

**Primate Evolution and Radiations  
Anthropology 571 (16:070:571:01)**

**Autumn, 2004  
S. Cachel**

**Instructor:** Dr. Susan Cachel  
Office: Biological Sciences Building, Room 316, Douglass Campus  
Office hours: Tuesday, 2:30-4:00, or by appointment  
Phone: 732-932-9475; 732-932-9886 (dept.)  
[cachel@rci.rutgers.edu](mailto:cachel@rci.rutgers.edu)

**Location:** Wednesday 2:50-5:50 P.M., Biological Sciences 206, Douglass Campus

**Required Texts:**

Agustí, J. & Anton, M. 2002. *Mammoths, Sabretooths, and Hominids*. Columbia University Press.

Martin, R.A. 2004. *Missing Links: Evolutionary Concepts and Transitions Through Time*. Jones & Bartlett.

Prothero, D. 2004. *Bringing Fossils to Life: An Introduction to Paleobiology*, 2<sup>nd</sup> ed. McGraw Hill.

Turner, A. & Anton, M. 2004. *Evolving Eden: An Illustrated Guide to the Evolution of the African Large Mammal Fauna*. Columbia university Press. [published in October]

All texts available from the Cook-Douglass Cooperative Bookstore

**Course Requirements:**

Two short papers (ca. 5-8 pages, each), each worth 20% of the final grade. One longer paper (ca. 15-20 pages) reconstructing the paleobiology of an extinct primate or the paleoecology of an ancient primate-containing ecosystem from published information on body size, limb proportions, brain size, etc. This paper is worth 40% of the final grade, and is due on Dec. 15<sup>th</sup>. It must contain a data table, and a discussion of your original reconstruction using the data in the table. All papers must be referenced in the standard journal style—i.e., no footnotes! Consult a recent copy of the *American Journal of Physical Anthropology* for this reference style. Class participation accounts for the remaining 20% of the final grade.

## Course Topics:

Week 1 (Sept. 1): Introductory; the limits of the fossil record; the 2004 International Geological Time Scale (International Commission on Stratigraphy); sedimentation and stratigraphy; the paleobiology database; NOW: the Neogene mammal database (Fortelius et al.); taphonomic processes; time-averaging  
Species definition; defining fossil species

Week 2 (Sept. 8): Macroevolution—the Procession of Life; patterns of origin and extinction

Paleobiology—Bringing Fossils Back to Life; what is found in the fossil record and how this limits reconstruction; functional morphology; inferring function from structure; reconstructing soft tissue—use of the living to reconstruct the dead; dentition and diet; microwear and diet; diet from the chemistry of prehistoric enamel and bone

Prothero, pp. 5-18, 21-37, 39-45, 46-63

Week 3 (Sept. 15): Biomechanics—form and function; joint structure: weight-bearing and locomotion; bone density and activity; behavior and the internal architecture of bones; CT-scanning; relative brain size; natural and artificial endocasts—is it possible to do paleoneurology?

The Physical Environment: paleogeography, paleoclimatology, and some detectable physical determinants of paleoecology (global temperature, sea-level, etc.)

Prothero, pp. 65-78, 81-95, 97-117, 119-146

Week 4 (Sept. 22): Special Lessons from the Pleistocene—paleoenvironments of the Mediterranean Basin at the Last Glacial Maximum versus today; patterns of evolution in Ice-Age mammals; rates of evolutionary change; refugia; extinctions

Special Lessons from the Pleistocene—climate change and evolution; re-colonizing depopulated areas; evolution on islands; body size changes; species interactions; “contemporary evolution”; reconstructing the lifeways of fossil animals is not an exercise in fantasy &/or psychic prowess

Prothero, pp. 169-185, Martin, pp. 5-71, 175-190, 257-277

Week 5 (Sept. 29): The Primate Fossil Record; a series of adaptive radiations; origins and extinctions

The Origin of Primates; primate relatives; primatomorphs; primate eyes (relative orbit size, relative corneal size, the brain and the visual system); primate limbs and extremities; the North American fossil record

Prothero, pp. 394-416, Martin, pp. 117-140

**First short paper due!** Topic to be chosen from course themes covered thus far.

Week 6 (Oct. 6): The Cretaceous World; the Great Dying; the earliest primate record; in the shadow of the dinosaurs; Paleocene primates

The Paleocene Extinction—The First Major Primate Extinction Event; the Paleocene/Eocene Thermal Maximum—why?

Begin Agustí & Anton book

Week 7 (Oct. 13): Origins and adaptive radiation of the Eocene Primates

Adapiform and Tarsiiform primates; what is a tarsier? tarsiers as living fossils; the Eocene Messel Grube

Prosimian extinction in North America—why were prosimians vulnerable?

Week 8 (Oct. 20): The Malagasy primate radiation; the subfossil primates of Madagascar; human impact on Malagasy extinctions

Week 9 (Oct. 27): What is an anthropoid primate? first anthropoids; Africa or Asia as center of origin for basal anthropoids

The Platyrrhine Radiation; across the South Atlantic by raft? South American Miocene primates

Week 10 (Nov. 3): Plate tectonics in the Caribbean; Primate fossils in the West Indies; colonizing islands; contrasting higher primate evolution in the Old and New Worlds

The First Catarrhines; early catarrhines of the African Eocene and Oligocene; monkey? ape? other? the Parapithecoidea; the Fayum ecosystem

Begin Turner & Anton book

**Second short paper due!** Topic to be chosen from course themes covered thus far.

Week 11 (Nov. 10): The Hominoid Radiation; the pliopithecids; African early to middle Miocene hominoids; the Proconsulidae

Fossil hominoids of Eurasia; persistence of the pliopithecids until the early Pliocene; *Dryopithecus*, the first fossil ape ever discovered; significance of the dryopithecine apes; ancestors of living African pongids in Europe?—out of Africa into Europe and back again?

Week 12 (Nov. 17): The Tusco-Sardinian Island; what is *Oreopithecus*?—monkey, ape, indeterminate catarrhine? new studies by Lorenzo Rook et al.; special lessons from *Oreopithecus*

The Asian hominoid radiation; rich material from the Siwaliks and the Lufeng Basin; special lessons from *Gigantopithecus*

Nov. 24—**NO CLASS!** Thanksgiving!

Week 13 (Dec. 1): Decline of the hominoids; extinction caused by climate change, habitat restriction, competition...?; victoriapithecids

Rise of the Old World monkeys late in time—the Plio-Pleistocene cercopithecoid radiation; macaques as living fossils

Week 14 (Dec. 8): Hominid origins—where, when, and why; the Messinian Crisis

General patterns in primate evolution; do hominids follow the evolutionary patterns seen in other primates? hominization schemes

**Dec. 15: Paleoecology paper due!**