More Early Hominids from East Rudolf

PALAEOANTHROPOLOGISTS traditionally have had to be content with the study and description of a very limited number of specimens, but because of the recent discovery of important early man sites in east Africa this situation is rapidly changing. Since intensive field work began in 1968 in the East Rudolf area in Kenya more than forty-five hominid specimens have been found by Richard Leakey and his colleagues at the two main sites of Ileret and Koobi Fora.

A tenet, which is basic to many theories of human evolution, is that no more than one type of hominid has existed at any one time. This view has often been challenged but the fossil evidence has been equivocal. Almost from the beginning of the field work at East Rudolf, however, it was apparent that more than one type of early hominid had lived there, and that the two could have been contemporaneous. Richard Leakey's report of the 1971 collection from the area (see page 264 of this issue of *Nature*) further strengthens the evidence for the coexistence of at least two types of hominid during the early Pleistocene in east Africa.

The hominid collection from the 1971 season again demonstrates, as it did in 1970, the existence of the genus *Australopithecus* at East Rudolf; members of this group are, of course, known from Olduvai Gorge in Tanzania and from other sites in east and southern Africa. It is recognized that this genus contains a wide range of variation and the taxonomic significance of this variation is an important question in human palaeoanthropology today.

One of the most interesting specimens from the last season is the massive mandibular fragment, KNM-ER 818. This jaw demonstrates the now familiar pattern of the large australopithecines—large molars and premolars and reduced anterior dentition combined in a robustly constructed mandible.

The new material also demonstrates, again as it did in 1970, the existence of a more advanced hominid; this material is possibly referable to the genus *Homo*. The cranial vault material is still incompletely known so that a generic diagnosis must, for the present, rest largely with jaws and teeth. Teeth, however, are notorious masqueraders: one fossil "primate" turned out to be a pig and several isolated "hominid" teeth remain in taxonomic limbo.

Jaws are usually a different matter, although Piltdown's orang-utan jaw fooled more people than one cares to remember. The morphology of the jaw in hominids reflects many diverse but highly interrelated evolutionary trends and the total morphological pattern of fossil mandibular material is usually of considerable taxonomic value, at least at the generic level. The size relationships between the teeth and the general mandibular structure are particularly relevant. With this in mind, it is very difficult to regard the KNM-ER 730 jaw from the 1970 season, and the new juvenile mandible, KNM-ER 820, as anything other than *Homo*.

Much post-cranial material, chiefly of the lower limb, has also been recovered at East Rudolf. Six femora are now known from the area, and although some of this material appears quite modern in many respects, other specimens show a morphology more similar to known australopithecine femora from Olduvai Gorge and South Africa. Of particular interest is the partial skeleton, KNM-ER 803, from Ileret. This is the most complete assemblage of associated hominid material from the early Pleistocene and a functional analysis of the lower limb of this specimen will be of considerable interest and importance.

Richard Leakey has very wisely refrained from allocating this material to any particular species; in this he shows welcome, if almost unprecedented, restraint in a field cluttered with arbitrary and invalid nomina. His suggestion that some material presently attributed to *A. africanus* should be included within *Homo* is interesting. It has been obvious for some time that existing theories of Linnean taxonomy are somewhat inadequate for dealing with the early Pleistocene hominids—indeed, for dealing with palaeotaxa in general—and a comprehensive revision of this problem is long overdue.

At present, the dating of the Ileret and Koobi Fora sequences must be regarded as somewhat uncertain. No firm dates have been published for the Ileret sites—the suggested date for the Upper Tuff of 1.0 to 1.5 m.y. is based on faunal remains. Although the Pleistocene faunal assemblages are well known in east Africa and are therefore fairly reliable for dating purposes, the possibility of sampling error always imposes an element of doubt for dates so derived. One radiometric date does exist for Koobi Fora—an age of 2.6 m.y. based on potassium/

Carbon Fibres and the Griffith Equation

IN the next issue of *Nature Physical Science* (June 5), W Whitney and R. M. Kimmel show that the Griffith equation, which connects the total energy required to break a brittle material with such parameters as the breaking stress and strain, the apparent surface energy and the size of the critical flaw at which fracture commences, is applicable to the filaments that go to make up carbon fibres.

Whitney and Kimmel tested several groups of filaments to fracture—a typical fracture surface of a filament is shown in the diagram where the length of the bar is 2 μm. The total energy required and the size of the critical flaw were measured and fitted to a logarithmic form of the Griffith equation. The values of the surface energy which emerged turned out to be quite comparable to the surface energy calculated from the description in the literature of the two fractured ends of another carbon fibre. A certain amount of variation in the surface energy is, of course, to be expected because the filaments are not ideally brittle materials. If they were, the surface energy would be just that needed to break the chemical bonds, but in real materials this energy is enhanced because plastic work always has to be done before fracture.