Lesson
Student Handout 1–It's All in the Family: Who Were Our Ancestors?

Chimpanzees: The two living species in this genus are our closest relatives. We share 95-98 percent of our genes with them. (We also share 80 percent of our genes with a laboratory mouse). Our ancestor at the point where ape and human lines of descent divided must have been very similar to living chimpanzees, though we have no fossil proof of this.

Time-frame

5-9 million years ago to the present.

Range

Equatorial African rain forest, open woodland, mixed riverside forest, and savanna.

Physical characteristics

- Estimated brain capacity 300-400 cubic centimeters (cc).
- Face sticks out far forward, heavy jaw, large canine teeth with gaps next to them.
- Arms longer than legs.
- Opposable big toes, long fingers, short thumbs.
- Walks on soles of feet and knuckles of hands; can stand and walk upright briefly.
- Average adult male height about 4 feet, female about 3 feet. Individuals varied.

Diet

About 75 percent of their diet consists of ripe fruit. They also eat nuts, seeds, blossoms, leaves, and insects. Some groups hunt bush pig, antelope, and monkeys, but meat is only about 2 percent of diet. Some groups do not hunt.

Technology

The only apes known to use tools are one of the two species of chimpanzee. Different traditions of tool use exist among different chimpanzee groups, even those living in the same kind of environment. In areas where termites, ants, nuts, and stones are all plentiful, some groups carefully dig into termite holes with sticks or vines they have stripped of leaves. They wiggle their tool delicately to fool the insects into fastening onto it, then carefully pull it out to get a good mouthful. They do not, however, do this to get ants; nor do they use stones as tools. Other groups use sticks to "fish" for ants but not termites. Still other chimps use specially chosen stones and carry them some distance in order to crack nuts. But these animals do not go after ants or termites with sticks. Adult chimps teach these tool-using skills to their young, who take several years to fully master the skill. But no chimpanzee in the wild has been known deliberately to shape stones into tools.

Earliest hominids: Remains belonging to a very early ancestral group have been found in Chad, Ethiopia, and Kenya in recent years. Together, they date to about 5-7 million years ago. Each of the specimens had different mixes of ape-like and hominid-like characteristics, though more of the former. We do not know whether or not they walked upright.

Australopithecines: Remains of some half dozen species. These species emerged at various times and survived on earth for varying lengths of time. Several were contemporaries for considerable periods.

Time-frame

Remains of all known species are dated to between 1 and 4.2 million years ago.

Range

Varied by species, but some known from all over Africa below the southern edge of the Sahara. Preferred environments have included tropical river and lake shores with permanently wooded fringes and some grassy areas. Some later species lived in drier, sparsely wooded savannas and uplands. Evidence for their environment comes from seeds, fossil woods, and animal bones.

Physical characteristics

- Estimated brain capacity 375-500 cc.
- Estimated height of males about 4 feet, females about 3 feet; individuals varied.
- Face and jaw stuck out significantly, to varying degrees; very heavy and robust in some.
- Teeth of all were larger than humans' but lacked extra large ape-like canines, though one early species had ape-like gap next to their enlarged canines. Two late species had extremely large and massive back teeth, unlike either apes or humans.
- Tooth enamel smoothly worn, in pattern characteristic of fruit eaters.
- Hip, leg, and foot bones show all walked upright (confirmed for one by footprints dated to about 3.7 million years ago). However, features such as arms long relative to legs and length of fingers show that some adaptation to tree-climbing continued, whether for shelter, sleep, or feeding. The earliest species had the most human-like leg and arm joints. Another, from about 2.5 million years ago, was also human-like in its skeletal bones but very primitive in skull, jaws, and teeth.

Diet

Fruit was the main part of the diet. This is inferred from the size and shape of teeth, from the type of wear on them, and from the amounts of various elements in bones. The species with extra heavy back teeth ate harder, more fibrous, vegetables, nuts, and tubers, in addition to fruit. One early and one late species were less exclusively vegetarian than the rest. For these two, the possibility of some limited meat eating is an open question. Competitors for food in most environments were, among other species, monkeys and baboons (for fruits and nuts), pigs (for tubers), and rodents (for seeds and nuts).

Technology

Two of the species have been suggested as makers of stone tools dated to a time when they co-existed with Homo habilis. Fossils of one dated to about 2.5 million years ago have been found together with antelope bones that show cut marks of the kind made by stone tools. No tools, however have so far been found with any Australopithecine remains.

Homo habilis: Remains may belong to two different species.

Time-frame

Remains of all known specimens dated to 1.4 to 2.3 million years ago.

Range

Range and environments are much the same as those of the Australopithecines.

Physical characteristics

- Estimated brain capacity about 510-750 cc.
- Some individuals had relatively large skulls and Australopithecus-like teeth; others had small Australopithecus-sized skulls and human-like teeth.
- Inside shape of some skulls suggests left/right differentiation of brain, which may be a pre-condition for language development. Other anatomical features rule out language ability itself.
- Estimated height: males from about 3 to 5, females barely over 4 feet; individuals varied.
- Foot less completely evolved for walking than that of some earlier Australopithecus species. In spite of that, and most specimens' more ape-like proportions of arm and leg length, all walked upright.

Diet

Fruit was still a staple part of diet as shown by tooth wear. But there is reliable evidence for some opportunistic meat eating. Habilis fossils have been found associated with stone tools and with bones of prey animals such as antelopes. On some of these bones microscopic analysis has shown cut marks, definitely made by chipped blades of the type found with Homo habilis remains. In 5 of the 13 bones where carnivore teeth marks and cut marks overlapped, the cut marks were on top, suggesting that the hominids consumed scavenged meat that animals had earlier killed. Adding scavenged meat to the diet was not accompanied by any evolutionary changes such as the size or power of teeth or fingernails.

Technology

The earliest Homo habilis fossils and the earliest stone tools have been dated to approximately the same time-period. However, evidence of both tools and Homo habilis fossils in the same place is scant. At one site where this occurs, use-wear on the stone

tools shows that they were used in butchering meat and in cutting or shaping wood and soft vegetation. Raw material for tools has in some cases been fetched from as far as seven miles away. The tools are typically small (1-4 inches). They are of several types, including choppers and scrapers, but not shaped to consistent patterns. This stone tool-making tradition survived until after the extinction of Homo habilis.

Homo erectus

Time-frame

Known remains dated to between 1.9 million and 27,000 years ago.

Range

First known species to move into extreme southern and northern Africa. Certainly by about 1.2 million years ago and perhaps earlier species moved into Asia. Soon Homo erectus ranged from the Caucasus to Indonesia and northern China. It was also the first hominid or human species to become at home in environments as varied as tropical, temperate, hot and dry, cool and dry, and seasonally downright cold.

Physical characteristics

- Estimated brain capacity about 850-1200 cc. (Modern Homo sapiens is 1220-1600cc.)
- Estimated height of males about 5.9, females 5.2 feet; individuals varied.
- Face somewhat stuck out; some had ridges above eyebrows and on top of the skull. First species with protruding rather than flat nose.
- Tooth enamel heavily pitted and scratched, unlike other hominid species.
- Reduced arm length and narrower hips that increased efficiency of leg-muscles suggest an exclusively ground-dwelling rather than partly tree-dwelling way of life.
- Narrower hips imply less room for guts, in turn suggesting need for higher quality food.
- Some anatomical features are considered to rule out human-like speech, making pronouncing of vowels and clear articulation difficult or impossible. No anatomical evidence exists for or against capacity for abstract or symbolic thought. Note, though, that experimenters have recently taught chimpanzees to use symbols, though in extremely limited ways.

Diet

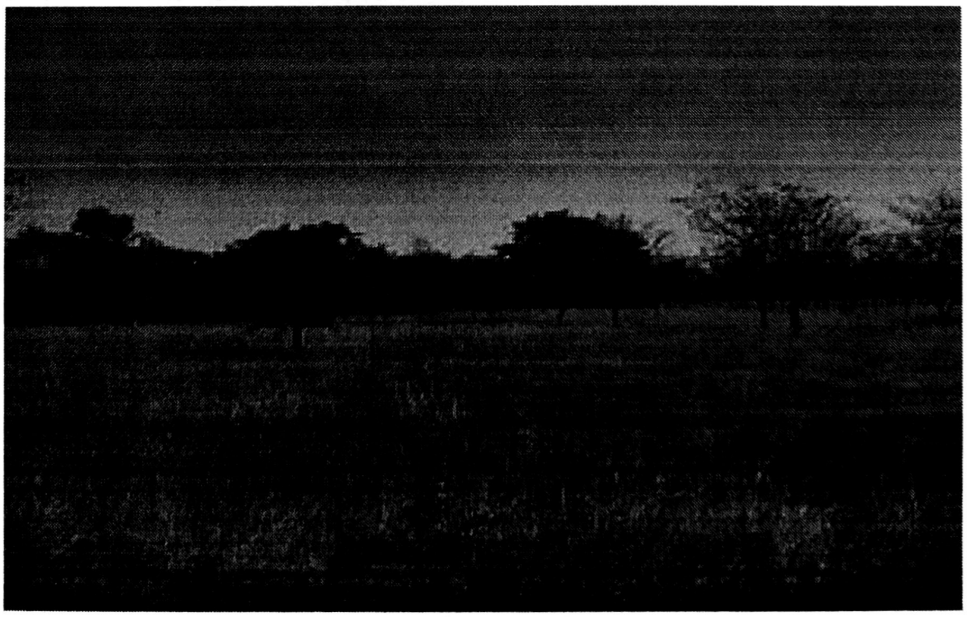
Circumstantial evidence, including tooth wear, suggests Homo erectus was omnivorous, with meat playing a much larger part in the diet than in that of Australopithecines or Homo habilis. There is no conclusive evidence either for or against Homo erectus having been a hunter. The first explicit evidence of hominids hunting comes from Germany, where three 6-foot wooden spears have been found along with stone tools and bones with cut-marks, mostly from horses. This material dates to about 500,000 years ago. The species responsible is not known.

Technology

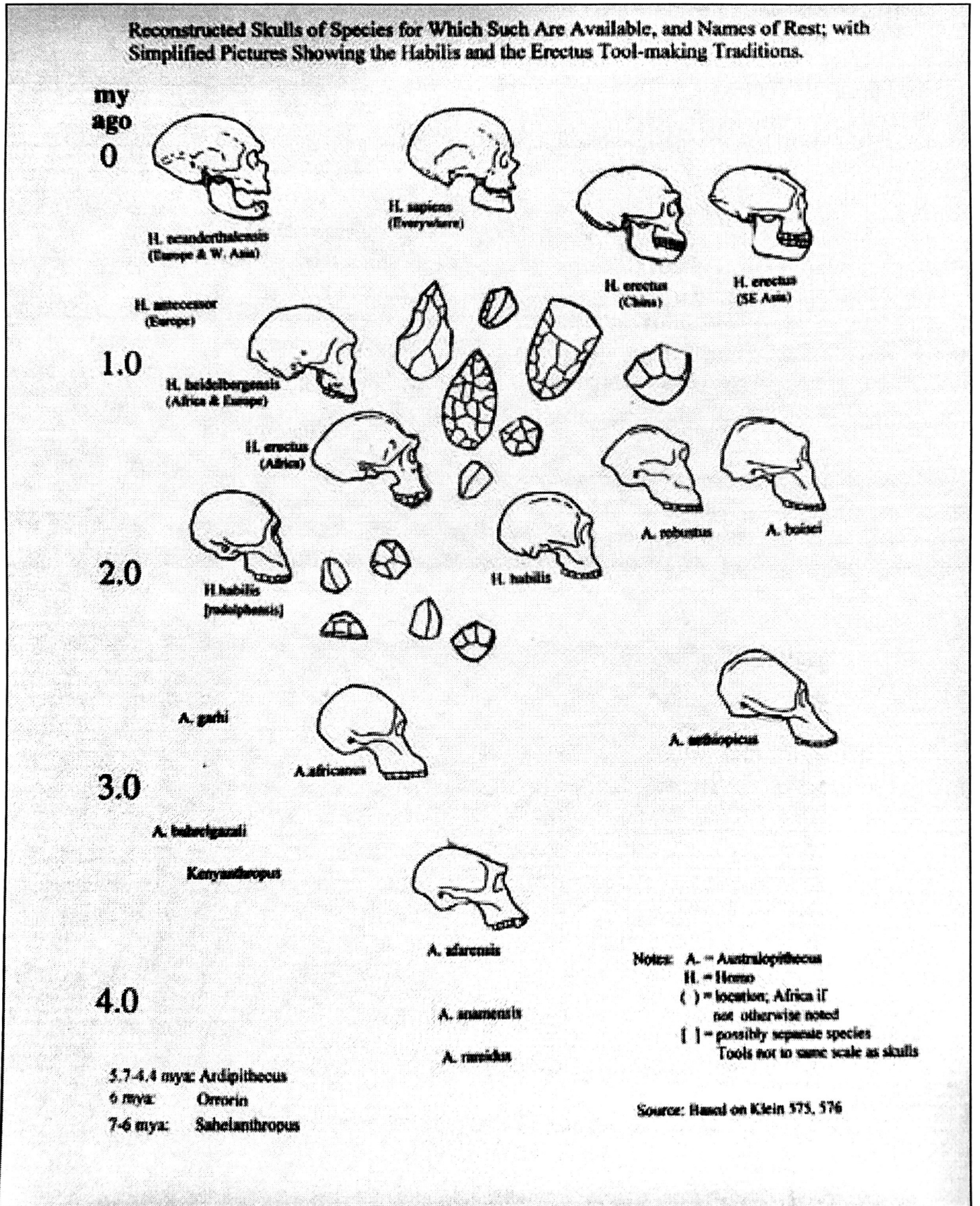
For nearly half a million years Homo erectus went on using the same kinds tools as had Homo habilis. About 1.5 million years ago, however, a new kind of stone tool, the teardrop-shaped hand axe, appeared at Homo erectus sites. This new type, called Acheulean by scientists, was larger than earlier ones and deliberately shaped to a standard form. It was symmetrical in three dimensions. It was produced in enormous numbers. Some specimens are several times larger than the typical 6 inch or so fit-in-the-palm models. Bone hammers were used on some to produce a finer edge. The earlier types of stone tools also continued to be made long after the Acheulean type made its appearance.

Hand axes continued unchanged in shape and style, except for increasingly fine craftsmanship, for about a million years. It appears that Homo erectus highly valued these tools because they were carried away from butchery sites to be used again. Modern experiments prove that they worked well in butchering animals as large as elephants. These tools have not been found at sites in Indonesia and China, perhaps because Homo erectus migrated to those areas before the more sophisticated hand axes were invented in Africa.

Tools associated with Homo erectus dated to about 800,000 years ago have been found on the island of Flores, which was never connected to the Indonesian mainland in the era when that species existed. This suggests that Homo erectus was able to cross open water. The next sea crossing known was not taken until Homo sapiens peopled Australia only 40,000 to 60,000 years ago.



Sparsely wooded savanna in Southern Africa
Photo by R. Dunn



Based on illustration in Richard G. Klein, *The Human Career: Human Biological and Cultural Origins,* 2nd Ed. (Chicago: University of Chicago Press, 1999), 575-576.