

ANTH 260 - UNIT 2 STUDY GUIDE

PRIMATES

GENERAL TRAITS

Upright posture, 5 digits on hands and feet (flexible nails not claws, opposable thumb/big toe, tactile pads on finger tips), collarbone for mobile front limbs, different dentition/teeth equations, reduced emphasis on smell, orbital eye with color vision, primate history traits (few offspring per pregnancy, prolonged period of infancy & dependency, long lifespan for body size, learned behavior, large social groups)

EVOLUTIONARY EXPLANATIONS

Arboreal Hypothesis: basic primates selected to fit an adaptive niche in the trees

Visual Predator Hypothesis: primates adapted to forest ground to catch small insects & prey

Fruit Flower Eating Hypothesis: favored by selection to better harvest flowering plants & fruit

SURVEY OF 4 GROUPS

Prosimians

- Locomotion vertical clinging and leaping
- Mostly eats insects, but also birds, bats, snakes
- Confined to Madagascar, tropical Africa and Asia
- Greatest number of ancestral traits of all primates
- EXAMPLES: Lemurs, Tarsiers, Lorises, Aye-Ayes Indris

New World Monkeys (Platyrrhini)

- Anthropoid (higher primate, close to humans)
- Small and have prehensile (grasping) tails and run on top of branches
- Spend a lot of time in trees so they live in tropical forests of Central & South America
- Large multi-male, multi-female groups
- EXAMPLES: Woolly Monkey, Spider Monkey, Squirrel Monkey, Howler Monkey, Owl Monkey, Pygmy marmoset

Old World Monkeys (Cercopithecoidea)

- Anthropoid
- Cercopithecines: partly terrestrial, omnivorous, live in large groups
- Colobines: arboreal, colorful, feed on leaves
- EXAMPLES: Baboons, Macaques, Mandrills, Langurs, Vervet Monkey, etc.

Hominoids

- Anthropoid
- "Great Apes"
 - o Chimpanzee (Africa equator, knuckle-walkers, groups lead & defended by males competing for status, important mother-infant bond, Jane Goodall studied them, use tools for meals and hunting)
 - o Bonobo Chimpanzee (taller, longer arms, darker faces, less aggressive, larger female group role, sex a lot for anything)
 - o Gorilla (Africa equator forests, sexual dimorphism in body size, one-male and multi-female groups, mostly vegetarian)
 - o Orangutan (rainforests of Borneo and Sumatra, large tree climbers, smaller social groups, frugivorous - eat mostly fruits)
- "Lesser Apes"
 - o Gibbons and Siamangs (tropical SE Asia, pair bonded adults and offspring, brachiation - swing like monkey bars, long arms & fingers, short legs)

PRIMATE BEHAVIORAL ECOLOGY: REPRODUCTIVE STRATEGIES

BEHAVIORAL ECOLOGY

Natural selection favors strategies that increase fitness

Strategy: a set of behaviors that produces a particular course of action under certain conditions

- No perfect strategy, doesn't imply conscious reasoning or intent

FEMALE AND MALE REPRODUCTIVE STRATEGIES

Female success: related to ability to obtain calories and nourishment for herself and offspring

- Transportation, warmth, protection from danger also very important

Male success: affected more by access to females than to calories resulting in competition

MALE COMPETITION

Being more attractive, beating up the competition, favored sexual dimorphism (traits that differ between the sexes in a species), sperm competition, infanticide (killing infants)

PRIMATE BEHAVIORAL ECOLOGY: EVOLUTION OF COOPERATION

SOCIAL INTERACTIONS

+ - **Selfish:** improves own fitness at the detriment of others

+ + **Mutualistic:** both parties cooperate to get mutual benefit

- + **Altruistic:** actor does something that decreases own fitness, to benefit someone else

- - **Spiteful:** goes out of the way to knock another down, but pay a cost as well, both worse off

PROBLEM OF ALTRUISM

Poses an evolutionary problem, acts are costly to self at the benefit of others

EXAMPLES: alarm calls, territorial defense, food sharing, communal care of young

SOLUTIONS

Social interactions must be nonrandom (similar characteristics); towards other altruists

Kin Selection (Hamilton 1964):

- o assumes that altruism is underwritten by genes to pass on

o **Hamilton's Rule:** $rb > c$

- R = relatedness or probability that 2 individuals have same allele (high value with parents, closer to 0 with non-kin)
- B = benefit to recipient (# of additional offspring result)
- C = cost to the altruist (# of fewer offspring result)

Multilevel Selection (Wilson 1975):

- o When groups with greater frequency of altruists out compete groups with fewer altruists.
- o Can only occur when variation between groups is greater than variation within groups

Reciprocal Altruism (Trivers 1971):

- o Altruists take turns giving and receiving benefits, without cheaters
- o This requires opportunities to act in different roles, being able to keep track of what's given and received, only help those who provided help in the past

FOSSILS

COMPONENTS OF PALEOANTHROPOLOGY

Paleoanthropology

- multidisciplinary pursuit seeking to reconstruct and explain the timing and nature of evolutionary change in the morphology and behavior of our hominin relatives.

Geography

- Continental drift: the movement of large tectonic plates (0-100 mm per year) on top of denser rocks beneath

Paleoclimatology

- climatic conditions of the past analyzed from cores of the earth (usually from deep sea)
- Paleomagnetism: movement of the magnetic north pole

TAPHONOMY

The study of how fossils and the fossil record form.

Fossilization/mineralization: process by which organic material is replaced by minerals, creating a stone copy of the organic original

These are rare because few conditions allow this formation (rapid burial in fine sediment, gentle burial, mineral-rich chemical environment)

DATING TECHNIQUES

Relative Dating:

- Place finds in a sequence relative to one another, but provide no actual dates or date range
- Stratigraphy and the law of superposition: older layers overlain by more recent years

Radiometric/Absolute Dating:

- provides date estimates (in years before present, BP) for geological deposits
- Ex: stopwatch analogy
- Radiocarbon dating
 - o C12: stable, doesn't decay, same amount in organism dead or alive as C14
 - o C14: decays through time, created constantly until death

EVOLUTION

EARLY PRIMATES

Miocene (23-5 mya): hominoid radiation, "planet of the apes", world became cooler & drier during latter half, climate change shows shift in primate species (more monkey, less ape), sets the stage for appearance of hominins, Asia and Europe

- *Dryopithecus* (9.5 mya): teeth chimp-like in size and enamel indicating frugivory, cranium and skeleton ape-like, brachiation locomotion (swings branch to branch)
- *Sivapithecus* (14-8 mya): big powerful jaws, large molars and thick teeth enamel, Orangutan ancestor, India and Pakistan

Oligocene (34-23 mya): anthropoid radiation, best known early anthropoids come from fossil beds in Fayum Basin, Egypt

- *Aegyptopithecus*: relatively long snout and tiny brain, post-orbital closure, binocular vision, apelike dental formula (2.1.2.3), sexual dimorphism in skull size

Eocene (54-34 mya): Prosimian adaptive radiation, appearance of true primates, Adapids & Omomyids, grasping hands and feet with nails,

- EXAMPLE: *Ida* (47 mya) is the worlds best preserved adapid

Paleocene (65-54 mya): first possible primates

- Plesiadapiforms (Plesiadapids): small primate like animals, solitary (mostly alone), terrestrial (live on the ground) and arboreal (live in the trees), quadrupeds (walk on all fours), well developed sense of smell, claws on hands and feet
 - o *Carpolestes simposoni* (56 mya): nearly complete skeleton discovered in Wyoming, 2002, had opposable big toe with nail, but claws on rest of digits

ORIGINS OF BIPEDALISM

Bipedal gait (our form of walking on two legs) is unique to hominins (humans)

- Foramen magnum: small hole that connects spinal chord to skull is located under, in the middle, rather than the rear of the skull
- S shaped curvature of spine helps balance and cushion torso