The DLESE Ambassadors Program will leverage the experience and expertise of current Digital Library for Earth System Education (DLESE) users and provide important opportunities that promote DLESE to larger, more diverse communities. DLESE ambassadors will be comprised of small teams of practicing teachers (K-12, undergraduate, graduate, and informal educators), students, and researchers committed to facilitating effective DLESE use at local, regional, and national levels. Prior to serving as ambassadors, each DLESE Ambassador Program participant will attend a DLESE Ambassadors Institute. In addition to engaging in a series of orientation and training activities, the program participants will also receive outreach and instructional materials, as well as guidance and assistance in developing a strategic plan that is tailored to each team's target audience. The DLESE Ambassadors Program's coordinator and participants will work with the DLESE core services to facilitate the continued development and distribution of resources that support the implementation and adoption of DLESE into the classroom.

ED11A-08 0945h INVITED

The DLESE Evaluation Core Services Project

Susan M. Buhr[1] (303-492-5657; susan.buhr@colorado.edu)

Lecia J. Barker[2] (303-735-5578; Barkerl@colorado.edu)

Thomas C. Reeves[3] (706/542-3849; treeves@coe.uga.edu)

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309-0216, United States

[2]Alliance for Technology, Learning and Society Institute, University of Colorado, Boulder, CO 80309-320, United States

[3]Dept. of Instructional Technology College of Education, University of Georgia, Athens, GA 30602-7144, United States

The DLESE Evaluation Core Service project will conduct evaluation of DLESE and provide evaluation consultation, resources and services to the DLESE community. Through this work we anticipate that we will learn more about the impact and use of digital libraries, and will promote an evaluation mindset within the geoscience education community. Activities of the DLESE Evaluation Service team include 1) evaluation planning for and of DLESE, 2) conducting formative evaluation of DLESE (user needs, data access, collections, outreach), 3) conducting classroom evaluation of DLESE use on teaching practices and learning outcomes, and 4) collection, synthesis, and reporting of evaluation findings garnered from all core teams and major projects. Many opportunities for community involvement exist. A strand group convened during the 2004 DLESE Annual Meeting took DLESE Evaluation as their topic, provided recommendations and will continue their activities through the year. The related Evaluation Toolkit collection is now discoverable through DLESE, and upcoming activities of all the core teams will provide evaluation opportunities to be described. Other community opportunities include consulting with Evaluation Service for education grant proposals, attending an evaluation workshop,and applying for an Evaluation Minigrant (up to $5K per award) Progress to date will be discussed, the Evaluation Core Services team members will be introduced, and plans and opportunities will be described in more detail.

ED11B MCC: Level 1 Monday 0830h

Promoting Undergraduate Education Through Involvement in Research Posters *(joint with P, C)*

Presiding: **L A Reinen,** Pomona College**; K M Menking,** Vassar College

ED11B-0100 0830h POSTER

Experiencing the Full Research Process at Sea Education Association (SEA)

Sara E Harris[1] (sharris@sea.edu); Paul Joyce[1] (pjoyce@sea.edu); Gary Jaroslow[1] (garyj@sea.edu); Lisa Graziano[1] (graziano@sea.edu); Charles Lea[1] (clea@sea.edu); Jan Witting[1] (jwitting@sea.edu); Amy Bower[1,2] (abower@whoi.edu)

[1]Sea Education Association, PO Box 6, Woods Hole, MA 02543, United States

[2]Woods Hole Oceanographic Institution, Mail Stop #21, Woods Hole, MA 02543, United States

While some undergraduate research experiences include only a small piece of the research process, students attending Sea Education Association's SEA Semester complete all aspects of oceanographic research in an intensive 12 week program that earns a full semester's credit. In the first half of the program, students read and discuss background literature on a subject, ask questions, pose hypotheses, and develop a written research proposal, which they defend orally. The second half of the course takes place at sea on one of SEA's state-of-the-art oceanographic research vessels where students carry out their sampling plans, analyze samples and data, write a final paper and present their results before the vessel reaches port, completing the course. At sea, students participate in sample collection and analysis for all student projects in addition to learning the general oceanography along their cruise track. This structure exposes students to the realities of research from start to finish and allows them to take full ownership of their projects. In addition to honing writing, public speaking, and problem-solving skills, students learn that research requires dedication, flexibility, and creativity, particularly when their results are unexpected or negate their hypothesis. SEA's undergraduate research program has been developing since 1971. Over that time, SEA has collected an extensive historical oceanographic database in the western Atlantic and Caribbean, plus Pacific data since 2001. This database is available to both students and outside research scientists. Collaborations with scientists outside SEA enhance the student experience and help facilitate oceanographic research by providing "ship-of-opportunity" sampling in remote locations. SEA Semester provides an excellent model for undergraduate research experiences with over 5000 alumni, about 30% of whom enter graduate school. About half the students in SEA's undergraduate programs are non-science majors. Although their experience at SEA may be their only hands-on exposure to scientific research, they take away an understanding of the process and an ability to think critically about scientific problems.

URL: http://www.sea.edu

ED11B-0101 0830h POSTER

Integrating Undergraduate Research into the Curriculum: Approaches, Models, and Thoughts About What Works and What Doesn't Work

Jill Singer (singerjk@buffalostate.edu)

Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222, United States

Over the past decade, there has been an increasing awareness and interest in integrating research experiences into the undergraduate curriculum. A number of successful models are emerging and elements of these models are being adapted by departments and institutions to meet the needs of their students and reflect their teaching and learning environments. This presentation will focus on successful strategies and describe department and institutional approaches to broaden the participation of undergraduates in research. It will also provide an overview of the programs and opportunities available to students at Buffalo State College and attempt to identify those features that work, do not work, and why.

ED11B-0102 0830h POSTER

Promoting Undergraduate Research at Grand Valley State University

Peter Riemersma[1] (riemersp@gvsu.edu)

Figen A Mekik[1] (mekikf@gvsu.edu)

[1]Grand Valley State University, Department of Geology, Allendale, MI 49401, United States

Grand Valley State University (GVSU) is a relatively young, rapidly growing, predominately undergraduate institution of about 20,000 students located in western Michigan in which undergraduate research plays a vital role in the education of our students. Student research is supported and actively promoted by 1) creating university funding opportunities and taking advantage of small outside funding sources 2) building a tradition of undergraduate research 3) incorporating small research activities into classes and 4) educating students explicitly in how to prepare a professional poster, give a professional talk and write a journal article. As the saying goes, if you have money, the students will come. At GVSU most students recognize the value of a research experience but need income to pay for college expenses. The internally funded Student Summer Scholars program at GVSU provides student salary and faculty stipend for a summer research project ($6000 per grant). The geology department has also been successful at obtaining grants from the NASA Michigan Space Grant Consortium ($5,000 plus a 100% GVSU match). We have been successful in using these easier to obtain smaller grants to fund undergraduate projects. In some cases small grants actually allow us to pursue "risky" or otherwise difficult to fund projects. Undergraduate research "counts" at GVSU and once a tradition and critical mass of undergraduate research has been established, it can become self-sustaining. To recognize the achievements of undergraduate research at GVSU, there is an annual Student Scholarship Day in which the students (580 university wide) present the results of their research. Also, by persuading students in our introductory classes (for extra credit) to attend Student Scholarship Day, the students, early in their college career, can see what fellow students can accomplish and student presenters can revel in their role of researcher and educator. Such an event helps to build a tradition of undergraduate research. Students are more likely to tackle larger research projects if they have gained confidence and experience by successfully completing smaller research projects. Many upper level geology courses require that students complete a research project. Research projects can range from investigating the grain size variability of river sediment in sedimentology to analyzing a Superfund site in hydrogeology. The geology department is also committed to instructing all our majors in how to organize and communicate the results of their research. Students are required to complete a course in geology Information Literacy and a geology seminar course. The information literacy course instructs the students in how to search for articles, introduces common graphing and computing software and demonstrates how to design and produce a research poster. In seminar, the entire geology faculty participate and instruct and mentor the students as they prepare a research paper and professional talk. In conclusion, we have created a supportive undergraduate research atmosphere at GVSU by acquiring funding for their research, by training our students in how to conduct and present their research, and, perhaps most importantly, by celebrating their accomplishments.

ED11B-0103 0830h POSTER

Research and Research-Type Experiences Throughout an Undergraduate Liberal Arts Curriculum

Linda A. Reinen[1] (909-621-8672; lreinen@pomona.edu)

Eric B. Grosfils[1] (909-621-8673; egrosfils@pomona.edu)

[1]Pomona College, 609 North College Avenue, Claremont, CA 91711

During the past several decades there has been a growing awareness of the educational benefits to students who participate in undergraduate research experiences. These benefits include, among others, increased communication skills, ability to work as part of a research team, and enhanced self-confidence in personal problem-solving skills. Several programs have been developed which provide summer research opportunities for undergraduates; however these programs must limit the number of students participating each year. In order for all of our students to reap the benefits of participating in research experiences, during the past eight years the Pomona College Geology Department has focused on developing a Community of Research for all members of our department which incorporate multiple research experiences into the geology curriculum. Students in geology courses at Pomona College participate in research and research-type experiences - including introductory-level and mid-tier courses through the required senior thesis. A central component of this research curricular "thread" is the mid-tier Research Methods course required of all geology majors. The research experience varies between courses and projects, but all share two elements which we find to be key to a successful experience: (1) The research results are unknown by both the student and the professor prior to the start of the project. The investigative nature of research is highlighted when students and professors are learning new results together. (2) Each student is responsible for deciding some important aspect of the project (e.g., defining the question to be addressed, the methods to be used, the area to be studied). This ownership helps students remain engaged in projects through difficult times and over long durations; the students thus become vested in the project results. In this session, we will present several examples of research projects and research-type experiences. The projects presented include a watershed investigation from an introductory-level course for majors and non-majors, a remote-sensing research project from a mid-level course for non-majors, both field-based research projects and investigations of planetary surfaces using satellite data from the Research Methods course, and senior theses.

URL: http://www.geology.pomona.edu

ED11B-0104 0830h POSTER

Promoting undergraduate education through involvement in research in the Geosciences

Solomon A Isiorho (isiorho@ipfw.edu)

Dept. of Geosciences, Indiana University - Purdue University Ft. Wayne (IPFW), 2101 E.Coliseum Blvd., Fort Wayne, IN 46805, United States

The push to involve undergraduates in research is gaining ground in most universities and colleges. Within our geosciences department at Indiana University - Purdue University Fort Wayne (IPFW), undergraduate education is promoted as the faculty in the department involves students in their research projects. All faculty members involve students in their research works. Dating of monazite using energy dispersive x-ray, size-frequency distributions of leopard frogs, structural organization and growth of Silurian chain corals, seepage meters, and wetlands are some of the recent students' projects facilitated by our faculty. Students are involved in either the professor's research project or projects are specifically designed for students using local sites and materials. Physical geology, environmental geology, environmental conservation, wetlands and hydrogeology are some of the courses that I teach. One common thread in all the courses that I explore is water. I involve my upper-level students to observe some aspect of water as it relates to the environment. My students' projects involve the use of local materials (wetlands, sand dunes, river, wells) or sites within a thirty minute drive off campus. Most students appreciate the chance to be involved in research projects. Students have presented the results of their projects at local, regional and national conferences. Also, some students' works have resulted in peer review articles. Involving undergraduates in research projects introduces them to scientific methods, real world learning, being published, and, it also provides the instructor with materials for effective teaching and getting published too. Sample student projects would be presented.

ED11B-0105 0830h POSTER

Successful Undergraduate Research: Creating Win-Win-Win

Andrew J Guswa[1] (413-585-7000; aguswa@email.smith.edu)

Amy L Rhodes[2] (arhodes@email.smith.edu)

[1]Picker Engineering Program, Smith College, Northampton, MA 01063, United States

[2]Department of Geology, Smith College, Northampton, MA 01063, United States

Undergraduate involvement in research has the potential to advance science, enhance education, strengthen the research community, and raise general awareness of the importance and impact of scientific understanding. Rather than being competing objectives, these goals are synergistic. Effective research experiences are those that create win-win-win situations: benefits to the student, benefits to the project, and benefits to the scientific community. When structured appropriately, undergraduate research fits into a learner-centered paradigm that puts emphasis on student learning, rather than instructor teaching. Under such a paradigm the student and professor learn together, constructing knowledge by integrating information with critical-thinking and problem-solving skills, and use this knowledge to address issues in real-life contexts. Creating such a learning environment requires that the professor be vested in the outcome of the research, that the student take a meta-cognitive approach to the project and work at a level appropriate to her abilities, and that the student understand how her contribution fits into the project and the larger field. All of these factors lead to greater independence, confidence, and productivity on the part of the student. By providing undergraduates with these experiences, we introduce not only future scientists but also non-scientists to the excitement of discovery and the value of scientific research. Currently, we involve undergraduates in our research on the hydrology and geochemistry of a tropical montane cloud forest in Monteverde, Costa Rica. At the start of each student's involvement, we provide her with the big picture: our project goals, the relevant social issues, and the importance of watershed research. Each student then articulates her own educational and project objectives. Together, we choose tasks that match her skills and interests with our scholarly work. Specific activities range from literature review to experimental design to installation of field instrumentation to sampling and analysis of data. At the conclusion, each student produces a report on her work along with a written reflection on the value of her experience and how it affected her knowledge, values, and actions. In this learner-centered way, we look to create successful undergraduate research experiences that benefit the student, our project, and the broader scientific community.

ED11B-0106 0830h POSTER

Undergraduate research in geochemistry at a larger university: developing a community of undergraduate and graduate researchers.

Jeffrey G Ryan (703-292-5323; ryan@chuma.cas.usf.edu)

University of South Florida, 4202 East Fowler Ave. SCA 528, Tampa, FL 33620-5201, United States

Faculty at state research universities can find the paired requirements of establishing research programs and developing a "pipeline" of graduate students to be the most challenging aspects of their jobs, especially with shrinking pools of graduate applicants. These problems may be more acute for laboratory-based geochemists, as few graduate candidates possess the requisite quantitative and chemical backgrounds. The need to "get my research going" at the University of South Florida led me to work primarily with undergraduates, as a) they were available and interested, b) they required no more laboratory training than M.S. students; and c) small-dollar funds were available to support them, both in-house and via NSF REU Supplements. Some senior colleagues argued that this approach would hinder my developing a graduate program as is necessary for tenure. This contention turned out to be untrue. My success in undergraduate research draws funding (in NSF REU Site and disciplinary research grants), has attracted outside MS and Ph.D. candidates, and has retained quality in-house students seeking MS degrees. Students working with me join a laboratory community in which undergraduate and graduate researchers are on equal footing in terms of access to instrumentation and other facilities. I work with all my students, irrespective of rank, as members of a cooperative research group. I encourage and expect that technical instruction I provide to any individual will be passed on to their colleagues, which helps develop a "lab culture" of best practices, and ingrains new knowledge and skills through the act of teaching them to others. Maintaining this research environment requires active recruitment of capable graduate AND undergraduate students, regular monitoring of laboratory practices, and ready availability for consultation and mentoring. One must be cognizant of the differing time commitment issues of undergraduates and graduates, and set research goals appropriately. Undergraduate research projects in which 3-4 students work together to collect necessary data can get around the class vs. research scheduling issues they face as they can share the laboratory workload through the week. Group projects can thus collect larger bodies of data, allowing students to address more substantive problems.

ED11B-0107 0830h POSTER

Mentoring Through Research as a Catalyst for the Success of Under-represented Minority Students in the Geosciences

Kathie Marsaglia[1] (818-677-3541; kathie.marsaglia@csun.edu)

G. Simila[1] (818-677-3543; gsimila@csun.edu)

V. Pedone[1] (818-677-3541; vicki.pedone@csun.edu)

D. Yule[1] (818-677-3541; j.d.yule@csun.edu)

[1]Department of Geological Sciences, 18111 Nordhoff St., Northridge, CA 91330

The Catalyst Program of the Department of Geological Sciences at California State University Northridge has been developed by four faculty members who were the recipients of a three-year award (2002-2005) from the National Science Foundation. The goal of the program is to increase minority participation and success in the geosciences. The program seeks to enrich the educational experience by introducing students at all levels (individual and team) to research in the geosciences (such as data analysis for earthquake hazards for 1994 Northridge event, paleoseismology of San Andreas fault, Waipaoa, New Zealand sedimentary system and provenance studies, and the Barstow formation geochronology and geochemistry), and to decrease obstacles that affect academic success. Both these goals are largely achieved by the formation of integrated high school, undergraduate, and graduate research groups, which also provide fulfilling and successful peer mentorship. New participants first complete a specially designed course that introduces them to peer-mentoring, collaborative learning (think-pair share), and research on geological data sets. Students of all experience levels then become members of research teams and conduct four mini-projects and associated poster presentations, which deepens academic and research skills as well as peer-mentor relationships. This initial research experience has been very beneficial for the student's degree requirements of a senior research project and oral presentation. Evaluation strategies include the student research course presentations, summer field projects, and external review of student experiences. The Catalyst Program provides significant financial support to participants to allow them to focus their time on their education. A component of peer-tutoring has been implemented for promoting additional student success. The program has been highly successful in its two year development. To date, undergraduates and graduate students have coauthored six abstracts at professional meetings. Also, high-school students have gained first hand experience of a college course and geologic research.

ED11B-0108 0830h INVITED POSTER

Involving Undergraduates and K-14 Teachers in Research: Measuring and Modeling Crustal Deformation in Southern California

Joan E. Fryxell[1] (909-880-5311; jfryxell@csusb.edu); Jacquelyn Hams[2] (909-880-5336); Maureen Barley[1] (909-880-5336); Karen Hobart[1] (909-880-5336); Joan Ramirez[1] (909-880-5336); Sally McGill[1] (909-880-5347; smcgill); Greg Lyzenga[3]

[1]Dept. of Geological Sciences, California State University, San Bernardino, CA 92407

[2]Dept. of Earth Science and Anthropology, Los Angeles Valley College, Van Nuys, CA 91401

[3]Dept. of Physics, Harvey Mudd College, Claremont, CA 91711

With funding from the NSF OEDG, we initiated a project to: (1) involve undergraduate students and K-14 teachers to research in geology, and (2) use GPS to monitor deformation across the plate boundary zone in southern California, and to model partitioning on specific faults that account for that deformation in the upper crust. Starting in July 2002, we collected campaign-style GPS data twice a year from 13 sites along a line across the San Andreas and San Jacinto faults near CSUSB. Our field crews have included 43 students and teachers in our three campaigns to date. These include 30 undergraduate and 3 graduate students, 1 middle school and 8 high school teachers, and 1 community college professor. We are also modeling site velocities from the SCEC Crustal Deformation Velocity Map. Our preliminary results are presented in session ED14 at this meeting. Our most recent campaign (June 2003) was expanded to include workshops. As before, the field crews got one day of hands-on training in setup and operation of the geodetic-quality receivers and antennae. In addition, we held a one-day workshop before the campaign on the active tectonics of southern California, elastic rebound theory, and the scientific goals of the project. After the campaign another one-day workshop was held to plot GPS position results from previous campaigns for a station crew members had occupied during the campaign, and to estimate a velocity for that station. Participants also tried modeling SCEC site velocity data from a transect across the San Andreas, San Jacinto and Elsinore faults. Four of the co-authors on this abstract were campaign participants, and have continued to work with faculty on processing our data and on modeling SCEC data. Students (geology and other majors) felt that participation in the campaign stimulated their interest in geology, and that their participation was a worthwhile experience. Most students are interested in participating in upcoming campaigns, and would recommend the program to other students. The ethnicities of the students include: African American (including Jamaican-American) 3; Hispanic 11; Native American 1; Pacific Islander 1; Asian 1; White 16. Over half of the teachers felt that their participation in the project would very much help them to inspire students to become interested in the Earth Sciences, and all said they would recommend this program to other teachers. All of the teachers felt that their participation was a worthwhile experience, and most would like to participate again. The ethnicities of the teachers include: African American 1; Hispanic 1; Asian 1; White 7. These teachers come from schools in which 20-90% of the students are from ethnic groups that are under-represented in the geosciences. The GPS campaigns and workshops successfully involved students and teachers in active research. Almost all of the participants had a positive experience. One-dimensional modeling of geodetic data from transects across the plate boundary allows students to see how well a particular model fits the data, thus providing a good introduction to the modeling process. One student is learning to use Simplex to conduct further modeling. Another student is using AutoGIPSY to process our GPS data. The K-14 teacher involvement is forging closer ties with their schools and their students, which we anticipate will help unveil geology as a potential career.

ED11B-0109 0830h INVITED POSTER

Utilizing Undergraduate Research Projects to Assist in the Development of Interpretive Resources at City of Rocks National Reserve and Castle Rocks State Park, Idaho

Kevin R Pogue (509 527-5955; pogue@whitman.edu)

Whitman College, Department of Geology, Walla Walla, WA 99362, United States

In the Albion Mountains of southern Idaho, granitic rock of the 28 Ma Almo pluton and 2.5 Ga Green Creek Complex of southern Idaho has weathered and eroded into a spectacular landscape of towers and spires. These unusual landforms impressed travelers on the California Trail who compared their shapes to cathedrals, castles, pyramids, and other man-made structures. The region eventually became know as the City of Rocks and was a local scenic attraction until City of Rocks National Reserve (CRNR) was established in 1989 to provide more effective management for the main group of spires which were drawing an increasing number of tourists. In 2003, Castle Rocks State Park (CRSP) was created to provide both access and protection to a less extensive group of spires located a few kilometers north of the City of Rocks. Interpretive resources at CRNR have generally focused on the human history of the region, particularly its importance to the California Trail, and have largely neglected the fascinating geologic story. Although the general framework of the geology of the Albion Mountains is reasonably well known, this "big-picture" geology does little to answer many of the questions posed by the average visitor. During the summer of 2001, a Keck Geology Consortium undergraduate research project was conducted in CRNR to seek answers to these types of questions. CRNR staff could then utilize the students' research to develop interpretive resources. Six students and two professors spent 4 weeks in the field investigating the structures and processes that have contributed to the architecture of the City of Rocks. The general geomorphology of the Albion Mountains was the focus of a Keck Geology Consortium undergraduate research project conducted during the summer of 2002. Nine students and three professors studied the glacial and landslide history of the highest peaks and the geomorphic evolution of the proposed CRSP. Students working in the Castle Rocks had 2 main goals: 1) assisting park management in the recognition of geologic features that are exceptional, unique, or fragile, and 2) investigating processes responsible for the large- and small-scale geomorphic evolution of the spires. These students were able to document evidence for the complex multi-stage evolution of the Big Cove, the basin that hosts Castle Rocks. Episodic exhumation of the spires is almost certainly related to variations in late Quaternary climate recorded in lake cores obtained by other students studying glaciation. The projects as a whole have produced extended abstracts published by the Keck Consortium and senior theses. A simplified geologic map of the CRNR and CRSP, as well as other maps, diagrams, and photographs suitable for use by the general public have been provided to park management. The staff of CRSP was also provided with GPS waypoints and aerial photographs detailing the locations of important or sensitive geologic features. A proposal has been made to CRNR for a self-guided interpretive geologic trail and road log. The Idaho Geological Survey has agreed to publish a geologic guidebook to the area that will incorporate many of the results of the Keck projects.

ED11B-0110 0830h POSTER

Digital Underground (Shh... It's really Applied Geophysics!)

Brian G. McAdoo (845.437.7703; brmcadoo@vassar.edu)

Vassar College, 124 Raymond Ave. Box 735, Poughkeepsie, NY 12604, United States

Digital Underground (Geology/Physics 241) at Vassar College is an applied geophysics course designed for a liberal arts curriculum, and has nothing to do with Shock G and Tupac Shakur. Applied geophysics courses have a history of using geophysical methods on environmental contamination-type applications (underground storage tanks, leach fields, etc.). Inspired in large part by the Keck Geology Consortium project run by Franklin and Marshall College geophysicist (Robert Sternberg) and archaeologist (James Delle) in an old slave village in Jamaica in 1999, this class examines the history of slavery in New York's Hudson Valley region by way of its forgotten African-American graveyards. This multidisciplinary approach to an issue draws students from across the curriculum- we have had our compliments of geologists and physicists, along with students from sociology, environmental studies, history, and Africana studies. The name of the class and content are designed to attract a non-traditional student of geophysics.- The project-based nature of the class appeals to student yearning for an out-of-classroom experience. The uncontrolled nature of the class demonstrates the complications that occur in real-word situations. The class has in the past broken itself into two teams- a surveying team and an archival research team. Archival research is done (usually by the social scientists in the class) to add a human dimension to the geophysical. The surveying equipment used in delineating these forgotten graveyards includes a Total Station surveyor, an electrical resistivity meter, a magnetometer, and a ground penetrating radar. All students must have a rudimentary understanding of the physics behind the equipment (to the level of where they can explain it to the general public), and the methods used by those studying the archives. This is a project-based class, where the instructor acts as a project manager, and the students make the decisions regarding the survey itself. Every year we undertake a different site- the first year we surveyed a Huguenot era (late 17th -early 18th century) family plot where slaves were rumored to have been buried, then the 19th-20th century Ulster County (NY) Poorhouse "potter's field" where we found evidence of over 2,000 unmarked graves (some underneath the County pool complex!), and this year we are surveying The Dutchess County (NY) Poorhouse burial grounds. The final exam is a public presentation (either to government legislatures or local historical societies). The public presentation is an extraordinary aspect of the course as the students come to realize that they are the experts on this particular site and this suite of tools. The confidence gained by a 3rd year sociology student explaining a cesium-vapor magnetometer to a government official is indescribable.

URL: http://faculty.vassar.edu/brmcadoo/digitalunderground.html

ED11B-0111 0830h POSTER

Designing Undergraduate Research Experiences for Non-Traditional Student Learning at Sea

James E Gawel[1] (253-692-5815; jimgawel@u.washington.edu)

Cheryl L Greengrove[1] (206-723-1026; cgreen@u.washington.edu)

[1]University of Washington, Tacoma, 1900 Commerce St. Campus Box 358436, Tacoma, WA 98402, United States

The primary goal of the experiential learning model that forms the basis of the environmental science curriculum at UWT is to enhance undergraduate education by involving students in ongoing relevant research projects that extend beyond the classroom into the broader scientific community. To do this it is imperative to minimize costs while providing student access and ensuring data quality so that this data may be used for scientific purposes. During the summers of 2001 and 2002, undergraduate students from the University of Washington, Tacoma, participated in two very different marine research courses designed by environmental science faculty. We compare these two educational models and discuss the pros and cons of each.

ED11B-0112 0830h INVITED POSTER

Student Research Projects in Geophysics Through a Consortium of Undergraduate Geology Departments

Glenn C Kroeger (210-999-7607; gkroeger@trinity.edu)

Department of Geosciences, Trinity University, One Trinity Place, San Antonio, TX 78212, United States

Beginning in 1987, and continuing to the present, the Keck Geology Consortium, a group of 12 undergraduate institutions, has sponsored a series of summer research projects. These projects typically involve from 9 to 12 students and 3 to 4 faculty members and consist of a 4 to 5 week summer research program followed by continuation of the research at the students' home institutions, often as a senior thesis. Many of these projects have included extensive field and laboratory geophysical components. In order for students to carry out successful research projects in geophysics, several hurdles have to be cleared. Frequently these students have not had a formal course in geophysics, so although they may have strong geologic and quantitative skills, there is usually the need for a concentrated classroom immersion in the geophysical theory and methods related to the project. Field geophysics projects are labor intensive, so it is common for a group of three or more students to produce only one or two complete data sets in the course of the summer program. Generating individualized projects so that students feel ownership of their thesis research can be challenging. Most of the departments do not have a geophysicist on the faculty, so follow-up support for the student research involves continued long-distance collaboration between project directors, students and sponsoring faculty. The impact of the internet on this collaboration cannot be overstated. Finally, diverse computing environments at the participating institutions were a significant problem in the early years. Migration of geophysical software to Windows from Unix, and the widespread availability of Linux has mitigated these problems in recent years. The geophysical components of these projects have been largely successful. A series of vignettes is presented showing the range and nature of geophysical projects that have been carried out. In addition to anecdotal evidence of student satisfaction, there is quantitative evidence of success. A substantial number of students have gone on to graduate work in geophysics. Of those students who did not pursue geophysics, a substantial fraction has pursued graduate work or careers in other areas of quantitative geosciences.

URL: http://keck.carleton.edu

ED11B-0113 0830h POSTER

Introductory Geophysics at Colorado College: A Research-Driven Course

Carl-Georg Bank (719 - 389-6512; cbank@coloradocollege.edu)

Colorado College, Department of Geology 14 East Cache la Poudre, Colorado Springs, CO 80903, United States

Doing research during an undergraduate course provides stimulus for students and instructor. Students learn to appreciate the scientific method and get hands-on experience, while the instructor remains thrilled about teaching her/his discipline. The introductory geophysics course taught at Colorado College is made up of four units (gravity, seismic, resistivity, and magnetic) using available geophysical equipment. Within each unit students learn the physical background of the method, and then tackle a small research project selected by the instructor. Students pose a research question (or formulate a hypothesis), collect near-surface data in the field, process it using personal computers, and analyse it by creating computer models and running simple inversions. Computer work is done using the programming language Matlab, with several pre-coded scripts to make the programming experience more comfortable. Students then interpret the data and answer the question posed at the beginning. The unit ends with students writing a summary report, creating a poster, or presenting their findings orally. First evaluations of the course show that students appreciate the emphasis on field work and applications to real problems, as well as developing and testing their own hypotheses. The main challenge for the instructor is to find feasible projects, given the time constraints of a course and availability of field sites with new questions to answer. My presentation will feature a few projects done by students during the course and will discuss the experience students and I have had with this approach.

ED11B-0114 0830h POSTER

Access to Space: Hands on flight instrument experience for sophomores at UW

Robert H. Holzworth[1] (206 685 7410; bobholz@washington.edu)

Erika M. Harnett[1]

Robert M. Winglee[1]

Timothy M. Chinowsky[2]

Michael P McCarthy[1]

[1]Earth and Space Sciences, University of Washington Box 351310, Seattle, WA 98195-1310, United States

[2]Electrical Engineering, University of Washington Box 352500, Seattle, WA 98195-2500, United States

Students at the college sophomore level, with no science or technical prerequisites, form teams to design and fabricate sounding balloon payloads. This 200 level class promotes interest in research and involves a mixture of lectures about the upper atmosphere and space environment coupled with an intense laboratory experience. Students are taught rudimentary electronics and fabrication techniques, culminating after just 4 weeks of the flight of a CricketSat instrument (single, thermistor-controlled tone telemetry modulation; kit by Bob Twiggs at Stanford) on a sounding balloon. Following this appetite whetting, student teams design, test, calibrate and interface an instrument of their own choosing to a telemetry system for sounding balloon flight. During Spring 2003 student built payloads included devices to measure direct and reflected solar radiation, magnetic field variations, temperature and pressure, and even a small 'biosphere' with crickets which actually survived flight to near 30km altitude! Students go on a one day field trip to launch the sounding balloons and attempt recovery. This is followed by the last two weeks of data analysis and final report writing.

ED11B-0115 0830h POSTER

Northwest Tribal Interaction with Washington State University: Research and Education Opportunities Afforded Through the Center for Multiphase Environmental Research

Brian Rumburg[1] (509-335-7205; brumburg@wsunix.wsu.edu)

David Yonge[1] (509-335-2147; yonge@wsu.edu)

Justin Jacob[1] (509-335-6273; jpjacob@mail.wsu.edu)

[1]Center for Multiphase Environmental Research, Department of Civil and Environmental Engineering, Washington State University, Sloan Hall, Pullman, WA 99164-2910, United States

The under-representation of Native Americans in engineering and science at the student and practicing engineer or scientist level is a national problem. To begin addressing this problem Washington State University (WSU) has initiated discussio with local Native American tribes to strengthen the relationship between WSU and the tribes and to improve the educational opportunities available to tribal members. The Center for Multiphase Environmental Research (CMER) received a 1999 National Science Foundation (NSF) Integrative Graduate Education and Research Training (IGERT) grant to train Ph.D. students. The main goal of the program is to foster multidisciplinary research and education for future scientists and engineers in the broad field of study that incorporates the fate and transport of environmentally significant species between interfaces. We are also focused on recruiting and educating Native American students. CMER is committed to cultivating its relationship with Native American tribes by identifying the environmental concerns of the tribes and developing collaborative research efforts utilizing CMER's infrastructure. Through these collaborative projects the CMER hopes to better understand the social and cultural aspects important to the tribes and develop the familiarity needed to effectively enhance student recruitment. This poster highlights the CMER's interdisciplinary research and teaching efforts and focuses on Native American recruitment.

ED11B-0116 0830h POSTER

A Mentoring Program for Native Students

Janie Nall[1] (301-286-0885; jnall@pop100.gsfc.nasa.gov)

Nancy Maynard[2] (301-614-6572; Nancy.G.Maynard@nasa.gov)

[1]NASA, Goddard Space Flight Center, Code 120, Greenbelt, MD 20771, United States

[2]NASA, Goddard Space Flight Center, Code 900, Greenbelt, MD 20771, United States

Working in conjunction with several Tribal Colleges, the NASA Goddard Space Flight Center has developed a model program for mentoring Native students. In this session we will share our approach with others who would like to develop effective mentoring for successful internship and recruitment plans. Our program has proven beneficial to the mentoring scientists in terms of moving forward on their projects, and to the students and Universities, in terms of gaining meaningful research experience and new pathways opening between our institutions.

ED11C MCC: 3012 Monday 1020h

Building Strong Geoscience Departments: Examples That Work I

(joint with OS, C)

Presiding: **C A Manduca,** Science Education Resource Center, Carleton College**; R H Macdonald,** College of William and Mary

ED11C-01 1020h

Earth Sciences at Boston University: Reorientation and Renewal

Richard W Murray[1] (617 353-6532; rickm@bu.edu)

Carol Simpson[1] (617 353-2532; csimpson@bu.edu)

[1]Dept of Earth Sciences, Boston University, Boston, MA 02215, United States

Beginning in 1994 with the renaming of its Department of Geology as the Department of Earth Sciences, Boston University has invested much effort into developing a modern, energetic department that excels in its dual research and teaching mission. These changes required strong leadership at the departmental and senior administrative level, but they have resulted in a moderately sized program (9.5 full time faculty) that is competing with "Top Ten" institutions for graduate students and faculty, and which is also placing its undergraduates in the leading graduate programs. Most of the revitalization was achieved over a 5-year period in which across the board changes occurred in our undergraduate curriculum and during which we recruited junior and mid-level faculty on the basis of their scholarly abilities and for their belief in the culture of our new mission and program. The undergraduate curriculum, which had been oriented towards traditional geologic offerings, was greatly increased in rigor (requiring a full year each of calculus, physics, and chemistry) and redesigned to expand flexibility in the broad field of earth sciences. During the evolution of the curriculum, it was extremely important not to confuse "tradition" with "rigor". Undergraduates became more critically involved with our research mission through senior theses, a formal Undergraduate Research Opportunities program, and by work-study participation in the laboratories. By making the program more challenging, over the period of 3 years we doubled the number of majors and minors and increased the average GPA by 0.5 units. Now, after 8 years, we have nearly tripled our overall number of students, with further improvements in quality and intellectual diversity. The opportunity to replace departing senior faculty was achieved through effectively arguing to the central administration that modern earth sciences are an essential component of any leading institution of higher education. By persuading the administration to take advantage of targets of opportunity in hiring, we were able to recruit about 1/3 highly visible mid- or senior-level faculty and 2/3 junior faculty. Recruitment of an external Chair was the single most critical action, and was taken near the outset of the rejuvenation. Further hires were staggered over 5-8 years, to ensure compatibility and minimize transitional issues, and are continuing. We did not replace departing expertise with that same expertise and, above all, faculty with quantitative approaches to earth sciences were welcomed. Once on-campus, all faculty are involved in the various aspects of the re-building process, so that all are enfranchised and invested in the program. Based on AGI statistics, critical mass in earth sciences only begins to be realized at the level of 13-15 full time faculty. We have not achieved that number yet, but have created an integrated program by ensuring cross-fertilization across the scientific methods used by the various faculty. The key strategy was to ensure that regardless of a professor's specific orientation, the approach taken is relevant to a variety of disciplines (e.g., chemical diffusion in metamorphism is analogous to diagenesis). As a result, our research productivity has increased by an order-of-magnitude as measured by external grants and journal citations, with each faculty member now supporting 2-3 graduate students and their associated research costs. In less than 8 years, the department has not only changed direction and dramatically increased in student size and quality, but in the process it has gained a national and international stature that speaks well of our efforts to date and serves as a stimulus for further gains.

ED11C-02 1035h

Strategic Planning for Interdisciplinary Science: a Geoscience Success Story

Dr. Harshvardhan[1] (1-765-494-0693; harsh@purdue.edu)

Jonathan M Harbor[1] (1-765-494-9610; jharbor@purdue.edu)

[1]Department of Earth and Atmospheric Sciences, Purdue University, 550 Stadium Mall Dr., West Lafayette, IN 47907-2051, United States

The Department of Earth and Atmospheric Sciences at Purdue University has engaged in a continuous strategic planning exercise for several years, including annual retreats since 1997 as an integral part of the process. The daylong Saturday retreat at the beginning of the fall semester has been used to flesh out the faculty hiring plan for the coming year based on the prior years' plans. The finalized strategic plan is built around the choice of three signature areas, two in disciplinary fields, (i) geodynamics and active tectonics, (ii) multi-scale atmospheric interactions and one interdisciplinary area, (iii) atmosphere/surface interactions. Our experience with strategic planning and the inherently interdisciplinary nature of geoscience helped us recently when our School of Science, which consists of seven departments, announced a competition for 60 new faculty positions that would be assigned based on the following criteria, listed in order of priority - (i) scientific merit and potential for societal impact, (ii) multidisciplinary nature of topic - level of participation and leveraging potential, (iii) alignment with Purdue's strategic plan - discovery, learning, engagement, (iv) existence of critical mass at Purdue and availability of faculty and student candidate pools, (v) corporate and federal sponsor interest. Some fifty white papers promoting diverse fields were submitted to the school and seven were chosen after a school-wide retreat. The department fared exceedingly well and we now have significant representation on three of the seven school areas of coalescence - (i) climate change, (ii) computational science and (iii) science education research. We are now in the process of drawing up hiring plans and developing strategies for allocation and reallocation of resources such as laboratory space and faculty startup to accommodate the 20% growth in faculty strength that is expected over the next five years.

URL: http://www.science.purdue.edu/COALESCE/

ED11C-03 1050h

Building a Geoscience Program in an Adverse Fiscal Climate: Keys to Success

Robert L Hooper (715 836 4932; hooperrl@uwec.edu)

University of Wisconsin - Eau Claire, Department of Geology, Eau Claire, WI 54702, United States

Despite an almost 50 percent decline nationwide in undergraduate geoscience enrollment between 1995 and 2002 the Department of Geology at the University of Wisconsin - Eau Claire has experienced a 20 percent increase in the number of majors and minors studying geology over the same period. The department now has 90 majors/minors studying geology in an institution with 10,000 student headcount. In the face of declining State support for public higher-education and eroding university budgets, the Department of Geology has also added two faculty positions and over 1.3 million dollars in new laboratory equipment over the same period of time. Keys to building a successful program have been faculty recruitment and retention efforts, an increased emphasis on excellence in undergraduate collaborative research, attention to building a faculty and student community of scholars, and collaborative promotional work with other science departments. In addition considerable efforts have been devoted to explicitly recruiting top quality students from introductory courses and effectively using students to promote the department at the local, regional and national level. Recruiting top quality faculty is crucial and has required competitive salary packages, significant start-up funding and negotiating spousal hires within an extremely tight fiscal climate. Retaining faculty also requires attention to salary issues especially salary compression. One key to our success has been the undergraduate student's willingness to support high-priority academic activities such as collaborative research, technology initiatives and department capstone field experiences through a university-wide voluntary tuition surcharge. Many of the strategies that have been successful at UW-Eau Claire are transferable to other institutions.

ED11C-04 1105h

Strength Through Options: Providing Choices for Undergraduate Education in the Geosciences

T. Furman[1] (814-865-5782; furman@geosc.psu.edu)

K. H. Freeman[1] (kate@essc.psu.edu)

Departmental Faculty[1] (furman@geosc.psu.edu)

[1]Pennsylvania State University, Department of Geosciences, University Park, PA 16802

Undergraduate major enrollments in the Department of Geosciences at Penn State have held steady over the past 5 years despite generally declining national trends. We have successfully recruited and retained new students through intensive advising coupled with innovative curricular revision aimed to meet an array of students' educational and career goals. Our focus is on degree programs that reflect emerging interdisciplinary trends in both employment and student interest, and are designed to attract individuals from underrepresented groups. In addition to a traditional Geosciences BS program we offer a rigorous integrated Earth Sciences BS and a Geosciences BA tailored to students with interests in education and environmental law. The Earth Sciences BS incorporates course work from Geosciences, Geography and Meterology, and requires completion of an interdisciplinary minor (e.g., Climatology, Marine Sciences, Global Business Strategies). A new Geobiology BS program will attract majors with interests at the intersection of the earth and life sciences. The curriculum includes both paleontological and biogeochemical coursework, and is also tailored to accommodate pre-medicine students. We are working actively to recruit African-American students. A new minor in Science and Technology in Africa crosses disciplinary boundaries to educate students from the humanities as well as sciences. Longitudinal recruitment programs include summer research group experiences for high school students, summer research mentorships for college students, and dual undergraduate degree programs with HBCUs. Research is a fundamental component of every student's degree program. We require a capstone independent thesis