

MAN'S PLACE AMONG THE PRIMATES¹).

By

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The founders of the science of anthropogeny recognized man as a member of the mammalian order of Primates, and modern anthropologists, in the light of many subsequent observations, regard this as a fact of record. The majority of anthropologists likewise accept the decision of the founders that the living anthropoid apes, especially the chimpanzee and the gorilla, are man's nearest living relatives. But as to the exact nature of the relationships between man and the anthropoids and as to the geologic epoch in which the two families became separated, several investigators dissent from the conclusions of the majority.

Professor WOOD JONES has defended the claims of *Tarsius* for the honor of being man's nearest relative, but it may be said that his stimulating work has called forth considerable evidence in rebuttal.

In 1927 Professor HENRY FAIRFIELD OSBORN, adapting to his own views the phylogenetic tree worked out by Professor J. H. MCGREGOR and myself, sharply separated the families Simiidae and Hominidae at least as far back as basal Oligocene or even Eocene times. This was not far from the conclusion of Sir ARTHUR KEITH, who tentatively placed the time of divergence between man and the great apes in the Upper Oligocene, and now a similar view is defended by Doctor LEAKEY.

At the opposite extreme, Professor HANS WEINERT in 1932 published a phylogenetic tree in which the point of divergence of man from the chimpanzee is dated as late as the Upper Pliocene.

¹) Read before the International Congress of the Anthropological and Ethnological Sciences, London, July 31 to August 4, 1934. Abstract published in the Proceedings of the Congress.

Dr. ROBERT BROOM, the eminent South African palaeontologist, in his recent book "The Coming of Man: Was It Accident or Design?" places the point of divergence of man from *Australopithecus* as late as Lower Pliocene.

I believe that this disagreement in results is due not to any material differences as to facts, but chiefly to different postulates as to the modes of evolution.

Most palaeontologists have not only accepted DOLLO's law of the irreversibility of evolution but seem to have extended it to mean that during phylogeny a change in the relative lengths of one part to another, when once initiated, continues in the same direction until the phyletic line becomes extinct. Undoubtedly this viewpoint is based upon a large number of actual fossils. For example, in the *Dolichorhinus* group among the late Eocene titanotheres described by Professor OSBORN (1929) it is plain that the skull, already dolichocephalic in the older forms, becomes hyperdolichocephalic in the later members of the phylum. In one of the Lower Oligocene phyla the relatively earlier stage, *Brontops brachycephalus*, has a short wide head, and in its descendant, *Brontops robustus*, this condition is further emphasized. Such are our impressions of undeviating evolution if we limit our attention only to the very short sections of phylogenetic history that we can follow in a single phylum.

But the comparative study of fossil and recent mammals of many families has convinced me that there have often been marked changes in the direction of evolution. I have elsewhere pointed out²⁾ that the skulls of all the oldest and most primitive perissodactyls were strongly dolichocephalic, that in some lines there was a marked widening of the skull which finally resulted in hyperbrachycephalism and that even in the dolichocephalic lines there was a greater or less degree of widening. Again, the feet of primitive unguiculate mammals of Eocene and later times were relatively short and spreading, but in the ancestral perissodactyls the digits became elongate and the carpus narrow; in some lines the feet then became extremely long and narrow, as in the Equidae, but in others, including the rhinoceroses and titanotheres, after an initial period of lengthening, a tendency

²⁾ GREGORY, WILLIAM K., in "The Titanotheres of Ancient Wyoming, Dakota and Nebraska" by HENRY FAIRFIELD OSBORN. Vol. II, pp. 828 to 833.

toward widening supervened and resulted in so-called brachypodal feet, which were thus derived eventually from dolichopodal feet.

In short, the evidence suggests that palaeontologists, through the habit of looking at phyla over short and broken segments, are apt to become believers in undeviating evolution and to forget that often there is also such a thing as transformation or a marked change in the direction of skeletal proportions and ratios. Man, for example, has relatively long legs and short arms and if we insist that his remote ancestors must have the same proportions, we lose sight of the evidence that a veritable transformation of proportions has indeed occurred.

The same contrast in viewpoint holds with regard to the origin of the human thumb. If we insist that the remote ancestors of man must not have a short thumb, then we shall exclude from such ancestry all known forms and we shall overlook the direct evidence of comparative anatomy that the thumb of man has actually lengthened.

Of a somewhat similar kind is the objection of Dr. GERRIT S. MILLER³) that since the anthropoids normally throw their hallux sharply inward in walking, man could never be derived from a form with an inwardly directed hallux. But the evidence of comparative osteology suggests that the hallux was drawn toward the other digits and that the facet of the entocuneiform became flattened. This view has been supported in detail by the investigations of Professor ADOLPH SCHULTZ.

A more serious objection was made by both Dr. GERRIT S. MILLER and Professor WOOD JONES, namely, that in man the hallux is securely tied to the other toes by the deep transverse metatarsal ligament, whereas in the anthropoids no such structure is present. But my colleague Mr. H. C. RAVEN has pointed out that the hallux of a chimpanzee, although widely divergent, is tied to the other digits by abundant ligamentous tissue and that apparently all that would be necessary would be for this tissue to shorten up and become strengthened so as to give rise to the deep transverse ligament, as the gap between the hallux and the second digit diminished.

³) MILLER, G. S., 1920. Conflicting Views on the Problem of Man's Ancestry. Amer. Journ. Phys. Anthrop., Vol. III, No. 2, April-June, 1920, pp. 213—245.

That man originated during the course of a profound transformation of proportionate dimensions is suggested by the fact that in spite of wide differences from the anthropoids in his habits, he is allied with them by a large number of qualitative agreements in many different parts of the body. Under this head I may cite, as a few examples:

(1) the qualitative resemblances between the humerus of man and those of the gorilla and chimpanzee⁴);

(2) the qualitative resemblances in the crown patterns of the molar teeth between the fossil anthropoid *Dryopithecus* and recent anthropoids and primitive men⁵);

(3) the very far-reaching identity in ground-plan in the skull of chimpanzee and man joined with differences in proportionate development of certain parts in man. As I have considered Professor WOOD JONES's objections to this on other occasions⁶), I will only refer to the matter in passing;

(4) the profound qualitative identity in ground-plan of the brain of man as a whole with those of the anthropoid apes, a fact abundantly attested by observers;

(5) the curious "all-pervasive" likeness of details in many special parts of the brain of man and anthropoids, as in the region of the nucleus dentatus cited by Professor TILNEY⁷);

(6) the convincing identity between the placentation of anthropoids and that of man, as described in the monograph of Professor J. P. HILL⁸).

In the presence of great numbers of such agreements between man and ape, the suggestion of "homaeomorphy" or "parallelism",

⁴) GREGORY, WILLIAM K., 1928. Were the Ancestors of Man Primitive Brachiators? Proc. Amer. Philos. Soc., LXVII, No. 2, pp. 129—150, 5 figs., 4 pls.

⁵) GREGORY, WILLIAM K., and MILO HELLMAN, 1926. The Dentition of *Dryopithecus* and the Origin of Man. Anthropol. Papers, Amer. Mus. Nat. Hist., XXVIII, Part I, 123 pp., 32 figs., 25 pls., 52 tables.

⁶) GREGORY, WILLIAM K., 1934. Man's Place among the Anthropoids. Oxford. The Clarendon Press.

⁷) TILNEY, FREDERICK, 1928. The Brain from Ape to Man. New York. 2 vols.

⁸) HILL, J. P., Croonian Lecture: The Developmental History of the Primates. Philos. Trans. Roy. Soc. London, Series B, Vol. 221, pp. 45—178, 21 pls.

which has been so frequently raised, seems to rest largely upon rather vague analogies.

In a recent expedition sent by Yale University to the Siwaliks, Mr. GEORGE EDWARD LEWIS⁹⁾ found certain jaws and teeth which left him in doubt whether they ought to be referred to the Simiidae or to the Hominidae. Up to the present the fossil record has yielded no reliable indication that man antedates the Upper Miocene, while the many qualitative agreements between man and existing anthropoids seem inconsistent with the supposed separateness of the Hominidae in the early Eocene.

I therefore desire to put forward the following thesis: the *qualitative agreements* between man and the anthropoid apes, such as are found in the brain, in the placentation, in the reproductive organs and in various physiological reactions, reveal the relatively close relationship of man to those animals; the *quantitative disagreements* between man and chimpanzee, such as the great relative lengths of man's legs, of the great toe, thumb, etc., and the greater volume of his brain, are in each case complex quantities made up of a number of factors, including the amounts due to divergence, to parallelism and to common inheritance from a still more remote past; many important *qualitative distinctions*, such as differences in hair pattern, the powers of articulate speech and verbalized reasoning, have been acquired by man during a period of lengthening childhood and maturity following the parting of the ways between the nascent Hominidae and the ancestral apes, as suggested by DAVIDSON BLACK¹⁰⁾.

As to the time of this separation, if we grant that some of the eoliths from late Tertiary formations are true artifacts, the advocates of early Tertiary man have still to prove that the twelve-million-odd years assigned by Professor SCHUCHERT to the Pliocene and the sixteen millions of years of the Miocene are together not sufficient for the transformation of a *Dryopithecus*-like ape into a *Sinanthropus*-like hominid.

⁹⁾ LEWIS, G. EDWARD, 1934. Preliminary Notice of New Man-like Apes from India. Amer. Journ. Sci., Vol. XXVII, March, 1934, pp. 161—179, 2 pls.

¹⁰⁾ BLACK, DAVIDSON, 1925. Asia and the Dispersal of Primates. Bull. Geol. Soc. China, Vol. IV, No. 2, pp. 133—183, 9 pls.

In conclusion, the undetermined time since the parting of the ways between apes and man has left a mass of quantitative differences belonging to different categories, including factors due to divergence, to parallelism and to inheritance from the common stock and from the still more remote past. Even when the time of initial separation of the Hominidae and Simiidae shall have been determined, we shall still have plenty to do in evaluating and distinguishing the different categories of quantitative differences. In short, the mere adding and averaging of such resemblances and differences as between man and the anthropoid apes can often lead to sterile numerical results.

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