

Quaternary Biogeography

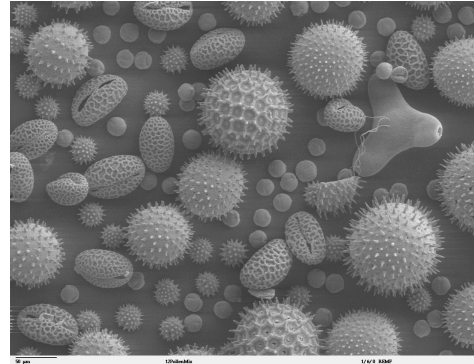
Geography 607

Spring 2010

Instructor: Dan Gavin

Fridays 9:00-11:50 in 207 Condon

Field trip on Saturday April 24th



Goals and expectations for this course:

1. To develop an appreciation of the environmental changes, and their causes, of the past two million years.
2. To survey the empirical evidence for past 1) climate change (including abrupt climate change events) and 2) responses of the biota to past climate change, using data from ice cores, sediments, and DNA.
3. To examine the post-glacial biogeography of the Pacific Northwest vegetation (and possibly other biota) from a survey of classic review papers and from recent research.
4. To gain first-hand experience obtaining sediment cores from a deep lake.

Description:

Studying past environments is the key to the present and the map to the future. Effective reconstruction of the past requires an interdisciplinary approach, merging methods from geology, ecology, and evolutionary biology. The Quaternary provides an incredibly rich history of changes that can be used broadly as analogy for the future and specifically to test mechanistic models of change. Similarly, the climatic oscillations of the Quaternary have left broad imprints on the pattern of life on Earth as well as specific instances of rapid reorganization of biota. The evolution and dispersal of humans is has played a significant role in many regions, as well. The course will serve as an introduction to the broad range of approaches used to study past environmental change and a chance to address the specific history of the Pacific Northwest.

The field trip will involve coring of a deep lake on the Oregon coast for an M.S. thesis. A pontoon boat will be available to accommodate the entire class. Everyone will participate in the work, both on and off the water. This trip may be postponed if strong winds are forecast.

Grading: Grading is on a Pass/No Pass basis. Assessment will be based on class participation (including leading class discussions on assigned papers) and a research paper. The research paper will be on a focused topic developed in collaboration with the instructor and your peers. The last week will be used for short presentations of your findings.

See other side for tentative list of readings.

Quaternary Biogeography readings—TENTATIVE!

Weeks 1-2: Introduction to Quaternary Period and post-glacial climate change

Roberts, N., 1998. *The Holocene: An Environmental History*, 2nd edition. Wiley-Blackwell

Webb, T., Bartlein, P.J., 1992. Global Changes During the Last 3 Million Years - Climatic Controls and Biotic Responses. *Annual Review of Ecology and Systematics* 23, 141-173.

Thompson, R.S., Whitlock, C., Bartlein, P.J., Harrison, S.P., Spaulding, W.G., 1993. Climatic changes in the western United States since 18,000 years BP. In: Wright H.E., Jr., Kutzbach J.E., Webb III T., Ruddiman W.F., Street-Perrott F.A., Bartlein P.J. (Eds.), *Global Climates Since the Last Glacial Maximum*. University of Minnesota Press, Minneapolis, pp. 468-513.

Weeks 3-4: Scales of change in space and time

Delcourt, H.R., Delcourt, P.A., 1991. *Quaternary Ecology: A Paleoecological Perspective*. Chapman and Hall, New York.

Williams, J.W., Jackson, S.T., 2007. Novel climates, no-analog communities, and ecological surprises. *Frontiers in Ecology and the Environment* 5, 475-482.

Gillson, L., Ekblom, A., Willis, K.J., Froyd, C., 2008. Holocene palaeo-invasions: the link between pattern, process and scale in invasion ecology? *Landscape Ecology* 23, 757-769.

Week 5: Phylogeographic angle on Quaternary Biogeography

Emerson, B.C., Hewitt, G.M., 2005. Phylogeography. *Current Biology* 15, R367-R371.

Riddle, B.R., 1998. The historical assembly of continental biotas: Late Quaternary range-shifting, areas of endemism, and biogeographic structure in the North American mammal fauna. *Ecography* 21, 437-446.

Willis, K.J., Whittaker, R.J., 2000. Paleoecology - The refugial debate. *Science* 287, 1406-1407.

Week 6: Patterns on islands and continents

Cannon, C.H., Morley, R.J., Bush, A.B.G., 2009. The current refugial rainforests of Sundaland are unrepresentative of their biogeographic past and highly vulnerable to disturbance. *Proceedings of the National Academy of Sciences of the United States of America* 106, 11188-11193.

Riddle, B.R. et al., 2008. The role of molecular genetics in sculpting the future of integrative biogeography. *Progress in Physical Geography* 32, 173-202.

Week 7: Earth-system science: climate feedbacks and vegetation change through the ice ages: focus on the Sahel and Sahara.

Claussen, M., 2009. Late Quaternary vegetation-climate feedbacks. *Climate of the Past* 5, 203-216.

Kropelin, S. et al., 2008. Climate-driven ecosystem succession in the Sahara: The past 6000 years. *Science* 320, 765-768.

Week 8-10: The Pacific Northwest

Whitlock, C., 1992. Vegetational and climatic history of the Pacific Northwest during the last 20,000 years: implications for understanding present day biodiversity. *Northwest Environmental Journal* 8, 5-28.

Gavin, D.G., 2009. The coastal-disjunct mesic flora in the inland Pacific Northwest of USA and Canada: refugia, dispersal and disequilibrium. *Diversity and Distributions* 15, 972-982.

Westfall, R.D., Millar, C.I., 2004. Genetic consequences of forest population dynamics influenced by historic climatic variability in the western USA.