



Review

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Le Crâne des Anthropomorphes, Croissance Relative, Variabilité, Évolution. By NICOLÉ HEINTZ. 2 volumes, viii + 122 pp. + 94 graphs. Koninklijk Museum voor Midden-Afrika, Tervuren, Belgie Annalen, Nieuwe Reeks in-4° Zoologische Wetenschappen, No. 6. 1966.

The present work attempts to elucidate the evolutionary relationships of the Hominoidea through examination of the relative growth patterns of the cranium of both its living and fossil members. Secondary to this is the search for the metrical features that separate the various species with the greatest reliability.

Volume one contains the text of the work divided into an introduction, chapters on the cranial base, cranial vault, thickness of the cranial vault at glabella and inion, and face, a conclusion and appendix. Volume two comprises graphic representations of the data given in total in the appendix (34 measurements), for *Homo*, *Pan*, *Gorilla*, *Pongo*, *Hylobates* and *Symphalangus*. Among the non-human primates the figures for each character are divided into the age periods milk dentition, eruption of M_1 , eruption of M_2 and eruption of M_3 (adult). For man, additional data are provided for neo-natal infants. For each of these series we are given the sample size, mean, standard deviation and the coefficient of variation.

The presentation of information in tabular form in volume two is designed to supplement and clarify the text. The order is similar to the discussion in volume one. In each graph the measurements are presented in pairs, one on each axis. Different symbols are used to represent the individuals of the various species under consideration. Fossil forms are represented in red to distinguish them from the living. All individuals measured are indicated.

The task attempted is an extremely large and difficult one. It is the type of work that is required in the elucidation of the varying growth patterns within primate taxa. For this reason Dr. Heintz is to be commended. However, several pitfalls occur that tend to reduce its total value. First of all there are definite limitations in sample size. The total sample for *Homo* is only 227 individuals and of these only 55 are adult (M_3 fully erupted). Though there are 380 non-human primates, these are spread over five species ranging from 178 chimpanzees to 15 *Symphalangus* (I am not concerned whether this is a distinct genus). This makes any conclusions very tentative. For any age group of any species the sample size is seldom greater than 50 and is quite frequently less than 10. Added to this is the lack of any true statistical analysis. The question of the significance of group separations is approached subjectively using the degree of group overlap, a rather misleading indicator if the coefficient of variation differs to any great extent between measurements.

A second problem surrounds the presentation of the individual measurements in the graphs. For each species the data for all individuals, infant through adult, are presented with no indication of age or even delimitation of broad age groups. For example, there is a problem in distinguishing large juveniles from small adults within a particular species, or determining whether the overlap between two species for any feature is between adults of both groups or of juveniles in one and adults in the other etc. Though it is clear that the extremes of variation for a species represent infants and adults, further separation is entirely guesswork. These two problems reduce the value of this work as a source of information for other workers.

There are also data from the hominid fossil record. This includes Australopithecines (in the broadest sense), *Homo erectus*, Neandertals and Upper Paleolithic *Homo sapiens*. These are informative in several ways. Not only do they show to what extent these forms are metrically within the range of variation of modern man, but clearly indicate those features defining hominids through time. In other features examined it

is clear that the smaller-brained hominids are intermediate between *Homo sapiens* and the pongids, or within the range of variation of the pongids. These are measurements that are simply dependent on brain size, not marking a basic hominid as against pongid pattern. Four basic features or trends are shown by Heintz to distinguish hominids from pongids even in infants and early Pleistocene forms. These are parietal breadth, facial shortness, parietal length and angulation of the frontal.

The comparison of measurements in pairs in the graphs shows the differences in the relative growth of features. Heintz distinguishes five growth patterns that she feels represent specializations of varying antiquity. These are, 1) growth pattern similar in all groups, 2) direction of relative growth parallel in all groups (size being the only distinguishing factor), 3) one group retains fetal growth direction, others showing a sharp divergence in direction from a relatively early stage, 4) patterns identical at birth becoming rapidly divergent for each lineage shortly thereafter (a fan arrangement), and 5) direction of growth quite different from the earliest stages. Of these the first two are said to have no phylogenetic separation and the fifth ancient specialization and marked genetic differentiation. While this may all be so it appears to be mainly intuitive in basis and requiring much more research. We know relatively little about the length of time required to produce changes in basic growth patterns, changes that must vary greatly in their antiquity and be dependent on the nature of the selection pressures on the various portions of the organism.

In general this volume attempts to fill some of the gaps in our knowledge of the relative growth patterns of hominoid crania, and their evolutionary significance. Differential growth is emphasized as a major factor in the separation of hominid, pongid and hylobatid lineages. The attempt is to be praised as a basic project. Problems involve sample size and statistical treatment. It is to be hoped that Dr. Heintz will follow this work with larger samples and modern statistical methods.

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