiments, Kellogg concluded that the chimpanzee could respond correctly to a number of simple commands in spoken human language and achieved this slightly ahead of a child of the same age. But having done this, by the end of the first three years the chimpanzee seemed to have reached its limit of learning capacity, just at a time when the child, which had been its companion, began to forge ahead at a tremendous speed. These simple commands were such as the following: "no, no," "come here," "close the door, blow the horn," "don't put that in your mouth," "go to daddy, go to mamma," "go to Donald," and so on.

Two important conclusions emerge: first, neither Gua nor Vicki learned to speak in the ordinary sense (Vicki's four words were not really being used as words), and secondly, the ape's mind can clearly discriminate the intent of sentences in which the succession of sounds is distinguishable and will respond to them —such as go to daddy, mamma, or Donald. But understanding, not mimicking, is the limit of achievement. A horse or a dog will also respond to commands.

The experiments of the Gardners were much more sophisticated and clearly gained a great deal from the experiments of their predecessors, the Kelloggs and the Hayeses. In their report in *Science*, they pointed out that although the Hayeses spared no effort to teach Vicki to make speech sounds, she nevertheless succeeded in a period of six years only in learning four that approximated English words. They, too, noted that while the vocal apparatus of the chimpanzee is very different

148. Kellogg, W. N., "Communication and Language in the Home-Raised Chimpanzee", *Science,* vol.162, 1968, p.424.

from that of man, the vocal behaviour of the chimpanzee is even more so:

> Chimpanzees do make many different sounds, but generally vocalization occurs in situations of high excitement and tends to be specific to the exciting situation. Undisturbed, chimpanzees are usually silent.[149]

The close tie between vocalization (in the sense of giving voice) and emotion is highly significant in dealing with the whole problem of the origin of speech in man. The subject has been discussed in summary fashion in another Doorway Paper,[150] to which the reader should refer for a more extended bibliography. But the point at issue here is that linguists who have concerned themselves with the problem of the origin of speech agree upon this fact, that emotional cries are not the foundation of man's speaking capacity, since emotion has precisely the opposite effect. It tends rather to reduce him to a state of speechlessness. The emotional exclamations—oh, ah, etc—are involuntary (except when acted, of course), and they have the characteristic brevity of all emotional cries. Cries like, Help! are equally monosyllabic. Cries such as these do not constitute speech: they are formalized signs of emotional stress. In emotional language we usually use short words. The feelings of the man who says to a girl "I love you" are easily distinguished from those of the man who says, "I have a tremendous admiration for you." The longer the word, the less its emotional content as a rule; and the greater its emotional content, the less does it reflect the true nature of speech as a means of communication, particularly the communication of ideas. Thus the very fact that these non-human primates (which

149. Gardner, R. A. and B. T. Gardner, "Teaching Sign Language to a Chimpanzee," *Science,* vol.165, 1969, p.664 .

150. Custance, Arthur, "Who Taught Adam to Speak?" Part VI in *Genesis and Early Man*, vol.2 in The Doorway Papers Series.

seem so responsive in other ways) nevertheless do not learn to speak, seems to be closely related to the fact that vocalization is for them an expression of emotion, not of thought.

For this reason, the Gardners adopted the very sensible plan of using something akin to deaf and dumb language which involves no vocalization at all but the use of signs. The results of their experiment fully justify this approach. Their experimental animal, whom they called Washoe, proved herself an apt pupil. Within sixteen months, she had learned nineteen signs reliably, with five more in process. By the end of twenty-two months, she understood and used twenty-eight signs in one day, out of a total of thirty-four which she had learned. By the time she was four years old, she had been taught to make reliable responses to more than eighty different signs, though it is not clear whether she actually used all these signs herself. Not only did she make use of signs, but she was able to transfer their value. For example, the sign for "open" she could apply to the unlocking of a cupboard and then to the unlocking of doors, and finally to the idea of turning the ignition key in the car. Occasionally she "confused" the signs a little, like flower with odour, and dog with barking. But, as the Gardners put it, "Her signs do not remain specific to their original referents but are transferred spontaneously to new referents."[151]

While I think that we are forced by these results to recognize that part of our problem in accurately assessing the animal mind lies in our inadequate means of communication with them, we must not —for all our surprise—over-estimate the animal mind nor under-estimate the fundamental difference between animal mind and human mind. In Washoe's case the response was always situational. The signs that were adopted and used by Washoe had to do with, and were used in connection with, personal needs, not with the needs of others. Nor were they used

151. Gardner, R. A. and B. T. Gardner, "Teaching Sign Language to a Chimpanzee," *Science*, vol.165, 1969, p.671.

in connection with unrealities, abstract concepts, things merely of interest for conversation, hypothetical things. Conceptual language was not involved. Nor were the signs structured consistently into sentences in such a way as to indicate an awareness of grammatical principles. A child becomes aware of grammar by some unconscious process, and untaught. One can observe this in delightful ways in children, if one is careful. Last summer a little friend of ours, who is about three years old, was talking to me as I climbed out of my car, and suddenly noticed a dead grasshopper at his feet. He looked at it for a moment, and then he said reflectively, "Somebody deaded it." He had learned the difference in meaning between an adjective and a verb, between "dead" and "deaded." He created the verb for himself, quite correctly—though uncommonly. There is no doubt that no one had taught him to do this.

In his review of E. H. Lenneberg's *Biological Foundations of Language* E. A. Weinstein notes that in children there is a normal order of the development of vocalization from crying to cooing, and then to babbling.[152] Single words appear between the ages of twelve to eighteen months, followed by two-word combinations "which are not random compositions, but constitute a primitive subject predicate organization. They are not imitations of adult speech, but indicate that certain rules of grammar have been acquired." Even in brain-injured, deaf, and otherwise handicapped children, though the rate of language learning is slowed down, nevertheless the same order obtains.

In other words, Washoe never put her signs together to construct a sentence. Neither did she invent words. There was no grammar involved. Yet it is grammar that converts a series of sounds into a form of speech. Furthermore, the use of signs was always immediately contingent upon circumstance. There was no delay. Man can sit and think over a situation, take it apart,

152. Weinstein, E. A., reviewing E. H. Lenneberg, *Biological Foundations*, *Science*, vol.156, 1967, p.1585.

analyze it into components each of which he can label separately, and then he can reconstitute reality and give it expression verbally in a sentence in which the very organization of the components conveys his understanding. As the Gardners put it, in Washoe's case, there was no "disengagement from the immediate context."

The Gardners achieved their success by adopting a means of communication which did not require Washoe to speak, that is, to attempt the vocalization of words. In commenting on their work, I think David McNeil of the University of Chicago summed things up very nicely when he said:

> The Gardner's ape is fascinating, but the few examples of her "speech" that I have seen appear to be quite different from the speech of young children. The structural arrangement, if there is any, looks unlike anything that occurs in the development of language.[153]

Using the same principle of signs developed by the Gardners, a still more sophisticated series of experiments was conducted by David Premack and reported under the title, "Language in Chimpanzee?"[154] Premack's program was carried out with an African-born female chimpanzee whom he named Sarah. She was six years old when the study began, a fact which suggests that it may not be altogether true that man's greater learning capacity is due to the much longer period during which man is anatomically and physiologically still plastic, although the experience of the

153. David McNeil: in a discussion following his paper "Empiricist and nativist theories of language: George Berkeley and Samuel Bailey in the 20th century" at the Alpbach Symposium, in *Beyond Reductionism*, eds., Arthur Koestler & J. N. Smythies, Lon., Hutchinson, 1969, p.307.

154. Premack, David, "Lamguage in Chimpanzee?" *Science*, vol.172, 1971, p.808-822.

Kelloggs did suggest that some measure of "fixity" began to take place in their subject at about three years of age.

Premack's experiments seem to have been even more elaborate than those of his predecessors'. In some ways they force us to credit the chimpanzee's mind with even greater potential for communication by such means, because there was evidence of the ability to understand at least something of the meaning of sentence structure, the concept of class relative to objects, the meaning of the copula (is), of pluralization, of logical connections (if—then), of the conjunction "and" and in a rudimentary way the meaning of symbolization. With respect to this last, Premack rightly asks the question whether it is possible to teach an organism the meaning of symbolization if it does not already symbolize in its own mind. He felt that the training procedures he used were not teaching symbolization, but must have been utilizing a capacity the animal already possessed. Who knows, therefore, what really goes on in the mind of such an animal?

Several of his findings confirm, or seem to me to confirm, previous observations. For example, Premack could not induce Sarah to structure a sentence which was directed altruistically, unless he rewarded her very specifically.[155] Thus she would put down the symbols in the right order for, say, "Mary give Sarah apple," but she was reluctant to put down, "Mary give Gussie [another person familiar to Sarah] apple." She would only do it when she was rewarded with a tidbit she preferred in exchange for the right answer. She could not be sufficiently motivated by a situation which did not reward her personally. It should not be thought, however, that in Nature animals never act altruistically.[156] They do, not only in parent-child relationships, but in fellow creature relationships.

It should be borne in mind that Sarah still did not speak, did not verbalize. She merely manipulated plastic symbols, as a child

155. *Ibid.*, pp.808-810.

156. For examples, see Arthur Custance, "The Survival of the Unfit," Part IV in *Evolution or Creation?*, vol.4 in The Doorway Papers Series.

manipulates alphabet blocks. But she did manipulate them in quite sophisticated ways.

In a study of the vocal tract limitation of non-human primates, Philip H. Lieberman *et al*,[157] concluded that the inability of apes to mimic human speech results from the inherent limitations of their vocal mechanisms. It is conceivable that they have something to say, "but they have no way of saying it. "The human speech-output mechanism should thus be viewed as part of man's species-specific endowment."[158]

Somewhere in the total constitution of man's mind, there appears to be a capacity for the use of symbols which, coupled with his appropriately designed organs of speech, allows him to manipulate his understanding of reality and to discuss it intelligibly with his own kind. It now appears, therefore, that it is man's combined capacities, capacities involving the nature of his mind and his anatomy working together which allow him to acquire and sustain speech and, through speech, to enhance his powers of understanding and communication. So he compounds

157. Lieberman, P. H.; D. H. Klatt & W. H. Wilson, "Vocal Tract Limitations on the Vocal Repertoires of Rhesus Monkeys and Other Non-Human Primates," *Science*, vol.164, 1969, p.1187. Another study of the organs of speech has been published: J. Wind, On the Phylogeny and the Ontogeny of the Human Larynx: a Morphological and Functional Study, the Netherlands, Groningen, 1970. In reviewing this [*Science,* vol.173, 1971, p.414], R. O'Rahilly notes the author concludes that "no satisfactory explanation of speech emergence has yet been given."

158.On this see also G. G. Simpson (*Biology and Man*, N. Y., Harcourt, Brace & World, 1969, p.116): "Perhaps we can at least determine when language arose by tracing the anatomical evolution of the vocal apparatus? That line is even now being followed seriously by some anatomists, but I think they are astray. A human brain in a monkey's body would probably mispronounce English words, but *it would certainly produce a language*" [my emphasis]. The point is well taken and underscores the fact that unless the brain is human, true language will not emerge whether the organs of speech are appropriate or not: and conversely, if the brain is human, language will emerge under the right social conditions even when the organs of speech are faulty. Even the anatomically dumb can employ language.

the fruits of his learning and enormously multiplies his cultural wealth. Somewhere in the process of socialization, self-awareness arises and with it self-evaluation, the ability to assess and judge the actions and motives, in others and in himself.[159] And so the way is opened for him to become, by reason of the divinely implanted spiritual component in his nature, a morally responsible creature.

Thus although tremendous advances have been made in our understanding of the potential for communication in animals below man, the work of the Kelloggs, the Hayeses, the Gardners, and now Premack, with chimpanzees, has underscored the fact that speech, the use of the spoken word, is a unique human faculty. The means of communication between animals are much more varied, it seems, than in man, but far less pregnant with potential. Bees may use a language of movement.[160] Fishes use a chemical one.[161] Mutual recognition between birds is based on sound as well as visual cues.[162] It has even been found recently that unborn chicks, still in their shells, communicate with each other by clicks and other vocal sounds which have been tape-recorded.[163] Bats, of course, signal to one another in frequencies beyond the hearing range of the human ear. So animal means of communication are varied indeed. One of the most useful collections of data on the use of signs by animals was

159. Mead, George Herbert, *Mind, Self and Society,* Univer. of Chicago Press, 1948.

160. Bees: Carl von Frisch's justly famous *Dance Language and Orientation of Bees* has been republished in a translation by L. E. Chadwick, Harvard Univer. Press, 1968, xiv and 566 pp.

161. Fishes: John H. Todd, "The Chemical Language of Fishes," *Scientific American*, May, 1971, pp.98 ff.

162. Birds: W. H. Thorpe, "Perceptual Basis for Group Organization in Social Vertebrates, Especially Birds," *Nature*, October 12, 1968, pp.124-128.

163. Unhatched chicks: Margaret A. Vince of Cambridge, in *Britannica Book of the Year*, 1971, under the heading "Biological Sciences," p.166.

produced by Dietrich Burkhardt, Wolfgang Schleidt, and Helmut Altner in *Signals in the Animal World*.[164]

If evolution were a fact, it seems as though it must have somehow miscued by dividing the potential of living creatures in such a way as to reduce the likelihood of their developing the capacity to speak. What I have in mind is the fact that in one class of animals, the birds, we find the combination of erect posture, vocal organs which allow for song, and—even more importantly—the ability to imitate a substantial number of words and sentences—as seen in parrots and other bird species. But the ability to communicate by the use of deliberately chosen signs, such as can be acquired by some of the non-human primates, appears to be lacking. They thus have the ability to speak, but have nothing to say. By contrast, evolution has produced (supposedly) another class of animals, represented by chimpanzees, which, while they can manifestly learn to communicate with man in a sign language, are evidently not equipped anatomically for speech. They are quite unable to vocalize words as some of the birds are able to do. They thus may possibly have something to say, but can't say it. This seems like a misdirected distribution of capabilities, for we therefore have in one line of development the necessary mechanism for the sounding of words which can only be meaningless; and in an entirely different line of development the mechanism for giving meaning to words which can't be said. In short, only in man do we find these two capabilities united; along with an erect posture that makes conversation easy and natural face to face, coupled with a manipulative skill in the hands, providing a unique extension of the mind, and a means of considerable reinforcement to verbal expression.

Although many contributory factors in the anatomy of man are obviously involved, nevertheless it seems pretty clear that the

164. Burkhardt, Dietrich, *et .al.*, trans. by Kenneth Morgan, Lon., Allen & Unwin, 1967, 150 pages.

prime source of uniqueness, the seat of ultimate superiority, lies in his mind. Whether mind and brain can be related, as we have for the most part imagined them to be, does not seem to be as clearly demonstrated today as it seemed to be a few years ago. In some way, the whole man appears to be alive with man-soul. Yet it is simpler and more convenient, perhaps, for purposes of discussion to accept for the moment the idea that "mind" is at the root of it all, and by putting the *mind* in quote marks I want to leave it as an open question whether the mind of man encompasses both his intellect and his spirit. One thing seems reasonably certain that if we allow the quality of his mind to stand as representative of his humanness, then the mind of man is not the same as the mind of an animal, and therefore he himself is not the same as an animal—despite all appearances. In part this is recognized by many writers. Years ago, Briffault observed:

> Between the mental constitution of the rudest savages and that of any animal, including the anthropoids, there is a wide gap, and that gap consists of more than a difference in degree; it amounts to a difference in kind. Primarily that difference depends upon the conceptual character of human mentality.[165]

"Conceptual character of human mentality": what does it mean? It means man's ability to create mental images which are not bound to the realities which impinge upon his senses. He can dream of things which do not yet exist: he can imagine situations which are contrary to fact. He can, indeed, tell lies usefully. The early Church Fathers recognized this as one of the special characteristics of man. They pointed out that animals cannot tell lies (though they can, of course, be deceived) and God would not

165. Briffault, Robert, "Evolution of Human Species," in *The Making of Man*, ed.,V. F. Calverton, Modern Library, N.Y., Random House, p.762.

tell lies. Man does. He will speak of negative numbers or of decimals—parts of numbers. He will speak of ten days which never exist at one time, or (in statistics) of the average family as being composed of 3.6 people. Thus he can do impossible things with his mind. His speech is propositional, he can discuss hypotheses and play with his ideas until he invents new things and achieves new understandings. His ability to verbalize allows him to talk about what is contrary to fact and thus often bring to pass things which enormously extend his dominion over the earth—and even beyond the earth. Some years ago in thinking about these things, Henri Bergson wrote:

> The impression arises when we compare the brain of man and that of animals that the difference at first appears to be only a difference in size and complexity. But judging by function, there must be something else besides [...] Between man and the animals the difference is no longer one of degree but of kind.[166]

All of history confirms this judgment. The difference is absolute, even though there are enough parallels to make it virtually impossible to quantify the difference when its substance is dissected. It is the potential which really clinches the matter.

Conclusion

We begin to see, therefore, something fundamentally new in man, which is not merely the result of the addition of new capacities but seems to arise from a whole new dimension that is somehow in the mind and yet not of it. The whole increasingly becomes more than merely the sum of the parts. Everything about

166. Bergson, Henri, *Creative Evolution*, Modern Library, N.Y., Random House, 1944, pp.200, 201.

this creature, *Homo sapiens*, is of a piece, each part uniquely contributing. The specialized hands and their nervous connections with an area of the brain seems designedly to be juxtaposed against the centres of speech and motor control of the tongue and voice box, and the receptive areas of hearing and seeing. There is design here, optimization of the system as a whole, not for the survival of the organism (though this is necessary), but for the elaboration of the life of the organism beyond mere survival and often, in fact, to its very endangerment.

Compared with other creatures, man seems constantly at a disadvantage, yet he can dominate them all. Taken singly, his hearing and his seeing are less acute than theirs, his sense of taste and smell are less refined, the speed of reaction of his reflexes and the strength of his muscles cannot compare, his resistance to disease and his powers of recovery from wounds are lower, his rate of reaching maturity and independence in infancy, and even his achievement of "social wisdom" are slower—all these, individually, fall far behind the faculties, abilities, and processes in other animals. It seems, superficially, that none of these have been maximized in man relatively speaking, and some of them, important as they are to animals, seem to be almost rudimentary in him.

Yet in some remarkable way, the total configuration of strength and weakness seem to contribute to rather than detract from his potential for greater things, for a higher position, for greater responsibility, for an entirely new kind of self-realization. His very weaknesses seem to fit him uniquely for fellowship with God.

Now we have already considered some of these more obvious specific qualifications which contribute manifestly to man's superiority. Let us now look at some of those which by contrast would superficially seem to be a handicap to him, though in point of fact, they are not. Let us examine the significance for man of his slowness in reaching physical maturity and his long dependency

in childhood, the role of the male in the human family, his progressive complexification of his social relationships, his ability to achieve personal individuation, the factors governing breeding in animals and in man, his dietary lack of wisdom, his susceptibility to disease and slowness in healing, his strange drive to order, arrange, and organize, and finally his willingness to sacrifice the temporal for the transcendental and his need for, and capacity, for redemption. In all these things, as we shall see, man stands apart by himself.

Chapter 6

The Expression of Humanness in Man

In this chapter I draw attention to some significant factors in the development of a human being which do not appear in the animal world. Superficially, they look like mere extensions of animal behaviour. When analyzed more carefully, it will be seen that they are not. If a student begins with the assumption that he will find the explanation of human behaviour in the animal world, he will discover in due course that he has been mistaken. Those who have matured in their study and have honestly faced the evidence will already have discovered the inadequacy of such an assumption. It is in the textbooks which are written for younger students and for the public that the most misleading statements in this regard are to be found. In works of a more serious nature a different picture emerges. Let me illustrate this with a series of quotations, before entering into a detailed consideration of this chapter under more specific headings.

Writing in *Science* in 1945, Alexander Novicoff said:

> Man's social relationships represent a new level, higher than that of his biological make-up. Man's behaviour differs from that of other animals because of his possession of body structures, notably the highly developed nervous system, which make thought and speech possible and whose functioning is profoundly affected by social and cultural influences [...]

> The study of animal behaviour cannot be a substitute for the study of man's behaviour. As we establish the likenesses in behaviour of animals and men, we must simultaneously investigate the fundamental qualitative differences between them [...] Animal societies never rise above the biological level, only man's society is truly sociological.
>
> Anyone who has tried to teach biological change to college students knows the barriers to learning that have been created by the identification of animals with men throughout the student's lifetime.[167]

This observation underscores an important point. For reasons which are complex, man does not build his society along the lines of biological expedient. Let me quote from a more recent source on this point. David R. Pilbeam, reviewing a book by P. V. Tobias, *The Brain in Hominid Evolution*, challenged his view that this unique creature, man, really emerged in his present form because he became a toolmaker. Pilbeam felt otherwise:

> There is more to human cultural behaviour than the ability simply to learn, or to chip flint. Our behaviour differs from the learned behaviour of all other animals, including chimpanzees, in such important ways as to render descriptions of non-human primate learned behaviour as examples of "crude and primitive culture" potentially highly misleading.
>
> Human cultural behaviour involves a very special form of learning, depending upon learned

167. Novicoff, Alex, "The Concept of Integrated Levels and Biology," *Science,* vol.101, 1945, p.212

> rules, norms, and values which vary arbitrarily from one culture group to another [...][168]

About the only thing that can be said that is universally true of human behaviour is that it is non-instinctive. As a consequence, like Cleopatra's charms, it has "infinite variety." When you have a single species producing an infinite variety of cultural patterns, even where those varied patterns are found to have developed in virtually identical environments, then you obviously have a species that is not like any other species in nature. Bertalanffy had this to say on the subject:

> According to von Uexkull's doctrine, the organization and specialization of an animal is decisive for what enters into its ambient world. Of the great cake of reality, an animal cuts a slice, so to speak, of what becomes stimuli, to which it reacts in correspondence with its inherited organization. The rest of the world is non-existent for that particular species.
>
> In contrast to the organization-bound ambient of animals, "Man has a universe," to use an expression of Gehlen. Any section of the world, from the galaxies that are inaccessible, to direct perception and biologically irrelevant, down to the equally inaccessible atoms, can become an object of interest to man [...]
>
> Precisely because he is lacking organic and instinctual adaptation to a specific environment, he is able to conquer the whole planet from the poles to the equator. So man creates his own ambience, which is what we call human culture.[169]

168. Pilbeam, David, reviewing P. V. Tobias, *The Brain in Hominid Evolution*, *Science*, vol.175, 1972, p.1101.
169. Bertalanffy, Ludwig von, "A Biologist Looks at Human Nature," *Scientific*

In one of the flood of Darwin Centennial volumes which appeared from 1958 on, Ernest R. Hilgard in *Theories of Learning*, observed:

> There have emerged (in man) capacities for retraining, reorganizing, and foreseeing experiences which are not approached by the lower animals including the other primates. No one has seriously proposed that animals can develop a set of ideals that regulate conduct around long-range plans, or that they can invent a mathematics to help them keep track of their enterprises [...]
>
> There are probably a number of different kinds of learning which have emerged at different evolutionary periods, with the more highly organized organisms using several of them. It is quite probable that these different kinds of learning follow different laws, and it is foolhardy to allow our desire for parsimony *to cause us to overlook persisting differences* [my emphasis].[170]

We have, then in man a new kind of learning. In point of fact, man's kind of learning actually leads him to ignore experience, to live in an unreal world. No animal does this. As we shall see, because animals learn by experience, the older animal is almost certain to be the wiser animal. This is by no means true of man. Yet his very foolishness has enormously enriched his experience. In fact, it is probably the basis for one form of human behaviour which must surely be unknown in any other animal, namely, laughter. We can find, as we shall see, some evidence of culture

Monthly, January, 1956, p.35.

170. Hilgard, Ernest, *Theories of Learning*, 2nd ed., N.Y., Appleton-Century, 1956, p.461.

in animals, including art; and of course we find a gamut of emotions from the sheer joy of life of the young colt or the spring lamb to the grief of a dog which has lost its human companion. But we do not observe laughter.

One final quotation: Clifford Geertz, in a paper entitled "The Transition to Humanity," had this to say:

> Some students, especially those in the biological sciences—zoology, paleontology, anatomy, and physiology—have tended to stress the kinship between man and what we are pleased to call the lower animals. They see evolution as a relatively unbroken, even flow of biological processes, and they tend to view man as one of the more interesting forms life has taken, along with dinosaurs, white mice, and dolphins. What strikes them is continuity, the pervasive unity of the organic wild, the unconditioned generality of the principles in terms of what is formed.
>
> However, students in the social sciences—psychologists, sociologists political scientists—while not denying man's animal nature, have tended to view him as unique, as being different, as they often put it, not just in degree but in kind.
>
> Man is the tool making, the talking, the symbolizing animal. Only he laughs; only he knows he will die; only he disdains to mate with his mother and sisters; only he contrives those visions of other worlds to live in which Santayana called religions, or bakes those mud pies of the mind which Cyril Connolly called art.
>
> He has, the argument continues, not just mentality but consciousness, not just needs but values, not just fears but conscience, not just a past

> but a history. Only he, it concludes in grand summation, has culture.[171]

I'm not sure Geertz himself accepts this demarcation altogether, but it is a beautiful summary of a position to which I subscribe and which the rest of this chapter explores analytically. And it leads us, in the end, to man's unique possession of conscience and spiritual aspiration, his need for redemption and his capacity for it, which is the subject matter of the final chapter of this paper.

Let us, then, turn first to an analysis of man's culture.

Home and Hearth – Uniquely Human

All mammals have some form of family life. The young are born in varying states of dependence upon their parents for food, shelter, warmth, protection against enemies, and discipline. But the period of dependence is comparatively short, in some cases exceedingly so, and this brevity is related to the fact that in all animals, except man, the time to maturity relative to the total life-span is much shorter. This seems to be governed partly by the speed with which the young mature and become self-sufficient, and perhaps partly because the maturing process is reached more quickly, the educatability of the young comes to an end far sooner.

The consequences of these two circumstances are, first, that the family unit in the animal world tends to be ethereal for any particular brood. The young are very quickly and very deliberately ejected from the home, even from the territory, being forced thereafter "to go it alone" and actually being unwelcome any longer around the house, as it were. Secondly, from experience with apes, and indeed with many other animals, it has

171. Geertz, Cliffard, "The Transition to Humanity," in *Human Evolution,* eds., N. Korn & F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, p.114.

by and large been found that any training in performance which is not natural to the animal must be done very early, before the animal's brain seems to have become "crystallized." We have noted already, the Kelloggs found that at three years of age their experimental chimpanzee had reached her graduation point, whereas the human subject, which was sharing the chimpanzee's experience, was just beginning to accelerate his learning processes. Indeed, in the normal course of events, it is likely that the child would go on learning, actively, in the sense of formal education for perhaps another twenty years. In terms of total life-span, the average human being is still highly teachable for from one-third to one-half of his normal life whereas the chimpanzee does most of his learning in what is probably less than one-tenth of his normal life. Since learning is cumulative and not merely additive, a program of education conducted actively for twenty years has not merely seven times the potential of the ape, but some much greater factor entirely.

Eric H. Lenneberg, in his study on the physiological basis of the human faculty of speech, attributes man's ability to use language to the slow maturing of his brain:

> Species differ in their embryological and ontogenic histories. Brain maturation curves of *Homo sapiens* are different from those of other primates. Man's brain matures much slower, and there is evidence that the difference is not merely one of a stretched time-scale, but that there are intrinsic differences. Thus man is not born as a fetalized version of other primates, the developmental events in his natural history are *sui generis*. The hypothesis is advanced that the capacity for language acquisition is ultimately

> related to man's peculiar maturational history[...][172]

Not only does the animal's mind reach a static maturity sooner, but its whole body reaches mature stature more rapidly. Man at birth is approximately 5 percent of his mature weight; at fourteen he is about 60 percent; and he must reach the age of twenty before he will be 90-95 percent of his final size.[173] By the time they are one year, other animals will have reached 60 percent of their adult size, and by the time they are three years old 90-95 percent of adult size. In other words, their growth is relatively accelerated—something like seven times compared with man. In some animals the acceleration in growth rate is much greater than this. Samuel Brody said "Pre-pubertal percentages of sheep and goats which have the same mature weight as man is sixty fold that of man."[174]

Brody examined the effects of the decelerated growth rate for man in terms of experience and observed:

> The large and highly developed brain affords reflective power and furnishes the basis for speech and writing, the long growth period affords opportunity to learn, and the long life span affords time to reflect and to develop traditions, all of which are pre-requisite for the development of religion and science.
>
> Moreover, the long human childhood period of dependency on parents stimulates socialization, the rearing of children of different ages simultaneously (a uniquely human characteristic) reinforces socialization, with charity and tolerance

172. Lenneberg, E. H., *Biological Foundations of Language*, N.Y., Wiley, 1967, p.179.
173 Brody, Samuel, "Science and Social Wisdom," *Scientific Monthly*, September, 1944, p.207.
174. *Ibid.*, p.209.

> on the part of the stronger towards the weaker children, and the mental consciousness of the involved relationships leads to the development of group morals.[175]

Robert Briffault emphasized the matter of slow maturing in terms of educatability:

> The question is sometimes mooted whether young gorillas or chimpanzees might not by careful training be taught to speak [...] The brain of the young anthropoid grows too quickly; it is formed, it has lost its malleability before the time required for such an education.[176]

This was written in 1931, long before the Kelloggs and their successors reported their experiences. Briffault has proved to be quite correct in his prognostications. It is true that Premack did not begin his program of training of Sarah until she was six years old and he had surprising success, which might seem to contradict what we have been saying. It is possible that Sarah was an exceptional animal. Or it is possible that if she had begun her training in infancy, she, too, would have reached her capacity within three years. Perhaps her brain, in so far as some kind of speech area was involved, was in this area still "uncommitted," to use Penfield's apt expression. Nevertheless, the experience of other trainers of animals which can learn to respond to human commands bears out the statement that their learning capacity falls off very rapidly as soon as they reached, for them, adolescence.

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175. *Ibid*.

176. Briffault, Robert, "Evolution of the Human Species" in *The Making of Man*, ed., V. F. Calverton, Modern Library, N.Y., Random House, 1931, p.768.

In his paper, Samuel Brody had a scattergram (Fig. 22) showing the relative growth rate of nine animals (cow, pig, sheep, rabbit, fowl, rat, mouse, guinea pig, and dove) contrasted with the growth rate of man. In the interest of simplicity, I have traced his curves but omitted all the symbols which he used to show the actual scatter for the different species. The point O represents the point of birth for the animal species. The points C and B represent the time of conception and the time of birth for man. The difference between these two curves in childhood and adolescence (up to 14 years of age in man) will be seen to be quite fundamental.

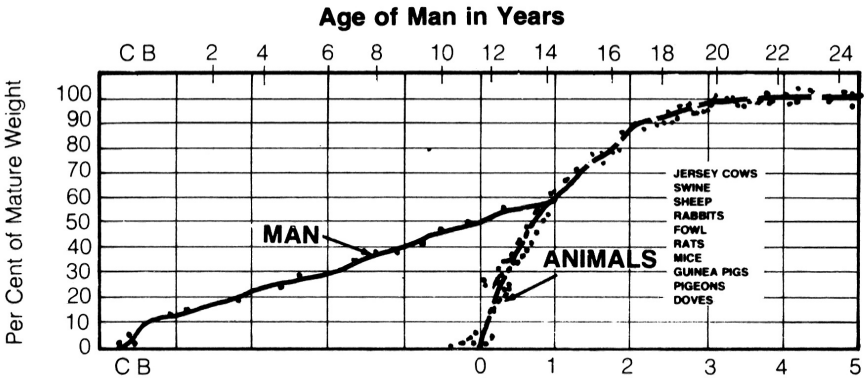

Fig. 22. Scattergram showing the relative growth rates to maturity for man and ten other animals. Redrawn after Brody (*Science*, September 1944, p. 207).

This fact has been recognized for many years, of course, but many textbooks are strongly biassed toward human evolution and they tend to omit information of this sort, because it requires explaining and evolution has not come up with an explanation.

But commenting on the form of such curves, Bertalanffy had this to say:

> The time curve of growth in mammals, fish, crustaceans, clams, and other classes follows a pattern which is characterized by the fact that it approaches a final weight by way of an S-curve. These characteristic growth curves as well as different ones found in different groups such as insects and snails, can be explained and predicted by a theory of "growth types and metabolic types."
>
> Since its pattern is essentially the same, the growth of different species, such as a fish, a mouse, an elephant, or man can be represented by the same curve shape. Only the scales of unit of time and size are different.
>
> In such comparison, only one organism, man, makes an exception. In its first part, the human growth curve is distinguishable from that of all other animals in that a growth cycle seems to be added so that the infant period is greatly prolonged, and the steep almost exponential increase in size as is characteristic for early post-embryonic growth curve may appear to be an insignificant detail but it has tremendous consequences.
>
> Thus animals run swiftly through the period of the somatic and behavioural growth, and sexual maturity is soon reached. In contradistinction the characteristic shape of his growth curve gives man his uniquely long period of growth and opportunity of a long period for learning and

> mental development. It is an indispensable prerequisite of human culture.[177]

Not only does the human organism mature more slowly, but by comparison with the bodies of other animals like him, it does not mature at all in some respects, or only very late in life. For some reason, the human body retains its youthful stages into adult life. This is known technically as paedomorphism, and Sir Gavin de Beer wrote at some length on the phenomenon in man. In his *Embryos and Ancestors*,[178] he gave a chart showing for example, how the relationship between the head, neck, and spinal column has retained in man the configuration which it has in the embryo. In animals, the head section swings through ninety degrees in order to bring it into the right position for an animal which is to carry its body horizontally. As we have seen, the position of man's head and neck with respect to the organs of speech is very important, making it possible for him to communicate while maintaining a natural position. Thus, even in this respect, the changes which take place in the maturing of animals carries them away from the likelihood of acquiring the same capabilities that man has as an adult. The whole design and structure and growth pattern of man is of a piece, looking to the future potential, and in the meantime involving him in a period of dependency through extended immaturity, which results in the development of family relationships which are not reflected in any other species.

Goldenweiser attaches great importance from the cultural point of view to this protracted dependency relationship in the life of the human infant:

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177. Bertalanffy, Ludwig von, "A Biologist Looks at Human Nature", *Scientific Monthly,* January, 1956, p.36.
178. de Beer, Sir Gavin, *Ancestors and Embryos*, Oxford, Clarendon Press, 1951, p.56.

> We know then that there is culture and that it comes to man in the process of education. But even this is not enough for an exact understanding of what it is that happens here. One of the differences of what occurs in the case of any animal on the one hand, and in that of man on the other, is the rate at which they grow up.
>
> With variations, as between animal and animal, their young mature very fast. It is a matter of mere months. So fast do they mature that were there much for them to learn and had they the ability to do so, they could not, on account of the very shortness of the period separating birth from relative maturity [...]
>
> Fortunately for the animal, its life is planned differently. It is equipped by nature with a large assortment of instincts or reactive complexes which make their appearance almost ready for action and which develop perfect form after relatively few experiences [...]
>
> The factor in human life on the other hand, which makes acquisition of vast knowledge and the accumulation of experience possible for the young, is the so-called prolonged infancy in man.[179]

It is evident, therefore, that man has not been provided with such instincts as animals have for a very good reason. His pattern of behaviour has been left "open" and not instinctive. This means that he must learn for a longer period before he can become independent, but it also means that he is free to a larger extent in

179. Goldenweiser, Alexander, *Anthropology*, N.Y., Crofts, 1945, p.39.

his behaviour and therefore responsible for it in a way which animals never are.[180]

It is also important to underline the significance of the fact that children of different ages mature together. To my knowledge this never happens among animals because the young are ejected from "home," not only before the next brood is born but probably before the mother becomes pregnant again. In some cases this is because she does not come to heat until her family has left home, and in other cases it is because the male is not allowed in the home while the young are still dependent on the mother.

Now, the fact that we have a group of children growing up at different stages of development is of great importance in the formation of personality, as Samuel Brody pointed out. The fact of diversity of age within a single cohesive family has implications for the structure of society. In the animal world there may be a number of offspring growing up together but they will all be of the same age, and for the most part they are likely to be the same size. The very idea that any one of them might be responsible for the safety or well-being of a younger sibling can never arise in this situation. The whole idea of being responsible for one's fellows begins to arise in a child's mind, not because it becomes aware that the parents are responsible for it, but because it is made aware of its own responsibility for others. Edward Sapir underscored the significance of the "family" situation for the development of social organization as a whole. He rejected an older view that the organization of the family evolved out of the kind of promiscuous clan structure in which, at first, everybody made their own way with no special attachments or responsibilities:

> A more careful study of the facts seems to indicate that the family is a well nigh universal

180. For a discussion regarding moral responsibility of animals, see Arthur Custance, "The Extent of the Flood," Part I in *The Flood: Local or Global?* vol.9 of The Doorway Papers Series.

> social unit, that it is the nuclear type of social organization *par excellence*. So far from a study of clans, gentes, and other types of enlarged kinship groups giving us the clue to the genesis of the family, *the exact opposite is true*.[181]

In case the point should be missed and in view of its importance, it is worth underscoring. Since family life in the human sense cannot be derived directly from anything in the animal world, it was at one time felt necessary to account for it through an intermediary stage. Herds of protomen became herds of men with perhaps a herd leader but no breakdown into small family units which were in any way recognized or protected as such by the group. Such recognition and such protection was then supposed to have emerged later. A study of primitive people suggests that this is entirely unrealistic. Moreover, there is some evidence that family life is as old as fossil man. The finds at Choukoutien (China) and at Es Skhul (Palestine) both seem to imply the same kind of family life. Several adult males were involved in a single setting, and at least in the case of the former, all were killed at the same time—men, women, and children.

Jacobs and Stern wrote:

> The absence of a stable family unit has been claimed for early Pleistocene eras, but no convincing arguments [...] have been adduced. All of the economically most primitive societies known are characterized by monogamous families, with rare but permissible polygamy or polyandry.
>
> The lower the technological level, the greater need there appears to have been for a family of

181. Sapir, Edward: quoted in Selected Writings of Edward Sapir, ed., David C. Mandelbaum, Univer. of California Press, 1949, p.336.

> two persons, one a man who had relative freedom of movement, the other a woman who did not have to hunt or fish and who could therefore bare and nurse her baby.
>
> It follows that the monogamous family thus existed from the very beginning of culture—that is to say, from eolithic or earliest paleolithic times [...] The monogamous family and not promiscuity was, then, in all likelihood the earliest form of family, and it has remained the dominant form in all societies.[182]

Goldenweiser was even more specific and added that there is no evidence whatever for any concept of communal ownership of any kind of property at all, whether things or persons. He said, "The patent facts do not at all support the *a priori* conception which must be regarded as one of the *ad hoc* concoctions of the evolutionists, who were looking for something less specific than individual property [...] and found this in communal ownership."[183]

Another factor which indicates that family life in the sense of broad interdependence between parents and children is unique to man, is the fact that fertility in the human female tends to decline or cease at such an age in her life span that she is not likely to have children so late in life that she cannot perform the role of mother until the child has reached an adequate stage of independence—more particularly perhaps where female children are involved. Parents will therefore live long enough under normal circumstances to raise all the children to maturity.[184] Since

182. Jacobs, M. and B. J. Stern, *Outline of Anthropology*, Barnes and Noble, N.Y., 1947, pp.151, 152.

183. Goldenweiser, Alexander, *Anthropology*, N.Y., Crofts, 1945, p.147.

184. Swartout, Herbert O., "The Meaning of the Origin and Activities of the Human Body: Control of Growth and Aging in the Human Body," *Bulletin of Creation, the Deluge, and Related Science,* vol.4, no.5, 1944, p.71 f.

the process of maturing in animals is so much faster, fertility can be extended later in life. I believe this is generally found to be the case. For example, C. R. Carpenter mentioned a case of a female gorilla in a state of advanced senility which was found to be carrying an infant when shot.[185]

In the animal world, the raising of a brood cannot be compared with the raising of a family in the world of man. Normally, in the latter, both man and woman play a role of equal importance in terms of discipline, protection, feeding, and education. In the animal world the role of the male is entirely different in those species that might be supposed to serve as prototypes for man. Among birds, both sexes will care for the young, but this is something of an exceptional circumstance. Certainly such a shared responsibility is not reflected among the primates, and cannot possibly be the basis of human behaviour.

The Role of the Male in the Human Family

I cannot do better than quote Ralph Linton on the role of the male in the human family:

> There is no point at which present day man departs more widely from the general primate condition than in the male's assumption of responsibility for and care of his offspring. Even the anthropoids seem to leave the care of the young almost entirely to the females, although the males may exhibit good-natured curiosity or even play with them.[186]

185. Carpenter, C. R., "Life in the Trees: The Behavior and Social Relations of Man's Closest Kin," in *A Reader in General Anthropology*, C. S. Coon, N.Y., Holt, 1948, p.21.
186. Linton, Ralph, *The Study of Man*, N.Y., Appleton-Century, 1936, p.148.

Other authorities would go further than this and say that in the great majority of animal societies the male is actually antisocial. In some instances this is so marked that the females take steps to incapacitate the males in one way or another. In termite societies and other such insect communities, the males are "sterilized," only just enough "unsterilized" males being left to guarantee the continuance of the breeding process. Even among domesticated animals where males and females are kept together unnaturally, it is a common enough observation that one can easily create a herd of cows, but a herd of bulls would be unthinkable. The only way in which males can be added successfully to the herd is by castrating them.

The primates reflect the same pattern of rivalry, the old or stronger male builds his harem and drives the other males to the periphery. This is particularly true in the breeding season for the species. Once this season is over, the males are apt to be excluded even from their own harem and either form bachelor societies or become loners.

William M. Wheeler of Harvard, in a paper entitled "Animal Societies," written years ago, remarked:

> Owing to the decidedly unsocial character of behaviour (of the male) which manifests itself almost exclusively in voracity, pairing, or fighting with other males, he is always so to speak socially more or less indigestible. There seems to be no reliable record, at least among the lower animals, of a male providing food for the female or the young, or even protecting them.
>
> Indeed, after pairing, the sexes seem to become indifferent or even hostile to each other, and the female retires to bear, suckle and rear her young in a safe lair or retreat which she alone establishes. She thus forms a family with her young of both

> sexes, and in advanced life may become the leader of a herd consisting of several such female-offspring families (this is true of ruminants, elephants, cetaceans, etc.) [...]
>
> The unsocial character of the male reveals itself even more clearly, both among the lower mammals and the anthropoid apes, when he becomes senescent and impotent and wanders away from the herd or troop, to lead the life of a rogue.[187]

It was at one time customary to view primitive cultures as representative of a stage of social organization halfway between the anthropoids and modern man. But it was very quickly apparent that the argument did not hold, for among primitive people family relationships are far more carefully hedged about and precisely defined than in our own more advanced (?) society. And as far as the role of the male is concerned, so much importance is attached to providing every child with a father who is recognized as such that even where the actual physical father has not been established, some official father must be provided. Moreover, in some societies until comparatively recent times, the role of the father in procreation or the fact of "physical paternity," to give it its proper anthropological name, was not even recognized (which was the case among the Trobrianders and some Australian aborigine tribes, for example). Even here a father had to be apportioned, as it were, to each child.[188] Manifestly, therefore, in human social organization, the role of the father was not established on a biological foundation. It seems to be based on something more profound. It could be that it goes back to Adam

187. Wheeler, William M., "Animal Societies" in Biology and Society section, *Scientific Monthly*, October 1934, p.295.

188. Physical paternity: see Arthur Custance, "Light From Other Forms of Cultural Behaviour on Some Incidents in Scripture," Part VII in *Genesis and Early Man*, vol.2 of The Doorway Papers Series.

and God's appointment, in order to provide a paradigm for our relationship to God Himself.

Complexification of Social Relations

Social organization and Culture are quite distinct concepts. Culture is learned, rather than instinctual behaviour, but social organization may be entirely instinctual, as it is with insects. Kroeber observed, "The presence of culture-less societies among insects is an aid in distinguishing the two concepts in the abstract."[189] It is estimated that there are some 10,000 insect societies in which the organization is highly complex.[190] Referring to the behaviour of ants, Ruth Benedict observed:

> The queen ant, removed to a solitary nest, will reproduce each trait of sex behaviour and each detail of the nest. The social insects represent nature in a mood when she was taking no chances. The pattern of the entire social structure Nature has committed to the ant's instinctive behavior. There is no greater chance that the social classes of an ant society or its patterns of agriculture, will be lost by an ant's isolation from its group, than that the ant will fail to reproduce the shape of its antennae, or the shape of its abdomen.
>
> For better or for worse, man's solution lies at the opposite pole. Not one item of his tribal organization, or his language, or his local religion, is carried in his germ cells.[191]

189. Kroeber, A. L., *Anthropology*, N.Y. Harcourt & Brace, 1948, p.34.
190. Wheeler, William M., "Animal Societies" in Biology and Society section, *Scientific Monthly*, October 1934, p.291.
191. Benedict, Ruth, *Patterns of Culture*, Boston, Houghton Mifflin, 1958, p.12.

Under human influence, animals can be taught different patterns of behaviour, but, as Schneirla pointed out, the learning process is stereotyped and rote in character, limited to the individual and the given situation. Unlike human societies where knowledge is cumulative, "such special learning of each society (of animals) dies with it." [192] The important point here is that human learning processes are cumulative and transferable, that is to say, they are not necessarily tied to the situation in which the learning occurs, but can be broadly applied. The experiments of Z. Y. Kuo with cats and rats illustrates that learning dies with the individual.[193] He showed that cats could be trained to play with rats rather than to kill them, but he also showed that cats could be conditioned to be afraid of rats. But the kittens of these cats so differently conditioned, when raised in isolation, all became rat killers when they grew up. Lorenz pointed out:

> In animals, individually acquired experience is sometimes transmitted by teaching and learning, from older to younger individuals, though such true tradition is only seen in those forms whose high capacity for learning is combined with a higher development of social life. True tradition has been demonstrated in jackdaws, Graylag geese, and rats.
>
> But knowledge thus transmitted is limited to very simple things, such as path finding, recognition of certain foods, and of enemies of the species, and in rats knowledge of the danger of poisons. However, no means of communication, no learned rituals, are ever handed down by

192. Schneirla, T. C., "Problems in the Biopsychology of Social Organization," *Jrl. of Abnormal and Social Psychology*, vol.41, 1946, p.385-402.
193. Kuo, Z. Y., "The Genesis of the Cat's Responses to the Rat," *Jrl. of Comparative Psychology*, vol.11, 1930, p.1-30.

> tradition in animals. In other words, animals have no Culture.[194]

The matter of path finding as learned behaviour is difficult to assess because a number of social animals leave a trail of scent. The animal which picks up this scent is not really following the trail by imitation and learning is not strictly involved. This has been demonstrated for many animals and insects. With respect to rats, the situation is rather exceptional because it has been found that when a colony of rats come across a new food, only one of the rats will eat it while the others look on. The rest of the rats will not touch the new food for two or three days but will observe its effect on the single rat who has eaten it.[195] Since rats are rather unique in that they inhabit areas only where man is and therefore are introduced to new foods provided by man, their behaviour is in some sense unnatural and cannot be taken as an example of what occurs in Nature among other species.

In man, culture and social organization seem to go hand in hand, and both are learned: even in family organization in so far as the roles of mother and father are concerned, the behaviour patterns normal to a society are learned. The roles may be reversed (as in the Tchambuli), combined or blurred (where all are alike, mother and father, as among the Mundugumor or the Arapesh), or even ignored entirely (as among the Alorese).[196] What we suppose to be the instinctive and therefore predetermined role of the mother as opposed to the father is evidently not instinctive, in spite of general impressions to the contrary. It may be entirely absent; even mother love may be

194. Lorenz, Konrad, *On Aggression*, trans. by Marjorie Kerr Wilson, N.Y., Bantam Books, 1967, p.64f.

195. Garcia, John, "The Faddy Rat and Us," *New Scientist and Science Jrl.*, February 7, 1971, p.254.

196. Reversed roles: Margaret Mead, *Sex and Temperament in Three Societies*, N.Y., William Morrow, 1963; and Cora DuBois, *The People of Alor,* Univer. of Minnesota Press, 1944.

lacking.[197] Under circumstances which occur not infrequently, a mother may not love her newborn but reject it. Scripture asks the question, "Can a woman forget her suckling child?" (Isaiah 49:15). The answer is, Yes, she may, according to Scripture itself.

It is difficult to know exactly what goes on in the mind of a natural mother, whose culture differs radically from ours, but judging by the fact that in a time of famine such people will eat their newborn babies apparently without hesitation, seems to indicate the absence of the kind of attachment between mother and child which we assume to be instinctive. Such behaviour has been reported from a number of primitive cultures. Daisy Bates mentioned it several times in her study of the Australian aborigines.[198]

One of the most difficult factors about human culture is to understand why man insists upon elaborating it to the point where it is not only no longer useful, but often positively dangerous, as Susanne Langer observed:

> To contemplate the unbelievable folly of which (men) the symbol-using animals are capable, is very disgusting or very amusing, according to our mood: but philosophically it is, above all, confounding. How can an instrument develop in the interests of better practice, and survive, if it harbors so many dangers for the creature possessed of it?[199]

197. Mother love: see Robert Briffault, "The Origin of Love," in *The Making of Man*, ed., V. F. Calverton, Modern Library, N.Y., Random House, 1931, p.497.

198. Bates, Daisy, *The Passing of the Aborigine*, Lon., Murray, 1966: first published in 1938.

199. Langer, Susanne, *Philosophy in a New Key,* N.Y., Mentor Books, 1942, p.27

Linton wrote at some length about this anomaly, admitting that the reason why men have gone on amplifying culture generation after generation is still an unsolved problem:

> If Culture, like the social heredity of animals, were simply a means of insuring survival for the species, its progressive enrichment might be expected to slow down and ultimately cease [...]. Every society has developed techniques for meeting all the problems with which it was confronted passably well, but it has not gone on from there to the development of better and better techniques along all lines. Instead, each society has been content to allow certain phases of its culture to remain at what we might call the necessity level while it has developed others far beyond this point [...]
>
> Even in the case of tools and utensils where the disadvantages of such a course would seem most obvious, we have plenty of examples of quite unnecessary expenditure of labor and materials. Hundreds of tribes ground and polished their stone axes completely, although such instruments cut no better than those ground at the bit and are actually more difficult to haft [...]
>
> In rare cases the elaboration of certain phases of Culture is even carried to the point where it becomes activity injurious and endangers the existence of the society. Many Eskimo tribes prohibit the hunting of seals in summer. Although this meant little under ordinary circumstances, there were times when it was highly injurious. It is said that if land game failed, a tribe would often starve when there were plenty of seals in sight [...]

> The natives of Australia in some parts of that continent appear to be obsessed with social organization and prohibit marriage between many different classes of relations. It is said that in one tribe these regulations were worked out to the point where no one in the tribe could properly marry anyone else [...] This tendency towards unnecessary and in some cases injurious elaboration of culture is one of the most significant phenomena of human life.[200]

It requires little imagination to see this happening in our own culture with grave consequences not only to ourselves but to mankind. The future looks gloomy indeed. It would almost seem that man has now organized and elaborated his culture for the elimination of himself.

John H. Hallowell rightly observed that with man, "economic desires are never merely the expression of the hunger or the survival impulse in human life."[201] The lion's desire for food is satisfied when his stomach is full. Man's desire for food is more easily limited, but the hunger impulse is subject to the endless refinements and perversions of the gourmet. Shelter and raiment serve entirely other purposes, man's coat never being merely a cloak for his nakedness, but the badge of his calling, the expression of an artistic impulse, a method of attracting the opposite sex, or a proof of a social position. His house is not merely his shelter, but becomes an expression of his personality and the symbol of his power, position, and prestige.

It is a curious thing that this drive towards complexification seems to be almost a drive toward suicide. Individually, very few primitive people commit suicide, and as a rule they tend to do so

200. Linton, Ralph, *The Study of Man,* N.Y., Appleton-Century, 1936, pp. 87-90.
201. Hallowell, John H., *Religious Perspectives in Political Science, Religious Perspectives in College Teaching*, The Edward Hazen Foundation, New Haven, Conn., no date, pp.17,18.

only when old age has brought their powers of contributing as expected to their society to an unacceptably low level. In such cases suicide becomes part of the cultural pattern and is not frowned upon. By adopting this "out," they are actually redeeming themselves. But in our complex civilization suicide does not have any socially redeeming features about it; it is only an acknowledgment of despair and total failure. The primitive may seek and receive the help of his own fellows to end his life in a culturally acceptable way.[202] With us, such behaviour is totally unacceptable. Nevertheless, every year the suicide rate goes higher and higher as our civilization becomes more complex, a circumstance which suggests that the complexification of culture may have something inherently inimical to man about it.

We suppose that culture evolved by the same kind of natural process as everything else that is assumed to have evolved from the simple to the complex. But no animal society ever deliberately elaborates its organization to the point where it endangers the species. It should not be supposed that primitive societies are incapable of such complexification. This is obviously not the case, as Linton pointed out with the Australian aborigines, whose culture is otherwise the simplest known to us in modern times. Moreover, research has shown that primitive languages consistently turn out to be more complex than modern languages, when they are adequately studied. So somewhere there is in man a tendency which has become entirely harmful to him and in fact may very well endanger his existence as a species.

Other animal species have disappeared when their environment changed or as a consequence of the predatory habits of man, but no other species has deliberately followed a course of increasingly complicating its patterns of behaviour to its own increasing detriment. Arthur Koestler attributed this to a fault in the mechanism of man's mind, a mechanism which he considered

202. See, for example, the Yahgans as reported by Thomas Bridges in C. S. Coon, *The Story of Man*, N.Y., Knopf, 1962, p.97 [unable to verify—Ed.].

to be faulty not because it is too limited, but because its potential is altogether too great for man to control himself. He would not have suggested such a thing, but to me this looks like clear evidence of the Fall, which has disrupted human nature in its every aspect—physiologically, spiritually, and intellectually. Koestler wrote:

> When we say that mental evolution is a specific characteristic of man and absent in animals, we confuse the issue. The learning potential of animals is automatically limited by the fact that they make full use—or nearly full use—of all the organs of their native equipment, including their brains.
>
> The capabilities of the computer inside the reptilian and mammalian skull are exploited to the full, and leave no scope for further learning. But the evolution of man's brain has so wildly overshot man's immediate needs that he is still breathlessly catching up with its unexploited, unexplored, possibilities.[203]

It is well known that neurologists estimate that even at the present stage we are using only 2 or 3 percent of the potentialities of the brain's built-in "circuits."[204]

It seems as though man is operating, therefore, at an exceedingly low efficiency in terms of his potential. Either he was made this way which would be a solecism in Nature, or he is a fallen creature. In either case, since animals were not made this way, operating as they do probably at near 100 percent mental efficiency relative to their capacity, man is in a class by himself. Presumably if he had not fallen, he could safely have

203. Koestler, Arthur, *The Ghost in the Machine*, Lon., Hutchinson, 1967, p.299.
204. Koestler, Arthur, *The Sleepwalkers*, Lon., Hutchinson, 1959, p.514.

complexified his culture perhaps to fifty times what it is without the slightest ill effects ensuing.

Individuation

In the present context, by the word *individuation* I have in mind underscoring the quite exceptional degree to which in man, the individual may develop a uniqueness of character which marks off one person from another. Even in cultures which frown upon "being different," there are individuals who stand out as exceptional people. Their endowment seems to mark them out as "great" when judged by the standard of the rest of their community. The human potential seems to have encompassed within itself a tremendous range of variability in terms of personal differences between individuals, and this far exceeds anything that is found among the animals within a species which have not been interfered with by man.

In domestication, by selective breeding man has produced varieties of particular species which have markedly different character from other varieties, as different as the bulldog is from a spaniel, for example, or a Clydesdale from a thoroughbred race horse. These animals differ not merely in physique but in temperament. But if one compares bulldogs with bulldogs or spaniels with spaniels, or any other variety with members of its own variety, one finds a uniformity of character which makes it possible to predict animal behaviour in a way that is totally impossible in man. The unpredictability of a human individual and the predictability of the animal has been underscored by Chesterton's famous remark: It makes good sense to ask the young child what he's going to be when he grows up, because that is virtually impossible to predict; but it is quite unnecessary to ask a puppy what he's going to be when he grows up, because we know. It seems as though God has assigned to each species of

animal a place in the total economy of things, and a form and a disposition entirely appropriate to that place.

It may be objected that there are notable animals in a herd or a pack—born leaders, as it were. But as far as I have been able to discover from a fairly wide search of the literature on herd leaders, there is pretty well agreement about the nature of this kind of leadership. In 1832 the English jurist, John Austin, published his famous *Province of Jurisprudence Determined.* [205] He was one of the founders of University College, Lon., and its first professor of jurisprudence. And although almost everyone disagreed with his thesis, he had a profound influence on the thought of his day, and on people like John Stuart Mill. Essentially, his view was that all laws, properly so-called, are commands addressed by a human superior to a human inferior, and that the system or institution of government by law evolved from this basis. It was a kind of "great man" view of history. The curious thing is that most disagreed with him because they could not see any evidence for such a "great man" thesis among animals, and it was felt that such a view made man too exceptional.

The position regarding animals has not changed. One can legitimately speak of "great apes," but one cannot speak of *a* great ape. It has been pointed out many times that herd leaders are not commanders in the sense that human leaders are.[206] They function really as special sense organs for the group, that is, for the herd, the flock, or the pack. They watch and listen, while the rest of the members tend to the other businesses of life. The group reactions of the herd are not responses to commands, but rather group reflexes set off by stimuli transmitted through the leader, acting as a sensory receptor for the group. There is a sense in which the "leader" of a wolf pack may maintain a certain hierarchy by establishing superiority as a fighter, but it is a transient leadership, and he may very easily be displaced by some other

205. Austin, John: quoted by Raymond Pearl, *Man the Animal*, Bloomington, Ind., Principia Press, 1946, p.115.

206. Herd leaders: Raymond Pearl, *ibid.*, p.115.

member of the pack who showed no special character up to that moment and who may later return to the position of being merely a follower when another leader takes over. The leadership appears to be transient and must at least quite often be the result of almost an accidental victory in a fight, which was equally unplanned.

In his *The Territorial Imperative,* Ardrey referred to some experiments by C. R. Carpenter who established a colony of rhesus monkeys on an island in the West Indies.[207] Groups marked out territories, and one of these groups was led by a male of very strong dominance, which continually led his followers into neighbouring preserves with much success. When this male was experimentally removed, the group no longer trespassed, so that he was clearly a leader. When restored to the group, again trespassing went on as before. Ardrey observed that Carpenter's experiments were impressive evidence of leadership, but he pointed out that later research revealed that in rhesus life the conditions which Carpenter established were artificial because territory is not normally defended at all.

By and large, animals of a species have a distinct character that can be described, and the vast majority of the members will fit the description. There is a uniformity that seems to be native to the species. Now and then some accident gives rise to a single exceptional animal, but it seems to be a rare event. With human beings such uniformity is found only among primitive people, but for reasons that have nothing to do with their potential for individuation. As described briefly below, the uniformity of character is the result of a particular situation.

Primitive people have always tended to show more respect for Nature and for animals than highly civilized man. Western man has customarily attributed this to some kind of spiritual kinship, a kinship most of us have lost and therefore look upon with some nostalgia. The sense of community with Nature appeals to the

207. Ardrey, Robert, *The Territorial Imperative*, Delta Books, 1966, p.279

tired city dweller every now and then, though not as a steady diet, or he would move to the country. Actually primitive man (a very unjust epithet really) is not so much in communion with nature much of the time as he is in awe of it, or envious of its self-sufficiency. In reports of those who knew the Eskimo years ago in his "unspoiled" times, we read of his reverence before the capture of his prey, but then are surprised at his almost insane delight after the prey has been subdued. He often took a kind of savage pleasure in proving his mastery over it by a display of cruelty toward it that was rather unnecessary. Later he might feel it wise to apologize to the dead animal or to the Creator. The fact is that primitive man saw and envied the strength or wisdom, or skill of the creatures he hunted—or which hunted him—and he was impressed with the precariousness of his own position. As long as he was the weaker element in some particular situation, it was necessary to be humble, but the moment he had the upper hand he could exult in being for a short time superior.

As an illustration of what I mean, consider the following incident which was told to me by a man who had spent some time in the Arctic. An Eskimo who had a number of dogs trained to pull his sleigh and whose hunting trips often took him a hundred or more miles away from home, on one occasion got lost in a storm because his dogs wandered from a track which they normally followed quite regularly. His friends had often observed how well he treated his dogs and how there seemed to be a good working relationship between him and them. Such dogs do not normally make pets, but he had apparently got as close to this as ever happened. When he discovered his dogs had followed the wrong trail, he was furious and started to whip them. The dogs became excited and frightened, and then a little vicious. He suddenly dropped his whip, ran back to the sleigh, got his gun and shot them one by one, every single one of them, shouting a great victory cry as each animal fell over in its tracks. He then turned his back on the whole outfit and walked the full hundred

miles to his own camp with a sense of high elation. In his own mind he had proved his absolute mastery of the situation.

Most primitive people live precariously, partly because they occupy areas that the more civilized members of the human race have not yet taken over, because of its inhospitability. Such people, over the centuries, have learned how to adjust themselves, their behaviour, and their needs to the limited resources of their environment. The margin of survival is often very small. As a consequence, these people become highly conservative and are very reluctant to upset the pattern of living. Given the superior weapons of the White Man, all the caution, which was often mistaken for some sense of communion with Nature, is apt to be lost very quickly. With horses and firearms, the Indians probably did as much as the White Man to bring the buffalo, on whom he had depended for centuries, almost to extinction.

The point here is that in any society which lives in a precarious position, it is not wise to rock the boat. Individualism is therefore suppressed. Every member of the community must be trained to conform to the established way of life with as little disturbance as possible A small tribe with little margin of survival cannot support individualism. Yet, for all that, now and then great individuals do arise in such societies, strong enough and with sufficient character and intelligent enough to ignore the taboos and caring about radical changes in their own culture. Such men may displace hereditary chiefs and become leaders by sheer will-power and sustained personal initiative.

In the animal world, the situation at first appeared similar, but closer study has suggested that this is not so. In the first place, animals do not live in a consciously precarious condition. They belong in the web of life. Instinct guides them to avoid certain dangers, to eat certain foods, to respect neighbour's rights, and to seek no goals that are not natural for them or proper for them individually. It is well known in England that foxes will not molest natural prey in the immediate vicinity of their own home

base. And these neighbours, whether birds or rabbits or any other like potential sources of food, know this instinctively and do not therefore live in constant fear. Of this sort are the checks and counter-balances in Nature. Accordingly, it is not on account of any fear of disturbing the status quo that exceptional individuals are discouraged from emerging as such. It is simply not in the nature of animal species other than man to individuate.

To be a leader, one must have followers. Among animals this "following" seems to be instinctive. There is a kind of tension between any individual who strays out from the group and the rest, which either causes him to double back or leads the other animals to suddenly follow.[208] Quite by chance any one individual can stray and be followed, thereby becoming a leader, purely by accident. Konrad Lorenz described an interesting little experiment conducted by Erick von Holst who operated on the brain of a minnow in order to destroy the animal's tendency to stay with the rest of the fishes. As a consequence, whenever this brainless minnow did actually stray, it did not have the same sudden urge to return to the shoal, and the end result was that the rest of the shoal immediately set out after him. As Lorenz put it, "By virtue of its deficiency, the brainless animal had become a dictator."[209]

In conclusion, I suggest that *Homo sapiens* is in some unique way equipped to become individual in his person, in a way which does not apply to other animal species. This does not make every man great, but in a remarkable way it does make every man unique. Even physiologically, this uniqueness exists and is reflected in the fact that skin grafts cannot be made from person

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208. One often observes a beautiful V formation of Canada geese suddenly breaking off and reforming when some particular goose seems to have decided to leave the line.

209. Lorenz, Konrad, *On Aggression,* trans. Marjorie Kerr Wilson, N.Y., Bantam Books, 1967, p.140.

210. Medawar, Sir Peter B., *The Uniqueness of the Individual,* N. Y., Basic Books, 1957, pp.148,176,177. See also R. A. Reisfeld and B. D. Kahan, "Marker's of Biological Individuality," *Scientific American*, June, 1972, pp.28-37.

to person (except, of course, in the case of monozygotic twins), whereas the same operation has readily been performed from animal to animal, providing that they are of the same species[210] Only in primitive societies where extreme conservatIsm has tended to take over for circumstantial reasons does individuation seem to be minimal, but the potential is there—as we can see at once in the so-called "emerging nations."

It has been said that when God makes the mould in which to cast an individual, He breaks the mould when the work is done. I think it must be true.

The Impulse to Breed in Man and in Animals

In animals, mating and the impulse to breed are virtually synonymous. In man the impulse to breed has been sublimated, and in normal human male-female relationships it is no longer the only bond which holds them together. It has become only one of several contributing elements in the expression of what we call love, a term which is indeed difficult to define but which, perhaps ideally, is most directly equated with a willingness to make self-sacrifice. As such, it seems to be essentially a human relationship, though there is no question that some animals that have become domesticated will deliberately give expression to it by sacrificing themselves—as dogs have been known to do. I think it is safe to say that within a species, that is, between members of a single species, love as a basis of relationship is uniquely human.

In animals, the drive to breed is almost, if not entirely, the basis of all social organization. It is the fundamental regulatory mechanism which controls their behaviour, whether social or

210. Medawar, Sir Peter B., *The Uniqueness of the Individual,* N. Y., Basic Books, 1957, pp.148,176,177. See also R. A. Reisfeld and B. D. Kahan, "Marker s of Biological Individuality," *Scientific American*, June, 1972, pp.28-37.

antisocial. The behaviour patterns of animal communities are predetermined and regulated by the reproductive cycle of the female. This, in turn, is chemically controlled but is in some way responsive to environmental conditions. Thus among species which live under environmental conditions that do not favour the raising of young at certain seasons of the year, it has been observed that the period of heat is governed by the gestation period in such a way that the young will be born when environmental conditions provide the best opportunities of surviving birth and reaching a stage of comparative independence. Samuel Brody wrote:

> Species that evolved and are living in regions with wide seasonal temperature fluctuations confine their breeding activity to a sharply limited interval of the year [...]
>
> Shifting of the animal to another latitude correspondingly changes the breeding date. Shifting the animal to the tropics, where fluctuations in temperature, light, and food supply are insignificant, or domesticating it so that its food supply, warmth, and light are uniform throughout the year, often abolishes the seasonal breeding rhythm.
>
> Thus, whereas wild cattle breed in the autumn only, domesticated cattle breed throughout the year. Whereas wild fowls produce only one batch of perhaps half a dozen or a dozen eggs in the spring, domestic fowl may produce eggs throughout the year.[211]

211. Brody, Samuel, "Science and Social Wisdom", *Scientific Monthly*, Sept, 1944, p.206.

In Nature, the optimum breeding season is regulated by factors which are not directly under the control of the individual animal. Even domestication does not alter this fact, it only broadens the range of conditions under which the mechanism is triggered. This mechanism governs also the migration schedules of birds, the periods of separation of males and females among mammals for a large part of the year, and the antagonisms and the bonds between the sexes and within a sex. It is, in fact, pervasive in regulating animal behaviour.

In man, the situation is uniquely different. In an article entitled, "The Influence of Hormones on Man's Social Evolution," Sir Solly Zuckerman pointed out:

> There is one major difference of a negative kind between us and the rest of the zoological group to which we belong [...] It is our freedom from the rigorous internal chemical control of reproductive functions, such as is experienced by apes and monkeys, and even more so by other mammals. Recent research into the physiology and chemistry of the hormones which control reproduction—the hormones of the anterior lobe of the pituitary gland, and the steroid hormones of the gonads—shows that this freedom must have been vital to our emergence as *Homo sapiens*.[212]

He then pointed out that the rhythm of life in most wild animals is rigidly fixed by the periodicity of the reproductive processes. The entire life of most mammals, he argues, is constrained by the periodic functioning of the sex organs. He summed this up by saying:

212. Zuckerman, Sir Solly, "The influence of hormones on man's social evolution", *Endeavour*, April, 1944, p.81.

> The worlds of such animals, already restricted to their immediate environment and immediate present, are thus rigidly determined by an internal chemical control, whose bonds cannot be broken; what they do next and their social relationships are both pre-ordained.
>
> This internal chemical control is not as strict in the world of apes and monkeys, but, as far as is known, it is still sufficiently powerful to dominate the lives of almost all species.[213]

Moreover, Zuckerman pointed out that the relationships of the females to the males within each family unit, and of the females to each other, are controlled by the alternating periods of heat of a female. He concluded: "From all this man has been freed," and to it must be attributed "the stabilization of the family unit."[214]

When we examine the relationships that appear in man, we find a fundamental difference: the time of heat and the time of ovulation no longer coincide, and indeed the former seems to bear no relationship whatever to the latter. G. W. Corner of the Carnegie Institute, writing in the *British Medical Journal*, noted in this connection:

> There is a strange difference in the outward expression of these two events, between the human species and other mammals [...] In animals commonly observable to us (mouse, rat, guinea pig, etc.) sexual activity of the female is restricted to a limited period at the time of ovulation. In the human female a very different pattern exists. The event of ovulation is not marked by any outwardly observable sign, nor by a surge of erotic

213. *Ibid*., p.82.
214. *Ibid*.

> responsiveness. This great recurrent crisis in the human life process is silent and occult.[215]

Corner then examined briefly the evidence for the existence of any peak of sexual response and sought to relate it to the chemical events which are occurring in the female body. He then concluded:

> Although in the human species the corpus luteum phase begins with no outward sign, its conclusion is marked by a conspicuous event, namely, menstruation. Exactly the opposite condition prevails in those animals in which estrus and the ovulation phase are physically evident [...]
>
> In the case of the human female, however, the peak of sex response occurs at the very time when both estrogen and progesterone are at or approaching their lowest level in the cycle. We must therefore assume either that the rhythm of endocrine control differs from what we know in other animals, in the face of all the similarities in the cyclic histology of ovaries and uterus between the human and other species, or (which is more probable) that in women endocrine control of sex arousal has become subordinate to other factors, presumably neuro-psychological, which culminate not at the time of ovulation, but shortly before menstruation.[216]

Now the effect of freeing of human behaviour and responsiveness in this matter from hormonal control has been to throw the responsibility for restraint upon the individual himself.

215. Corner, G. W., "The Events of the Primate Ovarian Cycle," *British Medical Jrl.*, August 22, 1952, p.403.
216. *Ibid.*, p.405.

The sexual drive, being liberated from chemical control, had to be placed instead under some other kind of control in order to make social organization possible, otherwise chaos would have resulted in family life and consequently in social life. This has had tremendous repercussions in human society. Robert Lowie pointed out some of these:

> The admirable researches of Yerkes, Carpenter, and others about the sex life of the anthropoid apes do not directly help us (in understanding our own problems) [...]
>
> The sociologist has to cope with the fact that every known society discriminates among forms of sexual intercourse. Biologically, rape, incestuous unions, fornication, concubinage, companionate, civil, and ecclesiastical marriage are not distinguishable. Sociologically, the several forms of mating are outlawed, reprobated, condoned, accepted, or definitely approved. The forms enjoying the highest approbation constitute "marriage" in a given society [...]
>
> A chasm, then, yawns between man's sex life and that of the gorilla or the chimpanzee. The question is not at all whether the gorilla may turn out to be monogamous or polygamous: the question is whether gorilla society countenances, punishes, or otherwise judges the sexual activity of its members.[217]

So we are once again forced to recognize the absolutely fundamental difference between the impulse to breeding which is instinctive and governed entirely by chemicals, and the desire to breed which in man has been separated from purely chemical

217. Lowie, Robert, *Social Organization*, N.Y., Rinehart, 1949, p.87.

control. Once again, man seems to be in a class by himself. How did this come about? Of course, the evolutionists cannot admit a separate creation for man, but they do admit, much as Humboldt admitted for the possession of language, that man must have been truly man as soon as this dissociation occurred. What caused it to occur is a mystery. We know that the most primitive of societies, from whom evolutionists hopefully expected to be able to draw some conclusions regarding the twilight period when man was "becoming" human, have thrown no light whatever on the origin of language since primitive man has had more complex forms of speech than highly civilized man. In the same way—as Lowie pointed out—"Extremely primitive tribes are monogamous, very advanced societies permit polygamy."[218] Thus we do not find promiscuity among the very people who are supposed to give us some clues about human nature and behaviour in this twilight period. It looks as though man was created as he now is with the freedom and therefore the responsibility that he now has in the matter of his sex life.

There is another, more specifically physiological, difference between man and all other animals which shows up as soon as we begin to attempt to apply to man the breeding principles and practices which work so well with animals. From the point of view of eugenics it has often seemed desirable to be able to improve the race selectively by mating individuals who seem to have superior characteristics. Hitler actively supported research along these lines in the hopes of producing a super race. I'm not sure whether any adequate report has ever been made of these experiments, but certainly in the rest of the scientific community very little hope of success is placed in such experiments. The fact is that man seems to be afflicted with more deleterious mutant genes than any other species. If an attempt is made to inbreed the members of a family who by chance have produced a number of outstanding individuals and who are therefore assumed to have

218. *Ibid.*, p.229.

some measure of genetic superiority, the results have proved most disappointing. Raymond Pearl wrote:

> In absolute numbers the vast majority of the most superior people in the world's history have in fact been produced by mediocre or inferior forebears. And furthermore, the admittedly most superior folk have been singularly unfortunate in their progeny.[219]

Pearl believed that any analogy drawn between human breeding and livestock breeding is in part both specious and misleading. Inbreeding with animals may and often does lead to the rapid, sure, and permanent improvement of a strain of livestock. But as he said "When the results of human breeding are interpreted in the light of the clear principles of the progeny test (i.e., empirical results), the eugenic case does not fare too well."[220]

So disappointing have been the few such attempts made, that in certain countries even the formation of a Eugenics Society has been virtually suppressed by the scientific community in view of the fact that it is not only in danger of becoming a political tool, but it is almost certainly doomed to failure. In his book *Why We Behave Like Human Beings*, George Dorsey wrote:

> Man could probably breed a race of human beings with the following traits: bald, fat, long chest, short and crooked legs, left handed, six-fingered, fingers and thumb webbed, near-sighted, deaf and dumb, feeble minded, curly hair, cataract, albino, long-lived, and prolific with a tendency to twins [...]. At any rate, these are a

219. Pearl, Raymond, *Biology and Human Trends, Smithsonian Report for 1935,* Smithsonian Institute, Washington, D.C., 1936, Publication #3364, p.339.
220. *Ibid*.

few of the so-called Mendelian traits capable of transmission. [221]

The fact is that in every primitive society, as well as in the higher civilizations, one of the most rigidly enforced taboos is that regulating the mating of individuals too closely related. Experience throughout history has shown that under normal circumstances such matings rapidly degrade the stock. In small communities, isolated from larger communities, where continued inbreeding has occurred, the incidence of deaf mutism and the number of imbeciles relative to the size of the population is far above the average.[222] Willard Hollander wrote, "Hidden within many of us are recessive genetic factors which, if we had ill-luck to mate with another carrier, would be deadly to our offspring."[223] And again in the same connection Hollander said, "The quickest way to expose lethal traits is by intense and continued inbreeding."[224]

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221. Dorsey, George, Why We Behave Like Human Beings, N.Y., Blue Ribbon Books, 1925, p.116.

222. W, L. Ballinger remarked, "Forty-seven marriages between blood relatives produced seventy-two deaf mutes" (*Diseases of the Nose, Throat and Ear*, 8th ed., Philadelphia, Lea & Febiger, p.823). E. B. Dench stated, "Consanguinity of the parents is among the most common causes, and the greater frequency of deaf-mutism among the inhabitants of mountain districts is probably to be explained by the fact that intermarriage is much more common among such people" (*Diseases in the Ear*, Appleton, 1921, p.694). And Lajou's *Analytical Cyclopedia of Practical Medicine* states "Several statisticians have proved that the closer the degree of relationship between parents, the larger was the number of deaf-mute children born" (p.450). Curt Stern wrote, "If a gene is a rare autosomal one, it is highly improbable that a woman heterozygous for it will marry a man who also carries it . . . unless the spouses are closely related to each other" (*Principles of Human Genetics*, San Francisco, Freeman, 1950, p.226). It is rather interesting that the effects of such close intermarriage should be found in that area of man's constitution which is so essential for speech, and by which therefore he stands separated from the animals.

223. Hollander, Willard, "Lethal Heredity," *Scientific American*, July, 1952, p.15.

224. *Ibid*., p.60.

In a paper entitled "A Biological View of Human History," Bentley Glass attempted to indicate the kind of possibilities that there are of multiplying the effects of man's seemingly excessive complement of harmful mutant genes.[225] He certainly did not favour the Christian view that man is a fallen creature, but if in the Fall man began in himself a unique process of deterioration which has been cumulative through the succeeding centuries, we would have some explanation for this unhappy uniqueness. Moreover, that incest was not forbidden until long after the creation would seem to suggest that at the beginning there were no such dangers from inbreeding, because there were few if any mutant genes. The marriage of a brother and a sister might be undesirable for quite other reasons, but it would not be forbidden because of its probably disastrous consequences to offspring. Cain might safely have married a sister—as indeed, he must have done.[226]

I can hard do better than sum up this aspect of man's total uniqueness than to quote some words of John H. Hallowell:

> It is the transcendence of man's spirit over the physical and historical processes which distinguishes man from the beast. It is for this reason that man can never be completely comprehended or explained in physical terms alone.
>
> The sex impulse which man shares with the animals is never purely biological in man as it is in the beast. Sex in man is bound up with love, and when man endeavors to make the sexual act a purely biological experience it is only by an act of perversion that he is able to do so.

225. Glass, Bentley, "A Biological View of Human History, *Scientific Monthly*, December, 1951, p.367.

226. Custance, Arthur, "Cain's Wife and the Penalty of Incest," Part VI in *Time and Eternity*, vol.6 of The Doorway Papers Series.

> Only man is capable of perverting his natural impulses; animals are not.[227]

Man's Dietary Lack of Wisdom

Nowhere does man better display his ineptitude than in the matter of diet. He is the only creature who eats what is not good for him. He eats when he is not hungry, drinks when he is not thirsty and does not replace his water loss adequately when he ought to do so. In some strange way, man's senses are out of kilter. His sense of hunger no longer regulates effectively the quantity or type of his food intake, and his sense of thirst is no longer adequately adjusted to the fluid needs of his body. To my knowledge, all the experimental evidence presently available points in precisely the opposite direction with respect to animals. The discriminating powers of animals can only be described as absolutely fantastic when it comes to choice of diet, and their sense of thirst is precisely adjusted to any water imbalance in their bodies.

It might be supposed that domestication would have upset this discrimination. But apparently it has not done so. As far as I'm aware, the sole exception to this rule might be that horses will drink water immediately after eating oats and thereby endanger their lives rather dramatically, because the oats swell and the animal is choked. If young colts are allowed to take water at will after eating oats, they will tend to avoid this mistake by drinking very little and will not act unwisely when they grow up. It is true that pets will sometimes be led into eating things that violently disagree with them but even here, if they are given half a chance, they will recover themselves by selecting other foods which serve as antidotes.

227. Hallowell, John H., *Religious Perspectives in College Teaching: Political Science*, Hazen Foundation, New Haven, no date, p.17.

The powers of discrimination of both domestic and wild animals in choosing the most nutritious foods where there is a selection of varying value in this respect is almost unbelievable. Curt Richter,[228] in an extended article significantly entitled "Total Self-Regulatory Functions in Animals and Human Beings," a title appropriate indeed for animals but hardly for man, found experimentally that rats would refuse to eat sugar or fat when their bodies were operatively modified so that they could not digest these substances. When they were given increasing quantities of insulin, they ate increasing quantities of sugar made available, precisely adjusting their intake to what was appropriate for their condition. Subsequent experiments with rats have only served to emphasize their powers of discrimination. Paul Rozin of the University of Pennsylvania demonstrated the remarkable ability of the thiamin-deficient rat to sense the deficiency and search for food containing thiamin.[229] The rat would change his eating pattern as the deficiency became evident, abandoning its current diet and exploring new food sources. When placed in an "experimental cafeteria" containing a variety of flavoured foods, one of which had adequate thiamin, the rat went into a "testing mode." That is to say, it ate small meals of one new food at a time, spacing its meals several hours apart. It is thus able to locate or identify the food containing thiamin. Rozin says that the rat behaved precisely as would a rational man who had lost all the labels in his medicine cabinet and was feeling ill. In the wild, whenever rats encounter novel food, they will eat a small amount of it and wait before consuming more. Thus they are able to detect poisoned baits while minimizing risk.

Bennett Galef[230] of McMaster University was able to demonstrate something which is perhaps even more

228. Richter, Curt P., *The Total Self-Regulatory Functions in Animals and Human Beings,* Harvey Lecture Series, no.38, 1942-43, p.63.
229. Paul Rozin: referred to by John Garcia, "The Faddy Rat and Us", *New Scientist and Science Jrl.*, 7 Feb., 1971, pp.254-255.
230. Bennett Galef: referred to by John Garcia, *ibid.*, p.255.

surprising—that experimental rats are able to associate the effects of a particular food with the food itself, even though those effects do not show up until hours later. Moreover, he showed that this is not because traces of the meal or drink lingered in the mouth or gastrointestinal tract. No visual cues were involved. Colouring the disagreeable food in order to mark it visually, or serving it in a particular form, or on a particular dish, did not provide the cue. In the experiments, such possible visual cues were eliminated by scrambling them constantly. The rats were still able to identify which food was causing its discomfort.

In a fascinating paper entitled "Discrimination in Food Selection by Animals," William Albrecht collected in short compass some of the extraordinary evidence of the sensitivity of animals to the relative nutrient values of the same foods grown in variously enriched soils.[231] This applies both to animals in the wild and to farm animals. He spoke of their discriminating powers as being "uncanny." Among many examples he gave the following, relating to a particular hundred-acre area which was well enriched up to 1936 but then had no further treatment of any kind until the time of the experiments in 1943. The delicacy of the appetite of the cattle kept there is clearly demonstrated by the following factors in the case. No more than 600 pounds of fertilizer was put on the surface of the soil (i.e., only six lb per acre). It was subjected to an annual rainfall thereafter of thirty-five inches for a period of eight years. Nine crops of hay were removed. This "treated" hay was each year "diluted" by being mixed in the proportion of one part in five with other hay taken from untreated fields. In the eighth year the animals were still bypassing the untreated hay in the mixed haystacks. It should be borne in mind that this hay was enriched only to the extent that it came from soil treated eight years previously and since washed by 280 inches of rain. By the ninth year the cattle could still recognize the effects of the original

231. Albrecht, William A., "Discrimination in Food Selection by Animals," *Scientific Monthly,* May, 1945, p.350.

fertilizer if free to graze in the hundred-acre lot, but they no longer recognized it when cut and mixed with the other untreated hay. He concluded:

> In the light of this evidence the animal's choice must be recognized as a refinement of detecting differences in the crop coming by way of the soil that chemistry as yet cannot duplicate.[232]

Similar findings have been reported for wild deer, for hogs, and "very delicate differences are even recognized by chicks," as demonstrated by Weston A. Price. With respect to hogs whose capacity to exercise choice he also described as "uncanny," Dr. Price had this to say:

> When it is now reported that vitamins are generated through microbial activity in the cow's paunch, we may appreciate the soundness of the old practice of hogs following fattening steers in order to gather the undigested corn.[233]

He commented that by and large the evidence shows that in otherwise unmarked patches animals will crop out of a field which has received varying enrichment treatments with such accuracy that they will recreate these patches by close cropping to within an inch or two of the original demarcation line. He spoke of this as an animal detecting instrument with a delicacy such as approaches that of the chemist's spectrograph.

So much, then, for the ability of animals not only to choose what is best for them, but also to compensate for vitamin or other deficiencies in their own bodies. Nor do animals over-indulge. Only man becomes needlessly fat thereby endangering his

232. *Ibid*.
233. Weston Price: quoted by William Albrecht, *ibid*., p.352.

existence. I have said "needlessly," because animals do fatten themselves in anticipation of extended periods without food intake. But man does this to his own ill-health and for no other reason than that his appetite has somehow got out of adjustment with the demands of the body. If a man were to eat only just the food that would satisfy the demands of his body, he would be hungry much of the time. One basic reason for this is that his body is so inefficient relative to the bodies of animals. This may well be due to the effects of the Fall. But the mechanism responsible for this lack of adjustment is fairly well understood.

The following statement is an over-simplification. We obtain the energy we need for the work we do by burning food in the body. This generates heat. The experimental evidence, which has been substantiated in hundreds of laboratories, shows that the human body in this respect is only about 20-25 percent efficient. We have established in our laboratories, for healthy young men (army volunteers) doing various exercises and at rest, efficiencies that show considerable variation, running from 16 percent to 36 percent in one case. The high figures were always for men riding a bicycle—in a way a curious finding, but one which has been reported by others also.

Animal efficiencies as studied by others, are found to be very high indeed. Fish are somewhere near the top of the scale with approximately 80 percent.[234] This efficiency is established by measuring the work output and comparing this with the oxygen intake, the amount of oxygen being used providing a measure of the actual energy that one ought to get out of the human "engine." Even at rest, of course, the body uses oxygen, but the measurement of "work" output is much more difficult. During exercise it is simpler to measure. In either case, what is found is that approximately four-fifths or 80 percent of the potential energy of the oxygen consumed by a man is not turned into "useful" work

234. Efficiency of fishes: "Submarines as Efficient as Fish," item under "Technological Review." in *New Scientist*, June 25, 1970, p.629.

and must be eliminated as heat. The rise in body temperature initiates the loss of this heat normally by radiation or evaporative cooling. The more a man has to sweat to do the same amount of "useful" work, other things being equal, the less efficient he is. Just as a scale of reference, it might be added that a steam engine is seldom more than 15 percent efficient, a diesel engine around 33 percent, and some highly refined aircraft engines of conventional design 40 percent. Compared with animals, both man and man-made machines are not outstanding. In terms of food intake man eats, theoretically, about four times as much as he should be eating if he were simply an animal. But if he cut down his food intake to one-fourth of what it is, he would be everlastingly hungry.

The same general picture holds for man with respect to his fluid intake. It has been found that the level of dehydration of an animal's body guides it precisely in the control of the amount of water it drinks. Man, by contrast, finds his thirst is quenched when he has only drunk about one-third to one-half of what his body in some stressful circumstances actually needs to replace water lost by the evaporation of sweat. He accepts a severe level of dehydration voluntarily. On the other hand, of course, he may over-indulge, to an even greater detriment.

By and large, therefore, man stands apart from the rest of the animal world, as far as we know, both with respect to his appetite for food and his thirst for fluid. This may indeed be simply the consequence of the Fall, but it also has the effect of extending man's potential enjoyment of life in directions which manifestly would never have been likely if eating and drinking were, for him, merely a question of satisfying physiological demands, as it is apparently with all other animals.

Susceptibility to Disease and Slowness in Healing

Man not only appears to have lower resistance to disease of bacterial and viral origin but he seems to be susceptible to more of such diseases. Animals do suffer from disease (including dental caries), but compared with man they are relatively disease-free. And as a matter of fact some authorities have suggested that all disease is essentially man-made. It is a little doubtful whether this can be wholly true, but it is possible that man is responsible for the conditions which have allowed most diseases to invade the animal world. Moreover, it has been observed that wounds do not infect where man has never cultivated the soil. Some primitive people perform rather gruesome initiation rites which involve severe insults to the body, but curiously enough the wounds heal without becoming infected in those societies where the soil has never been cultivated.

One thing is fairly clear when comparing human and animal wound—animal wounds (with some exceptions among domesticated animals) do not need suturing. The animal's skin is loose and does not immediately gape open even when very severe tears occur. In speaking of this fact in a book appropriately entitled *The Uniqueness of the Individual*, in a chapter with equal appropriateness entitled "The Imperfections of Man," Medawar had this to say:

> If the entire thickness of the integument in the chest region of an adult rabbit is excised over a rectangular area of 100 sq. cm., something that looks superficially like an irreparable injury is produced. But, so far from being irreparable, it requires for its quick and successful healing nothing but the most elementary surgical care [...]
>
> The surface area of an adult human being is about 7 or 8 times as great as the rabbit's, but a skin

> defect of the same absolute size and depth, and the same relative position, cannot by any means be relied upon to heal satisfactorily of its own accord. If left to itself, it will heal painfully slowly and will gather up and scar; a wound of similar size in the leg (which is not so much thinner than a rabbit's trunk) could cause a serious disabling injury if left untreated [...] Such an injury cries aloud for skin grafting.[235]

So he asked why the rabbit is so accomplished in wound healing and the human being so strikingly poor, and added that the answer hinges upon an understanding of the mechanism of healing as it occurs in the rabbit's skin. He then explained how healing occurs in the rabbit by a process which is ultimately dependent upon the fact that this skin is loose on its body. This is true of most dogs also, domesticated though they are, and it is true of cats, horses, and cattle. When the skin is cut, the wound does not at once pull apart as it does in man. Medawar continued:

> In human beings, the integument is no longer a generous fitting coat, but is much more firmly knit to the tissues below; the intrinsic muscles of the skin are now (was it ever otherwise?) confined to areas of the face and neck, and the skin generally is much more of a piece with the rest of the body.
>
> The upshot of this new anatomical arrangement is that contracture (the ability of the skin to close the wound by drawing together), so far from being an efficient mechanism of wound closure has become something of a menace; it constricts,

235. Medawar, Sir Peter B., *The Uniqueness of the Individual*, N. Y., Basic Books, 1957, p.130.

> disfigures, and distorts, and may yet fail to bring the edges of the wound together.[236]

At the end of the chapter he asked, "What compensating advantage the human being gets from the novel structure of his skin is far from obvious, though it is hard to believe that there is none."[237]

After reading this statement, I wrote to Medawar and asked him whether the tightness of human skin might not be related to the fact that the sweat glands, which are deeper than the skin, express their fluid to the skin surface to provide evaporative cooling through a comparatively long thin tube. If the skin was too loosely wrapped around the body, such tubes would have to be unduly elastic or they would be constantly in danger of rupture. Such elasticity would in any case be likely to cause rupture under certain conditions of normal sweating because the fluid pressure in the sweat glands is remarkably high (250 mm. mercury),[238] and not infrequently the orifice of the gland becomes temporarily plugged at the surface. Since man is so entirely dependent upon the effective evaporative cooling of his skin surface via sweat gland activity to prevent deep body temperature from rising unacceptably, any structural feature of his body which interferes with such a mechanism or endangers it, would limit his ability to inhabit a large part of the earth's surface. There are many climatic zones where environmental temperatures exceed our normal skin temperature, which is about 80-90 degrees F. depending upon where on the body it is measured. Medawar replied to my query very graciously, and though not at once convinced said, "However, I shall ponder upon the matter and allow my subconscious to pass judgment on it."

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236. *Ibid*., p.132.
237. *Ibid*., p.133.
238. Best, C. H., and Taylor, N. B., *The Physiological Basis of Medical Practice*, Lon., Williams and Wilkins, 1945, p.627.

Man pays a penalty for his ability to live anywhere on the globe, the penalty of a tight skin and certain problems in wound healing. Perhaps if man had not fallen, serious wounds would have been very rare. In any case, man is capable of engineering the necessary repair because of his unique hand and brain combination. The chimpanzee can thread the needle, but man can make the needle and the thread, and use it appropriately to suture the wound—which no animal can do.

One further point: Man's susceptibility to disease and his comparative helplessness when sick in a way that animals are not, is both a curse and a blessing. Washburn and Lancaster, in pointing out how well adapted to their environment animals are and having in mind at the time those animals which live in the African savanna said:

> Man cannot survive the diseases of the African savanna without lying down and being cared for. Even when sick, the locally adapted animals are usually able to keep moving with the troupe [...]
>
> Although many humans die of disease and injury, those who do not, almost without exception, owe their lives to others who cared for them when they were unable to hunt or gather, and this uniquely human caring is one of the patterns that builds social bonds in the group and permits the species to occupy almost every environment of the world.[239]

This is certainly true and probably has far wider application than the authors had in mind—although I think it needs qualification to this extent that there are occasions, exceptional though they may be, in which animals have been known to care

239. Washburn, S. L., and Lancaster, C. S., "The Evolution of Hunting" in *Human Evolution*, eds., N. Korn & F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, pp.74, 75.

for one another in times of injury. Some illustrations of this in birds, dogs, and even rats will be found in another Doorway Paper.[240]

There is no question that in some wonderful way God has blended strength and weakness in man, so that he can be ubiquitous because his temperature regulation has been so elaborately refined, but only at a cost to his capacity for healing ‹ which, in turn, has made him more than ordinarily dependent upon others when wounded. So man takes his unique social organization with him into every part of the world.

Man the Organizer

Grace de Laguna in a paper entitled "Culture and Rationality," gave an apropos observation about man's insistence upon order, reason, and organization in his life, a characteristic that appears to be almost entirely lacking in the animal world except where, purely by instinct, the bee, for example, constructs a symmetrical comb. Such "ordering" is not deliberate, nor does it extend to anything else that the animal does. Grace de Laguna wrote:

> Man's rationality is not a higher faculty added to, or imposed upon, his animal nature: on the contrary it pervades his whole being and manifests itself in all that he does as well as in what he believes and thinks.[241]

One might almost say that man does not have rationality. It would nearly be true to say he is rationality, perhaps in some sense reflecting the sentence construction of the Lord's words, "I am the

240. Custance, Arthur, "The Survival of the Unfit," Part IV in *Evolution or Creation?*, vol.4 in The Doorway Papers Series.
241. De Laguna, Grace, "Culture and Rationality", *American Anthropologist*, vol.51, 1949, p.380.

truth" (John 14:6), not "I have the truth." I am not equating truth and rationality in this statement: I mean only that in some way the Lord was the truth, not merely holding it as part of His being. And in some way man is rationality, not merely having rationality. I believe that he is often irrational, but in a strange way even his irrationality has a certain order to it, a certain rationale, unless of course, he is suffering from a mental disorder.

In almost every aspect of man's mental activity he prefers order to disorder, reason to unreason, structure to non-structure. Where they do not exist in his environment, he seeks to impose them. Even in the great move "back to Nature" when the English countryside was deliberately restructured to look more "natural," care was taken not to create chaos. This movement can be viewed as a revolt against the influence of some of the great landscape artists like Claud Lorrain, a reaction against the previous tendency to landscape everything in straight lines and symmetrical patterns that characterized formal gardens after the pattern of Versailles. But rather than disorder, this movement can be described better perhaps as a restrained freedom in the planting of things.

Virtually every aspect of man’s cultural activity reflects this drive, if we can but recognize it. Consider the following tabulation, for which I have no other scholarly authority but my own judgment, yet every article of which could be the subject of a supporting essay:

Man structures time by composing music.
Man structures emotion by writing poetry.
Man structures space by art and architecture.
Man structures quantity by creating mathematics.
Man structures events by writing history.
Man structures experience by philosophizing.
Man structures his sense of justice by formulating codes of law.

Man structures social behaviour by custom (really the objective of primary education).
Man structures his religious impulses by liturgy and ritual.
Man structures his faith and calls it theology.

Man must organize. He cannot allow anything to remain disorderly for very long without either feeling uncomfortable or turning his back deliberately on something that is very deeply ingrained in his nature. In this he is removed far from the rest of the animal world. Indeed, so inseparably do we consider this sense of order to belong to truly human activity that we speak of a mind which has something basically wrong with it as being "disordered." And when it was proposed that we should try to communicate with other intelligences in the universe, the first proposal was that a series of huge fires should be set out in the Sahara Desert in such a way as to mark the corners of a right angled triangle with squares on the three sides. It was believed by H. G. Wells and others at the time that if there were anywhere in the universe other intelligences who had the earth under surveillance, they would understand from the order and logic of the fires that the earth also was inhabited by intelligent creatures. No animal would ever think of communicating by the use of consciously ordered signals or displays of this kind.

In this list above we have essentially the sum of human activities as distinct from the accomplishments of animals. Language we have already examined. Among animals music is not believed to be consciously created with infinite variety and elaborated as man creates his music, but is used instinctively and always bound tightly to a given circumstance and a specific message. It is a warning of territorial rights, it attracts the female, or it is an involuntary expression of inner feelings of joy, pain, or anger. Because animals do not write, they cannot write poetry or history. Their social behaviour is, as we have seen, fixed and conditioned, and if they do happen to add anything to its pattern

it is strictly utilitarian. They never elaborate or embroider social activity and sustain it unless it contributes in some specific way to their survival. Man does this even when it has precisely the opposite effect. In spite of certain advertisements a few years ago of some brand food which was believed to be particularly desirable for "thoughtful dogs," there really is no reason to believe that dogs or any other animal philosophize. Philosophy involves unreality, abstraction, the consideration of alternatives to fact, the power to analyze in retrospect experiences long past and to contemplate in prospect experiences which are remote from reality. Animal thought is contingent: they live in the present. This is true even though they may confuse past, present, and future, as when a dog may yelp with pain before the punishing blow falls. There is no evidence that animals have any sense of the presence of God, such as leads men to worship in adoration, in awe, or in gratitude.

Kroeber mentions some examples in which chimpanzees, gorillas, and Cebus monkeys seem to derive pleasure from a form of painting.[242] Just what this means is hard to say. Some recent experiments suggest that chimpanzees like to play around with coloured paints, but there is no evidence of harmony, form, or order of any kind in their "creations." They are purely random expressions of some kind of exuberance. I do not think anyone has suggested that they are emerging artists. Bower birds decorate their homes, but again the essence of order and meaning seems to be missing.

There is a report of the ability of birds to "count," but only up to six or seven. And in this case it appears to be more pattern recognition than number comprehension.[243] Munro Fox, in his book *The Personality of Animals*, has a whole chapter entitled "Can Animals Count?" in which he refers to a particular zoo chimpanzee

242. Kroeber, A. L., *Anthropology*, N.Y., Harcourt & Brace, 1948, p.65.
243. "Learning in Man and Animals," editorial, *Nature,* June 23, 1956, p.1147.

named Sally who learned to pick up four or five straws when asked to, but that was as far as she could count. Above five she made mistakes.[244] He also refers to a pigeon that was taught to pick up five grains of wheat. The bird was then placed before a heap of wheat, in front of which were piles of one, two, three, and four grains of wheat. Faced with each pile separately, the pigeon ate the grains in front of it and then went to the heap and ate just enough to make a total of five. Fox believes that this is real addition; but actually it could again be simply a pattern of movements which were conditioned leaving the bird in some kind of state of dis-ease until it had completed the circuit of movements. It is very difficult to know whether any of these experiments really demonstrate the ability to count.

To my mind, even the quite fascinating experiments carried out with rats by Loh Seng Tsai, reported in *Life* (January 11, 1954), did no more than to demonstrate the rat's ability to recognize a configuration of signs and only up to three signs in any case. However, the ability of birds to count up to six or seven does not always appear to be merely pattern recognition. Huxley referred to some work done by Otto Koehler who set jackdaws the problem of taking a definite number of peas out of a series of boxes:

> Surely they mastered this problem fairly easily, but sometimes they made mistakes: and one jackdaw realized his mistake. He ought to have taken 6 peas—2 out of the first box, then none, 1, 2, and 1 (out of successive boxes) [...]
>
> He went back to his cage after taking only five. But then he suddenly came back and counted out his task by bowing his head the right number of times in front of each box. When he got to five, he

244. Fox, Munro, *Personality of Animals*, Lon., Pelican Booth, 1952, revised ed., p.100.

> went on to the next box and picked up and ate the one pea he had forgotten.[245]

The behaviour of this jackdaw in bowing his head, however, could be taken as indicative of the fact that he had a kind of physiological memory of the number of actions to perform at each station that did not actually involve counting at all. It would be a kind of conditioned reflex. And something told him that he had not completed the performance. . .

We made some experiments with a cat we once had, who was raising a family of three kittens. When the kittens were old enough that they could half stand up and could raise a loud mewing, we took the mother cat out of the room and lifting the three kittens out of their box, we deposited them in the center of the floor, their box being in a corner of the room. When they set up a great noise, we allowed the cat in, and she frantically dragged off a kitten back into the box. While she was doing this, we quickly removed the other two kittens into another room where their noise was not heard. So long as the mother cat did not hear the noise of their mewing, she was not concerned any further than to rescue the single kitten. On the other hand, if we left one of the two remaining kittens on the floor, it would make such a noise that she would jump out of the box and rescue it also, dragging it back to the box. In the meantime, if we quietly and quickly removed the one she had already in the box, she apparently did not notice its disappearance at all when she got the second one home. It appears that she could recognize the difference between one and none, but not between one and two.

Mathiassen in his Fifth Thule Report, 1921-24, *The Material Culture of the Iglulik Eskimo*, remarked upon the method used by these people to attract caribou within range of their bows. Two men, having sighted a caribou, will proceed to walk away from it.

245. Otto Koehler: quoted by Sir Julian Huxley, *Evolution in Action*, Lon., Chatto & Windus, 1953, p.100.

The curious animal will follow cautiously at a distance. One man will suddenly drop out of sight behind a snow bank and remain hidden, while the other one goes on. The caribou unsuspectingly follows, not noticing the absence of one man; and of course, he pays the price. This seems clear evidence of inability to recognize the difference between two and one. Apparently it has also been found that if three men go openly to a hideout for shooting game fowl, the game will fly away from the area. But if one of the men openly leaves the hideout, the birds will unsuspectingly return. Beyond this, efforts to detect the ability to count in other animals have not been successful.

We have, then, in man one further unique character, namely, that of rationality, taking rationality in the broadest possible sense to include preference for order, which involves a form of counting, logic, truth, symmetry, and harmony against their respective alternatives. In all these things other animals seem to be totally indifferent wherever they have the power of choice.

Conclusion

Once again, we find that it is not possible to explain man's behaviour in terms of animal behaviour. Man's home and his role in it, and his relationship with others, are not based on the biological expedients of the animal world. Man displays infinite variety in terms of personality whereas animals have uniformity of character. But most unique in man is the quality of rationality which pervades his whole being. While this rationality opens up such great potential for him, he lacks the wisdom of animals in its exploitation. There seems to be something basically wrong with him, not only in the sickness of his body, but in the harmfulness of his behaviour.

Thus we come back to the question first proposed, What is man? In the next chapter we shall examine what I believe to be, at least

for the Christian, the most conclusive evidence of all that man is not merely more than, but something quite other than, an animal.

Chapter 7

The True Nature of Man in Jesus Christ

In the light of the evidence few will dispute the fact that man is anatomically, physiologically, and—for want of a better term—psychologically, unique; that some strange event somewhere back in the dim and distant past led to the sudden appearance of a creature whose whole being was a new departure from the then course of events in the living world of animals. Evolutionists themselves admit it. It has been referred to as the "critical point" concept.[246] A. L. Kroeber postulated that "the development of the capacity for acquiring culture was a sudden, all-or-none, quantum leap type of occurrence in the phylogeny of the primates."[247] Susanne Langer put it even more dramatically when speaking of the acquisition of language, the lifeblood of culture:

> Language is, without a doubt, the most momentous and at the same time the most mysterious product of the human mind. Between the clearest animal call of love or warning or anger, and a man's least trivial word, *there lies a whole day of creation* [my emphasis].[248]

Fothergill writing in *Nature* and reviewing two books on evolution, underscored his doubts about the validity of current conceptions regarding the origin of man by quoting the words of

246. Geertz, Clifford, "The Transition to Humanity" in *Human Evolution*, eds., N. Korn & F. Thompson, N.Y., Holt, Rinehart & Winston, 1967, p.114.
247. Kroeber, A. L.: quoted by Clifford Geertz, *ibid*., p.115.
248. Langer, Susanne, *Philosophy in a New Key*, N. Y., Mentor Books, 1942, p. 83.

Humphrey Johnson who said, "There is a wider difference between a man and a gorilla than there is between a gorilla and a daisy."[249] In some vaguely definable way, we know that the gorilla and the daisy really do belong somehow within the same world frame. Man seems entirely alien. In his book *God's Image in Man*, James Orr quoted a contemporary writer, Fiske, as having said, "While for *zoological* man, you can hardly erect a distinct family for man from that of the chimpanzee and the orang; on the other hand, for *psychological* man, you must erect a distinct kingdom, nay, you must dichotomize the universe, putting man on one side and all things else on the other."[250] It is quite true.

But it is apparent from history that when the coming of man introduced a sudden leap into a new order of life, it was not without a penalty. Indeed, it has manifestly been as harmful to the whole order of Nature as it has been beneficial, as though something went seriously wrong almost at the very beginning. So totally disrupting has man's presence been that there are those who are prepared to speak of modern man as being "obsolete — a self-made anachronism becoming more incongruous by the minute."[251] Arthur Koestler reflected the view of many thoughtful people when he said, "Something has gone seriously wrong with the evolution of the nervous system of *Homo sapiens* [...] The delusional streak which runs through our history may have been an endemic form of paranoia built into the wiring circuitry of the human brain."[252]

The assumption is always made by such writers that what has gone wrong is a "mechanical" fault. This may be true actually,

249. Humphrey Johnson: quoted by P. G. Fothergill, reviewing *Evolution After Darwin*, eds.,Sol Tax & Charles Callendar, in *Nature*, February 4, 1961, p.341.

250. Fiske: quoted by James Orr, *God's Image in Man*, Grand Rapids, Mi., Eerdmans, 1948, p.60.

251. Melvin, Bruce L., "Science and Man's Dilemma," *Science*, vol.103, 1946, p.243.

252. Koestler, Arthur, *The Ghost in the Machine*, Lon., Hutchinson, 1967, p.239.

though we tend to think of it as more spiritual than physico-electro-chemical. But in point of fact, the fruit that was forbidden to Adam but which he ingested may indeed have contained a poisonous substance of some kind that did cause "mechanical failure," a defect since then inherited by all who are his descendants.[253]

This is not, of course, to deny the fact that the very act of disobedience *per se* destroyed his communion with God and had equally fatal effects upon his spirit as the fruit did upon his body. The first was immediate, bringing what Scripture calls "spiritual death"; the second was more delayed in its effect, initiating a process which terminated in his physical death. At any rate, between the two, which appear to act synergistically, psychosomatically, and somato-psychically, the spirit on the flesh and the flesh on the spirit, the end result is best described by the simple word *suicidal*, to use James Gall's fitting description:

> What is wrong with man is some disease that has nothing good about it. No animal does by nature things which injure its instincts, spoil its enjoyment of life, or shortens its days to no purpose either to itself or its species. The behaviour of predators, which sometimes look savage and cruel in the extreme, and thus reminds us of human savagery and cruelty, really has none of the characteristics of human savagery. The animal is without hate, or revenge, or desire to hurt merely for the pleasure of hurting.[254]

253. Custance, Arthur, "The Nature of the Forbidden Fruit," Part II, in *The Virgin Birth an the Incarnation*, vol.5 in The Doorway Papers Series.
254. Gall, James, *Primeval Man Unveiled*, Lon., Hamilton, Adams, 1871, p.91.

It is possible that no predator ever does actually hurt its prey [255] and it certainly does no injury to its own nature unless its nature has been disturbed by human interferences. When man acts according to his nature, he all too frequently acts self-destructively. The fact is that natural human behaviour is diseased behaviour. To pretend otherwise, as humanists do, is folly. Man is a fallen creature. He is diseased, and the disease is sin: the symptoms of the disease are everywhere evident in human wickedness. It makes man essentially murderous in his intent. It is recognition of this fact even within himself that has driven human society to hedge itself about with the restraints which, when well structured, we call Civilization.

Murder and civilization emerged together (Genesis 4 ff.); it is not something observable anywhere else in Nature. As Arthur Koestler put it, the unique characteristic of our species is that we practice intraspecific homicide both individually and in groups.[256] Animals do not murder or torture one another, nor do they make war as man makes war on his own species. And the assumption, therefore, that man "though occasionally blinded by emotion, is basically a rational animal"[257] is an assumption that is "untenable in the light of both historical and neurological evidence." Whatever he is, man is not an animal. . . .

What has happened then? Is this the way man was made? And if not, how was he made at first? What was he like before the disease of sin entered? Is man as we see him in ourselves man at all? What is true manhood? Why did God create such a creature knowing what the consequences would be, even if the fault for the present situation is ours? Only when we know what man was created for, can we really know what man is.

A colleague of mine, a French-Canadian organic chemist, walked into my laboratories one day and said, "We've had this

255. Custance, Arthur C., "The Problem of Evil," Part IV in *The Flood: Local or Global?*, vol.9 in The Doorway Papers Series.
256. Koestler, Arthur, *The Ghost in the Machine,* Lon., Hutchins on, 1967, p.305.
257. *Ibid*., p.324.

thing around the house ever since I was a kid. Any idea what it is?" We both studied it carefully. It was made of wood, obviously shaped by hand, asymmetrical along its axis, and about six inches long. It weighed only a few ounces, and it had been nicely finished with a good lacquer. I've always felt I was quite sharp at guessing this kind of thing. But I couldn't identify it at all. Apparently nobody else had been able to either—not even at the National Museum! Yet it was not simply a piece of wood that someone had doodled into shape, as a fancy of the moment might have suggested. Without a doubt it had been made for some purpose. There were even unmistakable wear marks on it in one place that indicated it had actually been used for something. But what had it been used for?

Now there's the point. We could not say what it was, because we could not imagine what it was *for*. Knowing what it was made of, its shape, weight, colour, size, or any of its other physical or chemical characteristics, still did not tell us what it was, because we did not know what it was for. As far as I know, my friend never did find out. One day, someone will say, "Oh, I know what that was for. . ." And the problem of identity will be solved.

Nor can we say what man is—even knowing all these things about him, his physical characteristics, his chemical constitution, and even his psychological make-up—unless we know what he is for. But we shall know what man is only when we know what God's object was in creating him. We can see in some measure how each animal fits into the web of life and "makes its due, but only due, contribution to the scheme of Nature."[258] Man, by contrast, seems alien to this whole scheme. As Laura Thompson said, "He is the only one who could contribute to the regulation of the whole process of Nature by reason of his position at the apex."[259] Indeed, it has been Julian Huxley's basic philosophy that such was the goal

258. Dice, Lee, *Natural Communities*: reviewed by Ronald Good, in *Nature*, July 11,1953, p.146.

259. Thompson, Laura, "Basic Conservation Problems," *Scientific Monthly*, February, 1949, p.130.

of evolution, to produce a creature who could thereafter consciously direct its course in the future.[260] If this was the purpose of the emergence of man, he has certainly dismally failed in his responsibilities. But was this what man was made for? Once again we are back at the question, What for is Man?

Perhaps we can provide some kind of answer by the use of an analogy. If a man builds a house for his animals, he suits its construction to their nature and disposition, besides being guided by what he hopes to do with them. If he happened to be raising snakes in order to extract their venom for research purposes, it would be a house from which they could not escape but in which they would yet thrive. For his cattle, he could build a house that is large enough to accommodate their greater bulk, with facilities for keeping them fed, warm, and clean, but they must be able to go in and out. Yet he would not need to take the same precautions against their escape as he would have to do with dangerous creatures like poisonous snakes—or destructive animals like pigs, or vagrant ones like horses. For his dog, he would construct a house that in some small measure shared his own home comfort and style, for this is what his dog is likely to do. Thus the nearer he gets to a house for a creature sharing his own likes and dislikes, the more like his own house it will be. For his hired man, he will probably build a house that he himself and his family would be willing to occupy, if he is a man of feeling and concern.

Ultimately, we come to his own house. How does he build it? He builds it not to suit his livestock, or his pets, or even his hired man. He builds it for himself. It takes on and reflects his own person in many subtle ways. It is likely, at least in so far as he has the resources and the design ability, to be uniquely suitable for him—more suitable for him than for anyone else. When a man hands over such a house to someone else, either by sale or as a gift,

260. Huxley, Sir Julian, "New Bottles for New Wine: Ideology and Scientific Knowledge," *Jrl. of the Royal Anthropological Institute,* vol.80, nos.I and 2, 1950, p.20.

it is almost certain that it will be modified by the next resident, thus proving how special in certain respects it was for himself as a habitation.

Now what, then, will God do if *He* decides to build a house which is to be fit for Himself, which in due course will be *His* habitation, a house which is to serve Him for thirty-three years, in which *He* will live and express His character, inhabiting it day and night, constantly, actively, fully, sleeping and waking, being born and dying? It will be a house capable of being so lived in, appropriately and worthily. It will be a house that can sustain the demands of habitability that *He* will make upon it.

It will be beautiful, for obviously God must rejoice in beauty that He should make so many beautiful things in the world, and it will be "flexible" to allow for expression in the face, by the hands, by body movement, of the whole range of human mood from delight to mourning, from solitude to companionship. It must have all the facilities—faculties now, since it is a body that we speak of—which will permit movement, expression, communication, gesture, comprehension, display of emotion, and even feelings of weariness, which are necessary for true sympathy of the human lot and to which others can upon special occasion minister. And above all, if the object from the very first was to be not merely for the revelation of God but for the redemption of man, it must be a house of such a nature that it could be deliberately sacrificed, not because it has worn out or was wearing out, but because He who was incarnate in it chose to sacrifice it.

In order that this sacrifice could be truly and wholly an act of will and not something surrendered to inevitably, the house must be a house that would never wear out of itself, never collapse in the course of time as our houses do because it is their nature to do so, for otherwise it would be merely prematurely demolished. It must be capable of lasting indefinitely, even though it can be deliberately sacrificed. This house had to be of such a nature as to allow an event which was to signify something other than the

mere premature breakdown of its structure. The house had to be of such a nature that its demolition could be purely an act of will, unrelated to the condition of the house itself.

The same kind of house must be appointed as the habitation of the First and the Last Adam, in order that the conditions of physical life of both might have the same potential. It must be, for God's purposes, a house built with the capability of lasting for ever, even though that capability was twice sacrificed—the first time in Eden by an act of disobedience, and the second time on Calvary by an act of obedience.

Man is not a creature of spiritual significance who merely happens to have the kind of a body he does and who might just as easily have been equipped with any other kind of body. He is a creature whose uniqueness from the point of view of his humanness both in terms of culture and spiritual aspiration is as much dependent upon the structure of his body as upon the nature of his spirit. It is quite wrong to imagine that man's body is incidental and that he might have been structured like a giraffe, a dog, a mouse, or even an ape and still have fulfilled the role for which he was created. In 1810, Lorenz Oken said, "God objectified Himself in Man,"[261] and in 1872, Charles Hodge said, "Creation was in order to redemption."[262] Both statements are directly related, and both hinge upon the reality of man's uniqueness both spiritually and physiologically.

This house, this body that is the home of man's spirit, is not just a complex electrochemical machine. It was designed from the very first for a special purpose. It was so built that it would properly meet the requirements that God had in mind both for man and for Himself in the Person of the Lord Jesus Christ. In due course, it was to make it possible for God to express Himself perfectly in terms of human personality as a man. And then, as a man, to

261. Oken, Lorenz: quoted by A. O. Lovejoy, *The Great Chain of Being*, N.Y., Harper Torchbooks, 1960, p.321.

262. Hodges, Charles, *Systematic Theology*, Grand Rapids, Eerdman's, reprint 1973 (1872), vol.2, p.316.

sacrifice His life vicariously for any man who would believe and appropriate that sacrifice as full, perfect, and sufficient compensation in the face of the divinely appointed moral law, against his own sinfulness, failure, and self-will. God made man's body such that He Himself could assume it for a season as His own proper House—and in the person of His Son, Jesus Christ, could die in it that we who are dying in it even as we live, might be redeemed to live again. And this life will be forever in a new and even more glorious resurrected "house" throughout eternity, thus exhibiting the grace and love of our Saviour God as a matter of personal experience. No mere animal body could have sufficed for such a tremendous purpose.

It is inconceivable that God could have expressed Himself as a Person in any animal form. It is only in man's reprobate mind that the idea of God as a serpent, a crocodile, a bull, a wolf, or a bird could have occurred with such force that he would bow down and worship such images, changing the truth of God into a lie and worshipping and serving such creatures rather than their Creator (Romans 1:23-25). Even to worship God in an image fashioned after man as he now is is the expression of a mind that is darkened and foolish.

Yet the Lord Jesus Christ accepted the worship of men without rebuke. And one must therefore assume that the body which was His house, though it looked like ours, was somehow not the same. His body was glorious. His body was made with the potential for unending continuance (Hebrews 7:16). There was something in His body which distinguished it from ours and gave it its glory, though it was not different from the body which Adam had at first. He could become weary both in body and in spirit, and we know that He found rest—at least at Jacob's well—by sitting down, a circumstance which implies that gravity could have its effect on that body. And yet He could walk on the water, a circumstance which showed that gravity did not always have an effect on that body. His was a body that had the same needs for food and drink

at times, and yet was, perhaps, in some way not totally dependent upon these things as our bodies are. His body was a body so full of energy that those who strove to keep up with Him imagined, in their weariness, that He was obsessed, which, of course, He was. Yet that energy could be depleted and He be aware of it, as when the woman touched His garment.

This kind of body is not in the same category as an animal body. In some way that is impossible for us to analyze, there was a fundamental difference. But neither was it a body the same as our bodies are now, for in the Lord Jesus Christ the world was presented, once more, with Adam. And between our bodies and the body of Adam *before he fell*, there is a hiatus as between two different categories of life.

One could conceivably make out some kind of case for the derivation of fallen man's body from some animal prototype, though as we have seen in the previous chapters an extraordinary combination of special circumstances has to be postulated to account for the differences. But in order to account for a body that housed the spirit of the Lord Jesus Christ, a body which was born uniquely and terminated uniquely, and which reflected in a unique way the body of unfallen Adam *as created*, one has to search outside the ordinary course of events entirely. As to their origin, both the First and the Last Adam originated miraculously. As to their termination, there is this difference between them and all other living things. Whereas for animals death is natural, for man death is un-natural. And for the Lord Jesus Christ death was vicarious and super-natural.[263] At the root of virtually all false systems of theology lies the failure to recognize this fundamental truth.

In the Fall, man ruined this house in its nature. Death, physical mortality, was introduced into it via the forbidden fruit even as death was introduced into the spirit which inhabits it by the very

263. Custance, Arthur C., "How Did Jesus Die?" Part VII, in *The Virgin Birth and the Incarnation*, vol.5 in The Doorway Papers Series.

act of disobedience. If we allow that Adam was the first man but that by his Fall he surrendered his true nature as such, what we see now in ourselves is no longer true manhood, but something else. Man now has neither the virtual freedom from disease and fantastically efficiently operating body of an animal, nor the beautifully adjusted instincts which guide the life of every other creature below him. He is corrupted in body and in spirit. If he has any instincts at all, they seem to be instincts of destruction; destruction to himself, his society, and his environment. Something is totally, wholly, wrong with him—even if he were merely considered as an animal. Man is less than an animal, lacking in every impulse that is natural as well as healthful for every other creature in its contingent circumstances. He is virtually an alien in the universe, alienated from all other creatures and alienated from God.

Furthermore, unless man is redeemed by the grace of God, he is a lost creature under judgment in a way that no other creature is, whether animal or angel. Redeemed, he is greater than both. But in neither case is he an animal. He is in a different category, though his body and his mind show the hand of the same Designer and Architect at work in both himself and the animals. Only he was created in the image of God, in order that God might one day appear as man.

It is useless to ignore the Fall and try to discuss what man is. It is useless to ignore the Incarnation and try to discuss why man was made as he was. It cannot be done.

Man was made for God, and as such he had to be a creature with those freedoms which alone would make fellowship with God meaningful. But God knew what the consequences of such freedoms would be and how they must be dealt with. God knew that man would have to be redeemed and that He would have to be the Redeemer. To be the Redeemer, God had to become man in

the Person of His Son Jesus Christ. And thus man had to be such a creature that God could assume his form and his nature in order to become his Redeemer without diminishing His own Person.

The Incarnation, that God should be manifest as man in Jesus Christ, is the key to the reasons why man has been constructed in his total being in the way he has. This is part of the truth to which the child of God is called to bear witness, a truth the knowledge of which is not to be derived from philosophical reflection on scientific research but only from Scripture.

The evidence of anatomy, physiology, pharmacology, medicine, culture, and language, all tell the same story. Man is an animal only if one merely wants to emphasize what man and animals share in common. And they do share much in common, since the same Creator created them both to share a similar environment. But this ignores all that they do not share in common. It ignores what actually makes man, *Man*. What constitutes man something entirely other than an animal is the fact that he was not made for the same purpose. Superficially, a small chisel may look like a screwdriver. To argue that either can be used in emergency for cutting wood or for driving a screw does not make them both the same. They were intended to serve different purposes. To confuse them and to ignore differences is not only an insult to the designer, but a confession of ignorance.

The clue to man's identity, then, is in the purpose for which he was made. He was literally "made for God." In every sense this is true. It is the reason why he has the anatomy and physiology he has. It is the reason for the special nature of his central nervous system. And, in the final analysis, it is the reason for his Fall and his redemption.

I believe that even in a society which rejects the Gospel, the Church is still called upon to bear witness to the fact that man is not an animal, that man is a unique creature of unique significance in this universe, unique in origin, unique in design, of unique destiny, and, whether redeemed or unredeemed, related in a

special way to the Creator. This uniqueness stems not only from the circumstances surrounding man's creation and Fall, but also from the fact that after death he will live again to face judgment for what he has been in this life.

Man is not a superior animal but a child of eternity. And I am convinced that the world needs to be constantly reminded of this fact. And it needs also to be reminded that there can be no understanding of "the phenomenon of man" unless his special origin and destiny are recognized fully. Nor can the ills of society be properly diagnosed or any proper provision be made for the real fulfillment of human aspirations even at the ordinary social level unless the true nature of man as a fallen but redeemable creature is acknowledged.