A. behavior
- habitat & diet
  - frugivore, granivore (?)
  - homology v. analogy
- locomotion
  - able climber; why?
- life-history
  - $R = CR + FR$
- social organization
  - sexual dimorphism

early Homo
- grades < 2.5 mya
  - limiting similarity…
  - brain vs. brawn

early Homo anatomy
- cranial, post-cranial
- cranial capacity

one species, or more?
- sexual dimorphism

early Homo
- 2.5-1.8 mya
- geographic-temporal distribution
- key sites…

grades < 2.5 mya
- limiting similarity…
- brain vs. brawn

A.’s habitat and diet
- semi-forested habitats from fauna & flora for
  - *Ardipithecus ramidus, A. afarensis, A. africanus,* & possibly *A. aethiopicus*
- more open environments indicated for
  - *P. boisei* and *P. robustus*
- diets focused on fruits & leaves for
  - *Ardipithecus ramidus, A. afarensis, A. africanus*
- diets focused on hard fruits & tubers for
  - *A. aethiopicus, P. boisei* and *P. robustus*; seeds seem less likely now
- some meat in diet indicated by stable isotopes?

homology or analogy?

A. anamensis
A. afarensis
STS-5 “Mrs. Ples”

A. aethiopicus
KNM-WT-17000 “Black Skull”
2.8-2.3 mya

P. boisei, OH 5
2.3-1.2 mya
■ australopithecine locomotion
  ■ all were bipedal, but probably not as “smoothly” bipedal as developed with *Homo ergaster/erectus*
  ■ all retained a substantial ability to move around in the trees
    ■ not a bad idea if you are a frugivore/folivore!
    ■ not a bad idea if you are vulnerable to predators!

■ life-history – reproduction
  ■ 30-50% faster development
    ■ earlier reproductive maturity & shorter lifespan
      ■ RS = CR + FR
      ■ CR = 0 for shorter time period
      ■ FR = relatively small
    ■ females little or no post-reproductive lifespan
      ■ no “grandmothering”
      ■ RS = 0 if CR = 0 and FR = 0
      ■ grandmothering
      ■ RS = r*(CR₀ + FR₀)

Taung child, *A. africanus*  
M1 erupts at 3 years vs. 6 years

■ sexual dimorphism
  ■ males compete over reproductive female
    ■ single males or small groups defend several independent females
  ■ females compete over food resources
    ■ mother-offspring bond is primary stable social unit
  ■ males and females do not cooperate in food acquisition

<table>
<thead>
<tr>
<th>Geologic Age</th>
<th>Body Weight (kg)</th>
<th>Stature (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td><em>P. troglodytes</em></td>
<td>Modern</td>
<td>54</td>
</tr>
<tr>
<td><em>A. afarensis</em></td>
<td>3.8–2.9</td>
<td>45</td>
</tr>
<tr>
<td><em>A. africanus</em></td>
<td>3.0–2.4</td>
<td>41</td>
</tr>
<tr>
<td><em>P. robustus</em></td>
<td>1.8–1.4</td>
<td>40</td>
</tr>
<tr>
<td><em>P. boisei</em></td>
<td>2.3–1.4</td>
<td>49</td>
</tr>
<tr>
<td><em>H. habilis</em></td>
<td>2.4–1.6</td>
<td>52</td>
</tr>
<tr>
<td><em>H. ergaster</em></td>
<td>1.7–0.7</td>
<td>63</td>
</tr>
<tr>
<td><em>H. sapiens</em></td>
<td>Modern</td>
<td>65</td>
</tr>
</tbody>
</table>

■ advantages of bipedalism
  1. ability to carry meat or other food items to refuges, or to other group members
  2. reduction in amount of skin surface exposed to direct sun exposure at midday
  3. freeing the hands for tool use
  4. freeing the hands for carrying offspring
  5. minimizes the energy expended at walking speeds
  6. ability to see of tall savanna grasses
  7. enhances display abilities in competition over resources

ape-like pattern of social organization?
■ early *Homo* cranial anatomy
  ■ large endocranial volume
    ■ 510-750 cc (mean = 630 cc)
    ■ expanded frontal and parietal regions
  ■ rounded occipital contour
  ■ parabolic (vs. rectangular) dental arcade
  ■ reduced prognathism
  ■ small jaws with small cheek teeth
  ■ relatively thin tooth enamel
    ■ a reversal of the trend in australopithecines

early *Homo* 2.5-1.8 mya

■ very little known!
  ■ most from a single fragmentary find OH 62
■ early *Homo* was short!
  ■ 1 m (3’ 3”)
■ arms are long relative to legs (?)
  ■ humerofemoral index = 83-95
■ hand phalanges may be curved
implications of cranial expansion

- in early Homo changes in endocranial volume occur without changes in body size!
  - greater computing power!

Social Cognition Hypothesis

- selective pressures associated with living in social groups have led to the evolution of intelligence
  - coordinating social relationships
  - coordinate foraging activities

Among primates, ON AVERAGE group size is a stronger predictor of brain size than is environmental complexity

Group size TENDS to correlate with complexity of social relationships

is the bigger bran of early Homo related to the emergence of spoken language?

- some lateralization observed (hemispheric asymmetry)
  - right-handed bias seen in stone tool manufacture
- may be some enlargement of “language areas” (e.g., Broca’s Area)

But, THESE NEUROLOGICAL STRUCTURES ARE PRESENT IN APES (AND ARE ASSUMED TO BE HOMOLOGIES)

early Homo pattern is AN ELABORATION of a pre-existing condition

is the bigger bran of early Homo related to the emergence of spoken language?

- Q: Would the behaviors attributed to early Homo have required some form of linguistic communication?

- A: It depends…(come back next class to see…)
  - group size among early Homo?
  - foraging behaviors among early Homo?
one or more species?

- fossils attributed to early *Homo*
  1. larger cranium with large cheek teeth
  2. small cranium with small cheek teeth
  3. wide variation in body size

single species interpretation

- all fossils represent a single species (*Homo habilis*) that is extremely sexually dimorphic
  - smaller individuals = females
  - larger individuals = males

multiple species interpretation

- smaller hominid = *H. habilis*
- larger hominid = *H. rudolfensis*

Issues

- How much sexual dimorphism is possible within a viable species?

social dimensions of sexual dimorphism

- males compete over reproductive female
  - single males or small groups of males defend independent females
- females compete over food resources
  - mother-offspring bond is primary stable social unit
- males and females do not cooperate in food acquisition

Is the cranial expansion seen in early *Homo* consistent with strong sexual dimorphism?

People are now starting to favor two species

*H. habilis* = small brained, small toothed
*H. rudolfensis* = large brained, large toothed

age and distribution of early *Homo*

- earliest specimens 2.5-2.4 mya
  - Hadar, Ethiopia
  - Chamerion Formation, Baringo, Kenya
  - Chiwondo Beds, Malawi, 2.5-2.4 mya

- best known specimens 1.9-1.8 mya
  - Koobi Fora, Kenya
  - Olduvai Bed I, Tanzania

- southern outliers…
  - Sterkfontein, Member 5, 1.9-1.8 mya?
- hominid grades after 2.5 mya
  - specialization in two very different directions

“brain”

“brawn”

“software”

“hardware”

> 1.0 my coexistence of grades

limiting similarity