Michael Foote mfoote@uchicago.edu

**Nature of course:** Introduction to multivariate analysis, with particular emphasis on morphological and ecological data and problems in paleontology and evolutionary biology.

**Website:** [http://geosci.uchicago.edu/foote/MULTI](http://geosci.uchicago.edu/foote/MULTI)

**Required work:** Assigned readings; term project (publication format and quality); brief presentation to class.

**Recommended software:** R ([http://www.R-project.org/](http://www.R-project.org/)). Web site contains links to download software (click on CRAN) and to obtain documentation.

**Meeting times:** Tuesday and Thursday 10:30-11:59 am (except 29 January), HGS 184

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**Schedule–Winter 2009**

<table>
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<tr>
<th>Date</th>
<th>Topic and Readings</th>
<th>Assignment</th>
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| Jan.6 | 1. Introduction: course overview and goals; introduction to multivariate data; types of data & scales of measurement; size and shape; data transformations  
| Jan.8 | 2. Bivariate analysis  
Required Readings: Atchley (1978); Kuhry & Marcus (1977)  
Additional Readings: LaBarbera (1986); Hofman (1988); Plotnick (1989) |                                                                                                           |
| Jan.13| 3. Measurement of similarity and difference  
| Jan.15| 4. Cluster analysis I (methods)  
| Jan.20| 5. Cluster analysis II (cophenetic correlation and cluster patterns)  
| Jan.22| 6. Introduction to ordination: Nonmetric Multidimensional Scaling;  
Polar Ordination  
Jan.27  7. Linear algebra I (Review of fundamentals; Simultaneous equations)
       Readings: Davis (1986): 107-126; Jöreskog et al. (1976): 8-41

Feb.3  8. Linear algebra II (Least squares revisited; Multiple regression)
               Sepkoski (1976)

Feb.5  9. Linear algebra III (Singular value decomposition);
       Principal component analysis I
       Readings: Davis (1986): 126-139; Jöreskog et al. (1976): 41-52

Feb.10 10. Principal component analysis II
       Readings: Davis (1986): 515-554; Neff and Marcus (1980): 51-69,
              199-205

Feb.12 11. R-mode factor analysis
       Required Readings: Neff&Marcus (1980):93-117; Gould (1967);
       Chapman et al. (1981)
       Additional Readings: Jöreskog et al. (1976): 52-99, 127-174

Feb.17 12. Q-mode eigenvector analysis; SVD revisited
       Readings: Sepkoski (1981); Gould (1967)

Feb.19 13. Group distance and separation
       Required Readings: Neff&Marcus (1980):132-193, 209-212; Davis
       Additional Readings: Klovan & Billings (1967); Humphries et. al
       (1981)

Feb.24 14. Path analysis and structural equation modeling
       Required Readings: Bookstein et al. (1985): 78-101

Feb.26 15. Linear Models with categorical data (logistic regression, loglinear
       models)
       (2008); Cooper et al. manuscript
       Additional Readings: Goodman (1971); Fienberg (1970)

Mar.3  16. Miscellaneous Eigenvector Methods (Principal coordinates,
       correspondence analysis, canonical correlations)
       Readings: Gauch (1982): 144-172; Neff & Marcus (1980):70-93; Gauch
       et al. (1977); Sneath and Sokal (1973):245-253; Foote (1995)

Mar.5  Loose ends; begin student presentations

Mar.10 Finish student presentations

Term papers due