

ANTHROPOLOGY 611: PRIMATE EVOLUTIONARY BIOLOGY: BODY SIZE
FALL 2013
MONDAY 4:15-7:05, PH 116

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Office hours: Monday, 10 am to noon, or by appointment. (NOTE: The best way to reach me is to come to office hours. The next best way is by e-mail. However, please be aware that I receive a large volume of student e-mail, so I will not be able to respond right away.)

COURSE DESCRIPTION

You can drop a mouse down a thousand-yard mine shaft; and, on arriving at the bottom, it gets a slight shock and walks away, provided that the ground is fairly soft. A rat is killed, a man is broken, a horse splashes.

- J. B. S. Haldane, "On Being the Right Size" (1928)

The splashing of the horse vividly illustrates an important point: size matters. This course is an introduction to some of the many relationships between body size and physiology, life history, ecology, locomotion, social structure, time, and space; these are generally known as *scaling* relationships. We will use the comparative method to identify scaling patterns among mammals (and in some cases, vertebrates) in general, as well as relationships among primates. Equally important as the relationships themselves (if not more) are the deviations from those scaling patterns and the reasons for those deviations. We will address these points, and at the end of the semester we will pay particular attention to interpreting patterns of size evolution and their implications among fossil hominins (*i.e.*, extinct members of the tribe Hominini, those species which are more closely related to humans than to our closest living relatives, the chimpanzees and bonobos).

This course will use a discussion format, and you and your fellow students are responsible for leading and participating in the discussions – the best way to learn this material is to make efforts to explain it to others! Do not expect me to give lectures during which you can be passive note-takers. This course will be enjoyable and successful for you only if every student actively participates. Read each article closely and be prepared to comment on all of them during every class.

The prerequisite for this course is graduate standing in the Department of Anthropology or permission of the instructor.

REQUIRED READINGS

You will be responsible for the course readings listed on the schedule below. The readings will be made available via Blackboard.

COURSE WEBSITE

The course website can be found on Blackboard. Readings and announcements will be posted there. Check the website regularly for announcements about changes to office hours, readings, or anything else important.

GRADING

This course uses the A-E grade system. Your final grade is determined based on the following components:

leading discussion:	20%	presentation:	20%
research project:	40%	class participation:	20%

Leading discussion of readings (20%): Each student is responsible for leading the class discussion of readings for one week. I expect the discussion leader to not only carefully read all of the assigned readings (all students are required to do this for all classes), but also to **prepare a list of reading questions that are distributed to the rest of the class the week before the readings are to be discussed**. ALL students will participate. The discussion leader will not give lectures about the material, but will be responsible for guiding the class discussion about the readings. I will evaluate your performance as discussion leader based on how well you get your fellow students to talk about the material at hand.

Research project (40%): I expect all students to complete an independent research project (*i.e.*, not a literature review) during the course of the semester. Projects should be related to the topics discussed in this class in some way, although ideally they will also be relevant to your M.A. project, dissertation research, etc. Projects may be based on a data set previously collected by you, collected by you over the course of the semester, mined from the literature, or drawn from data sets previously collected by myself. I expect each of you to meet with me during my office hours by the beginning of week 7 to discuss your project topic. Class during week 11 (one month before the projects are due) will be dedicated to discussing your research progress. At that point you will be expected to have collected the majority of your data, and you will give a brief presentation on the status of your analysis along with any difficulties you are encountering. It's fine (and expected) for you to be encountering difficulties; the point is for you to have done enough work to have discovered what the specific difficulties you're up against are, and to convey them to the class so that we can help you work through them. You must be prepared to present a preliminary analysis at this time! Discussion will follow each presentation, and students are expected to provide constructive criticism on all projects.

Projects should be written in scientific journal format, with an abstract, introduction, materials and methods, results, and discussion. The project should be contextualized in terms of the relevant literature. Papers will be graded on content, style, and grammar. Papers are due on Monday, December 9th at the beginning of class.

Presentation of research project (20%): During the last class meeting, students will present their research projects in a conference meetings-style talk. Each student will have twenty minutes: fifteen minutes for the presentation, and five minutes for questions. You will be graded on the clarity of your verbal presentation, your ability to handle questions, and the clarity of your slides. Presentations should provide a brief introduction and contextualization, but should focus on the results and implications of the research. You are expected to use PowerPoint, and your slides should reinforce your talk without distracting the audience; *i.e.*, only one figure per slide, minimal text (just a few bullet points per slide, no paragraphs), and what text there is should be large and easily readable (*i.e.*, 20 point or larger).

Class participation (20%): During the class discussions, I will take note of who makes comments and asks questions. Do the assigned readings before coming to class and be prepared

to participate. Everyone must participate in the discussions – it is NOT acceptable to let all the others do the talking and not comment or ask questions. You are not expected to be an expert in the topics of discussion. You ARE expected to ask questions and make comments during class to show me that you are making an effort to understand the material, regardless of background, interest, amount of sleep, *etc.* DO NOT rely on the discussion leader or me to do all the discussing. Everyone should think about the readings – relevance, importance, unresolved questions, confusing bits, *etc.* – and talk about these things in class.

Attendance: Attendance is mandatory in this course and is reflected in your participation grade. Poor attendance suggests you are not committed to doing well in the course. I will allow excused absences in the case of religious holidays, documented illness, professional conferences, and possibly other activities, but please let me know about these absences with as much advance notice as possible. I understand that people have family emergencies, have car trouble, suffer power failures that render alarm clocks useless, *etc.*, and that sometimes you simply can't make class. Please just let me know why you missed class. If you have more than one unexcused absence, I will deduct 5% from your final grade for each additional absence. If for some reason you will miss the class for which you are scheduled to lead the discussion, it is your responsibility to find someone to trade with you – if you fail to do so, you automatically get a zero for leading discussion (which counts for 20% of your final grade).

ACADEMIC INTEGRITY

Academic dishonesty of any kind will not be tolerated in this course. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be academically dishonest will receive academic sanctions as outlined in the university's Graduate Regulations and Degree Requirements:

http://www.albany.edu/graduatebulletin/requirements_degree.htm#penalties

STUDENTS WITH DISABILITIES

If you have special needs, please notify me immediately; I will be happy to work with you. Let me know if you anticipate needing any type of special accommodation in this course or have questions about physical access. For more information about "reasonable accommodation", please see the Disability Resource Center's Reasonable Accommodation Policy:

<http://www.albany.edu/disability/docs/RAP.pdf>

MAJOR DEADLINES

Monday, Oct. 7th: Meet with me by this date to discuss research project
Monday, Nov. 4th: Have completed data collection and present preliminary analysis in class
Monday, Dec. 9th: Final research presentation in class, and research papers due at the beginning of class – no exceptions

COURSE SCHEDULE

Note that this schedule is subject to change.

WEEK	TOPIC	READINGS
1: 8/26	Introduction	Peters, 1983 Ch. 1 (pp. 1-9) Fleagle, 1985
2: 9/2	NO CLASS (LABOR DAY)	
3: 9/9	Size, Statistics, and the Comparative Method	Peters, 1983 Ch. 2 (pp. 10-23) Nunn and Barton, 2001 Desdevises <i>et al.</i> , 2003 Warton <i>et al.</i> , 2006
4: 9/16	Life history and ecological correlates of body size I: Metabolism	Brown <i>et al.</i> , 2000 Peters, 1983 Chs. 3 & 4 (pp. 24-53) Symonds and Elgar, 2002 Ross, 1992
5: 9/23	Life history and ecological correlates of body size II	Ross, 1998 Nunn and Barton, 2000 Peters, 1983 Ch. 5 (pp. 54-78) Raichlen <i>et al.</i> , 2010 OPTIONAL: Pérez-Barbería <i>et al.</i> , 2007
6: 9/30	Temporal trends in body size evolution	Gillman, 2007 Cardillo <i>et al.</i> , 2005 Jernvall and Wright, 1998 Okie <i>et al.</i> , 2013 Purvis <i>et al.</i> , 2000
7: 10/7	Ecogeographical trends in body size evolution	Ashton <i>et al.</i> , 2000 Freckleton <i>et al.</i> , 2003 Gordon <i>et al.</i> , 2013 Lomolino, 2005 OPTIONAL: Lehman, 2007
8: 10/14	NO CLASS (COLUMBUS DAY)	
9: 10/21	Size and locomotion	Alexander, 1985 Biewener, 1989 Biewener, 2005 Peters, 1983 Ch. 6 (pp. 79-99) Yamanaka <i>et al.</i> , 2005
10: 10/28	Growth and development	Leigh, 1992 Godfrey and Sutherland, 1996 Peters, 1983 Ch. 8 (pp. 118-146) Walker <i>et al.</i> , 2006

11: 11/4	PRELIMINARY RESEARCH PRESENTATIONS	
12: 11/11	Body size, skeletal size, and size estimation in fossils	Jungers, 1991 Kappelman, 1996 Smith, 1996 Ruff, 2010
13: 11/18	Evolution of body size in primates	Gebo <i>et al.</i> , 2000 Soligo, 2006 Soligo and Martin, 2006 Ruff, 2002
14: 11/25	Evolution of body size dimorphism in primates	Plavcan, 2001 Gordon, 2006 Reno <i>et al.</i> , 2003 Gordon, 2013 OPTIONAL: Smith and Cheverud, 2002
15: 12/2	TOPIC TBA	TBA
16: 12/9	STUDENT PRESENTATIONS	

FULL CITATIONS FOR READINGS

- Alexander RMcN. 1985. Body size and limb design in primates and other mammals. In Jungers WL (ed.): *Size and Scaling in Primate Biology*. New York: Plenum Press. pp 337-343.
- Ashton KG, Tracy MC, and de Queiroz A. 2000. Is Bergmann's rule valid for mammals? *American Naturalist*. 156: 390-415.
- Biewener AA. 1989. Scaling body support in mammals: limb posture and muscle mechanics. *Science*. 245: 45-48.
- Biewener AA. 2005. Biomechanical consequences of scaling. *Journal of Experimental Biology*. 208: 1665-1676.
- Brown JH, West GB, and Enquist BJ. 2000. Scaling in biology: patterns and processes, causes and consequences. In Brown JH and West GB (eds.): *Scaling in Biology*. Oxford: Oxford University Press. pp 1-24.
- Cardillo M, Mace GM, Jones KE, Bielby J, Bininda-Emonds ORP, Sechrest W, Orme CDL, and Purvis A. 2005. Multiple causes of high extinction risk in large mammal species. *Science*. 309: 1239-1241.
- Desdevises Y, Legendre P, Azouzi L, and Morand S. 2003 Quantifying phylogenetically structured environmental variation. *Evolution*. 57: 2647-2652.
- Fleagle JG. 1985. Size and adaptation in primates. In Jungers WL (ed.): *Size and Scaling in Primate Biology*. New York: Plenum Press. pp 1-19.
- Freckleton RP, Harvey PH, and Pagel M. 2003. Bergmann's rule and body size in mammals. *American Naturalist*. 161: 821-825.
- Gebo DL, Dagosto M, Beard KC, Qi T, and Wang J. 2000. The oldest known anthropoid postcranial fossils and the early evolution of higher primates. *Nature*. 404: 276-278.
- Gillman MP. 2007. Evolutionary dynamics of vertebrate body mass range. *Evolution*. 61: 685-693.
- Godfrey LR and Sutherland MR. 1996. Paradox of peramorphic paedomorphosis: heterochrony and human evolution. *American Journal of Physical Anthropology*. 99: 17-42.
- Gordon AD. 2006. Scaling of size and dimorphism in primates II: macroevolution. *International Journal of Primatology*. 27: 63-105.
- Gordon AD. 2013. Sexual size dimorphism in *Australopithecus*: current understanding and new directions. In Reed KE, Fleagle JG, and Leakey RE, eds.: *The Paleobiology of Australopithecus*. Vertebrate Paleobiology and Paleoanthropology Series. Springer. pp.195-212.
- Gordon AD, Johnson SE, and Louis EE Jr. 2013. Females are the ecological sex: Sex-specific body mass ecogeography in wild sifaka populations (*Propithecus* spp.). *American Journal of Physical Anthropology*. 151: 77-87.
- Jernvall J and Wright PC. 1998. Diversity components of impending primate extinctions. *Proceedings of the National Academy of Sciences USA*. 95: 11279-11283.
- Jungers WL. 1991. Scaling of postcranial joint size in hominoid primates. *Human Evolution*. 6: 391-399.
- Kappelman J. 1996. The evolution of body mass and relative brain size in fossil hominids. *Journal of Human Evolution*. 30: 243-276.
- Lehman SM. 2007. Ecological and phylogenetic correlates to body size in the Indriidae. *International Journal of Primatology*. 28: 183-210.
- Leigh SR. 1992. Patterns of variation in the ontogeny of primate body size dimorphism. *Journal of Human Evolution*. 23: 27-50.
- Lomolino MV. 2005. Body size evolution in insular vertebrates: generality of the island rule. *Journal of Biogeography*. 32: 1683-1699.
- Nunn CL and Barton RA. 2000. Allometric slopes and independent contrasts: a comparative test of Kleiber's law in primate ranging patterns. *American Naturalist*. 156: 519-533.

- Nunn CL and Barton RA. 2001. Comparative methods for studying primate adaptation and allometry. *Evolutionary Anthropology*. 10: 81-98.
- Okie JG, Boyer AG, Brown JH, Costa DP, Ernest SKM, Evans AR, Fortelius M, Gittleman JL, Hamilton MJ, Harding LE, Lintulaakso K, Lyons SK, Saarinen JJ, Smith FA, Stephens PR, Theodor J, Uhen MD, Sibly RM. 2013. Effects of allometry, productivity and lifestyle on rates and limits of body size evolution. *Proceedings of the Royal Society B*. 280: 20131007.
- Pérez-Barbería FJ, Shultz S, and Dunbar RIM. 2007. Evidence for coevolution of sociality and relative brain size in three orders of mammals. *Evolution*. 61: 2811-2821.
- Peters RH. 1983. *The Ecological Implications of Body Size*. Cambridge: Cambridge University Press.
- Plavcan JM. 2001. Sexual dimorphism in primate evolution. *Yearbook of Physical Anthropology*. 44: 25-53.
- Purvis A, Gittleman JL, Cowlishaw G, and Mace GM. 2000. Predicting extinction risk in declining species. *Proceedings of the Royal Society of London B*. 267: 1947-1952.
- Raichlen DA, Gordon AD, Muchlinski MN, and Snodgrass JJ. 2010. Causes and significance of variation in mammalian basal metabolism. *Journal of Comparative Physiology B*. 180: 301-311.
- Reno PL, Meindl RS, McCollum MA, and Lovejoy CO. 2003. Sexual dimorphism in *Australopithecus afarensis* was similar to that of modern humans. *Proceedings of the National Academy of Sciences USA*. 100: 9404-9409.
- Ross C. 1992. Basal metabolic rate, body weight and diet in primates: an evaluation of the evidence. *Folia Primatologica*. 58: 7-23.
- Ross C. 1998. Primate life histories. *Evolutionary Anthropology*. 6: 54-63.
- Ruff C. 2002. Variation in human body size and shape. *Annual Review of Anthropology*. 31: 211-232.
- Ruff C. 2010. Body size and body shape in early hominins – implications of the Gona pelvis. *Journal of Human Evolution*. 58: 166-178.
- Smith RJ. 1996. Biology and body size in human evolution: statistical inference misapplied. *Current Anthropology*. 37: 451-481.
- Smith RJ and Cheverud JM. 2002. Scaling of sexual dimorphism in body mass: A phylogenetic analysis of Rensch's rule in primates. *International Journal of Primatology*. 23: 1095-1135.
- Soligo C. 2006. Correlates of body mass evolution in primates. *American Journal of Physical Anthropology*. 130: 283-293.
- Soligo C and Martin RD. 2006. Adaptive origins of primates revisited. *Journal of Human Evolution*. 50: 414-430.
- Symonds MRE and Elgar MA. 2002. Phylogeny affects estimation of metabolic scaling in mammals. *Evolution*. 56: 2330-2333.
- Walker R, Hill K, Burger O, and Hurtado AM. 2006. Life in the slow lane revisited: ontogenetic separation between chimpanzees and humans. *American Journal of Physical Anthropology*. 129: 577-583.
- Warton DI, Wright IJ, Falster DS, and Westoby M. 2006. Bivariate line-fitting methods for allometry. *Biological Reviews*. 81: 259-291.
- Yamanaka A, Gunji H, and Ishida H. 2005. Curvature, length, and cross-sectional geometry of the femur and humerus in anthropoid primates. *American Journal of Physical Anthropology*. 127: 46-57.