

EVOLUTION OF EARLY MAN IN INDIA—PERSPECTIVES AND ISSUES¹

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Upwards of a century of painstaking investigations in the Sivaliks have yielded large primate fossil material. The entire spectrum of research work and fossil collections have been summarised in earlier communications with the important implications that this material has for human origins in India (Chopra, 1974, 1978, 1979, 1983). Although collections of Sivalik fossil primates are large and important for the understanding of primate evolution, one must bear in mind what has been said earlier, "Since the glacial period...the deposits and geological formations of the Pleistocene in which we could most advantageously study the earliest traces of primitive man, are in the greatest degree inaccessible to our investigations largely due to inadequate funding and scientific planning", (Chopra, 1979). It is against such a background that assessment of fossil primate material including traces of human remains is here sought to be presented. The Sivaliks have yielded diverse fossil material belonging to many primate genera including hominoids, cercopithecoids and prosimians. At this juncture it is not intended to dilate upon detailed descriptions and taxonomic considerations of these finds. It will suffice only to record the magnitude and diversity of such a material.

While the practice of fossil collection in India is ancient, the first serious attempts to their recovery and description were made by Webb, Buckland, Clift, Durand, Baker and Durand, Falconer, and Falconer and Cautley in the first half of the nineteenth century. Their work was supplemented by Lydekker in the later half of the nineteenth century and by Pilgrim, Lewis, Sahni and Prasad in the present century. The fossil primates, which have generally formed a small part of the overall vertebrate fossil finds from India, were first recovered from the Sivalik hills by Falconer and Cautley in the year 1836, (De Terra & Patterson, 1939). Amongst the lower primates descriptions of tree shrews (Chopra, *et al.* 1979; Chopra and Vasisht, 1979). Adapids (Chopra and Vasisht, 1980 a) and *Indraloris* (Lewis, 1933; Tattersall, 1968; Chopra and Vasisht, 1980 b) are available. The cercopithecoids

reported from the Sivaliks include, *Papio* (v Meyer, 1848, Lydekker, 1886, and Verma, 1968), *Cercopithecus* (Pilgrim, 1910), *Semnopithecus* (Lydekker, 1884) and *Macacus* (Lydekker, 1879).

The Sivalik Miocene-Pliocene beds have yielded numerous fossil hominoids which are ancestral to extant lesser and great apes and also the later hominoids. The fossil hominoids of the Sivaliks were first reported by Lydekker (1879, 1884) who described a partial palate assigned to *Palaeopithecus sivalensis* which was renamed *Sivapithecus* by Lewis (1937) and *Dryopithecus* by Simons and Pilbeam (1965). Subsequently, Pilgrim (1910, 1915, 1927) described and proposed new species of fossil hominoids: *Sivapithecus indicus*, *S. middlemissi*, *S. orientalis*, *S. himalayensis*, *Dryopithecus punjabicus*, *D. chinjiensis*, *D. giganteus*, *Palaeosimia rugosidens*, *Palaeopithecus sylvaticus*, *Hylopithecus hysuaricus*. Lewis (1934) also proposed a number of new taxa, namely *Sugrivapithecus solomontanus*, *Dryopithecus cautleyi*, *D. sivalensis*, *Bramapithecus thropei*, *Adaeontotherium incognitum*, on the basis of his further fossil finds consisting of fragments of mandibles, maxillae and teeth. Later, Lewis (1937) proposed a reduction by synonymy of over twenty species and half as many genera of the Sivalik hominoids thus far reported to only four genera and ten species: *Bramapithecus* (*B. punjabicus*, *B. sivalensis*, *B. thropei*); *Ramapithecus* (*R. brevirostris*); *Sivapithecus* (*S. darwini*, *S. giganteus*, *S. indicus*, *S. sivalensis*) and *Sugrivapithecus* (*S. solomontanus*, *S. gregoryi*). Wadia and Aiyengar (1938) provided a list of about eightytwo distinct primates arranged into eleven genera and twentyone species from the Tertiary deposits of the Indian sub-continent.

Prasad (1969 a.b) recovered and described a number of fossil anthropoids from the Nagris at Hariharyangar (HP) and assigned them to *Sivapithecus* (*S. aiyangari*, *S. indicus* and *S. sivalensis*); *Sugrivapithecus* (*S. gregoryi*, and *S. solomontanus*). Simons and Pilbeam (1965) included all the fossil hominoids from the Sivaliks into two genera, namely *Dryopithecus* (Family Pongidae) having three species: *D. laietanus*, *D. sivalensis* and *D. indicus*. The other Sivalik hominoid material

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namely *Dryopithecus punjabicus*; *Ramapithecus brevirostris* (YPM 13799); *Bramapithecus thropei*, *B. ? sivalensis* is included in the genus *Ramapithecus* represented by a single species—*R. punjabicus*. Prasad (1978) does not consider *Ramapithecus* to be monotypic but recognises two species—*R. punjabicus* (Pilgrim) and *R. brevirostris* (Lewis). Pandey and Sastri (1968) described a new species from the Nagri beds of Kangra District (HP) and assigned it to *Sivapithecus lewisi*. Gupta (1969) reported additional dryopithecine material from Kangra which he assigned to *Sivapithecus indicus*. Further to this, Sahni *et al.* (1974) described additional primate material which they assigned to *Ramapithecus* and *Dryopithecus*.

Researches made over the past two decades by the author and his co-workers have resulted in the recovery of additional and newer hominoid fossils from the Sivalik hills of North-West India. Chopra (1968 a, b) and Simons and Chopra (1969 a, b) reported on a hominoid mandible and assigned it to *Gigantopithecus bilaspurensis*. This genus shows greater affinity with pongids than with hominids, like a marked reduction of the front teeth, relatively small canine, and manner of tooth wear. A particularly distinctive feature of the molars is the extraordinary flatness of their occlusal surfaces. It would appear that this species represents a divergent branch of the pongidae with parallelisms in dental characteristics foreshadowing hominid trends. Additional dryopithecine material, consisting of a fragment of a left mandible, an isolated lower first molar and a crown of a lower last molar, was recovered from the Nagri beds of Haritalyangar (HP) and assigned to *Sivapithecus sivalensis* and *S. indicus* (Chopra & Kaul, 1975). A hominoid tooth, left M³, recovered from Haritalyangar was described by Chopra (1978) and Chopra & Kaul (1979) and assigned to a new species—*Pliopithecus krishnaini*. This find has recently been placed in a new genus *Krishnapithecus* by Ginsburg & Mein (1980). Chopra (1983) described a new genus and species, *Sivasimia chinjiensis*. The material consists of an isolated left molar M¹ which in its cusp morphology and strongly wrinkled enamel on the occlusal surface bears a striking resemblance to the Asian orangutan, *Pongo pygmaeus*.

The diverse fossil primates from the Sivaliks generally represent most of the major taxonomic categories that one could expect to exist in this region of the world. If one were to juxtapose this diversity against the environments that existed at that time, the picture becomes more meaningfully focussed. Such a task, however, is not without obstacles to it. Vishnu-Mittre (1979), in an extensive coverage reconstructing the environment of early man in North-West India,

points out the difficulties of such an attempt. He finds the information patchy with large areas of land where no information is available. He has suggested that more collections of megafossils be made and inferences drawn regarding palaeoenvironments. Basing his reconstruction of early human environments on palaeobotanical evidence, particularly palynological, Vishnu-Mittre (1979) suggests that the oceanic tropical wet climate characterised the entire northwestern and western region during the Eocene and most of the Miocene with closed forests interspersed with swamps and marshes perhaps forming the then landscape. Forests were most likely tropical semi-evergreen with tropical deciduous mixture. According to him progressive drying up of the climate took place from about the mid-Miocene to the historical period. The temperatures changed to continental and cool with a considerable reduction in precipitation.

The onset of the present decade in palaeo-anthropological researches has witnessed the genesis of a debate on the nature, type and emergence of the earliest hominids. Much of this debate has its roots in a symposium held in Florence in 1981 which, in essence, was and is an attempt to dovetail the biomolecular clock to newer finds from the Potwar region of Pakistan and the Afar Depression in Ethiopia. As a result the status of *Ramapithecus*, as the earliest known hominid, is challenged by a group of scientists. The consequential implications assume the character of drastic changes which would seek to revise the currently held views on human evolution. Primarily this debate replaces the *Ramapithecus* by as yet an undiscovered species as the earliest hominid which Kay and Simons (1983) feel may be found from deposits 7 to 4 million years old.

This controversy warrants a considered opinion of a wider body of students of human origins. The basic issue, therefore, will relate to the appraisal of the hominid status of the Miocene *Ramapithecus*. Another issue that needs examination is the implication of the biomolecular clock vis-a-vis comparative anatomical methods in the determination of evolutionary relationships. Further the underlying issue in this debate which relates to the question of the scenario of the origin of the hominidae becomes importantly relevant.

Ramapithecus fossil material is now available from an extremely wide geographic range. Lewis (1934) first proposed two species of this taxon and the nomen *Ramapithecus brevirostris* was assigned to the type consisting of "right maxilla and premaxilla with M² M¹ P⁴ P³, the alveolus of the canine, the root of I² and the alveolus of I¹ (YPM 13799)", found near Haritalyangar (HP). The other species *R. hariensis* was based on a type specimen (YPM 13807) consisting of right maxilla with first and second molars. As has

already been said revision by Simons and Pilbeam (1965) reduced the two species into one, *R. punjabicus*. Leakey (1962) diagnosed several teeth as belonging to *Kenyapithecus wickeri* which on re-examination were assigned to *Ramapithecus wickeri* (Simons, 1964, Pilbeam 1966, Andrews, 1971).

Ramapithecine fossils have been recovered from the Potwar Plateau by an expedition of the Yale University and the Geological Survey of Pakistan (Pilbeam 1980, Pilbeam *et al.*, 1982). A jaw (PA 580) was recovered from China and assigned to *Ramapithecus lufengensis* and a jaw and skull (partial PA 548) to *Sivapithecus yunnanensis* (Xu *et al.* 1978, Xu and Lu, 1979). Kretzoi (1975) reported the discovery of Miocene hominoids from Rudabanya (Hungary). Amongst them he reported a specimen *Rudapithecus hungaricus* whose close affinity with *Ramapithecus* was stressed by Kretzoi though he argued for a separate identity of the Hungarian material. Simons (1976), Greenfield (1979), Pilbeam (1979), Szalay and Delson (1979) and Wolpoff (1980) find close affinity of this material with *Ramapithecus*. Ramapithecines are also reportedly known from Greece, Turkey, Germany and Austria.

The hominid status of *Ramapithecus* was not in doubt until about 1979 when Greenfield (1979, 1980) raised the issue finding the adaptive complex of the inferior face region to be that of a pongid. The argument was taken up by Kay (1982) who proposed that *Ramapithecus* be synonymised as *Sivapithecus* thus making it a pongid and not an hominid. The Chinese material reported by Xu *et al.* (1978) and Xu and Lu (1979) was assigned by them to two separate genera *R. lufengensis* and *Sivapithecus yunnanensis*. Kay and Simons (1983) examined photographs of this material and concluded that it was referable to *Sivapithecus*. Indeed, one wonders how conclusive is the assessment of Greenfield (1979, 1980), Kay (1982), and Kay and Simons (1983) especially when the Chinese themselves identified their material into two separate genera *Ramapithecus* and *Sivapithecus*.

The assessment of ramapithecine material at Calcutta, Nairobi and New Haven by Greenfield (1979) which is perhaps the basis for the reassessment of the phyletic status of this genus is fraught with two major pitfalls. First the well known requirement of statistical comparison in terms of sample size is ignored. The comparison is mainly based on the study of specimens YPM 13799 of *Ramapithecus* and GSI-DI, GSI-D196, GSP 11704, GSP 9977/01/05/9564 of *Sivapithecus*. This sample is too small to make definitive statements especially when there is no real indication of the intraspecific variations that may have characterised the genus. Further, Greenfield (1979) and all other pro-

ponents of pongid status for the ramapithecines while admitting the large areas of similarity between *Ramapithecus* and *Australopithecus* dentition surprisingly do not give weight to this factor in their assessment of phyletic relationship. Kay and Simons (1983) explain this to the increased weightage that is sought to be given to the molecular clock evidence, but admit that, "Dentally ramapithecines were much like later hominids in some ways and show the initiation of other hominid trends in a sense, then, ramapithecines are dental hominids." Despite this admission they fall in line with Greenfield (1979), (1980), Kay (1982), Pilbeam *et al.* (1977) and Zihlman *et al.* (1978) in using the nomen *Sivapithecus* for the older *Ramapithecus*. Wolpoff (1983) in a detailed analysis of the ramapithecines and human origins from an anthropological perspective reaches the conclusion which is best stated in his words, "If *Ramapithecus* itself was not a hominid, there is a great likelihood that the earliest hominid was a ramapithecine." Further Simons and Pilbeam (1978) state that the choice whether to classify *Ramapithecus* as a pongid or a hominid is "a matter of taste". Five years later Kay and Simons (1983), with much of the debate on the status of the ramapithecines known to them, state "Whether *Ramapithecus*, *Sivapithecus* and *Gigantopithecus* should be all considered as separate genera or the former two lumped is a matter of taste." It does not require a great stretch of imagination to realize the absence of any real difference between the two viewpoints.

It would thus appear that the underlying motivation for the genesis of this debate is the more recent date of divergence of the hominidae from pongidae as suggested by the molecular clock. The hominid status of the ramapithecine invalidates such a view. In these circumstances it would become obvious that to meet the temporal demands of the molecular clock the traditional methods of study of fossils are sought to be made subservient. The biomolecular clocks is based on antigenic distances, amino acid sequences of proteins, immunodiffusion and micro-complement fixation to assess taxonomic similarity. These methods have, by and large, assumed that the evolutionary rates for macromolecules have not varied over the past millions of years. The biomolecular clock when applied to a cladistic model of hominoid phylogeny suggests that the three genera *Homo*, *Pan* and *Gorilla* had a monophyletic ancestor and the divergence of these lines is 5 ± 1.5 million years ago (Cronin and Meike, 1982). The biomolecular clock, therefore, dates the origin of the hominidae to a more recent date than is suggested by hominid ramapithecines. Further it suggests the divergence of orangutan lineage 10 ± 3 million years ago, (Cronin, 1983). It is evident, therefore, that should biomolecular clock be correct, the ramapithe-

cines need to be removed from human ancestry to that of Pongo ancestry. It is suggested here that the current debate on the reassessment of the phyletic relationships of the ramapithecines must be viewed against this background of the temporal demands of the biomolecular clock.

The major objections to the biomolecular clock are twofold: first the clock's formulation do not accord with the traditionally held interpretations of primate fossil record. Second, the clock's assumption of a temporal uniformity of the evolutionary processes is not impressive. As regards the first objection, it may also be said that the recognition by Kay and Simons (1983) that *Ramapithecus* is a dental hominid while at the same time accepting its reassignment to *Sivapithecus* is in the least incongruous. It is a well known fact that the attainment of the hominid status in dentition is the logical outcome of the process of hominization in posture, and skull (and by implication brain) and does not precede it. Therefore, the hominid status of the dentition suggests that extensive hominization had taken place in the post cranial skeleton. Further the deductions on the locomotion and tool use/manufacture by *Ramapithecus* are best reserved in the absence of any post-cranial skeletal material.

As concerns the second objection, it is observed that sequenced proteins show accelerations and decelerations in their evolutionary history and as such any clock model based on sequenced proteins leaves much to be desired. Goodman *et al.* (1983) suggest that since rates of deceleration increase over a time period, the divergence dates calculated by model have to be accepted with caution and the "clock dates for the divergence points within primates, especially within Anthroidea are far too recent, given the well established fossil evidence". This view by the pioneer of the clock far outweighs the acceptance of the clock dates by its later proponents.

Whatever might emerge from the ultimate analysis of fossil evidence concerning the hominid or otherwise status of *Ramapithecus* one cannot discount the suggestion that in India as in Africa advanced or progressive forms of primates were differentiating from the more conservative stock about 10 to 15 million years ago in the Miocene-Pliocene period. For our evidence to be more conclusive, it would, however, be important to recover more cranial and post-cranial fossil material in the main locomotor stages through which man's ancestors progressed from ape like forms to upright bipeds. Comparing African and Asian finds one notices that the diversification of fossil primates is perhaps not as extensive in Africa as it is in Asia. The Indian sub-continent primarily and Asia generally has yielded rich and diverse collection of primate fossils. In some

cases the finds in India antedate similar finds elsewhere as the Miocene fossil gibbons (*Pliopithecus krishnaii*), orangs (*Sivasimia chinjiensis*) are much older than the Pleistocene forms in South East Asia; as also the Indian *Gigantopithecus bilaspurensis* antedates *G. blacki* from China. It would thus appear that the great diversity of fossil primate fauna in India together with the assessment of the human skeletal remains underlying the Harrappan Civilization will have important implications on the problem of evolution of man in India.

The prehistoric skeletal material is available from a number of locations on the sub-continent including Sialkot, Mohenjo-daro, Harrappa, Nal, in Pakistan; Bayana, Langhnaj, Brahmagiri Yelleswaram and Adichanallur among other regions in North-West and South India. The material is both fragmentary and scanty. The sites at Sialkot, Nal and Bayana have each yielded a single, skull, while Mohenjo-Daro, Adichanallur and Brahmagiri have yielded 14, 13 and 11 skulls, respectively. Harrappa yielded the largest number of skulls numbering 80. On earlier examinations, Keith (1917) and Sewall and Guha (1929, 1931) had attributed this material to a migrant mediterranean population, while Guha and Basu (1938) identified a Proto-Australoid strain. Numerous sites have yielded skeletal material which is indicative of a dolichocephalic population with marked platyrrhine noses. Guha (1937) had preferred to term these people as Proto-Australoid, though Sarkar (1958) feels that a proto-type of an Australoid population is not known and prefers to use the term Australoid to describe it. He further holds that this was the oldest ethnic strain in the make up of the Indian people which formed the basal population of the Indus valley civilization. It is widely held that the Australoids, who are considered as the most primitive racial stock seen in mankind today, evolved on the Indian subcontinent and they seem to exist here long before the earliest migrations took place.

The brevity of this paper and the concomitant vastness of its subject renders it impossible to examine in detail the entire spectrum of human evolution in India. However, this review makes it hopefully evident the one major claim that the Sivalik fossil finds have to fame and to ignore their significance in human evolutionary studies would be a fallacy.

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