NEWS

Appetites, Asian Anthropoid Origins, and the Archontan Enigma: Recent Advances in Evolutionary Anthropology

Evolutionary anthropology is a diverse field, covering primate and human evolution, numerous aspects of primate behavioral ecology, primate (including human) skeletal biology and modern human variation. At no time is this diversity more apparent than at the annual meeting of the American Association of Physical Anthropologists, which took place in San Antonio this April. Several advances and new fossils were divulged and discussed as well as the more controversial aspects that we have come to expect.

ALL FOR ME, NONE FOR YOU

Among the costs and benefits of living in a social group are the complexities surrounding food acquisition. For example, if an individual is particularly expert at finding valuable food resources, how does she prevent her neighbors from bullying her away after food has been discovered? Alternatively, if an individual is a comparatively weak forager or does not want to devote much energy to active foraging, can she just follow her neighbors and share or take their food? Paul Garber and J.C. Bicca-Marques (University of Illinois, Urbana) addressed these questions in an experimental study of social cues during foraging in *Saguinus imperator* and *S. fuscicollis*. They cleverly distributed feeding platforms throughout their study groups' home ranges, a few of which had food rewards and many of which had decoys. The utility of this design is that it allowed the investigators to determine whether individuals scattered and investigated these foraging platforms at random or systematically, or whether social cues allowed some group members to cheat by taking advantage of the foraging skills and energy expended by other group members. Although there were species differences, they did indeed discover that search strategies differed among group members. Producers, of which there were only a few per group, were those individuals that found over 70% of the sources; scroungers, usually highly ranked adult group members, followed producers to feeding sites. Such strategies likely exist among other primates as well. Data on other taxa will have tremendous implications for primate socioecology.

It has been hypothesized that male chimpanzees hunt in order to trade meat for sex with females in estrus. The political and economic demands of meat trading within the social group have also been posited as a major selective force for Machiavellian intelligence in chimps. The data collected by David Watts (Yale) and John Mitani (University of Michigan, Ann Arbor) on chimpanzees at Ngogo, Uganda completely counter these suggestions. Watts and Mitani found that Ngogo males rarely trade meat for sex. Instead, meat was shared on a cooperative basis, dependent more on participation in the hunt. Also, hunting behavior increased with the availability of ripe fruit, suggesting that a dietary or energetic surplus allowed males to spend energy in hunting.

Carel Van Schaik (Duke University) presented data on orangutan foraging that demonstrated how variable meat eating is among hominoids. In contrast to chimpanzees, female orangutans may be more likely to catch and eat meat (including slow lorises on very rare occasions), although Van Schaik emphasized that more data are required. Another fascinating finding was the variation among individual orangutans in dietary choices: Juvenile and subadult males may eat higher proportions of insects and less fruit, and individuals seem to develop dietary specialities, like insectivory.

WILL THE TRUE SISTER GROUP TO PRIMATES PLEASE COME FORWARD?

Tree shrews and plesiadapiformes, once considered primitive primates that have since been cast out into Archonta, are often used as outgroup taxa in cladistic analyses of primates. Tupaiids, the most common and best studied scandentians, share possible synapomorphies with primates, such as a postorbital bar, middle-inner ear morphology, and neurological similarities. However, coding outgroup morphology based solely on tupaiids is complicated by the fact that scandentians are more morphologically diverse than once was thought. Eric Sargis (NYCEP) analyzed the postcranial anatomy of the rare and poorly studied scandentian *Ptilocercus lowii* (pen-tailed tree shrew), and found numerous differences in postcranial morphology that are possibly linked to variation in locomotor behavior between *Ptilocercus* and tupaiids. For example, *Ptilocercus* has a more widely divided trochlea and capitulum on the distal humerus and much shorter transverse and spinous processes on the lumbar vertebrae than do tupaiids. Sargis suggests that *Ptilocercus* has comparatively limited vertebral flexion and extension, which may be linked to more bridging and suspensory locomotion. Of great importance to Eutherian systematics are

the wide and cranio-caudally flattened ribs in *Ptilocercus,* a trait suggested to function in gliding and flying, and one that has long been used to group chiropterans and dermopterans in the Volintantia. This rib morphology in *Ptilocercus* suggests that cranio-caudally flattened ribs may be primitive for archontans and at least weaken the argument for a sister group relationship between bats and colugos. The question of whether *Ptilocercus* or tupaiids represent the primitive condition for scandentians is contentious. However, it is now clear that any cladistic analysis of primates that uses tree shrews as an outgroup must consider and code for all scandentian postcranial morphology.

The recent discovery and analysis of remains of the paromomyid plesiadapiform *Ignacius graybullianus* indicate that archontan interrelationships are as unresolved as ever. Jonathan Bloch (University of Michigan, Ann Arbor) and colleagues described a new ear region in *Ignacius* and noted differences between the internal carotid circulation and the pathway for the internal carotid nerves in this specimen and modern flying lemurs, which had been suggested as sister taxon based on both cranial and postcranial data.[1,2] So, at present, although there is a weak consensus that tree shrews may be the outgroup to primates, how they are related to other archontan mammals is still unclear.

OF ADAPOIDS AND ANTHROPOIDS

Is *Amphipithecus* an anthropoid? If so, this would have major biogeographic implications for the origin of anthropoids. *Amphipithecus* is one of several Asian fossil taxa, including *Siamopithecus, Pondaungia, Wailekia,* and *Bahinia,* which have been hypothesized to represent an Asian radiation of anthropoids.[3] *Amphipithecus* specifically has been suggested to represent the sister taxon to propliopithecids,[4] implying that the sister taxon to catarrhines originated in or dispersed into Asia. However, a poster presentation by Masanaru Takai (Kyoto University, Japan) and colleagues on *Pondaungia* and *Amphipithecus* specimens from the Pondaung Formation, Myanmar, included a photograph of *Amphipithecus* showing a smooth edge on the lateral maxillary orbital floor, an area to which the postorbital septum should attach. This suggests that a postorbital septum, a defining trait of haplorhines, was not present in *Amphipithecus*. The possible lack of a postorbital septum in *Amphipithecus* suggests two possibilities. Either the haplorhine postorbital septum has evolved multiple times (or been lost at least once) or the dental traits cladistically linking *Amphipithecus* to African anthropoids (for example, molar bunodonty, weak-to-lost paraconids, and inflated cusps) are homoplastic. Considering that dental characters in primates are known to evolve homoplastically at a rate at least twice that of the cranium and postcranium,[5] and that there is a robust functional model for the single origin of the haplorhine postorbital septum,[6] perhaps the suggestion made by Szalay years ago,[7] that *Amphipithecus* may be a notharctine adapoid, should be given another look.

David Strait (George Washington University) and Fred Grine (State University New York at Stony Brook) have extended their cladistic analysis of early hominids[8] to include taxa like *Australopithecus bahrelghazali* and *A. garhi,* which have been described subsequent to their original analysis. Strait and Grine evaluated the hypothesis proposed by Asfaw and coworkers[9] that *Australopithecus garhi,* based on similarities of its dentition (oval P^3 occlusal outline), palate (vertically thin and divergent posterior arcades), and cranium (moderate postorbital constriction) to those of *Homo,* is a "candidate" ancestor to early *Homo*. Wisely emphasizing that cladistic analysis does not demonstrate ancestry but only sister taxon affinities, the results of their analysis do not support that hypothesis. Instead, *Paranthropus* is still the cladistically demonstrated sister taxon to *Homo*.

REFERENCES

1 Beard KC. 1993. Phylogenetic systematics of the Primatomorpha, with special reference to Dermoptera. In: Szalay FS, Novacek MJ, McKenna MC, editors. Mammal phylogeny: placentals. New York: Springer-Verlag. p. 129–150.

2 Kay RF, Thewissen JGM, Yoder AD. 1992. Cranial anatomy of *Ignacius graybullianus* and the affinities of the Plesiadapiformes. Am J Phys Anthropol 89:477–498.

3 Ducrocq S. 1998. Eocene primates from Thailand: are Asian anthropoideans related to African ones? Evol Anthropol 7:97–104.

4 Jaeger J-J, Soe AN, Aung AK, Benammi M, Chaimanee Y, Tun T, Thein T, Ducrocq S. 1998. New Myanmar middle Eocene anthropoids: an asian origin for catarrhines? C. R. Acad Sci (Paris) 321:953–959.

5 Ross C, Williams B, Kay RF. 1998. Phylogenetic analysis of anthropoid relationships. J Hum Evol 35:221–306.

6 Ross C. 1996. Adaptive explanation for the origins of the Anthropoidea (Primates). Am J Primatol 40:205–230.

7 Szalay FS. 1970. Late Eocene *Amphipithecus* and the origins of catarrhine primates. Nature 227:355–357.

8 Strait DS, Grine FE, Moniz MA. 1997. A reappraisal of early hominid phylogeny. J Hum Evol 32:17–82.

9 Asfaw B, White T, Lovejoy O, Latimer B, Simpson S, Suwa G. 1999. *Australopithecus garhi:* new species of early hominid from Ethiopia. Science 284:629–635.

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