Field Geology at UC Berkeley: Evolution in Methods, Opportunities, and Issues Facing Field Training Programs Today

Abstract

Since Professor Andrew Lawson instituted the first field geology course at Cal in 1892, the Berkeley-Oakland Hills continue to provide a valuable natural field laboratory where geology undergraduates first acquire their mapping skills, gain confidence through systematic practice, and expand their powers of geological interpretation. This talk addresses how such field experience can still have relevance today, 104 years later. In particular, the question: How can a field area offer new challenges and opportunities after being mapped by so many generations of students? The answer is that illustrative field areas do not mature if new scientific questions continue to be posed. Furthermore, new technology is making its way into field mapping providing not only more efficient methods but ones that expand the powers of interpretation by integrating multiple sets of data including geophysics. Field classes provide a unique vehicle to integrate knowledge from diverse areas of earth science with personal experience. At Berkeley, after 5 weeks of mapping on paper topographic maps, students complete a semester's course with 10 weeks using pen tablet slate PC computers for mapping equipped with digital topographic maps, ortho-images, and card GPS units. A pen-based computer program called GeoMapper was developed at Cal to conduct mapping using the Penmap program. GeoMapper has now been introduced into other courses including structural geology and strong motion seismology. Digital overlays of seismic epicenters with geology show the faults mapped to be active, largely vertical structures indicating that the folds and faults of the Berkeley-Oakland Hills are best characterized by neo-tectonic processes. The Miocene age stratigraphic sequence is interpreted in terms of strike-slip pull apart basins, in-filled with a marine regressive sequence from Claremont, Orinda, Moraga, Siesta Valley, to Bald Peak Formations. Eruptions of MORB on land resulted in bi-modal subaerial volcanism consisting largely of voluminous basalts and minor but aerially-extensive rhyolite tuff. Continued research shows that the "Soda Rhyolite" described by Charles Palache is actually a dacite erupted from a vent facies breccia near the Space Sciences Lab on Grizzly Peak Blvd. The advanced summer field course is now taught in south west Montana to expand student's knowledge base using digital technology exclusively. In general, training in field geology in the U.S. is facing a challenge in academia. While these field courses are viewed as being valuable to student's education and are appreciated by students, they are thought by many faculty to be time-consuming, expensive, and potentially risking in terms of liability. Like other traditional areas of earth science, faculty are being replaced by researchers in new growth areas of earth and planetary science. Hence, a declining number of faculty have the inclination and experience to teach field classes. Short term field trips in contrast to field classes are becoming the norm but are not an effective replacement. What was once considered the right of passage of a geologist may one day be viewed as an unaffordable luxury unless departments continue to staff and support field courses. The intellectual justification for their continuations is unchallenged. The issue is how to continue to offer these field-based courses while adding new programmatic areas.

Biography

George Brimhall received his BA degree from UC Berkeley in 1969 and PhD in 1972. He then worked as a mine and exploration geologist for the Anaconda Company in Butte, Montana. In 1976 he moved to Baltimore, Maryland where he started his academic career. Since 1978 he has been a Professor in the Department of Earth and Planetary Science at Cal. The courses he teaches include Field geology and digital mapping, Advanced summer field course, Planet Earth, and Crossroads of earth resources and society. His research interests include digital mapping technology, ore deposits, mineral exploration science, chemical weathering, and paleo-climate control on geological processes. Besides working in the U.S. his field work has been in South America, Australia, Africa, and Russia. He was on the Science Advisory Panel of the California Commission of Teacher Credentialing and participated in writing the Subject Matter Requirements for Single Subject K-12 science teachers. He continues to work on standards-based geoscience education reform.