Order: Primates

- We looked at the characteristics of primates last time
- Mammals descended from earlier vertebrates
  - at some point, some vertebrates developed lactation, fur, and other features of mammals
  - all the descendents of those first mammals inherited these traits
  - since primates are among these descendents, the mammalian traits are ancestral to all primates
  - these descendents of the first mammals are the clade of mammals
  - in the Linnaean taxonomic (naming) system, this is the Class Mammalia
- At some point, some mammals developed the basic primate characteristics
  - grasping hands and feet, postorbital bar, etc.
  - all of the descendents of these first mammals inherited those traits
  - the basic primate traits are ancestral to all primates
  - some lineages, like ours, have lost some of these ancestral traits
    - we lack grasping feet, for example
    - but even so, grasping feet are the ancestral form of feet for humans
    - we have a new, derived type of foot that has been modified from the ancestral form to facilitate efficient bipedal walking
  - the descendents of these first creatures with grasping hands and feet are the clade of the primates
    - in the Linnaean taxonomic system, this is the Order Primates
- Later yet, some of these early primates developed a “dry” nose
  - with the sensory tissues located inside the head
  - rather than outside, as in “wet” nose or rhinarium, that you see on a dog or cat
  - the descendents of the first dry-nosed primates are the haplorrhines, or dry-nosed primates
    - Boyd and Silk use an older term for most of these: anthropoids
  - the others continued with the wet noses that they had inherited from the first primates
    - the descendents of these primates are the strepsirrhines, or wet-nosed primates
    - Boyd and Silk use an older term for these: prosimians
- how do we know that dry noses were the new (derived) trait, and wet noses were the original (ancestral) trait inherited from earlier mammals?
  - by looking at outgroups: species that are even more distant relatives than any primates
  - if we are interested in primates, then dogs and horses are outgroups
  - both dogs and horses have wet noses (rhinaria)
  - so the wet nose must have been present in the common ancestor of dogs, horses, and primates
    - perhaps even the first mammals, ancestors of all mammals
  - so the wet nose is the ancestral form of nose for mammals
  - and the dry nose must be a derived trait
– which is why it is found only in haplorrhine primates
– which all descended from the first primates to develop the dry nose
– Why all this fuss about phylogenies and obscure traits of different species?
– because it shows how the similarities of living species imply the pattern of phylogenetic branching
– which is reflected in the names of groups of primates
– so as we look at different kinds of primates…
– we are really looking at a story of the evolution of different features, in order
– that is,
– taxonomy (classification and naming) represents phylogeny
– and phylogeny tells a specific, concrete story of the evolution of our relatives and our own species
– So let’s look at the kinds of primates in the world
– their classification and naming
– and the phylogeny and evolutionary history that implies
– We will use a taxonomic classification chart
– which is essentially a phylogeny, drawn upside down
– Suborders of primates: strepsirrhines vs. haplorrhines
– Suborder: strepsirrhines (roughly the same as “prosimians” in the textbook)
– our most distant primate relatives
– generally the least like us
– the most varied category of primates
– strepsirrhines: retain the ancestral wet, “naked”, doglike nose (rhinarium)
– many nocturnal (active in the night), hence:
– more developed sense of smell than other primates, with the wet nose
– large eyes
– independently mobile ears
– sensory whiskers
– many arboreal (spend a lot of time in trees)
– many employ a body posture and locomotion called “vertical clinging and leaping”
– different species vary from being very specialized for vertical clinging a leaping and doing it much of the time, even on the ground
– to being more or less capable of doing it, and only actually doing it poorly and occasionally
– digits act in unison, not independently
– many have a “grooming claw” on the second toe only; nails on other digits
– many have a “dental comb”: the four lower incisor teeth and the lower canines are long, narrow, and close together, for use in grooming fur and gathering food
– most have the full three premolars (as do some haplorrhines, too)
– relatively smaller and simpler brains, less learned behavior, less complex behavior than the haplorrhines
– all strepsirrhines have the post-orbital bar but lack the post-orbital plate
- 3 infraorders: aye-ayes, lemuriformes, and lorisiformes
  - Aye-ayes
    - a single species of small, rare, nocturnal, arboreal primates found only in Madagascar
    - most known for having one very elongated finger that they use for digging insects out from under bark of branches
    - poorly known; we won’t deal with them further in this class
  - lemuriformes (lemurs)
    - only on Madagascar (a huge island off southeastern Africa)
      - evolved there in isolation from competitors on mainland
        - including humans
      - lemurs were a case of adaptive radiation
        - they evolved in many different directions to fill many of the niches occupied by other animals on the mainland
        - there were lemurs the size of calves!
    - humans reached Madagascar around the time of Christ
      - and within a few centuries had completely exterminated all the larger lemurs
      - mostly the smaller, tree-dwelling, nocturnal ones survived
    - the SF zoo has an important project going to study, breed, and release Madagascar lemurs, and many strepsirrhines that you can see
      - outstanding lemur area - really fun, highly recommended
    - quadrupedal plus vertical clinging and leaping
    - in many lemur species, females are socially dominant; they can push a male away from food
    - Within the lemuriformes, there are subtypes:
      - lemurs proper
        - like the ringtail lemur
      - lepilemurs
      - indris
        - like sifakas
  - lorisiformes (lorises)
    - African and Asian forests
    - small, nocturnal, arboreal
    - mostly eat fruit, gum, insects, some small vertebrates
    - lorises: slow climbers and creepers
    - galagos: fast hoppers and runners (“bushbabies”)
- Suborder: haplorrhines
  - this is our branch: monkeys, apes, and humans
  - dry nose: reduced sense of smell
  - generally larger body size
  - mostly **diurnal** (active in the day)
  - retina with a **fovea** (central area of higher resolution vision)
    - absent in all of the strepsirrhines
  - reduced sensory whiskers
- independently controlled, dexterous digits
- nails on all digits (no claws, except for tarsiers)
- generally larger brain relative to body size
- generally more complex behavior
- post-orbital bar (like all primates) plus post-orbital plate
- post-orbital plate is found only in haplorrhines, not in strepsirrhines

- Two infraorders of haplorrhine primates: tarsiiformes (“tarsier-shaped”) and simiiformes (“monkey-shaped”)
  - tarsiiformes (tarsiers) (“tarsier-shaped”)
    - high rain forests of Southeast Asia and Indonesia
    - small, nocturnal, arboreal
    - vertical clinging and leaping
    - eat insects and some small vertebrates
      - some tarsiers can withstand neurotoxins produced by snakes
    - they share many features (small size, nocturnal activity pattern, vertical clinging and leaping, etc.) with strepsirrhines
    - but they have several diagnostic haplorrhine features
      - especially the dry nose
      - post-orbital plate
      - fovea
    - so it appears that these features evolved in an ancestor of all the haplorrhines, including the tarsiers
      - but the tarsiers split off shortly after those innovations and did not change much further
      - retaining many of the other strepsirrhine features that were lost in the other branch of haplorrhines: the simiiformes
        - small size, large eyes, nocturnal
        - grooming claw
        - digits are not independent; and others
  - simiiformes (all haplorrhines except the tarsiers) (“monkey-shaped”)
    - The simiiformes are divided into two subgroups called parvorders: platyrrhines and catarrhines
      - Infraorder: platyrrhines
        - “flat nosed”: round, forward-facing, widely separated nostrils
        - only in the New World, hence often called “New World monkeys” (NWMs)
        - three premolars on top and bottom
          - retaining the ancestral trait
          - the rest of the simiiformes have lost one premolar
        - almost all diurnal
        - all mostly arboreal, living in forests
        - mostly quadrupedal
          - but like all primates, flexible locomotion, with lots of variety
          - some able to swing by arms or tail
a few have prehensile tails, which are found only among the New World monkeys
- specifically, only among one family of NWMs, the cebids
- one kind of cebid is the capuchin monkey, which is notable for being one of only a few primates that known to regularly make and use tools:
  - capuchin monkey
    - use sticks as weapons, modify twigs and leaves to probe for insect larvae
  - Chimpanzees
  - Bonobos
  - Orangutans
- Gorillas (just recently confirmed in the wild)
  - Only in 2005 were two gorillas observed to use tools
    - one used a stick to test the depth of water, another put a trunk in a muddy area and then walked across it like a bridge
- Humans
- consider where in the phylogeny of the haplorrhines the tendency to regularly use tools might have developed…
  - considering the phylogeny of these species, capuchins using tools is a bit surprising
  - there is no one place on the phylogeny where tool-using could have appeared that would account for the pattern of tool-usering species and species that do not used tools
  - what might this suggest about the haplorrhines in general?
- Infraorder: Catarrhines
  - our branch
  - more closely-spaced, downward-facing nostrils
  - more on these next time!