PALAEOANTHROPOLOGY

Renaissance of Europe's ape

Lawrence Martin and Peter Andrews

Dryopithecus was the first large fossil ape to be discovered but has lingered in obscurity for much of its history. Now it is back in the limelight. On page 543 of this issue[1], Moyà Solà and Köhler describe a new cranial specimen from the middle Miocene of Spain (about 10–12 million years ago) and claim to demonstrate that *Dryopithecus* is not only a member of the group comprising great apes and humans, but is particularly affiliated with the orang utan (*Pongo*). Begun[2] has recently argued that *Dryopithecus* is a close relative of the African apes. These contradictory views raise the question of what we really know about this European ape.

Dryopithecus fontani, the type species of the genus from southern France, was described by Lartet in 1856. In the early part of this century several new species were described from the middle and late Miocene of Indo-Pakistan, and subsequently material from Spain and Czechoslovakia was referred to one or other of the *Dryopithecus* species as well. *Dryopithecus* had thus become established as the default genus into which to put a fossil ape. The 1930s began to see a change from that position in the systematic revision of Lewis[3], who limited the recognition of *Dryopithecus* to Europe. New Miocene fossil apes from China were later described as belonging to the genus, but the basis for this assessment was their resemblance to specimens from Czechoslovakia that are more often considered to belong to *Sivapithecus*, or more recently to *Griphopithecus*.

The main revision of Miocene apes in the modern period was that of Simons and Pilbeam[4], who brought order into chaos by subsuming virtually all genera of Miocene large apes into *Dryopithecus*. But during the past 25 years, with major new discoveries of *Proconsul* and *Sivapithecus*, all workers in the field have come to accept that the taxonomic diversity of Miocene apes greatly exceeds what was recognized by Simons and Pilbeam.

Meanwhile, a steady steam of finds in Germany, Spain and Austria had added to our knowledge of *Dryopithecus*. In the late 1960s and early 1970s two principal collections emerged, the first from a number of localities in northeastern Spain and the second from Rudabánya in Hungary. In the past two years, *Dryopithecus* has leapt to prominence in the study of human origins, partly as a consequence of the recovery of important new cranial specimens from both countries. Begun[2] based his analysis on the Hungarian material, confirming the long-held view that *Dryopithecus* belongs to the great ape/human clade. Subsequently, he has developed his argument that *Dryopithecus* is in fact specifically related to the African ape and human part of this clade[5].

Moyà Solà and Köhler now provide additional evidence that *Dryopithecus* is indeed more closely related to great apes and humans than are the extant gibbons, based on their analysis of the subarcuate fossa. They take their analysis a step further and identify two characters of the zygomatic (cheek) region of the face that they interpret as shared derived between *Dryopithecus* and the orang utan. This in turn would imply that *Dryopithecus*, *Sivapithecus* and *Pongo* form a clade, within the great ape and human clade, that is no longer exclusively Asian in distribution.

Begun, and Moyà Solà and Köhler, cannot both be right. But both conclusions are based on very limited evidence, and neither analysis has settled the problem. For *Dryopithecus* to be either a relative of orang utans or a member of the African ape and human group (that is, to belong within the great ape and human clade), it must first be shown to possess the great ape and human clade synapomorphies for most known characters. Our analyses did not find this to be the case — like Begun, and Moyà Solà and Köhler, we found *Dryopithecus* to retain the ancestral condition for many characters for which great apes and humans share the derived state. Nonetheless, we concur with Begun and Moyà Solà and Köhler that *Dryopithecus* shares some derived characters with great apes and humans that warrant its recognition as the sister group of the great ape and human clade.

With the description and analysis of a second good facial specimen of *Dryopithecus*, this genus becomes one of the best known apes from the Miocene. There will undoubtedly be continuing controversy over its affinities. But whatever the final outcome, the new specimens and recent analyses of the morphology of *Dryopithecus* have demonstrated the critical importance of the only European Miocene ape for understanding hominoid phylogeny and human origins. □

Lawrence Martin is in the Departments of Anthropology and Anatomical Sciences, State University of New York at Stony Brook, New York 11794, USA. Peter Andrews is in the Department of Palaeontology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK.

1. Moyà Solà, S. & Köhler, M. *Nature* **365**, 543–545 (1993).
2. Begun, D. *Science* **257**, 1929–1933 (1992).
3. Lewis, G. E. *Am. J. Sci.* **34**, 139–147 (1937).
4. Simons, E. L. & Pilbeam, D. R. *Folia primatol.* **3**, 81 (1965).
5. Begun, D. *J. hum. Evol.* (in the press).

DAEDALUS

In from the cold

HOWEVER you go about it, slimming is a painful, almost masochistic endeavour. You must either take in fewer calories, or expend more of them. The second option is usually achieved by exercise, but exposure to cold should also work. This chilly alternative may seem almost equally unpleasant; but Daedalus has a plan to make it nearly painless.

Arctic explorers, shipwrecked mariners on wave-swept rafts, and snow-bound travellers, should all know one crucial rule for survival: no matter how cold you get, don't go to sleep! In sleep, the body relaxes its defences against cold. It loses heat so fast that its energy reserves rapidly run out; the sleeper may die quite quickly. So, says Daedalus, why not exploit this ready somnolent loss of calories? DREADCO engineers have built a prototype 'Frigibed' which freezes the sleeper, draining him of calories safely and controllably.

The occupant of the Frigibed wears a special nightcap. It carries an array of scalp-contact electrodes which record his skin temperature, and the EEG and REM signals from his brain and eye muscles. It transmits them by a local radio-link to a small computer, which deduces his depth of sleep, and adjusts the heaters and refrigeration units of the Frigibed accordingly.

While the occupant is awake, the Frigibed remains comfortably warm. As soon as he dozes off, it starts to cool down. As he plumbs the depths of sleep, the Frigibed plumbs the depths of temperature. His undefended body pours out calories to maintain its normal warmth. If the scalp-temperature or EEG start to falter ominously, the computer warms the bed up slightly: it mustn't freeze the sleeper to death. As he drifts towards wakefulness, the bed warms up more strongly. When he finally wakes up, he will find the Frigibed as warm and pleasant as when he went to sleep. During the night, knowing nothing about it, he will have lost hundreds of calories!

Intrepid DREADCO volunteers are now testing the prototype. Their main complaint is a tendency to dream of snowstorms and refrigerators. A sleeper waking suddenly in the night will find to his horror that such dreams have apparently come true. To avoid such frigid nocturnal surprises, Daedalus may have to fit the Frigibed with a powerful microwave flash-heater, to be triggered by signals of sudden waking. It will then restore a comfortable temperature instantly if the sleeper is startled into wakefulness. Truly masochistic slimmers, of course, may prefer to suffer its icy grip in full consciousness.

David Jones