

ANG 6555, section 06F2

Spring 2012

PRIMATE FUNCTIONAL MORPHOLOGY

Time: Wednesdays, periods 3-5 (9:35 AM – 12:35 PM)

Place: Turlington 2306

Instructor: David Daegling, TUR B376 392-2253 x245 daegling@ufl.edu
Office Hours: T 9:30 – 11:30 AM; W 2:00 – 3:00 PM

COURSE OBJECTIVES: This course covers the practical and theoretical aspects of functional morphology with respect to living and fossil primates. Seminar time will be devoted to discussion of assigned readings on topics listed under the course schedule. Some background in human or comparative anatomy/osteology is recommended. General issues and approaches to functional morphology are covered, including 1) relationship of evolutionary theory to the study of morphology, 2) functional morphology of specific anatomical systems and 3) techniques for resolving biomechanical problems.

COURSE REQUIREMENTS: Participation in class discussions is expected of all students; active participation is essential for the success of the course and in determining your final grade. In addition, two papers are required: 1) a 7-10 page paper critically examining the literature on early hominid bipedalism (due 4/25), and 2) a 5-7 page paper detailing a research protocol for an unresolved question in comparative primate morphology (due 3/21). Topics for the second paper require instructor approval. Analytical problems to be completed outside of class are periodically assigned. There are no examinations. Readings are available on-line through Sakai and in a course packet from Orange and Blue Textbooks (*OBT* in course readings, 309 NW 13th Street, 375-2707).

OTHER POLICIES: Cell phones and pagers must be turned off during class. Adequate participation in class discussions is impossible without regular attendance; absences will adversely affect your course grade. Late papers are subject to a full letter grade reduction. Incompletes will not be granted for any work submitted beyond the end of term (4/25/12 in this case). Plagiarism in any form is subject to university policy as outlined by the Dean of Students (<http://www.dso.ufl.edu/judicial/academichonestystudent.html>). Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

COURSE SCHEDULE:

Date	Topic
1/11	Introduction
1/18	Optima
1/25	Theoretical morphology
2/1	Phylogeny, constraint and the comparative method
2/8	Allometry and criteria of subtraction
2/15	Morphometrics: problems and prospects
2/22	Theoretical biomechanics
2/29	Experimental approaches
3/7	No class (<i>Spring Break</i>)
3/14	Special senses
3/21	Functional determinants of skull form
3/28	Dental functional morphology
4/4	Functional anatomy of speech
4/11	No class (<i>AAPA meetings</i>)
4/18	Primate locomotion
4/25	Case study in adaptation: primate origins

Readings for 1/18

Wainwright SA (1988) Form and function in organisms. *Am Zool* 28:671-680.

Alexander RM (1985) The ideal and the feasible: Physical constraints on evolution. *Biol J Linn Soc* 26:345-358. [OBT]

Rudwick, MJS (1964) The inference of function from structure in fossils. *Brit J Phil Sci* 12: 91-105.

Smith RJ (1982) On the mechanical reduction of functional morphology. *J Theor Biol* 96:99-106.

Readings for 1/25

Rasskin-Gutman D, Izpisua-Belmonte JC (2004) Theoretical morphologies of developmental asymmetries. *BioEssays* 26:405-412.

Thomas RDK, Reif WE (1993) The skeleton space: a finite set of organic designs. *Evolution* 47:341-360.

Bell AD (1986) The simulation of branching patterns in modular organisms. *Phil Trans Royal Soc B* 313:143-159.

Alberch P (1980) Ontogenesis and morphological diversification. *Am Zool* 20:653-667.

Readings for 2/1

- Pagel M (1999) Inferring the historical patterns of biological evolution. *Nature* 401:877-884.
- Freckleton RP, Harvey PH, Pagel M (2002) Phylogenetic analysis and comparative data: A test and review of the evidence. *Am Nat* 160:712-726.
- Hall BK (2007) Homoplasy and homology: Dichotomy or continuum? *J Hum Evol* 52:473-479.
- Lockwood CA, Fleagle JG (1999) The recognition and evaluation of homoplasy in primate and human evolution. *Yrbk Phys Anthropol* 110 (S29):189-232.
- Cartmill M (1994) A critique of homology as a morphological concept. *Am J Phys Anthropol* 94:115-123. [OBT]

Readings for 2/8

- Fleagle JG (1985) Size and adaptation in primates. In WL Jungers (ed) *Size and Scaling in Primate Biology*. New York, Plenum. p 1-19. [OBT]
- Jungers WL (1982) Lucy's limbs: skeletal allometry and locomotion in *Australopithecus afarensis*. *Nature* 297:676-678.
- Reno PL, McCollum MA, Lovejoy CO, Meindl RS (2000) Adaptationism and the anthropoid postcranium: Selection does not govern the length of the radial neck. *J Morphol* 246:59-67.
- Smith RJ (1993) Categories of allometry: Body size versus biomechanics. *J Human Evol* 24:173-182.

Readings for 2/15

- Oxnard CE (1973) Functional inferences from morphometrics: problems posed by uniqueness and diversity among the primates. *Syst Zool* 22:409-424.
- Slice DE (2007) Geometric morphometrics. *Ann Rev Anthropol* 36:261-281.
- MacLatchey L, Gebo D, Kityo R, Pilbeam D (2000) Postcranial functional morphology of *Morotopithecus bishopi*, with implications for the evolution of modern ape locomotion. *J Hum Evol* 39:159-183.
- Cardini A, Jansson A-U, Elton S (2007) A geometric morphometric approach to the study of ecogeographical and clinal variation in vervet monkeys. *J Biogeogr* 34:1663-1678.

Readings for 2/22

- Preuschoft H (1990) Mechanisms for the acquisition of habitual bipedality: are there biomechanical reasons for the acquisition of upright bipedal posture? *J Anat* 204:363-384.
- Fleagle JG (1974) The dynamics of a brachiating siamang *Hylobates [Symphalangus] syndactylus* *Nature* 248:259-260.
- Alexander RM (1984) Walking and running. *Am Sci* 72:348-354.
- Usherwood JR (2005) Why not walk faster? *Biol Lett* 1:338-341.
- OConnor CF, Franciscus RG, Holton NE (2005) Bite force production capability and efficiency in Neandertals and modern humans. *Am J Phys Anthropol* 127:129-151.

Readings for 2/29

- Swartz SM (1991) Strain analysis as a tool for functional morphology. *Amer Zool* 31:665-679.
- Kimura T, Okada M, Ishida H (1977) Dynamics of primate bipedal walking as viewed from the force of foot. *Primates* 18:137-147.
- Jungers WL, Stern JT Jr (1980) Telemetered electromyography of forelimb chains in gibbons (*Hylobates lar*). *Science* 208:617-619.
- Taylor CR, Rowntree VJ (1973) Running on two or four legs: Which consumes more energy? *Science* 179:186-187.

Readings for 3/14

- Barton RA (2006) Olfactory evolution and behavioral ecology in primates. *Am J Primatol* 68:545-558.
- Coleman MN, Ross CF (2004) Primate auditory diversity and its influence on hearing performance. *Anat Rec* 281A:1123-1137.
- Hladik CM, Pasquet P, Simmen B (2002) New perspectives on taste and primate evolution: the dichotomy of gustatory coding for perception of beneficent versus noxious substances as supported by correlations among human thresholds. *Am J Phys Anthropol* 117:342-348.
- Kirk EC (2004) Comparative morphology of the eye in primates. *Anat Rec* 281A:1095-1103.
- Spoor F, Garland T, Krovitz G, Ryan TM, Silcox MT, Walker A (2007) The primate semicircular canal system and locomotion. *Proc Nat Acad Sci USA* 104:10808-10812.

Readings for 3/21

Russell MD (1985) The supraorbital torus: "A most remarkable peculiarity". *Curr Anthropol* 26:337-360.

Moss ML (1968) A theoretical analysis of the functional matrix. *Acta Biotheoretica* 18:195-202.

Hylander WL, Picq PG, Johnson KR (2001) Function of the supraorbital region in primates. *Archs Oral Biol* 36:272-281.

Vinyard CJ, Wall CE, Williams SH, Hylander WL (2003) Comparative functional analysis of skull morphology of tree-gouging primates. *Am J Phys Anthropol* 120:153-170.

DuBrul EL (1977) Early hominid feeding mechanisms. *Am J Phys Anthropol* 47:305-320.

Readings for 3/28

Lucas PW, Prinz JF, Agrawal KR, Bruce IC (2002) Food physics and oral physiology. *Food Qual Pref* 13:203-213.

Boyer DM (2008) Relief index of second mandibular molars is a correlate of diet among prosimian primates and other euarchontan mammals. *J Hum Evol* 55:1118-1137.

Scott RS, Ungar PS, Bergstrom TS, Brown CA, Grine FE, Teaford MF, Walker A (2005) Dental microwear texture analysis shows within-species diet variability in fossil hominins. *Nature* 436:693-695.

Hylander WL (1975) Incisor size and diet in anthropoids with special reference to Cercopithecidae. *Science* 189:1095-1098.

Macho GA, Spears IR (1999) Effects of Loading on the Biomechanical Behavior of Molars of *Homo*, *Pan*, and *Pongo*. *Am J Phys Anthropol* 109:211-227.

Readings for 4/4

Kay RF, Cartmill M, Balow M (1998) The hypoglossal canal and the origin of human vocal behavior. *PNAS* 95:5417-5419.

Arensburg B, Schepartz LA, Tiller AM, Vandermeersch B, Rak Y (1990) A reappraisal of the anatomical basis for speech in middle Paleolithic hominids. *Am J Phys Anthropol* 83:137-146.

Lieberman P (2003) On the Kebara KMH 2 hyoid and Neanderthal speech. *Curr Anthropol* 34:172-175.

Ichim I, Kieser J, Swain M (2007) Tongue contractions during speech may have led to the development of the bony geometry of the chin following the evolution of human language: A mechanobiological hypothesis for the development of the human chin. *Med Hypotheses* 69:20-24.

Readings for 4/18

- Fleagle JG (1977) Locomotor behavior and muscular anatomy of sympatric Malaysian leaf-monkeys (*Presbytis obscura* and *Presbytis melalophos*) Am J Phys Anthropol 46:297-308.
- Carlson KJ, Doran-Sheehy DM, Hunt KD, Nishida T, Yamanaka A, Boesch C (2006) Locomotor behavior and long bone morphology in individual free-ranging chimpanzees. J Hum Evol 50:394-404.
- Tuttle RH (1969) Knuckle-walking and the problem of human origins. Science 166:953-961.
- Richmond BG, Strait DS (2000) Evidence that humans evolved from a knuckle-walking ancestor. Nature 404:382-385.
- Ruff CB (2002) Long bone articular and diaphyseal structure in Old World monkeys and apes. I. Locomotor effects. Am J Phys Anthropol 109:305-342.
- Fleagle JG, Stern JT Jr, Jungers WL, Susman RL, Vangor AK, Wells JP (1981) Climbing: A biomechanical link with brachiation and with bipedalism. Symp Zool Soc Lond 48:359-375. [OBT]
- Demes B, Larson SG, Stern JT Jr, Jungers WL, Biknevicius AR, Schmitt D (1994) The kinetics of primate quadrupedalism: "hindlimb drive" reconsidered. J Human Evol 26:353-374.

Readings for 4/25

- Hamrick M (2001) Primate origins: evolutionary change in digital ray patterning and segmentation. J Hum Evol 40:339-351.
- Bloch JI, Boyer DM (2002) Grasping primate origins. Science 298:1606-1610.
- Schmitt D, Lemelin P (2002) Origins of primate locomotion: gait mechanics of the woolly opossum. Am J Phys Anthropol 118:231-238.
- Soligo C, Martin RD (2006) Adaptive origins of primates revisited. J Hum Evol 50:414-430.
- Nekaris KAI (2005) Foraging behavior of the slender loris (*Loris lydekkerianus*): implications for theories of primate origins. J Hum Evol 49:289-300.