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NAGT—GEOLOGY EDUCATION
CCC: 274

№ 8791

EXPLORATION GEOPHYSICS - AN INTERACTIVE APPROACH

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More courses in exploration geophysics are being offered at the undergraduate level than ever before. These courses typically are only a semester in length, but in this short time an instructor must introduce students to the major methods of exploration geophysics, discuss field methods and techniques, and provide hands-on experience in the processing and interpretation of field data. Also essential to such an undertaking is exposure to computer techniques.

In order to ease this task, we developed an "interactive framework" that introduces students to key concepts for each geophysical method, allows students to investigate questions and test ideas, and provides questions and tools to simulate simple research projects. At the heart of this system is a series of ten applications for the Macintosh computer. These programs include forward and inverse modeling for reflection seismology, refraction seismology, electrical resistivity, gravity, and magnetics. A consistent user-interface, pull-down menus, and mouse-driven inputs make these programs easy to learn and use. Accompanying these applications are a series of spreadsheet templates that provide the means for processing and reducing field data.

Finally, and most importantly, a HyperCard stack functions as the integrator. This stack contains detailed introductions to the basic exploration methods as well as animations to aid understanding of several topics. The stack also functions as an "operaing system" to provide a seamless integration of spreadsheet data and the geophysical programs. Thus, while remaining within the control of our HyperCard stack, a student can study the basics of a particular method, view animations, investigate the effects of subsurface models of interest, select data sets for analysis, and process and interpret the data. The stack also offers a pathway to selected case studies for aid during analysis. Because of the capabilities of HyperCard, the learning curve for this entire package is minimal.

№ 4593

UNDERGRADUATE SEDIMENTOLOGY PROJECT - POINT BAR FIELD STUDY AND COMPUTER ANALYSIS

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Most educations in undergraduate geology are dominated by classroom lectures and laboratory exercises that keep the geology major at some distance from the real world of research and project reports encountered upon graduation. In a recent survey, our department's alumni identified four areas to which they required additional exposure: 1) assessing and solving geological problems, 2) field work, 3) report preparation, and 4) computers.

Our sedimentology course undertakes a major semester long research project on a river's point bar that provides exposure to all of these areas. The project begins with each student collecting surface and subsurface samples from one station along a perpendicular transect of the point bar. In successive weeks each student undertakes the sieving and textural analysis of their own samples in order to determine graphic mean, inclusive graphic standard deviation, inclusive graphic skewness, graphic kurtosis, and textural maturity. Mineralogical maturity is also determined based on a binocular microscope study of the relative abundances of stable versus unstable minerals.

All information is compiled as tables on a computer graphing program, such as Cricket Graph and shared among the class. Such a program provides for the easy examination of large amounts of data for significant relationships. Each student then prepares their own report based on the outline of a professional journal article. At the simplest level students can be expected to find vertical and lateral trends in grain size. Fortuitously, the point bar we study has two tiers. Although the lower tier shows typical vertical and lateral fining trends, the upper tier shows a vertical coarsening trend.

The beauty of such a study is that point bars or beaches are readily available that can provide our students with exposure to the realities of geological work.

№ 14130

EXPANDING THE USE OF GUEST LECTURE PROGRAMS IN GEOLOGY DEPARTMENTS

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Guest lecture programs are an excellent resource for undergraduate geology departments. Students learn about the specific lecture topic, expand their view of the work of geoscientists, and have an opportunity to meet professionals other than their instructors. Although the audience for such lectures generally consists of departmental majors and faculty, students in introductory geology courses, both potential majors and nonmajors, can benefit from lectures directed to a scientific community. This may be one of the few opportunities for non-science majors to hear a scientific lecture. Students in introductory courses who attend such programs are exposed to current geologic issues and questions, hear a focused scientific presentation and see how basic concepts are used by scientists. The lectures may increase student interest in geology.

To expand the use of guest lecture programs, students in a lower level geology course are required to attend one or two lectures and write a short reaction paper. The paper is a summary of the student's reaction to the lecture that should include the most interesting part of the talk and any questions that arise from the lecture. This assignment is particularly appropriate for an historical geology course because almost any topic would be relevant, but could be used for other courses depending on the lecture topics.

Response of students in historical geology and marine geology courses to this assignment has been positive; they give it high ratings and almost all think the assignment should be continued. The students like the different perspectives of the speakers and the opportunity to interact with professionals. Most prefer the informal reaction paper to a more structured paper and see it as a reinforcement of what they learn in the lecture. Benefits to the students are of sufficient value that is worth requiring them to attend scientific presentations outside the classroom.

№ 23101

GEOSCIENCE EDUCATION AND THE U.S. DEPARTMENT OF ENERGY: WHAT'S THE RELATIONSHIP?

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The involvement of the U.S. Department of Energy (DOE) in science education is often underestimated; DOE, one of the largest federal supporters of education, including the geosciences, is increasing its involvement through its national laboratory system. Total DOE support for educational activities in FY87 was $360M; this included faculty and graduate research, fellowships, teacher enhancement, and K-12 educational activities. Most funds were for college/post-college, faculty/student support; only a fraction ($1.3M) was for science education per se at the K-12 level. A 1988 report by DOE's Energy Research Advisory Board recommends increased K-12 emphasis.

With regard to the geosciences, there are few data to indicate exact levels of DOE support; nevertheless, it is beneficial to examine the myriad activities at the college/post-college and K-12 levels. DOE annually supports approximately 60 college faculty and students in geoscience; this is chiefly research participation at DOE labs, principally in the western U.S. In addition, DOE makes geoscience-related equipment and research grants to universities. At least 23 different research and teaching programs administered through the Oak Ridge Associated Universities address a geoscience discipline in their descriptions. The more exciting educational activities, however, are at the K-12 level, where a multitude of innovative programs exist, many with developing geoscience facets. For instance, the High School Honors Program incorporates geosciences at Oak Ridge National Laboratory, and there are programs that allow high school teachers to visit national labs for eight-week research interactions. Five national labs are cooperatively seeking funding for K-8 teacher enhancement; the geosciences are included through ORNL. In addition, there are many programs at the national labs that involve local geoscience teachers and students.

The opportunity to increase the involvement of DOE in geoscience education is real. With the enhanced awareness of the earth science professional societies in education, the profession should seek to encourage increased opportunities for geoscience enhancement with DOE.

№ 13840

READING AND ABSTRACTING JOURNAL ARTICLES IN SEDIMENTOLOGY AND STRATIGRAPHY LABORATORY; VARIATION ON A THEME

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Learning is enhanced in sedimentology and stratigraphy laboratories when students read journal articles and write abstracts of articles. As part of laboratory assignments, each student reads two journal articles from a suggested list covering a broad range of topics then writes an abstract of each article from the author's point of view. Students turn in a draft reviewed both by students in the class and the instructor and then submit a revised draft. Papers are evaluated on both the quality of the ideas and their presentation. The reading and writing assignments have four major goals: 1) introduce geologic journals as an information source, 2) foster more in-depth knowledge of wide-ranging topics, 3) encourage effective reading for main purposes, procedures, methods, data, and results, and 4) demonstrate, and practice writing, an effective abstract, an essential part of a technical paper. It is important