Teaching Materials Associated with Module 6

Human Variation:

- *Human variation* refers to the fact that there is a range of possible values for each of the numerous physical characteristics of human beings.
- Race and ancestry
    - Biological VS Phenotypic variation
        - Race is not a biological concept- it is a social construct
        - There is greater genetic diversity within any one population (intraspecies) than there is between populations (interspecies)
        - Although there is no genetic difference between humans of different ancestries, there are some phenotypic and morphological differences
        - Cranial variations between ancestries (images in power point)
            - Nasal aperture
            - Interorbital breadth
            - Nasal architecture
            - Inferior nasal architecture
            - Orbit shape
            - Palate shape
    - AAA Statement on "Race"
    - **Adaptation**- To say that an organism is adapted to its **environmen**t involves a genetic trait. Those individuals that possess genetic traits that allow them to survive and reproduce better than their peers are better adapted to their environment.
    - **Acclimatization-** physical environments can also introduce changes in a population without resorting to genetic change. We call this process *acclimatization*. Acclimatization involves physiological adjustments by an individual to certain environmental conditions. Individuals develop these during their lifetimes. They are not born with them, although over time, a population may become adapted to a certain environment due to them.
    - Physical variation in Humans examples:
        - Body build- Allen (limb length) and Bergmann's (body size) rule
        - Skin color
- Sex/Sexual Dimorphism (images in power point)
    - Some species, like gorillas, have high sexual dimorphism; while Homo sapiens have a level of sexual dimorphism, it is subtler, with slight differences in cranial and post-cranial skeletal morphology.

Os Coxae Feature	Male Characteristic	Female Characteristic
Superior Inlet	Heart shaped	Spacious, wide and oval
General Size	More robust and muscle-marked	Less robust
Obturator Foramen	Larger and oval	Smaller and triangular
Acetabulum	Larger, directed more forward/Anteriorly	Smaller, directed more laterally
Greater Sciatic Notch	Narrow and deep	Wide and shallow
Body of Pubis	Short, triangular	Longer, more rectangular
Subpubic Angle (area underneath the two pubic bones)	Narrow, V-shaped	Broader, more convex
Preauricular Sulcus (depression between greater sciatic notch and sacroiliac articulation)	Usually absent	Usually present

Skull Feature	Male Characteristic	Female Characteristic
General size	More robust	More gracile/delicate
Nuchal Crest	Well-demarcated nuchal lines and a prominent bump or "hook"	External surface of occipital bone is smooth, with no bony projections here
Mastoid Process	Large, projects below the external auditory canal	Smaller
Supra-orbital margin	Thick, rounded, blunt border	Thin, sharp border
Supra-orbital ridge	Prominent	Little or no prominence
Mental Eminence	Squarish, greater forward projection	More pointed (versus squarish), little forward projection
Gonial Angle	Flared, Less obtuse, <125 degrees (typically, about 90 degrees)	Typically > 125 degrees

- Evolutionary context
  - Microevolution- **short-term** evolutionary changes that occur within a **given species** over relatively few generations
  - Macroevolution- **long-term** evolutionary changes, especially the **origins of new species and their diversification** across space and over millions of years of geological time
  - Four Evolutionary Processes- can affect change in gene frequencies in population over time
    - Natural selection
    - Mutation

- Gene Flow
- Genetic Drift

TABLE 3.2 Effects of the Four Evolutionary Processes on Variation within and between Populations

EVOLUTIONARY PROCESS	VARIATION WITHIN POPULATIONS	VARIATION BETWEEN POPULATIONS
Mutation	Increases	Increases
Gene flow	Increases	Decreases
Genetic drift	Decreases	Increases
Natural selection	Increases *or* decreases	Increases *or* decreases

  - Natural Selection and Mutation
    - Natural selection- genetic mutation leads to variant individuals in each generation and those best suited produce more offspring
    - Mutation- creation of a new allele for a gene when the portion of the DNA molecule to which it corresponds in suddenly altered

Bias in the Fossil Record:

- Taphonomy
- Not all bones become fossils so it can create a bias when deciding if a new find is a new species or just a member of an already defined species with a morphological difference
- Many times in the study of paleoanthropology only a few bones or crania are found from any one species so there is not sufficient data to create catalogue of all the variations that may be present within any said species

Lumper or Splitter Case Study: Homo erectus vs Homo ergaster

- Many paleoanthropologists thing that H. erectus and H. ergaster actually belong to the same species. H. ergaster is used for the African variant of H. erectus, whereas plain H. erectus refers to the European populations.
- Alternatively, H. ergaster could be the direct ancestor of H. erectus. There is obviously variation in bone structure between the two geographical regions, but as with modern humans, phenotypic variation can dramatically over exaggerate any real genetic difference in a population. As we have explored, H. sapiens can have different skeletal morphology depending on geological ancestry. This may be the case with H. erectus as well; erectus and ergaster might very well be the same species, just with differing phenotypic expression due to environmental differences