

Lecture 6-3: The evolution of early humans: Late Pliocene & Lower Pleistocene III

Hominid fossils: Hominines

All known hominines, fossil and modern, are assigned to genus Homo. Broadly speaking, all are distinguished from australopiths by the fact that they have larger brains (>600 cc). Like australopiths, they vary markedly in anatomy, and as the archaeological record indicates (see below) in behavior as well.

There is much controversy over the assignment of early fossils to our genus. Many textbooks identify a set of samples called collectively "habilines" (Homo habilis and rudolfensis) as the first representatives. Examples are known from several sites in eastern and southern Africa, where they date to the period 1.6-2.5 Ma. The key criterion guiding their assignment to Homo is cranial capacity: both habilis and rudolfensis had brains that were on average larger than those typical of most australopiths (500-700 cc vs. 400-600 cc).

Critics of this view note that, brain size apart, habilis and rudolfensis were otherwise very similar to the australopiths, notably with respect to teeth and jaw size, body proportions, degree of sexual dimorphism, features of life history, and geographical range (like australopiths, all habilines are found in Africa, but not on other continents). For this reason, some prefer to see these two forms as "human-like" australopiths, assigned to the genus Australopithecus.

This leads these same commentators to identify another, later form, called Homo ergaster or "early African" Homo erectus, as the earliest representative of our genus. The earliest examples date to the period 1.7-1.9 Ma. They differ from the australopiths in several important ways:

- **Brain size.** H. ergaster and erectus have cranial capacities in the range 700-100 cc, intermediate between values for australopiths and modern humans.
- **Teeth and jaws.** These are smaller and less robust in ergaster/erectus than in australopiths; and similar to those of modern humans.
- **Thoracic shape.** This approximates the modern human pattern, indicating a smaller intestinal cavity. Along with reductions in tooth and jaw size, this change marks a significant shift in diet relative to the australopith pattern, probably involving increased use of foods that require either less digestive processing, or greater emphasis on pre-consumption preparation (e.g. cooking), or both.
- **Body proportions and degree of sexual dimorphism.** In ergaster/erectus, both of these attributes display values similar to those associated with modern humans - arm:leg length ratios 70:100; males about 20% heavier than females. These adjustments are also associated with a sharp increase in adult body size, especially for females. In H. ergaster, the latter have estimated average adult body weights in the 50-55 kg (110-120 lb) range.
- **Life history.** Details of ergaster/erectus life history are controversial; but most analysts would agree that values for key characteristics are very different from those of australopiths, falling much closer to, sometimes within, the modern human range. Age at maturity is pegged at about 15 years (vs. 18-20 for modern humans); maximum life span at about 60-70 years (vs. 80-100 in moderns). For reasons elaborated elsewhere (see assigned reading), some analysts hypothesize

that ergaster infants were also born at an earlier stage of development, and possibly weaned earlier than the age suggested for australopiths (3-4 yrs vs. 5-6 yrs in the latter). If so, they probably required more care (including post-weaning nutritional support) than did australopith infants and weanlings. Ergaster's longer adult life span may also have been associated with a period of extended *post-menopausal longevity*. Unlike the pattern in nearly all other mammals, modern human females typically enjoy active lives for many years after menopause. World-wide, most women stop ovulating at 45-55 years of age. In Utah, women who reach this age have an additional 25-35 years of life expectancy. Even among traditional hunter-gatherers, like the African San or Hadza, post-menopausal life expectancy is about 20 years. Some students of the evolution of human life history think this pattern of extended post-menopausal life may have begun, in at least a limited way, with ergaster/ erectus.

- **Geography.** As we said, australopiths were evidently restricted to Africa. H. ergaster and erectus were the first hominids to range beyond this continent. Examples are known from many areas of Europe and Asia as far north as 45 degrees, roughly the latitude of the Alps, southern Russia and northern China. By definition, this change implies a very different "ecology" for these forms than that (or those) characteristic of australopiths.

These observations indicate that, however one classifies habilis and rudolfensis, the real shift from the great ape patterns of anatomy, life history, and ecology associated with australopiths to something more like the human model begins with H. ergaster and erectus. **The question is: why the change?**