Phylogeography

This course is designed as a “gentle” introduction to the burgeoning field of phylogeography, the wedding of phylogeny reconstruction and biogeography. Since its relatively recent inception—it was "invented" only about twenty years ago—it has become one of the fastest growing fields of study in biology. Under the guise of phylogeography, evolutionary biologists and biogeographers have learned a great deal about when and where species diverged as well as identified putative glacial refugia and key centers of endemism, areas that appear to function as "speciation engines." The course travels through various aspects of the field, beginning with the relationship between demography and population genetics and the construction of phylogenetic trees. Because phylogenetic trees, whether rooted or unrooted, play such a crucial role in phylogeography, we will explore details about trees, including whether monophyly is a magic bullet and to what extent we can ever recover a species tree (i.e., our goal) from a suite of genes or morphological characters (i.e., what we have to work with). Through all of this we will keep an eye on basic biogeographic principles, with a focus on speciation mechanisms. The second half of the course deals with phylogeographic inference. How do we interpret patterns we recover? Interpretation is aided by exploration of several key themes or conceptual frameworks, ranging from glacial refugia—areas where ancestral populations were restricted during the Pleistocene—to ecological niche modeling and niche conservatism, two ways in which (macro)ecology has been brought explicitly into biogeography fold. We also review statistical phylogeography, an effort to make inference more rigorous and allow for more direct hypothesis testing. We close with a discussion of whether phylogeography has overemphasized phylogeny at the expense of geography and efforts being made to rectify that slight.