DOING FIELDWORK IN THE MUD*

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I study mud, an activity that confirms the apprehensions of some of my human-geography colleagues. Mud in lakes, as opposed to mud underfoot, is composed mostly of microscopic plant and animal remains and finely ground rock materials that have accumulated over thousands of years. For that reason mud is highly variable in color, feel, and even smell, and the information it contains is influenced by its geographical location and age.

There is a growing need to understand how the environment has changed over time, and gaining this knowledge can be approached in a number of ways. One way is to do fieldwork. Originally, going into the field meant collecting detailed observations to describe the physical world and its operation. Now, most field data are collected with a more directed purpose; namely, to test conceptual and numerical models of how the environment has changed in the past and may change in the future. My own interest in environmental change concerns the development of western North American forests and their sensitivity to past climate changes. This information comes from lakes and bogs, whose mud captures the pollen of nearby plants, charcoal from fires, and other organic and inorganic matter produced in the lake and watershed. Over time, lakes accumulate and preserve a thick sequence of sediments in a relatively undisturbed state. A core drilled vertically through these layers of mud retrieves a record that can extend back in time to the origination of the lake.

Pollen, produced by flowering plants, are the primary data that I use for understanding past environments. Pollen grains are distinctive and identifiable under the microscope (at least to the taxonomic level of plant family), and variations in pollen composition disclose changes in the vegetation through time.

Charcoal is produced during fires and carried aloft before settling on the ground and lake surface. In the sediments, layers with abundant charcoal particles are evidence of past fires and provide a basis for calculating changes in fire frequency through time. The chronology to support the environmental history is obtained using the radiocarbon dating method, which determines the age of small pieces of organic material preserved within the core. A seed or a small piece of wood is sufficient for a radiocarbon lab to make an age determination.

In the western United States, volcanic ashes from Pacific Northwest volcanoes, including Mount Saint Helens, Glacier Peak, and Mount Mazama, are regularly found in lake sediments. These ash layers are distinguished by their geochemistry and can

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