dynamic and has evolved over billions of years, and that the geological evolution of Earth has left a record of its history that geoscientists interpret. EarthComm builds upon these ideas to emphasize the study of the evolution of life and the planet using a community-based approach. Project CUES (Constructing Understandings of Earth Systems), a comprehensive middle school Earth science program to be tested in classrooms in the 2002-2003 school year, will focus student inquiry upon four key themes, including evolution and Earth history. In cooperation with the Paleontological Society, AGI recently released Evolution and the Fossil Record. The work discusses geologic time; change through time; Darwin's theory of evolution; evolution as a mechanism for change; the nature of species; the nature of theory; paleontology, geology, and evolution; and determining the age of fossils and rocks.

URL: http://www.agiweb.org/education/

ED22B MC: 308 Tuesday 1505h

Geoscience Graduate Degrees: Preparation for a Global Job Market?

(joint with PA)

Presiding: **J Giesler,** AGU**; A Staudt,** Harvard Univ**; C Johnson,** Scripps Institution of Oceanography

ED22B-01 1505h

Earth and Space Science PhDs: Class of 2000

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The American Geophysical Union (AGU) and the American Geological Institute (AGI) have been collecting data on recent PhDs in the geosciences for 5 years (1996-2000). Over these years continual improvement has been recorded in the job market through indicators such as time to find employment and starting salaries. As these indicators continue to improve, so too does the perception of the job market in general. There are several characteristics that are unique to PhDs in the geosciences. Unlike physical science graduates, there is a significant number who have been working full-time at least one year prior to earning their PhD. Recent graduates employed prior to graduation are heavily concentrated in Solid Earth Geology (41%) followed by Atmospheric Sciences (19%) and Oceanography (12%). A second distinguishable feature of Earth & space science PhDs is their age. Each year there is a higher percentage of recent graduates over the age of 40: 16% in 1998, 20% in 1999, and 23% in 2000. In 2000, the average time between earning a B.S. and starting a graduate program was 4.6 years. Both 1999 and 2000 show a drop in the overall numbers of postdoctoral appointments. This suggests that greater than 50% of the recent graduates are finding full-time permanent employment. Of the geoscience subfields, oceanography has greatest number of people obtaining employment outside the field.

ED22B-02 1520h

Technical and Soft Skills Expectations During the Transition from Recent Graduate to New Hire

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Employer-applicant skill compatibility represents a major component of the career development process, particularly for new entrants to the job market. Newly minted geoscientists largely bring a distinct set of skills learned during their formal education and training, which combined with a broader view of the person are evaluated for career potential in today's major employers. University departments possess a strong view of their role in educating future geoscientists, including the skill sets imparted, the basis of education provided, and the expectation for how their students will evolve into colleagues in the profession. Regretfully, based on numerous surveys by both the American Geological Institute's Human Resources program and other independent studies, the formally transferred skills and expectations do not necessarily match those of many geoscience employers. While academia has increased its focus on increasing technical skills and greater specialization, most geoscience employers have further increased the technology gap between themselves and academia, leading most employers to seek broadly trained and well-educated graduates. Additionally, soft skills represent an area of major disagreement between what is considered important and what is considered feasible in a formal education. While debate continues both within industry and academia over the ideal set of soft skills, the great variance in soft skill demands lead to better opportunities for matching of graduate to employer. This debate further enhances the ongoing discussion of the role of the university, the importance of employer needs, and the health of the geoscience discipline within society. Fundamentally, the hiring and career development process remains as sequence of compromises for both the employer and the recent graduate.

ED22B-03 1535h

Is That Graduate Degree Worth It? Comparing the Recruitment of Undergraduate and Graduate Degree Job Applicants

Randall M Richardson (520.621.8257; rmr@U.Arizona.EDU)

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One could argue from a business prospective that colleges and universities are not working hard enough to train students for life in the business and civic world, at either the undergraduate or graduate levels. What is it that employers are looking for in students? How different are the skills and attributes employers are looking for between undergraduate and graduate students? How unique are the geosciences in this respect?

At the undergraduate level recruiters have spoken loud and clear about what they want. According to the dean of the business school here at the University of Arizona, recruiters at the undergraduate degree level in business base less than half of their hiring decision on specific content knowledge in the discipline, and correspondingly more than half on the so-called soft skills ... ability to apply knowledge in new situations, ability to think critically, ability to communicate with others in both written and oral forms, ability to work in teams, ability to work with a diverse set of employees and customers (especially, but not limited to, the global job market), etc.

How true is this at the graduate level, where students have typically spent 4-6 years specializing in a discipline? Is there a set of fundamental knowledge that employers are looking for at the graduate level? Are the so-called soft skills correspondingly less important?

I will present results from a survey of graduate programs and industry recruiters addressing these questions, and highlight the areas of overlap and difference between undergraduates and graduates looking for jobs. I will concentrate specifically on jobs in the oil industry and on both masters and Ph.D. programs.

ED22B-04 1550h

Postdoctoral Positions and Career Growth

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Career choices begin to diverge at the time the doctorate is received. A variety of career options are available to pursue including positions in academia, government, and industry as well as non-traditional services.

A postdoctoral appointment is worth considering as preparation for a career in academia or basic research. The postdoctoral appointment can expand the recent graduate's background and broaden their scientific perspective and reputation. Postdoctoral experience may even be essential to be competitive for some faculty and research laboratory appointments.

However, there is a wide range of postdoctoral choices to consider. There are many opportunities for postdoctoral appointments in universities, and emerging opportunities in some corporate laboratories. We will mention opportunities in federal laboratories such as the National Research Council programs in NASA, NOAA, EPA, and the Dept. of Defense, which are open to U.S. citizens and in some cases to non-U.S. applicants, to pursue research in all areas of the Earth and space sciences. And there are exciting new interdisciplinary programs such as the NASA Astrobiology Institute, as well as international opportunities including the von Humboldt fellowships in Germany and similar programs elsewhere in Europe, Japan, and other countries.

URL: http://www.national-academies.org/rap

ED22B-05 1605h

Global Job Opportunities with a "Super-Major" Oil and Gas Company

Michael J. Baranovic (504-728-4150; mjbaranovic@shellus.com)

Shell Exploration and Production Company, P.O.Box 61933, New Orleans, La. 70161-1933, United States

Shell International Exploration and Production Company is one of the world's largest private employers of geoscientists with approximately 1500 geophysicists and geologists employed worldwide. The companies of the Royal Dutch/Shell Group together produce, process, and deliver energy to consumers. Operating across the globe, in more than 130 countries and with more than 100,000 staff, Shell companies are guided by values developed over more than a century of successful enterprise.

Responsibilities and Career Path - As a processing or research Geophysicist, you will use proprietary methods to prepare 2D and 3D seismic data volumes for the direct detection of hydrocarbons, the delineation of reservoirs or to define the stratigraphic and structural framework of the subsurface. As an exploration or development Geophysicist, your business will be finding commercially viable oil and gas reserves by using 3D seismic acquisition, processing, and interpretation techniques. Your advanced geological models of the subsurface will drive drilling proposals, optimizing appraisal of hydrocarbon resources. As a production or surveillance geophysicist, your 4D seismic interpretations and geological models will drive drilling proposals and optimize the production and depletion of existing oil and gas accumulations. Up to seven steps in the technical career ladder are possible. Team leader and management candidates are chosen from Shell's technical workforce based on technical and business acumen demonstrated on the job.

Projects - Geophysicists work as part of multidisciplinary teams on projects that typically last from 18 to 36 months. Teams are responsible for projects that may vary from $1 million to hundreds of millions in scope. Accountability and responsibility varies according to individual experience level and team structure.

Lifestyle - Geophysicists are mainly office-based, with business travel requirements rarely exceeding 2 weeks per event. In the U.S., Shell allows flexible daily office hours, and employees may choose an optional 9-hour work schedule that provides alternate Fridays off. Company pension and benefit programs are competitive with the best that industry has to offer.

Degree requirements: Shell recruits Geophysicists for the global staff pool from approximately 20 universities in the U.S. Universities are chosen based on the curriculum of the school, the size of the student enrollment, and the regional location of the school. Geophysicists generally must have at least an MS degree to qualify for Shell employment. Electrical Engineers and Physicists who are recruited as seismic processors are required to have at least a BS degree. Recruiting targets vary annually based on company need.

URL: http://www.shell.com/careers

ED22B-06 1620h

Working for a not-for-Profit Research and Development Organization in the Earth Sciences

h. Lawrence McKague (210-522-5183; lmckague@swri.edu)

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The Southwest Research Institute (SwRI) is an independent not-for-profit applied engineering and physical sciences research and development organization. This means that SwRI owes no allegiance to organizations other than its clients. As a not-for-profit organization, SwRI reinvests its net income into the organization to improve, strengthen, and expand facilities and to support internal research and development projects. Located in San Antonio, Texas, on 1200 acres, SwRI employs nearly 2800 staff and occupies nearly 2,000,000 square feet of office space. Its business is about equally divided between commercial and government clients, most of whom have specific scientific and technical problems that need to be solved in a timely, cost-effective manner. Governmental clients include local, state, and federal agencies and foreign governments. Commercial clients include local, national, and international businesses. Earth science disciplines at SwRI include geology, geophysics, hydrology, geochemistry, rock mechanics, mining engineering, and natural hazard assessment. Our overall approach is to systematically examine client problems and develop solutions that may include field work, laboratory work, numerical modeling, or some combination of these approaches. This method of problem solving places a strong emphasis on interdisciplinary teamwork. The work environment at SwRI strikes a balance among the freedom to attack technically important problems, consistent support to professional development, and a strong commitment to meeting client's deadlines and goals. Real problems with real consequences are routinely solved on a tight schedule. The diversity of clients gives exposure to an extraordinarily wide range of problems. Successful employees have sound technical backgrounds, are flexible in accommodating varying clients needs, bring creativity and energy to problem solving and applications of technologies, can work on multiple tasks in parallel, and can communicate

clearly with clients and other team members. Professional development is supported through encouragement of continuing education, as well as publication and presentation of professional work. An overview of the earth science staff and work at SwRI can be found at http://www.swri.edu/4org/d20/d20home.htm

URL: http://www.swri.edu/4org/d20/d20home.htm

ED22B-07 1635h

Mapping the Globe with C & C Technologies

Art A Kleiner ((337) 261-0660; art.kleiner@cctechnol.com)

C & C Technologies, Inc., 730 E. Kaliste Saloom Road, Lafayette, LA 70508, United States

C & C Technologies is an international survey and mapping company with an entrepreneurial spirit that is evident throughout. C & C was recently awarded the MTS (Marine Technology Society) ROV Committee Corporate Excellence Award in recognition of their pioneering spirit displayed by the introduction of the HUGIN 3000 Autonomous Underwater Vehicle (AUV) to the offshore industry. This presentation will outline the wide variety of global mapping projects that C & C has performed for government, private sector, and academia. These include high-resolution mapping of Cater Lake, the Panama Canal, Antarctica, Lake Tahoe, and the HUGIN 3000śs discovery of the German submarine U-166 in 5000 feet of water in the Gulf of Mexico. Adacemic disciplines required to support these technical challenges will be characterized and job opportunities in this emerging field will be addressed.

URL: http://www.cctechnol.com

ED22B-08 1650h

What Are Faculty Advisors To Do When Their Own Career Path Does Not Satisfy Their Students?

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As graduate students seek advice on broad career options, many faculty advisors do not know what to do. It is easy for them to do nothing. They may do nothing because they assume that their own students are interested only in an academic research career like theirs. The mistake here can be that the advisors' verbal and non-verbal communication deters students from mentioning their interests in the first place or pursuing those interests, if mentioned. Or advisors may do nothing by assuming that it is not their responsibility to advise students about career options other than being an academic researcher. The advisors' lack of knowledge about other careers may lead them to avoid the issue. The mistake here is obvious. So what are advisors to do?

They can encourage students to think of their graduate study as part of their career preparation, not just a task to obtain a research degree. Creating a risk-free environment for career discussion will enable faculty advisors to learn each student's career priorities and validate exploration of broad career options. Advisors should not feel inadequate by being unable to advise about everything. No one expects them to. They can encourage their students to meet together, on their own if necessary, to discuss common career concerns, even to invite speakers, including alums, to talk about different careers and the preparation required. They can encourage their students to seek additional mentors, people more knowledgeable about careers of interest to the students. They can encourage students to take courses for career preparation, particularly courses outside of science, even though these courses "take them away from their research." And advisors should not hold students at fault if they change their minds about career paths. More information often changes minds. These are a few of the many things that advisors can do.

It is essential that faculty advisors not resent students' decisions to follow a career path different from the advisors' or, for students wanting a faculty position, decisions to prepare themselves for teaching as well as research. Conflicts that do arise can at least be alleviated if these differences of opinion or goals are taken to be like the conflicts between offspring and parents, a normal part of maturing into one's own person.

ED32A MC: 122 Wednesday 1330h

Informal Education: A Powerful Tool in Science Literacy I *(joint with PA)*

Presiding: **J Thieman,** NASA/GSFC**; D Alexander,** Lockheed-Martin Solar Astrophysics Lab

ED32A-01 1330h

Bridging the Gap Between Formal and Informal Science Education

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Formal learning skills are enhanced throughout our daily lives through the public media, (television, newspapers, radio); while hiking our favorite park; or by visiting a museum or science center.

Over the past few years the informal science community has started to bridge the gap with the formal education community. Although few informal education organizations have established set curriculum guidelines, many have adapted the use of the National Science Standards. In so doing, these organizations have raised their level of professionalism. Many formal school programs are now actively seeking collaborative science education programs to enhance and expand their hands-on, inquiry based curriculia through informal science organizations.

This paper/presentation will address my current research within this field. I will discuss selected federal science agencies education and outreach efforts. Key points will include media useage, age of target audiences, credentials of interpretation staff, and level(s) of collaboration with formal schools.

ED32A-02 1345h

Space Mysteries: Making Science and Astronomy Learning Fun

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How do you get and keep a student's attention during class? Make learning fun! Using a game to teach students ensures that they have fun, enjoy the lesson and remember it. We have developed a series of interactive web and CD based games called "Space Mysteries" to teach students math, physics and astronomy. Using real NASA data, the students must find out Who (or What) dunit in an engaging astronomy mystery. The games include video interviews with famous scientists, actors playing roles who give clues to the solution, and even a few blind alleys and red herrings. The first three games are currently online in beta release at http://mystery.sonoma.edu.

URL: http://mystery.sonoma.edu

ED32A-03 1400h INVITED

Expanding Public Outreach: The Solar System Ambassadors Program

Kay Ferrari (818-354-7581; kay.a.ferrari@jpl.nasa.gov)

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The Solar System Ambassadors Program is a public outreach program designed to work with motivated volunteers across the nation. These competitively selected volunteers organize and conduct public events that communicate exciting discoveries and plans in Solar System research, exploration and technology through non-traditional forums. In 2001, 206 Ambassadors from almost all 50 states bring the excitement of space to the public. Ambassadors are space enthusiasts, who come from all walks of life. Last year, Ambassadors conducted almost 600 events that reached more than one-half million people in communities across the United States. The Solar System Ambassadors Program is sponsored by the Jet Propulsion Laboratory (JPL) in Pasadena, California, an operating division of the California Institute of Technology (Caltech) and a lead research and development center for the National Aeronautics and Space Administration (NASA). Participating JPL organizations include Cassini, Galileo, STARDUST, Outer Planets mission, Genesis, Ulysses, Voyager, Mars missions, Discovery missions NEAR and Deep Impact, Deep Space Network, Solar System Exploration Forum and the Education and Public Outreach Office. Each Ambassador participates in on-line (web-based) training sessions that provide interaction with NASA scientists, engineers and project team members. As such, each Ambassador's experience with the space program becomes personalized. Training sessions provide Ambassadors with general background on each mission and educate them concerning specific mission milestones, such as launches, planetary flybys, first image returns, arrivals, and ongoing key discoveries. Additionally, projects provide limited supplies of materials, online resource links and information. Integrating volunteers across the country in a public-engagement program helps optimize project funding set aside for education and outreach purposes, establishing a nationwide network of regional contacts. At the same time, members of communities across the country become an extended part of each mission's team and an important interface between the space exploration community and the general public at large.

URL: http://www.jpl.nasa.gov/ambassador/front.html

ED32A-04 1420h INVITED

The AGU and Planetariums: Effective Ways of Interacting With Planetariums As Informal Learning Centers.

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Today's planetariums are informal, science learning centers focusing on space/earth sciences, astronomy and the humanities. This paper shares creative ways on how planetariums reach their audiences effectively, and how professional scientists can be part of the planetarium education.

ED32A-05 1440h INVITED

Dive and Discover: Bringing Oceanographic Research into the Classroom and to the General Public

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We have developed the "Dive and Discover" web site for use in classrooms and for the general public to provide near real-time, daily access to oceanographic research expeditions, particularly those using deep submergence vehicles operated by Woods Hole Oceanographic Institution. The site was one of five science sites nominated for a 2001 Webby Award, was selected by Scientific American as one of the top five sites in the category of earth and environmental science, and was one of Eisenhower National Clearinghouse's "digital dozen" for science resources.

The web site consists of two major components. A series of educational modules provide both general educational information about the oceans and the people that study them, as well as cruise-specific information about the natural systems being studied, the participating scientists, and the data and sample-collecting methodologies and technologies being used. The second component consists of modules that allow access to near real-time updates of the progress of the cruise, images of seafloor features and animals, samples of data being collected and used on board, and general information about life on board. In addition, a Mail Buoy provides e-mail access for students to ask questions of the scientists on board the ship during the course of the expedition.

COSI Toledo have a linked Educators Companion that gives access to COSI project management tips, background information, activities, correlations to national science education standards, assessment tools, and a vast array of resources to assist educators in using the web site.