

Quantitative Methods in Paleoecology

Seminar: GEOG 607, Winter 2018; Prof. Dan Gavin, dgavin@uoregon.edu
 Fridays 11–1:40, Condon 207

Ecology is the study of the processes affecting the distribution of species in space and time; paleoecology addresses the same questions using data derived from natural archives, thus spanning periods longer than direct observations. Paleo-data present challenges due to their inherent biases (for example, some species are better represented than others) and uncertainties (for example, temporal error from dating sediments). Some methods are derived from community ecology while other methods are unique to paleoecological data.

In this seminar, we tackle a range of analysis problems in reconstructing past environments. Students will undertake a data-analysis project using their own data or data available through online data bases. The class format will be a combination of student-led presentations of papers and demonstration of analyses. The R computing language will be used in most cases. Parametric, maximum likelihood, and resampling methods will be introduced. Readings will be from important early papers, journal articles of recent applications, and review papers. We will also use chapters from Birks et al. 2012, a free e-book in the UO Library.

Birks, H. J. B., A. F. Lotter, S. Juggins, and J. P. Smol, editors. 2012. Tracking Environmental Change Using Lake Sediments. Volume 5. Data Handling and Numerical Techniques. Springer Netherlands, Dordrecht.

Chronology:	Absolute and relative dating methods; developing a site chronology
Compositing:	Qualitative and quantitative methods for contrasting data from disparate sources; interpolating and averaging time series to develop a mean chronology.
Multivariate data:	Paleo-diversity; zonation; modern analog analysis; “biome-ization”, ordination; correspondence analysis; climate transfer functions (weighted partial least squares, etc).
Stratigraphical data:	Accumulation rates versus relative frequencies; rates-of-change; change-point analysis; peak-over-threshold methods; presence-absence data; bivariate event (synchrony) analysis.
Biogeographic analysis:	Presenting data geographically (geostatistics, time-slice mapping)

