**Advanced Morphometric Methods**
**Anthropology 249.11**

Course Instructors: Adam Gordon, Brian Richmond
Class Time: Wed., 11-1
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Spring 2005
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COURSE DESCRIPTION: A practical course in analytical methods with special focus on morphometric analysis, this course will address hypothesis development and testing, data collection issues (including pre- and post-data collection), variable construction and assessment, and various analytical techniques applied in physical anthropology. Techniques discussed will include analyses of quantitative genetics, allometric scaling, geometric morphometrics, phylogenetic comparative methods, and resampling methods. Particular emphasis will be placed on learning how to apply the last three topics to actual data sets. This course assumes students have some familiarity with basic statistics, regression techniques, and multivariate statistics.

COURSE MECHANICS: The first four class sessions will typically consist of a lecture followed by discussion of topics raised in the assigned readings. Questions will be provided to guide the students' reading for these sessions. Later sessions will feature topics divided over two weeks. The first week will cover theory surrounding particular methods while the second week will feature application of the analytical method to real data sets. Pairs of students will be assigned to each of these later topics; these students will prepare questions for the rest of the class in advance of the class session. In general, students will be expected to discuss assigned readings each week as well as apply methods to their own data sets or to data provided for them. Because this course focuses on the practical application of analytical methods, over the course of the semester students are expected to develop an original research project, collect an appropriate data set, analyze the data, and present the results in a scientific conference format to the rest of the class at the end of the semester.

EVALUATION: Each student's grade will be based on a written research project (40%), a 12-minute presentation of that project (30%), and class participation (30%). Class participation will include each student providing questions and leading discussion for one of the topics in the second half of the course. Research projects will consist of original data analyses designed to address specific research questions of interest to each student using appropriate data sets. Specifics regarding project topics and expectations for each student will be determined in consultation with the instructors.

ACADEMIC INTEGRITY: All graded work must be completed in accordance with The George Washington University Code of Academic Integrity, available online (http://www.gwu.edu/~ntegrity/code.html).

## COURSE SCHEDULE

| DATE | TOPIC |
|---|---|
| Jan 19 | Research Questions and Design |
| Jan 26 | Data and Analysis |
| Feb 2 | Quantitative Genetics |
| Feb 9 | Allometric Analyses |
| Feb 16 | Individual Project Consultations |
| Feb 23 | Geometric Morphometrics: Why and How? |
| Mar 2 | Geometric Morphometrics: Application |
| Mar 9 | Data Collection |
| Mar 16 | SPRING BREAK |
| Mar 23 | Phylogenetic Methods: Why and How? |
| Mar 30 | Phylogenetic Methods: Application |
| Apr 6 | AAPA Meetings in Milwaukee (NO CLASS) |
| Apr 13 | Resampling Techniques: Why and How? |
| Apr 20 | Resampling Techniques: Application |
| Apr 27 | Presentations |

## COURSE SCHEDULE & READINGS

**Jan 19 Research Questions and Design**

Readings:

Lehner P (1996). *Handbook of Ethological Methods*. 2nd Edition. pp. 3-11.

Martin P & Bateson P (1993). *Measuring Behaviour: An Introductory Guide*. 2nd Edition. pp. 125-160, especially pp. 125-134 and p.144.

**Jan 26 Data and Analysis**

Readings:

Martin P & Bateson P (1993). *Measuring Behaviour: An Introductory Guide*. 2nd Edition. pp. 114-124.

Motulsky H (1995). *Intuitive Biostatistics*. pp. 11-21.

**Feb 2 Quantitative Genetics**

Readings:

Ridley M (1993). *Evolution*. pp. 211-240.

Leutenegger W & Cheverud JM (1985). Sexual dimorphism in primates: the effects of size. In: WL Jungers, ed. *Size and Scaling in Primate Biology*. NY: Plenum Press. pp.33-50, especially pp. 42-48.

**Feb 9 Allometric Analyses**

Readings:

Godfrey LR & Sutherland MR (1996). Paradox of peramorphic paedomorphosis: heterochrony and human evolution. *AJPA* 99:17-42.

Jungers WL, Falsetti AB & Wall CE (1995). Shape, relative size, and size adjustments in morphometrics. *Yearbook of Physical Anthropology* 38:137-161.

**Feb 16 Individual Project Consultations**

**Feb 23 Geometric Morphometrics: Why and How?**

Readings:

TBA

**Mar 2 Geometric Morphometrics: Application**

Readings:

"How-to" manual.

**Mar 9 Data Collection**

**Mar 16 SPRING BREAK**

**Mar 23 Phylogenetic Methods: Why and How?**

Readings:

Nunn CL & Barton RA (2001). Comparative methods for studying primate adaptation and allometry. *Evolutionary Anthropology* 10:81-98.

Symonds MRE & Elgar MA (2002). Phylogeny affects estimation of metabolic scaling in mammals. *Evolution* 56:2330-2333.

Smith RJ & 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.

**Mar 30 Phylogenetic Methods: Application**

Readings:

"How-to" manual.

Nunn CL & van Schaik CP (2002). A comparative approach to reconstructing the socioecology of extinct primates. In JM Plavcan *et al.*, eds. *Reconstructing Behavior in the Primate Fossil Record*. NY: Kluwer Academic/Plenum Publishers. pp.159-215.

**Apr 6 AAPA Meetings in Milwaukee (NO CLASS)**

**Apr 13 Resampling Techniques: Why and How?**

Readings:

Howell DC (2001). Parametric and resampling statistics: two different philosophies of hypothesis testing – or is it three? *http://www.uvm.edu/~dhowell/StatPages/Resampling/philosophy.html*

Manly, B. F. J. (1998). *Randomization, bootstrap and Monte Carlo methods in biology*. London ; New York: Chapman & Hall. Pages TBA.

**Apr 20 Resampling Techniques: Application**

Readings:

Richmond BG & Jungers WL (1995). Size variation and sexual dimorphism in *Australopithecus afarensis* and living hominoids. *JHE* 29:229–245.

Reno PL, *et al.* (2003). Sexual dimorphism in *Australopithecus afarensis* was similar to that of modern humans. *PNAS* 100:9404-9409.

**Apr 27 Presentations**