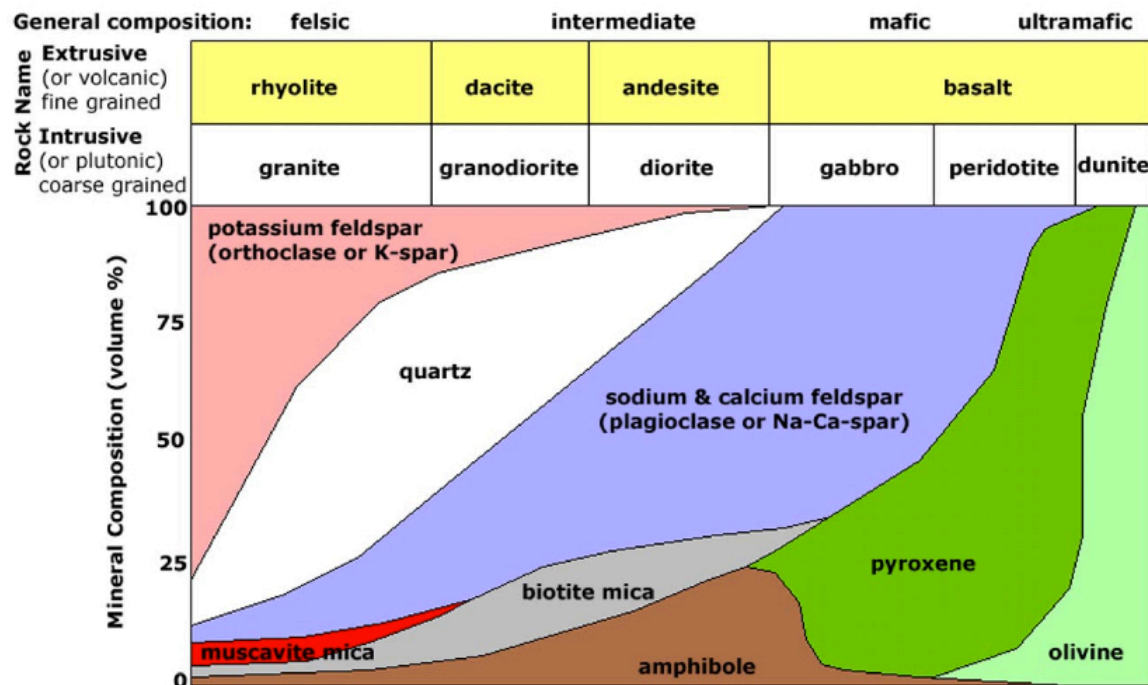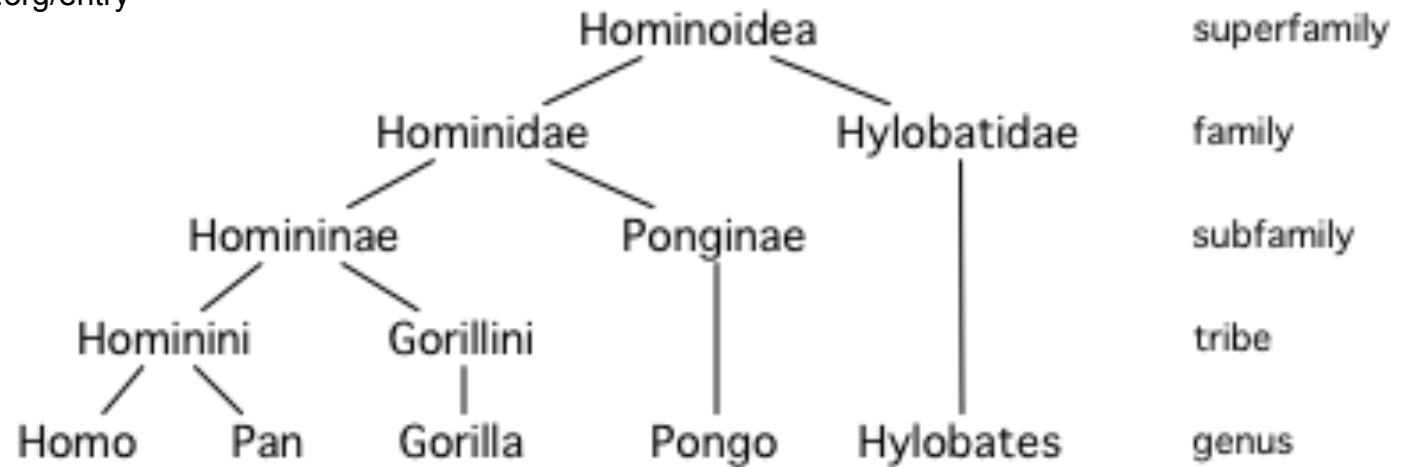# Systematics

Classifying organisms into groups

Why classify?

- To create the fundamental database of the science
- Analogy - classification systems for rocks
- Big difference -
  - Rocks are on a continuum of composition
  - Organisms fall into discrete groups (species)
  - So geological classification tends to be graphical and biological is hierarchal

A general classification of igneous rocks.

Goals of classification

- Make morphologic groups
  - This is what Linneaus was trying to do in the 1700's
- Represent evolutionary relationships
- These two goals are not always compatible

Schools of classification

- Traditional taxonomy
- Phenetics
- Cladistics

Traditional

- Original goal: produce morphologic groups
- New goal: represent evolutionary relationships, produce "natural groups"
- Find patterns of ancestry
- Methodology: analyze "important" characters
- Product: evolutionary trees
- Requires expertise - only an expert recognizes the important characters
- How is it objective?
- How is it subjective?
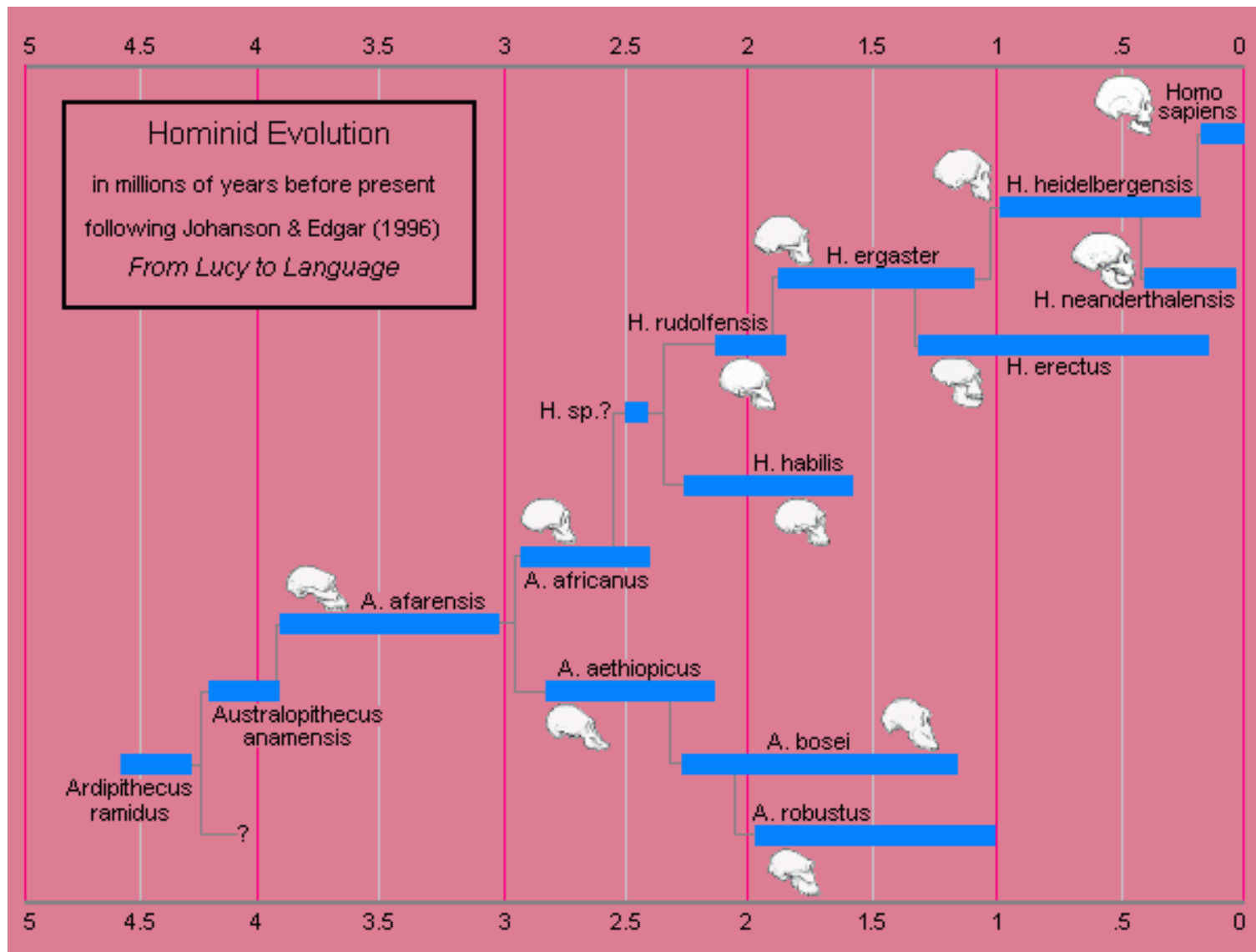- Challenges: convergent evolution

Cladistics

- Goal: to construct and test evolutionary hypotheses
- Find sister groups, not ancestry
  - Sister groups are evolutionary related, but it makes no statement about descent
- Methodology: analyze derived characters
  - Characters that mark a change from the lineage that led to this organism
- Product: cladogram

Cladistics, cont.

- Requires expertise to recognize derived characters
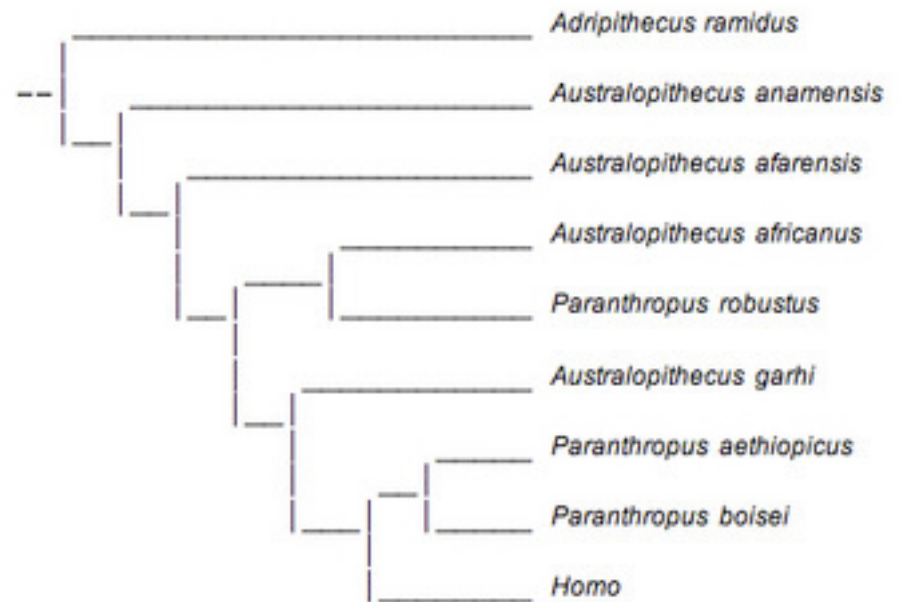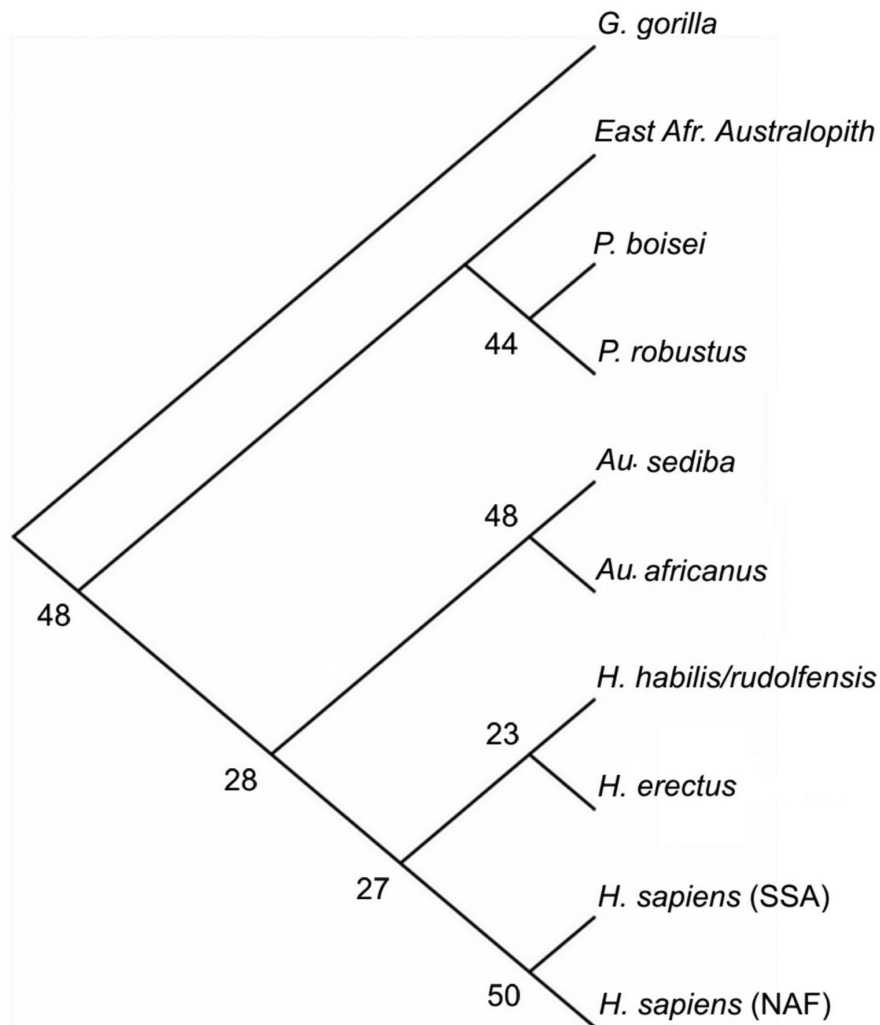- Challenge: blows up some recognized groups

Evolutionary tree – what are the axes?

http://darwiniana.org/famtree3b.gif

Cladograms – what are the axes? Why aren't they the same?

G. gorilla

East Afr. Australopith

P. boisei

44 P. robustus

Au. sediba

48 Au. africanus

48 28 H. habilis/rudolfensis

23 H. erectus

27 H. sapiens (SSA)

50 H. sapiens (NAF)

Adripithecus ramidus

Australopithecus anamensis

Australopithecus afarensis

Australopithecus africanus

Paranthropus robustus

Australopithecus garhi

Paranthropus aethiopicus

Paranthropus boisei

Homo

https://www.sciencemag.org/content/340/6129/
1233062/F1.large.jpg

http://tolweb.org/tree/ToLimages/
cladogram_parallel_evo.250a.jpg