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Some Tentative Conclusions

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Some tentative conclusions

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Perhaps it was too much to hope that we should get very far with answers to the questions: What is man?; where, when and why did he begin? But with a sound basis of chronology, such as was provided by Curtis, the dates by which several important stages had been reached can now be fixed more definitely than before. Evidence such as that of Tuttle and Leakey establishes that some hominids were certainly walking bipedally before 3.0 Ma ago. But as Simons asked 'How long before?' The conditions for bipedalism may have first arisen after the marked cooling *ca.* 14 Ma ago that led to formation of an Antarctic ice cap, producing a fall in sea levels and drier conditions generally (Kennet 1977). Much forest was then replaced by open prairie and many cursorial herbivores and carnivores appeared. Such circumstances would have favoured development of the earliest terrestrial anthropoids, who were probably still partly climbers, as indicated by the curved phalanges.

Unfortunately there is almost no evidence about the state of man's ancestors between the large fossil jaws of *Ramapithecus* about 15–8 Ma ago and the bipedal creatures living in Africa between 4 and 3 Ma ago. Apparently they were not yet using implements at that later period. As Isaac showed, implements are doubtfully present at Hadar but definitely appear at Omo, Olduvai and Koobi Fora from *ca.* 2 Ma ago. Reduction in the sizes of jaws and teeth also seems to have proceeded rapidly from about 1.6–1 Ma ago. However, there is no evidence that there were any hominids before 1.6 Ma ago with brain size more than half that of modern man. Of course larger skulls may yet be found, but it seems that the freeing of the hands by bipedalism was neither concomitantly nor even shortly followed by increase in brain size and use of implements.

This further evidence of the mosaic character of human evolution makes it more than ever difficult to give a clear answer to the question 'What is man?' The question is as hard to answer professionally as it is colloquially and is the nightmare of systematists who describe new material. Further, as Tobias emphasized, it is most important to consider variation in space as well as in time. For this and other reasons the use of subspecific groupings and names seems to have many advantages. They may be clumsy and unglamorous, but the possibility of their impermanence is an asset, and they should bring more honour to their creators than the founding of an unsatisfactory species or genus.

Of course any attempt to follow the emergence of man demands that we face the question of whether evolution has been continuous, or interrupted by quantal jumps of appreciable size (Gould & Eldredge 1977). This problem was raised occasionally in the symposium but not decisively answered. Tobias suggested four stages of evolution of brain size, micr-, meso-, macr- and gigant-encephalic. But have we enough skulls to be sure that the gaps are anything except accidents of discovery? Anyhow, size is not everything, and Holloway has provided an attempt to show when various *parts* of the brain developed. Surely such changes as may have occurred in the proportions of the visual or prefrontal areas must have proceeded gradually or

by small steps, and probably on several lines. Similarly, development of the capacity for sequencing movements by the premotor area, which as Passingham showed is necessary for speech, could well have been gradual.

Probably most biologists believe that evolutionary change occurs in small steps, even if these steps are sometimes discontinuous because they result from foundations by small colonies and geographical isolation. But ice-core evidence shows that large climatic changes have often occurred over quite short periods (Dansgaard *et al.* 1971). Moreover, the palaeontological record shows repeated extinctions of whole groups of animals and plants, often sufficiently rapid to be called catastrophic (Hallam 1977). Some molecular biologists are inclined to believe in evolution by small steps. Indeed, as Bodmer showed, the discovery of the close similarity of many molecules in creatures as different as man and chimpanzee makes the problem of defining differences between closely related groups very difficult. The extensive polymorphism indicated by Balner certainly provides the basis for gradual change. Further, as Jope and others speaking in this symposium explained, the complexity of the process of change of even one amino acid in a protein chain makes it unlikely that abrupt changes could be successful.

Questions about continuity lead to the problem of whether we should use concepts of genus and species to define horizontal or vertical groupings. This was also raised implicitly, but is not often faced by anthropologists any more than by other biologists, which is not surprising since in principle there can be no clear answer to it. The extension of *Homo* to include the specimens known as *H. habilis* may appear as a concession to cladistic concepts of linear classification (always assuming that the phylogeny is correct). But for fruitful discussion we often need to refer to *stages* of evolution, and for this horizontal definitions are better, with the assumption again that we must have names. Cladistically speaking, *Ramapithecus* might be made part of *Homo* (or vice versa). Such excesses lead to the situation that the word 'man' becomes more precise than *Homo*. I suggest that we should be very cautious about including small-brained creatures in the genus *Homo*, however we (re)define it. Whatever features we decide are characteristic of 'man' should surely be incorporated in the definition of the genus *Homo*.

The question of continuity is particularly important for evolution of the brain since study of fossil brains is one of the few ways of approaching the key problem of the origins of 'mental' characteristics. I was particularly sorry that in a joint meeting of the British Academy and the Royal Society there was little reference to the first appearance of these mental qualities that many philosophers and theologians regard as unique characteristics of man. Of course this was largely our own fault for not allocating time for appropriate speakers. But there is scope for another full meeting here, and indeed one is planned. It is important that we should not allow our Discussion to seem to ignore such questions, and indeed some were treated implicitly. So far as language is concerned, Brown's analysis suggested that there is no evidence that apes have the power to use symbols in syntactic combinations. If this power is unique to man could it have appeared gradually, and if so when? The assemblages of instruments in Olduvai bed 1 suggest that even around 2 Ma ago there was the ability to create distinct *classes* of instruments. This indicates the presence of a kind of segmented and symbolic conceptual ability. As Isaac showed, the development of such capacities was correlated with increase in brain size that seems to have occurred most rapidly from about 1 Ma ago. This might therefore be suggested, very tentatively, as the time for the appearance of rudimentary capacities for grammar and logic. The great selective advantages of these for social life may then have quickly produced still

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further enlargement of the brain. An inherited character such as an effective brain that leads to social competition is likely to proceed to a 'runaway evolution' (West-Eberhard 1979). Conspecific rivals then constitute an environmental contingency that itself evolves, increasing the stakes for access to scarce commodities. The advantages conferred upon groups by more intelligent and plastic behaviour could only be met by still further increases. If this analysis is correct it further emphasizes the interdependence of genetic and extrasomatic inheritance.

The evidence that instruments were used mainly for butchery also allowed Isaac to make one of the few suggestions as to 'why' human characteristics have appeared. Accepting the function of butchery, he suggested that the diet of big game necessitated specialization and social organization for food-sharing throughout kin groups. Jones showed the influence of material on the kind of implements that were made. He followed the ideas of the late C. B. M. McBurney as to the possibility of learning from the wear on the edges how implements were used and for what purposes.

Much of the evidence thus seems to suggest that about 1 Ma ago there were creatures with physical and cultural characteristics at least somewhat like those of modern man. This is such a long time ago that we have to look hard to find evidence of the culture and of the extent to which the proto-humans at that time were really like ourselves. Had they the elements of intentionality, of logical and syntactic powers, of aesthetics and religion? Did they believe in spirits? Oakley showed us that features of manuports, implements and pigments from more than 1 Ma ago already suggest considerable interest in symbols, aesthetic feeling and, from 0.2 Ma B.P., possibly even thoughts about the stars.

So the evidence, fragmentary though it still is, indicates that the bipedal hominids underwent great changes between 1.5 and 1 Ma ago. It may be significant that the particularly severe cold, with formation of Arctic as well as Antarctic ice caps, began about 2–3 Ma ago (Kennet 1977). The subsequent oscillations of climate of the Quaternary ice ages were often rapid and accompanied by a series of extinctions of plants and animals as great or greater than at any other time in geological history. The hominids proved able to survive these great changes, which occurred all over the world. Such conditions may have placed a special premium on the capacities conferred by social life and large brain. The later stages of the Pleistocene included some periods of extremely rapid change. The Greenland ice sheet record shows a variation at about 90 ka ago from warmer than today to fully glacial *in less than 100 years* (Dansgaard *et al.* 1972). There is evidence of this event also from stalagmites in France and foraminifera in cores from the Gulf of Mexico (Kennet & Huddlestun 1972). Such changes, however they were caused, may have provided the strongly selective conditions that encouraged the final development of the adaptive powers of *Homo sapiens sapiens*.

More precise dating thus allows us to see the outlines of human history, but the details still remain tantalizingly uncertain. The evidence of 'catastrophic' climatic changes perhaps increases the possibility that human characteristics appeared suddenly. The long survival of early hominid types is also used as negative evidence for rapid change by those who believe in punctuated equilibria (Gould & Eldredge 1977). A sudden emergence of man is certainly an attractive proposition for those who believe that his features are in some way 'unique'.

So we may suggest the hypothesis that the emergence of man has been the consequence of a series of climatic changes spread over some 14 Ma from a *Ramapithecus* stage. The dry conditions determined the adoption of a partially terrestrial life and the eating of meat, first as part of a mixed diet. The Australopithecines and such types as KNM-ER 1470 represent this

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stage, whether or not they are on the direct line of human ancestry. Then from about 2 Ma ago, with rapidly varying and often severe conditions came the changes in the brain and endocrines by which the hominids became social hunters, such as *H. erectus*, using implements, sharing the products of the quest for food and developing a simple culture. The advantages so conferred led to still more rapid increase of brain power, which allowed for survival through the often harsh conditions of the later Pleistocene. Finally further developments in the same directions made possible the logic, language and culture that marked the emergence of man as we know him when conditions became milder in the Neothermal period.

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