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NAG—GEOLGY EDUCATION

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EXPLORE GEO PHYSICS—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 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 simulations to aid understanding of several topics. The stack also functions as an "operating system" to provide a seamless integration of spreadsheets 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.

UNDERGRADUATE SEDIMENTOLOGY PROJECT—POINT BAR FIELD STUDY AND COMPUTER ANALYSIS
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Most sediments in undergraduate geology are dominated by classroom lectures and laboratory exercises that keep the geology major at some distance from the real-world 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 sampling 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 microlithic microscope study of the relative abundances of stable versus unstable minerals.

All information is compiled as tables on a computer graphics program such as Cricket Graph and shared among the class. Such a program provides for the ease of 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. Progressively more advanced students will attempt to draw upon the large database. 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.