

THE MOST PRIMITIVE ANTHROPOID.

White-handed Gibbon (*Hylobates lar*). The gibbon, Dr. Smith says, "is a true, if very primitive, anthropoid ape, nearly related to the common ancestor of man, the gorilla and the chimpanzee." The earliest gibbons were able to walk upright, but their brains were not sufficiently developed to enable them to make any use of this adaptation, and it is only the ancestral line of man that finally took advantage of it, with the freedom which it gave for the use of the hands. Even today the hands of the white man are more primitive in their characteristics than those of the anthropoid apes, or even than those of the negro—an indication, the writer points out, that he was not obliged to specialize them any further, after this early period, but made his evolutionary progress along other lines, principally relating to mental accomplishments. Photographed by Elwin R. Sanborn of the New York Zoological Society. (Frontispiece.)

MAN'S PEDIGREE

Line of Descent Fairly Clear as Far Back as Eocene Epoch—Development of Brain the Factor Which Separated Ancestors of Man from Other Apes—Effects of Life in the Trees.¹

DR. G. ELLIOT SMITH,

Professor of Anatomy, University of Manchester, England.

NONE who is familiar with the anatomy of man and the apes can refuse to admit that no hypothesis other than that of close kinship affords a reasonable or creditable explanation of the extraordinarily exact identity of structure that obtains in most parts of the bodies of man and the gorilla. To deny the validity of this evidence of near kinship is tantamount to a confession of the utter uselessness of the facts of comparative anatomy as indications of genetic relationships, and a reversion to the obscurantism of the dark ages of biology. But if anyone still harbors an honest doubt in the face of this overwhelming testimony from mere structure, the reactions of the blood will confirm the teaching of anatomy; and the susceptibility of the anthropoid apes to the infection of human diseases, from which other apes and mammals in general are immune, should complete and clinch the proof for all who are willing to be convinced.

Nor can anyone who, with an open mind, applies similar tests to the gibbon refuse to admit that it is a true, if very primitive, anthropoid ape, nearly related to the common ancestor of man, the gorilla, and the chimpanzee. Moreover, its structure reveals indubitable evidence of its derivation from some primitive Old World or catarrhine monkey akin to the ancestor of the langur, the sacred monkey of India. It is equally certain that the catarrhine apes were derived from some primitive

platyrrhine ape; the other, less modified, descendants of which we recognize in the South American monkeys of the present day; and that the common ancestor of all these primates was a lemuroid nearly akin to the curious little spectral tarsier, which still haunts the forests of Borneo, Java, and the neighboring islands, and awakens in the minds of the peoples of those lands a superstitious dread—a sort of instinctive horror at the sight of the ghost-like representative of their first primate ancestor.

This much of man's pedigree will, I think, be admitted by the great majority of zoologists who are familiar with the facts; but I believe we can push the line of ancestry still further back, beyond the most primitive primate into Haeckel's suborder Menotyphla, which most zoologists regard as constituting two families of insectivora. I need not stop to give the evidence for this opinion, for most of the data and arguments in support of it have recently been summarized most excellently by Dr. W. K. Gregory.²

PRIMITIVE RELATIVES.

This group includes the oriental tree shrews and the African jumping shrews. The latter (Macroscelididae), living in the original South African home of the mammalia, present extraordinarily primitive features linking them by close bonds of affinity to the marsupials. The tree shrews (Tupaïidae), however, which range from India to Java, while

¹ Portions of presidential address delivered before Anthropological Section of British Association for the Advancement of Science at Dundee in September, 1912; printed in full in *Nature*, London, Sept. 26, 1912. Dr. Smith is not responsible for the illustrations here used.

² "The Orders of Mammals," *Bull. Amer. Mus. Nat. Hist.*, Vol. 27, 1910, p. 321.

presenting very definite evidence of kinship to their humble African cousins, also display in the structure of their bodies positive evidence of relationship to the stem of the aristocratic primate phylum.

Quite apart from the striking similarities produced by identical habits and habitats, there are many structural identities in the tree shrews and lemuroids, not directly associated with such habits, which can be interpreted only as evidences of affinity.

* * * * *

The stock from which man eventually emerged played a very humble rôle for long ages after many other mammalian orders had waxed great and strong. But the race is not always to the swift, and the lowly group of mammals which took advantage of its insignificance to develop its powers evenly and very gradually without sacrificing in narrow specialization any of its possibilities of future achievement, eventually gave birth to the dominant and most intelligent of all living creatures.

The tree shrews are small, squirrel-like animals which feed on "insects and fruit, which they usually seek in trees, but also occasionally on the ground. When feeding, they often sit on their haunches, holding the food, after the manner of squirrels, in their fore paws."³ They are of "lively disposition and great agility."⁴ These vivacious, large-brained little insectivores, linked by manifold bonds of relationship to some of the lowliest and most primitive mammals, present in the structure of their skull, teeth, and limbs undoubted evidence of kinship, remote though none the less sure, with their compatriots the Malaysian lemurs, and it is singularly fortunate for us in this inquiry that side by side there should have been preserved from the remote Eocene times, and possibly earlier still, these insectivores, which had almost become primates, and a little primitive lemuroid, the spectral tarsier, which had only just assumed the characters of the primate stock, when nature fixed their

types and preserved them throughout the ages, with relatively slight change, for us to study at the present day.

Thus we are able to investigate the influence of an arboreal mode of life in stimulating the progressive development of a primitive mammal and to appreciate precisely what changes were necessary to convert the lively, agile, *Ptilocercus*-like ancestor of the primates into a real primate.

In the forerunners of the mammalia the cerebral hemisphere was predominantly olfactory in function, and even when the true mammal emerged and all the other senses received due representation in the neopallium the animal's behavior was still influenced to a much greater extent by smell impressions than by those of the other senses.

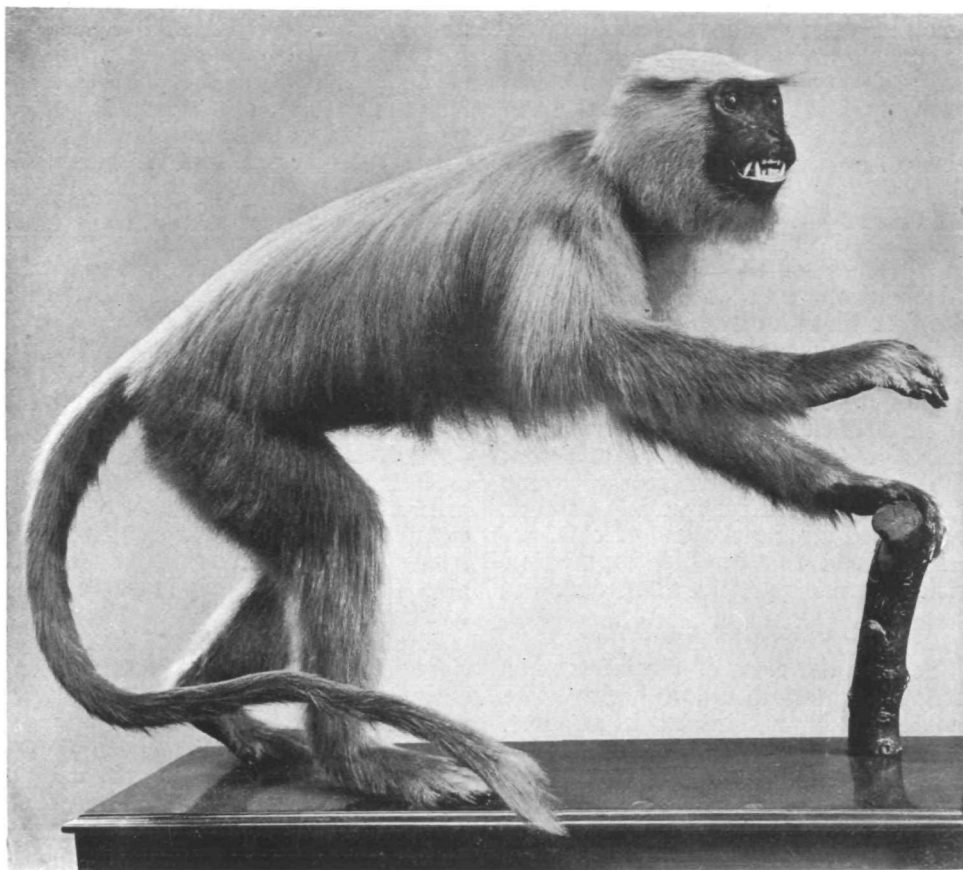
VALUE OF SENSE OF SMELL.

This was due not only to the fact that the sense of smell had already installed its instruments in and taken firm possession of the cerebral hemisphere long before the advent in this dominant part of the brain of any adequate representation of the other senses, but also, and chiefly, because to a small land-grubbing animal the guidance of smell impression, whether in the search for food or as a means of recognition of friends or enemies, was much more serviceable than all the other senses. Thus the small creature's mental life was lived essentially in an atmosphere of odors, and every object in the outside world was judged primarily and predominantly by its smell. The senses of touch, vision, and hearing were merely auxiliary to the compelling influence of smell.

Once such a creature left the solid earth and took to an arboreal life all this was changed, for away from the ground the guidance of the olfactory sense lost much of its usefulness. Life amidst the branches of trees limits the usefulness of olfactory organs, but it is favorable to the high development of vision, touch, and hearing. Moreover, it demands an agility and quickness of

³ Flower and Lydekker, "Mammals, Living and Extinct," 1891, p. 618.

⁴ W. K. Gregory, *op. cit.*, p. 269, and pp. 279, 280.



SECOND STAGE OF THE HISTORY.

Langur or Hanumán (*Pygathrix entellus* = *Semnopithecus entellus*), of southeastern Asia. "In the remote Oligocene, a catarrhine ape, nearly akin to the ancestors of the Indian sacred monkey, *Semnopithecus*, became definitely specialized in structure in adaptation for the assumption of the erect attitude." The second stage, as we ascend man's family tree, must have somewhat resembled this langur monkey, then, and it was at that stage that the specialization began which led man to diverge from all his relatives of the tree-tops. Photograph from the American Museum of Natural History, New York. (Fig. 1.)

movement that necessitates an efficient motor cortex to control and coordinate such actions as an arboreal mode of life demands (and secures, by the survival only of those so fitted) and also a well-developed muscular sensibility to enable such acts to be carried out with precision and quickness. In the struggle for existence, therefore, all arboreal mammals, such as the tree shrews, suffer a marked diminution of their olfactory apparatus and develop a considerable neopallium in which relatively large areas are given up to visual,

tactile, acoustic, kinaesthetic, and motor functions, as well as to the purpose of providing a mechanism for mutually blending in consciousness the effects of the impressions pouring in through the avenues of these senses.

Thus a more equable balance of the representation of the senses is brought about in the brain of the arboreal animal, and its mode of life encourages and makes indispensable the acquisition of agility. Moreover, these modifications do not interfere with the primitive characters of limb and body. These

small arboreal creatures were thus free to develop their brains and maintain all the plasticity of the generalized structure, which eventually enabled them to go far in the process of adaptation to almost any circumstances that presented themselves.

Amongst the members of this group, as in all the other mammalian phyla, the potency of the forces of natural selection was immensely enhanced by the fact that the inquisitiveness of an animal which can learn by experience—*i.e.*, is endowed with intelligence—was leading these plastic insectivores into all kinds of situations which were favorable for the operation of selection. Various members of the group became specialized in different ways. Of such specialized strains the one of chief interest to us is that in which the sense of vision became especially sharpened.

THE ORIGIN OF PRIMATES.

Toward the close of the Cretaceous period some small, arboreal, shrew-like creature took another step in advance, which was fraught with the most far-reaching consequences, for it marked the birth of the primates and the definite branching off from the other mammals of the line of man's ancestry.

A noteworthy further reduction in the size of the olfactory parts of the brain, such as is seen in that of *Tarsius*,⁵ quite emancipated the creature from the dominating influence of olfactory impressions, the sway of which was already shaken, but not quite overcome when its tupaoid ancestor took to an arboreal life. This change was associated with an enormous development of the visual cortex in the neopallium, which not only increased in extent so far as to exceed that of *Tupaia*, but also became more highly specialized in structure. Thus, in the primitive primate, vision entirely usurped the controlling place once occupied by smell; but the significance of this change is not to be measured merely as the substitution of one sense for another. The

visual area of cortex, unlike the olfactory, is part of the neopallium, and when its importance thus became enhanced the whole of the neopallium felt the influence of the changed conditions. The sense of touch also shared in the effects, for tactile impressions and the related kinaesthetic sensibility, the importance of which to an agile tree-living animal is obvious, assist vision in the conscious appreciation of the nature and the various properties of the things seen, and in learning to perform agile actions which are guided by vision.

An arboreal life also added to the importance of the sense of hearing; and the cortical representation of this sense exhibits a noteworthy increase in the primates, the significance of which it would be difficult to exaggerate in the later stages, when the simian are giving place to the distinctively human characteristics.

The high specialization of the sense of sight awakened in the creature the curiosity to examine the objects around it with closer minuteness, and supplied guidance to the hands in executing more precise and more skilled movements than the tree shrew attempts. Such habits not only tended to develop the motor cortex itself, trained the tactile and kinaesthetic senses, and linked up their cortical areas in bonds of more intimate associations with the visual cortex, but they stimulated the process of specialization within or alongside the motor cortex of a mechanism for regulating the action of that cortex itself—an organ of attention which coordinated the activities of the whole neopallium so as the more efficiently to regulate the various centers controlling the muscles of the whole body. In this way not only is the guidance of all the senses secured, but the way is opened for all the muscles of the body to act harmoniously so as to permit the concentration of their action for the performance at one moment of some delicate and finely adjusted movement.

⁵ "On the Morphology of the Brain in the Mammalia, with Special Reference to that of the Lemurs, Recent and Extinct," Trans. Linn. Soc. Lond., second series; Zoology, Vol. 8, part 10, Feb., 1903.



THIRD STAGE OF THE HISTORY.

White-throated Sapajou (*Cebus hypoleucus*), a platyrrhine monkey of tropical America. The platyrrhine apes were the ancestors of the catarrhine forms, and therefore represent another step as we ascend the family tree of *Homo sapiens*. It is, of course, not to be understood that this or any of the other mammals shown in this series are considered ancestors of man; but it is to be thought that this Sapajou and the present primates, including man, are both descended from a platyrrhine form of the old world, which has probably undergone very little change in its descent to the sapajou, but from which man's ancestors diverged through forms like the langur and gibbon. Photographed by Elwin R. Sanborn of the New York Zoological Society. (Fig. 2.)

In some such way as this there was evolved from the motor area itself, in the form of an outgrowth placed at first immediately in front of it, a formation, which attains much larger dimensions and a more pronounced specialization of structure in the primates than in any other order; it is the germ of that great prefrontal area of the human brain which is said to be "concerned with attention and the general orderly coordination of psychic processes,"⁸ and as such is, in far greater measure than any other part of the brain, deserving of being regarded as the seat of the higher mental faculties and the crowning glory and distinction of the human fabric.

* * * * *

Thus the outstanding feature in the gradual evolution of the primate brain is a steady growth and differentiation of precisely those cortical areas which took on an enhanced importance in the earliest primates.

So far in this address I have been delving into the extremely remote, rather than the nearer, ancestry of men, because I believe the germs of his intellectual preeminence were sown at the very dawn of the Tertiary period, when the first anaptomorphid began to rely upon vision rather than smell as its guiding sense. In all the succeeding ages since that remote time the fuller cultivation of the means of profiting by experience, which the tarsiod had adopted, led to the steady upward progression of the primates. From time to time many individuals, finding themselves amidst surroundings which were thoroughly congenial and called for no effort, lagged behind; and in *Tarsius* and the lemurs, the New World monkeys, the Old World monkeys, and the anthropoids, not to mention the extinct forms, we find preserved a series of these laggards which have turned aside from the highway which led to man's estate.

The primates at first were a small and humble folk, who led a quiet, unobtrusive, and safe life in the branches of trees, taking small part in the fierce competition for size and supremacy that was being waged upon the earth beneath

them by their carnivorous, ungulate, and other brethren. But all the time they were cultivating that equable development of all their senses and limbs, and that special development of the more intellectually useful faculties of the mind which, in the long run, were to make them the progenitors of the dominant mammal—the mammal which was to obtain the supremacy over all others, while still retaining much of the primitive structure of limb that his competitors had sacrificed. It is important, then, to keep in mind that the retention of primitive characters is often to be looked upon as a token that their possessor has not been compelled to turn aside from the straight path and adopt protective specializations, but has been able to preserve some of his primitiveness and the plasticity associated with it, precisely because he has not succumbed or fallen away in the struggle for supremacy. It is the wider triumph of the individual who specializes late, after benefiting by the many-sided experience of early life, over him who in youth becomes tied to one narrow calling.

MAN'S PRIMITIVENESS.

In many respects man retains more of the primitive characteristics, for example, in his hands, than his nearest simian relatives; and in the supreme race of mankind many traits, such as abundance of hair, persist to suggest pithecoïd affinities, which have been lost by the more specialized negro and other races. Those anthropologists who use the retention of primitive features in the Nordic European as an argument to exalt the negro to equality with him are neglecting the clear teaching of comparative anatomy, that the persistence of primitive traits is often a sign of strength rather than of weakness. This factor runs through the history of the whole animal kingdom. Man is the ultimate product of that line of ancestry which was never compelled to turn aside and adopt protective specialization either of structure or mode of life, which would be fatal to its

⁸ J. S. Bolton "The Functions of the Frontal Lobes," *Brain*, 1903.



FOURTH STAGE OF THE HISTORY.

The spectral tarsier (*Tarsius borneanus*), a lemur or lemuroid from Borneo which Dr. Smith considers to be the most primitive of the primates. Its ancestors, probably not much different from the tarsier of the present day, are then to be considered the ancestors of all the primates including man. The progress of the tarsiod toward domination of the world is due, the writer thinks, to the development of the prefrontal area of the brain, which gave it the power to profit by experience. (Fig. 3.)

plasticity and power of further development.

Having now examined the nature of the factors that have made a primate from an insectivore and have transformed a tarsiod prosimian into an ape, let us turn next to consider how man himself was fashioned.

* * * * *

THE ORIGIN OF MAN.

In the remote Oligocene, a catarrhine ape, nearly akin to the ancestors of the Indian sacred monkey, *Semnopithecus*,

became definitely specialized in structure in adaptation for the assumption of the erect attitude; and this type of early anthropoid has persisted with relatively slight modifications in the gibbon of the present day. But if the earliest gibbons were already able to walk upright, how is it, one might ask, that they did not begin to use their hands, thus freed from the work of progression on the earth, for skilled work, and at once become men? The obvious reason is that the brain had not yet attained a sufficiently high stage of development to provide a sufficient amount of useful skilled work,

apart from the tree climbing, for these competent hands to do.

The ape is tied down absolutely to his experience, and has only a very limited ability to anticipate the results even of relatively simple actions, because so large a proportion of his neopallium is under the dominating influence of the senses.

Without a fuller appreciation of the consequences of its actions than the gibbon is capable of, the animal is not competent to make the fullest use of the skill it undoubtedly possesses. What is implied in acquiring this fuller appreciation of the meaning of events taking place around the animal? The state of consciousness awakened by a simple sensory stimulation is not merely an appreciation of the physical properties of the object that supplies the stimulus; the object simply serves to bring to consciousness the results of experience of similar or contrasted stimulations in the past, as well as the feelings aroused by or associated with them, and the acts such feelings excited. This mental enrichment of a mere sensation so that it acquires a very precise and complex meaning is possible only because the individual has this extensive experience to fall back upon; and the faculty of acquiring such experience applies the possession of large neopallial areas for recording, so to speak, these sensation factors and the feelings associated with them. The "meaning" which each creature can attach to a sensory impression presumably depends, not on its experience only, but more especially upon the neopallial provision in its brain for recording the fruits of such experience.

Judged by this standard, the human brain bears ample witness, in the expansion of the great temporo-parietal area, which so obviously has been evolved from the regions into which visual, auditory, and tactile impulses are poured, to the perfection of the physical counterpart of the enrichment of mental structure, which is the fundamental characteristic of the human mind.

The second factor that came into operation in the evolution of the human

brain is merely the culmination of a process which has been steadily advancing throughout the primates. I refer to the high state of perfection of the cortical regulation of skilled movements, many of which are acquired by each individual in response to a compelling instinct that forces every normal human being to work out his own salvation by perpetually striving to acquire such manual dexterity.

MAN AND GORILLA.

This brings us to the consideration of the nature of the factors that have led to the wide differentiation of man from the gorilla. Why is it that these two primates, structurally so similar and derived simultaneously from common parents, should have become separated by such an enormous chasm, so far as their mental abilities are concerned?

There can be no doubt that this process of differentiation is of the same nature as those which led one branch of the Eocene tarsiods to become monkeys while the other remained prosimiae; advanced one group of primitive monkeys to the catarrhine status, while the rest remained platyrrhine; and converted one division of the Old World apes into anthropoids, while the others retained their old status. Put into this form as an obvious truism, the conclusion is suggested that the changes which have taken place in the brain to convert an ape into man are of the same nature as, and may be looked upon merely as a continuation of, those processes of evolution which we have been examining in the lowlier members of the primate series. It was not the adoption of the erect attitude or the invention of articulate language that made man from an ape, but the gradual perfecting of the brain and the slow upbuilding of the mental structure, of which erectness of carriage and speech are some of the incidental manifestations.

The ability to perform skilled movements is conducive to a marked enrichment of the mind's structure and the high development of the neopallium, which is the material expression of that enrichment. There are several reasons



FIFTH STAGE OF THE HISTORY.

The squirrel shrew (*Tupaia chrysura*), probably not widely different from its ancestor which gave rise to the lemuroids and thereby to the primates. The arboreal life of this creature undoubtedly had an important part in fitting it to progress upward, since it allowed the senses of sight, touch and hearing to be developed equably, and removed the animal from the fierce competition going on among larger mammals on the ground below him. These changes in habit were accompanied by changes in the structure of the brain, which made further evolution possible.

Even as far back as this stage in man's history, the beginning of the use of the fore-feet as hands is seen, as it is with the common squirrels, for the tree-shrews often sit on their hind legs and hold their food in their forepaws. They are largely insectivorous, and are agile, active creatures. The life in the trees of man's ancestors at a similar stage undoubtedly tended to develop this agility and quickness of movement which depends on the coordination of many muscles; and natural selection weeded out those who did not show progress along the chosen line. Thus the growth of the powers of the brain, which has largely contributed to make man the dominant mammal, received an impetus from the arboreal life of his ancestors, the importance of which it is difficult to overestimate. Photograph from the Brooklyn Institute of Arts and Sciences. (Fig. 4.)

why this should be so. The mere process of learning to execute any act of skill necessarily involves the cultivation, not only of the muscles which produce the movement, and the cortical area which excited the actions of these muscles, but in even greater measure the sensory mechanisms of the neopallium which are receiving impressions from the skin, the muscles, and the eyes, to control the movements at the moment, and incidentally are educating these cortical areas, stimulating their growth, and enriching the mental structure with new elements of experience. Out of the experience gained in constantly performing acts of skill the knowledge of cause and effect is eventually acquired. Thus the high specialization of the motor area, which made complicated actions possible, and the great expansion of the temporo-parietal area, which enabled the ape-man to realize the "meaning" of events occurring around it, reacted one upon the other, so that the creature came to understand that a particular act would entail certain consequences. In other words, it gradually acquired the faculty of shaping its conduct in anticipation of results.

MAN LEAVES THE TREES.

Long ages ago, possibly in the Miocene, the ancestors common to man, the gorilla, and the chimpanzee became separated into groups, and the different conditions to which they became exposed after they parted company were in the main responsible for the contrasts in their fate. In one group the distinctive primate process of growth and specialization of the brain, which had been going on in their ancestors for many thousands, even millions, of years, reached a stage when the more venturesome members of the group, stimulated perhaps by some local failure of the customary food, or maybe led forth by a curiosity bred of their growing realization of the possibilities of the unknown world beyond the trees which hitherto had been their home, were impelled to issue forth from their forests, and seek new sources of food and new surround-

ings on hill and plain wherever they could obtain the sustenance they needed. The other group, perhaps because they happened to be more favorably situated or attuned to their surroundings, living in a land of plenty which encouraged indolence in habit and stagnation of effort and growth, were free from this glorious unrest, and remained apes, continuing to lead very much the same kind of life (as gorillas and chimpanzees) as their ancestors had been living since the Miocene or even earlier times. That both of these unenterprising relatives of man happen to live in the forests of tropical Africa has always seemed to me to be a strong argument in favor of Darwin's view that Africa was the original home of the first creatures definitely committed to the human career; for while man was evolved amidst the strife with adverse conditions the ancestors of the gorilla and chimpanzee gave up the struggle for mental supremacy simply because they were satisfied with their circumstances; and it is more likely than not that they did not change their habitat.

The erect attitude, infinitely more ancient than man himself, is not the real cause of man's emergence from the simian stage; but it is one of the factors made use of by the expanding brain as a prop still further to extend its growing dominion, and by fixing and establishing in a more decided way this erectness it liberated the hand to become the chief instrument of man's further progress.

In learning to execute movements of a degree of delicacy and precision to which no ape could ever attain, and the primitive ape-man could only attempt once his arm was completely emancipated from the necessity of being an instrument of progression, that cortical area which seemed to serve for the phenomena of attention became enhanced in importance. Hence the prefrontal region, where the activities of the cortex as a whole are, as it were, focused and regulated, began to grow until eventually it became the most distinctive characteristic of the human brain, gradually filling out the front of



SIXTH STAGE OF THE HISTORY.

Jumping shrew of East Africa (*Petrodromus tetradactylus*). An ancestral and probably not dissimilar form of this insectivore is to be looked upon as representing man's ancestors in the Eocene period or earlier—a period which is to be dated one or perhaps several millions of years ago. At this time man's ancestors "lived essentially in an atmosphere of odors;" the sense of smell was the only one well developed. When they took to an arboreal life, they emancipated themselves from the dominance of this sense of smell, and thus, Dr. Smith thinks, started on the course which finally led to the evolution of man. Photograph from the Brooklyn Institute of Arts and Sciences.

That tropical Africa may have been the region where man's direct ancestors developed, was suggested by Darwin, and Dr. Smith looks with favor on the suggestion. Ancestors who did not progress, who fell by the wayside, are still there, he points out. It may be supposed that they found their environment perfectly congenial, had no reason to change it, and so stayed where they are and thus lost the impetus to evolution which a change of environment would have given. Man's direct ancestors, for some reason, left their homes and branched out into new fields, where variation and natural selection had a chance to accelerate their development. (Fig. 5.)

the cranium and producing the distinctively human forehead. In the diminutive prefrontal area of *Pithecanthropus*,⁷ and to a less marked degree, Neanderthal man,⁸ we see illustrations of lower human types, bearing the impress of their lowly state in receding foreheads and great brow ridges. However large the brain may be in *Homo primigenius*, his small prefrontal region, if we accept Boule and Anthony's statements, is sufficient evidence of his lowly state of intelligence and reason for his failure in the competition with the rest of mankind.

The growth in intelligence and in the powers of discrimination no doubt led to a definite cultivation of the esthetic sense; which, operating through sexual selection, brought about a gradual refinement of the features, added grace to the general build of the body, and demolished the greater part of its hairy covering. It also led to an intensification of the sexual distinctions, especially by developing in the female localized deposits of fatty tissue, not found in the apes, which produced profound alterations in the general form of the body.

⁷ Eug. Dubois, "Remarks upon the Brain-cast of *Pithecanthropus*," Proc. Fourth Internat. Cong. Zool., Aug., 1898, published Cambridge, 1899, p. 81.

⁸ Boule and Anthony, "L'encephale de l'homme fossile de la Chapelle-aux-Saints," L'Anthropologie, tome 22, No. 2, 1911, p. 50.

What Eugenics Means.

A plea for more care in the use of the word "eugenics" is made by Roswell H. Johnson in the last number of the *American Journal of Sociology* (XX, 1, 98, July, 1914). He points out the attempt of euthenists to appropriate the word to describe hygienic legislation, sex education, and even a milk and ice station for infants. Such a use, he shows at length, was never contemplated by Sir Francis Galton, who coined the word. He proposes that the term "projected euthenics" be used to cover euthenics that has as its avowed object the bettering of a new generation—for instance, by giving babies a proper start in life. Those who call themselves eugenicists may then, he says, "give their whole attention to those problems of heredity and selection which they are peculiarly fitted to handle."

Genetics and Eugenics.

By way of conclusion we may then say that the experimental study of inheritance in plants and animals is one of the main foundations upon which progress in scientific eugenics must rest. Genetics is at once the guide and the support of eugenics.—Raymond Pearl, in the *Eugenics Review* (1911).

Eugenic Legislation.

Legislating may be said to be a favorite American universal panacea for social evils. It is cheap, at least. * * * Is it not time that legislators stopped to think if there is any knowledge extant upon which to base their laws and, if not, to make an appropriation to get the knowledge? Today, if a legislature is urged to cure any social evil it proceeds to look for, and, if found, to copy any other legislation on the subject, but not to spend a dollar on the study of the subject. Very slowly, but I trust none the less surely, will legislation come to recognize that research is a basic function of the State.—Charles B. Davenport: *Eugenics Record Office Bulletin No. 9* (State Laws Limiting Marriage Selection) (1913.)