PALAEOANTHROPOLOGY

Out of Africa and into Asia

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FEW doubt that Africa was the birthplace of the hominid lineage, but there is no equivalent consensus about when hominids first moved out of that continent. Despite the announcement of early dates for a juvenile *Homo erectus* from Indonesia[1], the circumstances surrounding the recovery of many of the fossil hominids from the island will always hinder attempts to date them. Thus the excavation of hominid remains, in combination with crudely fashioned artefacts in what are claimed to be earliest Pleistocene deposits at Longgupo Cave in central China (Huang and co-workers, page 275 of this issue[2]), is of major importance. Most notably, the remains lend support to the idea[3] that representatives of the hominid lineage were established in mainland Asia as early as about 1.9 million years (Myr) ago.

Africa has been the focus for research into human evolutionary history for the past three decades, but it was not always thus. A century ago, space in the correspondence columns of *Nature* was regularly claimed to debate the significance of the finds Eugene Dubois had made, beginning in 1891, at Trinil in Indonesia. Although initially allocated to *Pithecanthropus erectus*, the species distinction of the Trinil hominid has survived but the genus has long since been sunk into *Homo*.

Two decades later, excavations were instigated by the Canadian anatomist Davidson Black in the cave deposits at Choukoutien, now called Zhoukoudian, and the first of the series of remains of what became known as 'Peking Man' was discovered. Despite being allocated to a new genus and species, their affinities with the hominids from Trinil, and with similar material that was subsequently recovered at Sangiran, also in Indonesia, was evident, and the Chinese remains have also been subsumed within *H. erectus*. There have been sporadic attempts to demonstrate both that the hominid remains from the Indonesian sites are from more than one species[4,5], and that they include specimens that should be allocated to *Australopithecus*[6] or *Paranthropus*[7], and thus to an earlier, more primitive phase of hominid evolution. But none of these claims has survived close scrutiny[8]. Likewise, until recently there has been little compelling evidence to suggest that any of the Asian hominid sites were yielding hominids more than one million years old[3].

The importance of the material from Longgupo Cave is twofold. Not only does it support an early date for the hominid occupation of Asia, but the morphological details of the admittedly fragmentary fossil evidence also mean that it may represent not *H. erectus* but a more primitive species akin to *H. ergaster*, thus far known only from Africa.

Of course, dating the material is crucial to the argument. Longgupo Cave has several lines of evidence, none of them contradictory. Palaeomagnetic stratigraphy shows a reversed polarity for most of the sediments, with the hominid fossils and lithic items associated with the lower of two normal events and therefore referred to the Olduvai magnetic event. The magnetic evidence is broadly supported by analysis of tooth enamel from the sediments, using electron spin resonance, which gives a minimum age of 0.75 ± 0.09 Myr based on an early uranium uptake model. It *could* be argued that the normal magnetic event associated with the material is therefore likely to be Jaramillo, but the associated mammalian fauna is really too archaic and points instead to the earlier Olduvai event. Of particular interest here is the presence of *Nestoritherium*, a genus of the family Chalicotheriidae, an extinct, bizarre, clawhoofed member of the Perissodactyla, today represented by tapirs, rhinos and horses.

The lithic items identified as primitive stone tools do seem to be exotic, and they are notably larger than the rest of the sediments. They look as much like stone tools as anything of this age ever does, and they fall into the category of items in finer sediment deposits that, as Gamble[9] has pointed out, tend to categorize genuine archaeological assemblages as opposed to naturally bashed stones. Moreover, the uneroded state of the bone in clay facies channels is consistent with primary deposition rather than intrusive burial. But we are unlikely to be dealing with a site of hominid occupation. The giant hyaena, *Pachycrocuta,* is a perfectly plausible agent of accumulation[10] (it is less likely that the sabre-toothed *Homotherium* did much bone destroying).

The authors draw attention to the presence of *Gigantopithecus*, a large, gorilla-like and presumably herbivorous primate, in the same level as the hominid fossils, and stress that this is the third such co-occurrence at Asian localities over a time span of some 1 Myr. Such co-occurrences are always intriguing, but the evidence of hyaena activity reduces the likelihood that *Gigantopithecus* was prey to the more

Australopithecus goes west

As discussed in the main article, on page 275 of this issue Huang *et al.* report evidence that bears upon the expansion of the range of hominids beyond Africa. But how well do we understand their distribution within that continent? Early hominid sites in Africa are concentrated in two regions: East Africa, where they are centred on the Gregory Rift Valley, and southern Africa, where fossil evidence has come from caves located in the high veldt. Discoveries in Malawi[1] have helped to bridge the gap between the two areas[2], but were the early hominids as restricted in their range as the distribution of these sites suggests?

Apparently not, for on page 273 Brunet *et al.*[3] announce the discovery of an australopithecine-like mandible, some 3–3.5 Myr old, from Chad. The known range of that genus is thus extended westward by 2,000 km or so.

Determining the range of an extinct species is particularly tricky. What should the null hypothesis be? If the starting point is that the range is determined by the location of fossil discoveries, how does one accommodate the maxim that 'absence of evidence is not evidence of absence'? Even if suitable fossil sites exist, low population density and the vagaries of preservation will result in the representation of some species being very patchy. The Mio-Pliocene hyaenids are a good example[4], and *Agriotherium*, a fossil bear, is only known from two sites in Africa[5], but they are 6,000 km apart.

The hominid mandible from Chad is clearly australopithecine in grade. It is closest in morphology to *Australopithecus afarensis*, but may turn out to be a new species; given its location, this would not be surprising. In the Pliocene, habitats similar to those indicated by the fauna associated with the Chad discovery extended from the Atlantic Ocean to the Cape. There is no reason to think that australopithecines did not use that range to the full. B. W.

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2. Wood, B. *Nature* **365**, 789–790 (1993).
3. Brunet, M. *et al. Nature* **378**, 273–275 (1995).
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5. Howell, F. C. in *Neogene Paleontology and Geology of Sahabi* (eds Boaz, N. T., El-Arnati, A., Gaziry, A. W., de Heinzelin, J. & Boaz, D. D.) 153–181 (Liss, New York, 1987).