What is Anthropology?

Study of *Homo sapiens*

Four subfields:
- Cultural Anthropology (participant observation)
- Anthropological Linguistics
- Biological Anthropology (Physical Anthro)
- Archaeology

Anything & everything to do with humans = holistic

Biology + Behavior + **CULTURE**

Anthropology as a Science

- Scientific method = Testable models & theories
- Theory laden nature of observation
- Objective measurement

Anthropological View Point

- Ethnocentrism or Culture Bound
- Cultural Relativism
Biology & Evolution

Charles Darwin 1859 “Origin of Species”

Preconditions for acceptance of Darwin’s theory in 19\textsuperscript{th} Century:

- Geology = Uniformitarianism vs. Catastrophism
  
  C. Lyell

- Age of the Earth = 4004 BC vs Deep time

- Fossil Discoveries = extinct species (Dinosaur)

- Fixed species vs. changing species (i.e., evolution)
  
  Lamark = Inheritance of Acquired Characteristics

Natural Selection = inheritance of traits in a specific environment may lead to differences in reproduction

= Adaptation

Three parts:

- Variability
- Inheritance
- Differential reproduction

\textit{Moth Example}
Rules of Heredity = Gregor Mendel

Genes
Alleles
DNA
Chromosomes

Homozygous vs. Heterozygous
Dominant vs. Recessive
Genotype vs. Phenotype
Mitosis vs. Meiosis

Meiosis = offspring inherits chromosomes (genes) from each parent

Combinations of pairs of genes (genotypes) result in physical traits (phenotypes) = Polygenetic inheritance

Dominant-Recessive relationship interacts to determine the phenotype.

Blue eyes vs. brown eyes

Controller genes = growth & development

Mutations = produce genetic variation (bad & good mutations)

- *chance* alteration of gene yields a new allele
- 30 mutations / million sex cells formed
Sickle Cell Anemia (genetic disease)

Blood incapable of carrying sufficient oxygen to survive

Anemia that is fatal

Red blood cells are sickle shaped

Africa = malaria transmitted by mosquitoes = blood disease

Genetic types

SS    normal but infected by malaria
Ss    malaria protected
ss    anemia = death

US African Americans rate of disease drops from 22% to 9%
Population Genetics (Microevolution)

Measuring evolution thru change in gene frequencies

Hardy-Weinberg Principal

Percentage of heterozygous and homozygous persons will remain the same from one generation to the next if:

- Mating is random
- Large population
- No genes are introduced from another population
- All individuals have an equal probability of survival

If these assumptions are not met then evolution is taking place

Genetic Drift

Gene Flow

Natural Selection
Macroevolution

Evolution of populations and species

Species = inter-breeding results in viable offspring.

Speciation = mechanisms that isolate separate populations
(geographic isolation)

Divergent Evolution

Linear Evolution

Punctuated Equilibrium = sudden speciation then stability from
long period of time (millions of years)

Primates

Classification of Humans:

Class —mammalian

Order—primates

Family—hominidae (hominid)

Genus—Homo

Species—sapiens
Primate Order

1. Prosimians (lemurs, tarsiers)
2. New World Monkey
3. Old World Monkey
4. Apes (gibbon, gorilla, chimpanzee, orangutan)
5. Hominids (H.s. & fossil ancestors)

DNA similarity

H.s. → chimp (98%) → gorilla → orangutan → gibbon → monkey

Primate Characteristics:

1. sense of smell not well developed
2. stereoscopic vision
3. color vision
4. fovea centralis
5. brain enlargement relative to body size
6. smaller less specialized teeth (omnivorous)
7. foramen magnum toward center of skull
8. clavicle/scapula better developed & flexible
9. five digits (prehensile → grasping)
10. nails vs. claws
11. opposable thumb → grasping
Early Primates

Visual Predation of Insects

Arboreal = tree dwelling vs. terrestrial

Vision → grasping → omnivorous → brain → locomotion

Primate Locomotion:

1. quadruped
2. brachiate
3. climbing
4. knuckle walking
5. bipedalism

Social Behavior of Primates gives insight into Hominid behavior

Jane Goodall, Diane Fosse

Primates = learning important & are social animals
Baboons (terrestrial monkey)

Open savanna of Africa comparable to environment of early Hominids

Troop Social Hierarchy & Predator Protection

Chimpanzee Behavior (Jane Goodall)

- meat eating
  - usually vegetarian
  - hunt young baboons, small arboreal monkeys
  - not common

but,
  - cooperate in the hunt
  - share meat but not other foods
  - dominance hierarchy lessens

- Tool making & use
  - Crushed leaf
  - Modified stick
  - Rock & anvil

Chimp “Culture” ?? — 39 cultural traits observed in the wild

Conclusion: since we have a common ancestor then genetic capacity in early Hominids is present
Early Hominids

Evolutionary Trends in Hominid Line

- Bipedalism
- Canine/incisor reduction
- Flatter face
- Brain size increases
- Tool use (culture) & increasing complexity

Which came first???

Early 20th century view & the Piltdown Skull

Australopithecines & Other Early Hominids (1-6 myr)

*Orrorin tugenensis* 6 myr
Ardipithecus ramidus 4.4-5.8 myr

Australopithecus 4.5-1.0 myr

- Gracile
  - A. anamensis
  - A. afarensis
  - A. africanus

- Robust
  - A. robustus
  - A. boisei

- All Australopithecine species are bipedal
• Parabolic dental arch
• Reduced canines
• Small brain
  - 380-500 cc (Chimps = <400 cc; H.s. 1400 cc)
• NOT a tool user or maker

Australopithecine afarensis (East Africa; 3+ myr)

Donald Johanson
Hadar, Ethiopia

“Lucy”
• 40% of skeleton
• 40 lbs, 3’10”
• adult female
• transitional dentition
  - small diastema
  - not as parabolic as H.s.
• long curved fingers = still arboreal much of the time
• bipedal (ape-like gait ??)
“First Family”

- 13 individuals (males, females, & children)
- all died at the same time
- live in rich grassland (savanna) – lake shore habitat

Laetoli, Tanzania  (Mary Leaky)
- fossil footprints in hardened volcanic ash
- 3.5 myr
- anatomically modern foot print of 3 individuals
  A. africanus
- South Africa
- gracile
- Dentition less ape-like
- 40-70 lbs
- 380-500 cc cranial capacity
- ate plants & fruit
- no tools
A. robustus (boisei)

- south & east Africa
- becomes extinct about 1 myr
- larger in size (80+ lbs)
- sagittal crest
- large jaw
- very large molars
- ate tough seed & nuts
- very specialized diet
- no tools
Genus Homo

Homo habilis

Louis & Mary Leaky, Olduvai Gorge 1960s
Richard Leaky, Lake Turkana 1970s (1470 Man)

- larger cranial capacity (600-775 cc)
- 1.6 – 2.0+ myr
- less robust skull
- post cranial = like Australopithecines
- fully bipedal
- found along lake shores
- TOOL MAKER
Beginnings of Culture = Lower Paleolithic

Oldowan

- 2+ myr
- pebble tools
- sharp-edged flakes
- manuports

Making tools
- abstract idea (finished product)
- Foresight
- Raw material selection

Sites = stone tools + animal bone

- Scavenging large mammals & hunting small animals
- Carcass processing
- Cache stone tools
- Not sleeping or camping sites
Homo erectus

1.8+ myr to 0.5 myr

- Cranial capacity 775-1225 cc
- Massive brow ridge
- Low cranial vault
- Powerful jaw
- Fully-modern biped
- Shorter than H.s. but more robust
- Tools = Acheulean (hand axe)
- Use of fire (after 1.0 myr—Thailand)
- Big game hunting by 500,000 yrs BP
- Language –after 500,000 yrs BP (hypoglossal canal)
- Wider geographic distribution
H. erectus (cont.)

Lake Turkana, Africa, Richard Leakey

- 1.8+ myr
- Turkana Boy = 12 yr old, 5’6” tall
- almost complete skeleton

Dmanisi, Georgia 1.8 myr?

Java 1.0+ myr???

Dragon Bone Hill (Zhoukoudian), China 500,000 yrs BP

Hunting

Torralba-Ambrona, Spain (400,000 yrs BP)
- Kill site
- Dismembered elephants & other game animals in a swamp
- Thousands of stone tools

Schoningen, Germany
- Five 7 foot-long wooden spears
- Butchered horse bone nearby
- 400,000 yrs BP
Dating Methods

Chronology building is an essential part of doing Archaeology

Approaches:

- Relative dating
- Absolute dating

Stratigraphy = oldest to youngest according to layering

Radiocarbon (C14) dating

C14 = radioactive isotope

C14 half-life = 5730 years

Make repeated counts of radioactivity = average value w/ plus/minus

Datable material (organic materials)
- Wood (charred)
- Bone
- Shell
- cloth

only useful to 50,000 years ago

Potassium-Argon

Half life = 1.3 billion yrs
Date volcanic ash

Dendrochronology (Tree-ring dating)

- Used in Southwest U.S.
- Annual growth ring on tree = count rings to determine age
- Develop a master index (to about A.D. 300)
- Date roof beams in pueblo structures

Stone Tool Technology (Lithics)

Chipped stone vs Ground Stone

Raw material = fine grain (chert or flint, obsidian, basalt)

Fracturing can be controlled because of conchoidal fracturing properties

**Hammerstone** is use to detach flakes

Direct percussion flaking (hard hammer, antler/bone) = shape & thin material

Pressure flaking = final shaping
Blades = specialized flakes removed from a blade core by indirect percussion (long with parallel sides)

Homo neanderthalensis

- 130,000 to 40,000 BP
- Lived in Europe (cold) and Middle East (mild)
- Cranial capacity = modern humans (1600 cc)
- Massive brow ridges
- Cold weather adapted
  - Enlarged nasal area
  - Stocky build

- Culture = Mousterian (Middle Paleolithic)
  - Refined hand axe
  - Other more specialized flake tools
  - Lived in caves
  - Systematic use of fire
  - Deliberate burial of the dead
  - Language? (larynx position)
  - Big Game hunter

Shanidar Cave, Iraq (40,000-50,000 BP)

- Burials
- Red Ocher = mineral paint to decorate body
- Flower pollen = wreath??
- Withered arm, arthritis & blind in one eye

Did Neanderthals evolve into modern humans or become extinct?

- Skeletal evidence
• DNA evidence
• Cultural evidence

Homo sapiens

• 200,000/100,000 BP
• High forehead
• Flat face
• Smaller jaw & teeth
• Culture = Upper Paleolithic

Origin of Modern Humans

• African origin model
• Multiregional model

Mitochondrial DNA

H. sapiens present in:

Europe by 35,000 BP
Australia by 40,000 BP
New World by 14,000 BP

Upper Paleolithic (H. sapiens) Europe 35,000-10,000 BP

• Blade tools
• Antler & bone tools (harpoons & atl atl)
• Pressure flaking technique
• More varied tool kit
- Cave & portable art
- Hunters of big game

**Upper Paleolithic (Modern Humans)**
pressure stone tool manufacturing technique
blades
antler and bone tools (harpoons)
atl atl
many more tools
cave art
big game hunters