Cranial Morphology of *Homo erectus*

- Alveolar prognathism
- Larger teeth than moderns
- Supraorbital torus
- Low forehead
- Postorbital constriction
- Occipital bun
- Thick cranial bones
- No chin
- Cranial capacity: 800-1100 cc (gradual increase)
The career of *Homo erectus*

- Africa 1.9 mya
- China and Java 1.6 mya
- Europe after 1 mya
- Java, 35,000 years?
- Acheulean tools after 1.5 mya, fire after 1.3 mya
If I Only Had a Brain . . .

What does it take?
**PROBLEM:**

- Most mammals cannot remain active in tropical daytime
- Brain cooling presents extra challenge

**SOLUTIONS:**

- Global cooling at time of *Homo* emergence
- Triple benefit of bipedal posture
- Sweat on hairless body 250 times more effective
- Altered arrangement of blood vessels cooling brain
Energy needs of an expanding brain

- 20% energy for 2% of body mass
- Gut vs. brain
  - Both expensive
  - Mutually exclusive
- Reducing gut size
  - Depends on diet
- Meat?
Meat and the Brain

- *Homo* brain grows at fetal rate after birth
- Energetics of nursing
  - Baby higher on food chain
  - 10:1 efficiency drop
- Maternal nutrition
- Significance of meat
Alternative Hypothesis: Tubers

- Abundant
- Digging sticks
- Nutritious if cooked
- Social structure?
Did *Australopithecus* eat meat?

- Stable isotope analysis of South African *africanus* fossils indicate C4 plants
  - Meat from grazing animals?
- *A. garhi* from Ethiopia: tools and cut bones
**KNM-ER 1808**

_Homo erectus/ergaster_

- Leakey team, 1974
- East Lake Turkana, Kenya
- Age: 1.7 million years

Partial female skeleton displays pathological bone buildup, suggesting hypervitaminosis from eating carnivore liver. She must have been cared for during her long terminal illness.
Many species do both

What kind of scavenging?
- Marginal scrounging?
- Power scavenging?
Hunters or Scavengers?

- Many species do both
- What kind of scavenging?
  - Marginal scrounging?
  - Power scavenging?
  - Blumenschine’s non-confrontational scavenging
- Louis Leakey
  - Experiments in low-tech hunting
  - Traps and snares
- “Mighty hunters” or opportunists?
  - \textit{rudolphensis} and early \textit{erectus} likely opportunists
  - Later \textit{erectus} a “mighty” hunter?
Torralba and Ambrona

Late *Homo erectus*
400,000 years ago
The Great Life-History Shift

- Life History: Gestation, birth, weaning, developmental patterns, sexual career, life span, etc.
- Leakey: major shift in Homo
- Evidence: Dental growth rates, pelvic and skull measurements
- *Australopithecus* had short, chimplike childhood
- *Homo* pattern:
  - Slow body growth, fast brain growth
  - Adolescent growth spurt

Brain growth from birth to adulthood:

<table>
<thead>
<tr>
<th>Species</th>
<th>Brain Growth Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ape</td>
<td>2x</td>
</tr>
<tr>
<td><em>Australopithecus</em></td>
<td>2.6x</td>
</tr>
<tr>
<td><em>Homo erectus</em></td>
<td>3.3x</td>
</tr>
<tr>
<td><em>Homo sapiens</em></td>
<td>3.5x</td>
</tr>
</tbody>
</table>
KNM-WT 15000
Nariokotome or “Turkana boy”
*Homo erectus/ergaster*

- Kamoya Kimeu, Leakey team, 1984
- West Lake Turkana, Kenya
- Age: 1.6 million years
- Cranial capacity: 880 cc

The Turkana boy is the most complete of any early skeleton, and it has enabled scientists to learn much about *Homo erectus/ergaster*. It died in early adolescence but would have reached a height of more than 6’ at maturity, with a cranial capacity of 909 cc.
Turkana Boy vs. Lucy

- Rib cage?
- Body shape?
- Pelvic shape?
- Waist (gut)?
- Tibia & ulna?
Size, proportions and dimorphism

Australopithecine

Male  Female

Human

Female  Male
Who talked?
- Contours of skull, neck
- Reconstructed *Australopithecus* vocal tract is apelike
  - Could not make human speech sounds
  - High larynx
- Human larynx is low
  - Flexed basicranium
- *erectus* was transitional
- Turkana boy’s vertebra had small spinal foramen
  - Limited ability to control muscles for speech
- proto-language?

(more later . . .)
Fire and speech

- Larynx descends in *Homo*, for speech
- Susceptibility to choking
- Meat is a common culprit
- Meat is important for brain growth
- Cooked meat easier to swallow

Viva Prometheus!
- Safety
- Warmth
- Hunting & technology
- Altering environment
- Extending daily activity
- Social focus

Promethean Fire
Home base, anyone?

- Glynn Isaac vs. Lew Binford
- Site 50, 1.5 mya?
- Terra Amata, France 400 kya
Example: FLK-Zinj “living floor”

- Olduvai Gorge, Mary Leakey
- Zinj skull found there
- Thousands of mammals bones
  - Open-country species
  - Cut marks & tooth marks
- *Homo* tibia
- Once near a lake
- Oldowan tools
- Manuports
Theories of Site Formation

- Home base?
- Animal activity?
- Water action?
- Routed foraging?
- Picnic site?
- Tool cache?
- Kill site?
- Scavenged carcass?
- Palimpsest?
Conclusions:

- Hominid Package (“Sharing and Carrying” hypothesis) provides framework for research and debate
- Criticisms and alternative theories
- Still defended by some (Latimer, Lovejoy)
- Problematic for *Australopithecus*
- More probable for *Homo*, especially after 1 mya
Next...

The transition to sapiens