“Training in the Analysis of Subsurface Geological and Geophysical Data at UNL: Preparing Future Professionals for the Energy Exploration and Production Industry”

Principal Investigator: Professor Christopher R. Fielding, Coffman Chair in Sedimentary Geology, Department of Geosciences, 214 Bessey Hall, University of Nebraska-Lincoln, NE 68588-0340, USA, tel. 402-472 9801, cfielding2@unl.edu
NEBRASKA CENTER FOR ENERGY SCIENCES RESEARCH
ENERGY SCIENCES EDUCATION PROPOSAL

"Training in the Analysis of Subsurface Geological and Geophysical Data at UNL: Preparing Future Professionals for the Energy Exploration and Production Industry"

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Dr C.R. Fielding, P.I.

Dr David Watkins, Chair of Geosciences Department

Dean, College of Arts and Sciences
ABSTRACT

This proposal aims to strengthen an existing course offered by the Geosciences Department at UNL: GEOL 485/885 (Fossil Fuel Geology and Exploration), which I teach. The course is currently being offered for the third time in Fall, 2006, and has 15 students. It aims to prepare students for, and foster interest in, employment in the exploration industry. An integral part of this course is training in techniques and methods for the analysis of subsurface geological and geophysical data (wireline logs, seismic reflection data, etc.), such as are routinely acquired during resource exploration. In industry, much of this work is currently carried out using high-end software running on dual-screen workstations. The Department has two individual licenses for the software packages PETRA and the KINGDOM suite, which run on machines in my research lab. The number of students in the class would overwhelm the available resources, however, and I am compelled to use paper copies for most practical exercises. The challenge is to provide experience in the use of these software suites for larger groups of people in a way that will create an effective learning experience for all. I propose to hire a graduate student for one semester who is familiar with the software to write, in collaboration with myself, a complete training course for use in GEOL 485/885 or as an additional, associated course in Subsurface Data Analysis. This will render the teaching and learning experience more effective, facilitate a more complete understanding of concepts among students, and ultimately provide better opportunities for employment among our graduates.
PROJECT DESCRIPTION

Rationale

The Department of Geosciences has trained professional geoscientists for the Energy Exploration Industry for many years, some of whom have gone on to achieve positions of prominence within the industry and profession. This tradition has led to a culture of philanthropy among many of our Alumni, who have donated generously to the University and the Department. Among various initiatives funded by Energy Industry Alumni includes establishing the Mr & Mrs JB Coffman Chair in Sedimentary Geology, of which I am the inaugural holder. The Alumni Advisory Board of the Geosciences Department, and the donors to the Chair, have expressed a desire to see improved opportunities for students to enter careers in the energy exploration and production industry.

Accordingly, since my arrival at UNL in 2002, I have designed a new course in fossil Fuel Geology and Exploration, which covers geological background, exploration techniques and methodology, and production science, of oil, natural gas and coal at an advanced level. The course, GEOL 485/885, is designed for senior undergraduates and graduates, and in Fall 2006 is running for the third time, with 15 students enrolled. An integral part of this course is training in techniques and methods for the analysis of subsurface geological and geophysical data (wireline logs, seismic reflection data, etc.), such as are routinely acquired during the exploration for, and production of, hydrocarbon (oil and gas) resources. Ability to use and interpret wireline logs and seismic reflection data are core skills among exploration industry geoscientists, and a basic grounding in interpreting such data is considered essential to any substantive education in the field. In industry, much of this work is now carried out using high-end software suites running on dual-screen workstation computers.

The Department currently has two individual licenses for the software packages PETRA and the KINGDOM suite, which run on dual-screen machines in my research laboratory and are used in research and, to a lesser extent, training. The number of students in the class would currently overwhelm the available resources, however, and thus I am compelled to use paper copies for most practical exercises and projects.

The GOAL of this proposal, then, is to provide experience in the use of these software suites for larger groups of people in a way that will create an effective learning experience for all.

The OBJECTIVES of the proposal are to prepare and deliver a comprehensive training program in the use of subsurface geoscientific data software suites, to help prepare students for careers in the energy industry.

The JUSTIFICATION for this proposal is that it will significantly enhance employment prospects for our graduates in the Energy Sciences arena, and provide more opportunities for graduate research.
Work Program

I propose to hire a graduate student who is already thoroughly familiar with the use of the KINGDOM suite and PETRA to design and deliver in collaboration with myself a new, comprehensive training course in the use of these software packages. I anticipate that the work required will occupy one person on a half-time basis for one semester, and would be equivalent in workload to a Teaching Assistantship. The physical resources required to carry out the required developmental work are in place, that is, workstations and the software are already installed in my laboratory. Furthermore, I have also secured subsurface datasets for use in teaching from former students now working in the exploration industry, from alumni of the Department, and from Government Geological Surveys. These datasets, together with more that I intend to seek, and the training resources that are integral to the software packages themselves, will form an adequate resource of data from which to build exercises and class projects.

The principal topics to be covered in the proposed laboratory-based course are:

1. recognition of significant events in seismic reflection data,
2. interpretation of geological structure from seismic reflection data,
3. mapping of horizons and prospects from seismic reflection data,
4. correlation of geological successions using wireline logs,
5. fluids evaluation (petrophysics) from wireline logs,
6. integration of seismic and wireline log data into subsurface geological models.

The Department of Geosciences currently has an operational computer laboratory for teaching purposes. In order to upgrade the equipment in this laboratory so as to accommodate the needs of this proposal, we are currently pursuing ways of acquiring the funds necessary to acquire 10-15 new workstation computers. It is anticipated that this process will be complete by the time the work program is conducted.

Outcomes

The principal outcome of this proposal will be a comprehensive, computer-based training program in the analysis of subsurface geological and geophysical data, for use in advanced level teaching. This will in turn allow the Department of Geosciences and UNL to be competitive with other peer institutions in the training of potential new geoscientists for careers in the energy industry. It is anticipated that the course will be conducted as the laboratory component of the existing GEOL 485/885 Fossil Fuel Geology and Exploration course, taking the place of the largely paper-based exercises currently used. Alternatively, the program could be established as a separate course in its own right if that is deemed more appropriate. Its immediate impact will be to raise the profile and skills set of our graduates and allow them to be more marketable in today’s industry recruitment environment.
Timeline

The timeline for the project will depend on the timing of grant awards. A suitable individual to carry out the proposed work has already been identified, and will be potentially available for the next two years. Once the financial resources are available, the work program will take one semester to complete. From that point, the training program will be fully operational and can be incorporated into the next running of GEOL 485/885, or established as a separate course with immediate effect.
NCESR Research Grant Budget Request

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Budget justification

The graduate Research Assistantship is essential to the project. Salary is set at current Geosciences Department rate of pay for a graduate TA ($1390/month x 5 months), with fringe benefits taken from the Office of Sponsored Programs webpage (salary x 0.32 for tuition remission, + $1000 for health insurance). A nominal sum is requested to cover consumable items such as media, copying costs, etc.
BIOGRAPHICAL SKETCH

Dr Christopher R. Fielding
Department of Geosciences
University of Nebraska-Lincoln, NE 68588-0340
Tel: 402-472 9801
Fax: 402-472 4917
(cfielding2@unl.edu)

A. PROFESSIONAL PREPARATION

• University of Edinburgh, Scotland (Geology) BSc Honours, 1st Class, 1979
• University of Durham, England (Geology) PhD, 1982

B. APPOINTMENTS

• Mr & Mrs JB Coffman Professorial Chair in Sedimentary Geology, Department of Geosciences, University of Nebraska-Lincoln (8/02 – present).
• Director (Academic), Department of Earth Sciences, University of Queensland, Australia (6/01 – 6/02).
• Reader (US Professor equivalent), Department of Earth Sciences, University of Queensland, Australia (1/97 – 6/02).
• Senior Lecturer (US Associate Prof. equivalent), Department of Earth Sciences, University of Queensland, Australia (1/97 – 12/96).
• Lecturer (US Assistant Prof. equivalent), Department of Earth Sciences, University of Queensland, Australia (7/86 – 12/90).

C. RECENT, RELEVANT PUBLICATIONS


D. SYNERGISTIC ACTIVITIES

• Acted as one of four Editors of the international journal “Sedimentology” (1998-2002).
• Member of the Editorial Board of the international journal “Sedimentary Geology” (1995 – 2005), appointed as one of three Editors-in-Chief as of July 2005.
• Co-convenor (with Frank & Isbell) of Topical Session at GSA Annual Meeting 2005 on late Paleozoic Gondwanan Ice Age, and of NSF-sponsored Research Workshop on same theme, October 2005, Salt Lake City.
• Elected as Research Councilor of SEPM (Society for Sedimentary Geology), 2006-7.
• Membership of US Steering Committee and Science Measurements Panel for ANDRILL Antarctic Scientific Drilling initiative.

E. COLLABORATORS AND OTHER AFFILIATIONS

(i) Collaborators
J. Alexander (Univ. East Anglia), K. Bann (Univ. Alberta), S. Bryan (Yale Univ.), S. Bryce (Geoscience Australia), G. Dickens (Rice Univ.) G. Dunbar (Australian Natl. Univ.), T. Frank (UNL), M. Gibling (Dalhousie Univ.), M. Hannah (Victoria Univ. Wellington), D. Harwood (Univ. Nebraska-Lincoln), S. Henrys (GNS New Zealand), R. Holcombe (Univ. Queensland), J. Isbell (Univ. Wisconsin-Milwaukee), RM Joeckel (Geological Survey of Nebraska), A. Jones (Geoscience Australia), H. LaGarry (Geological Survey of Nebraska), JA MacEachern (Simon Fraser Univ.), T. Naish (GNS New Zealand), M. Page (James Cook Univ.), G. Pocock (Qld Department of Natural Resources and Mines), R. Powell (Northern Illinois Univ.), J. Roberts (Univ. NSW), R. Sliwa (CSIRO), T. Wilson (Ohio State Univ.).

(ii) Graduate Advisors
A.P. Heward & G.A.L. Johnson (University of Durham, England)