

## ED71A-0046 0830h INVITED POSTER

## Reasons Why Some Women Quit Science

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Nearly half of all graduate students majoring in various disciplines of science today are women, yet men still predominate the faculty makeup at most universities and research institutions. This issue was discussed at length last year in the journal *Science* and also in the *Chemical Engineering News* (the ACS weekly publication magazine). The question is: why do so many women decide to major in science but not to pursue a career in science? Over the years I have seen highly capable women quit science for two main reasons. First, intimidation that can be very difficult to deal with when someone is just starting a career in science. Thus, I encourage young women to make a sincere effort to surround themselves with colleagues who are both knowledgeable and considerate. Keep in my mind that you have a choice to choose your future collaborators, so make some smart choices early on and throughout your career. Second, is the need to balance the demands of work with those of family life. Personally, I don't believe a tenure system is fair to young women who wish to have children during this appointment. The level of stress can be very high, which prevents women from applying to a position where they are given only a few short years to prove themselves. Also, try not to make a radical decision (i.e. quit science) if you are too stressed. Talk to more senior women in the field to learn how to better deal with your stress. After all a career in science has many ups and downs, and to survive, one needs to balance the good and bad days. In this talk I will address the questions outlined in the announcement as they relate to me. Overall, my advice to young women who are just starting their scientific careers is to celebrate your accomplishments and learn from your mistakes.

## ED71A-0047 0830h POSTER

## The Science of a Life - Career Path of an African American Geoscientist

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A career in the field of geophysical fluid dynamics is not an apparent choice for an African American woman from rural North Carolina. It was, however, the choice made. As a first generation college graduate, the catalyst to pursue such a career path was provided by those external to family; however, internally, the pursuit of education was valued, expected and required. It is this, the expectation and requirement, which serves as the foundation for the discussion of the balance of life in terms of family, education, and career.

There are no scales in existence on which to measure the balance of life. The selected educational institutions, Spelman College, The George Washington University, and Princeton University; nor career positions, National Aeronautics and Space Administration, AT&T Bell Laboratories, institutions of higher education, consulting opportunities, discuss, promote or encourage such a balance. Defining this balance, however, is a science that can only be advanced and achieved by the individual in relationship and partnership with community. The science and balance of a life is the focus of this discussion.

## ED71A-0048 0830h POSTER

## A Career in Marine Geology with the Naval Research Laboratory

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The voyage leading to my present position as a mid-career research scientist for the Naval Research Laboratory (NRL), has been littered with sinkholes and rogue waves, with occasional patches of calm seas and following winds. This poster chronicles my journey from undergraduate studies in terrestrial geology through my graduate work in Marine Sciences, and a few of the more interesting stops on the way to my present position at NRL. Questions to be answered: 1. Did I have a career plan (and how often did it change along the way)? 2. What/who were the major influences on the direction my career has taken? 3. Can you successfully balance work and family in this field? 4. How has the work environment changed in the past 20 years? 5. Is the government a female friendly employer? Suggestions/ideas will be presented on how to support and cultivate female Marine Geological careers and research in the future.

## ED71A-0049 0830h INVITED POSTER

## Choosing Your Geosciences Career Path

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There are many possibilities for rewarding careers in the geosciences including positions in academia, government, industry, and other parts of the private sector. How do you choose the right path to meet your goals and needs and find the right career? What are the tradeoffs and strategic moves that you should make at different stages in your career? Some of the pros and cons between soft-money research, government research, and management and industry positions are discussed from a personal perspective. In addition this presentation will provide some perspective on different career choices as seen by program managers in funding agencies. The competing priorities between work life and private life are discussed with the some thoughts on compromising between having it all and finding what works for you.

## ED71A-0050 0830h INVITED POSTER

## From Supernovae To Equatorial Ionosphere, Following a Tortuous Path Through Computer Sciences, Oceanography, and Much, Much More

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From as early as I can remember, I always wanted to be a scientist. My interests were oriented towards cataclysmic and catastrophic events. I first wanted to study volcanoes, then earthquakes. As I ended my PhD, my interests had gone a little higher, towards supernovae and the Crab Nebula. This was in Paris. I then immigrated to the US. My first job in the US was in computer sciences. I joined a team who made one of the first computer movies. I then switched fields once more. I went into ionospheric physics, where I stayed for more than 2 decades. I then did two tours of duty at National Sciences Foundation. I was first in the Magnetospheric Program. Then I started a multidisciplinary program that covered all sciences related to the arctic - from the bottom of the ocean to the confines of the magnetosphere, passing through biology, glaciology, etc. Presently, I lead a team of about 20 scientists at the Air Force Research Laboratory. We work on basic and applied ionospheric sciences problems as they relate to communications and navigation.

As a woman scientist, the hardest obstacle I had to overcome was probably the permanent guilt of not staying home with my children. I raised 3 boys, and, although they are happy, successful and well adjusted, I continue to feel guilt about not staying home for them, and working so long hours and with so much intensity. When they were small, society was not too accepting of working mothers. In one of my kids first grade class, he was the only child whose mother was working. As a teenager I also had to overcome rejection from boys who could not stand girls who studied science. My own father was not too encouraging to continue studies, warning me that women who are too bright have a hard time finding husbands. One University professor told the class that women were wasting taxpayers money since they would never put their degree to use. My greatest support was my husband, always there, sharing chores, and understanding my ups and downs. The saying that the difficult period in a womans life is only between the ages of 7 and 70 gives me solace. I cant wait to be 70.

## ED71B MCC: Hall D Sunday 0830h

## Improving Diversity in the Earth and Space Sciences: Programs That Work I Posters (joint with B, OS, P, S, SA, SH, SM, T, V, PA)

Presiding: F R Hall, University of New Orleans; K Grove, San Francisco State University

## ED71B-0051 0830h POSTER

## Enhancing Diversity in Earth and Space Science

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Interdisciplinary minors and courses have been developed on various CUNY campuses which include topics in physical science, geoscience, environmental science and computer science, as well as the latest developments in the field of Earth Science and Space Science. The objective is to excite students and create interest in Earth and Space Science by integrating an existing NASA and NOAA missions, e.g. SOHO, EOS, Landsat, into the curriculum and by having students use the mission data to either create code for data analysis and/or analyze data. This some courses team taught by physical, geoscience and computer science faculty in the various colleges. The missions becomes the basis for the physical principles and computer applications taught in the course and students are required to complete research projects, working individual at times and in teams. In addition, it is preparing the students for summer research programs at either Goddard Space Flight Center, Goddard Institute for Space Studies, South Carolina State University or on a campus in the City University of New York. Supported by NASA MU-SPIN and NASA Space Science.

## ED71B-0052 0830h POSTER

## The Space Place: Multifarious Merchandise for Omnifarious Folks

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"The Space Place" is a coordinated NASA educational outreach program that seeks to reach a diverse and under-served audience, including minorities, girls, inner city children, and those living in rural areas. This audience also includes the more than 27 million Americans who, according to the 2000 census, speak Spanish as their first language.

The Space Place began in 1998 with a child-oriented Web site (<http://spaceplace.nasa.gov>) presenting simple "make and do" activities and fun facts related to the technology validation space missions of NASA's New Millennium Program. The Web site is now sponsored by over 30 space science and Earth observing missions. And it is now also available in Spanish.

Having materials available on the internet, however, does not guarantee that everyone in the target audience will have access to them. So, The Space Place went on to create a suite of products and a network of partnerships that would allow more direct and diverse ways to communicate. Thus was invented Club Space Place.

Club Space Place works through two different types of partnerships: national and local. The products provided: quarterly guides for original Club Space Place group activities, plus NASA space and Earth science and technology bulletin board display materials.

The first of the national organizations participating in Club Space Place was Boys & Girls Clubs of America. With 3100 chapters and 3.3 million members ages 6-18, 67% of whom are minorities, BGCA has been able to distribute the quarterly Space Place activity guides electronically via its Web sites to all chapters that have internet access and by hardcopy to those that don't. Other national organizations that receive the activity guides include YWCA, 21st Century Learning Centers, and Civil Air Patrol.

Local community partners include about 240 museums, libraries, planetariums, zoos, and aquariums, largely in small cities, towns, and rural areas, with a combined annual visitorship of 26 million. These partners receive individual attention. Each receives the Space Place display materials, updated with quarterly mailings and the quarterly activity guides.

Another product is a monthly Space Place newspaper column written for children. This column is currently published in 14 English language newspapers and 7 Spanish language newspapers, with a combined daily circulation of over 2.5 million copies. And, for the target audience that has neither internet nor newspaper access, The Space Place has a toll free phone line (1-866-575-6178) with answers to often-asked questions about space sent in by the community partners. The monthly phone message is also given in Spanish.

Evidence continuously points to the success of The Space Place program at reaching its target audience. Counts of visitors to the Web site continue to grow, as

does the number of awards for its excellence and educational merit. The inauguration of its Spanish version was marked with coverage by CNN en Español and BBC Ciencia (radio program). Feedback from community partners is extremely positive, and the number of partners continues to grow. The number of both English and Spanish language newspapers wishing to carry The Space Place column is also growing.

The Space Place program owes its success, first of all, to the quality and diversity of its products, whatever language they are in. But without appropriate and effective partnerships for their dissemination, they would be worthless. With both, the winners are the youth who can see the excitement and hope of science, technology, and NASA's programs-youth who might not otherwise recognize their choices.

URL: <http://spaceplace.nasa.gov>

**ED71B-0053 0830h INVITED POSTER**

**New Initiatives for a Successful Diversity Program at the University of New Orleans**

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The Geoscience Program at the University of New Orleans has been actively working to increase diversity in the Geosciences since 1974 when Dr. Louis Fernandez (now at Cal State San Bernardino) initiated a summer field trip for local minority high school juniors and seniors. That early effort was funded with a grant from the National Science Foundation. After the NSF support ended, the department and local Petroleum companies maintained the program continuously to the present. The summer field trip has been a major source of minority geoscientists nationally and our minority enrollment has grown rapidly during the past approximately 5 years primarily as a result of significant additional scholarship support from industry. Based on our preliminary success, we decided to make a major effort to expand our program beyond the basic field trip and scholarships. In particular, with a grant from the National Science Foundation Geoscience Diversity program beginning this past year, we have 1) initiated a new summer field program for high school freshmen and sophomores that focus on our local environment, 2) created a summer field trip for K-12 science teachers, 3) developed a new program of independent research for our undergraduate students and 4) brought in our first two visiting professors. The new summer program involved 10 students in a 2-1/2 week series of classes, field trips and camping activities. In addition to studying the environment, students produced a movie about their experiences and a website. We anticipate a larger group of students in next years program and that several of this past summers participants will apply to go on our field trip for Juniors and Seniors when they are eligible. The first summer field trip for teachers focused on the area around the Teton Mountains and Yellowstone National park in Wyoming and Idaho. We devoted considerable time to learning basic geologic principles and collecting rock and fossil samples, outside of the national parks, for their classrooms. The teachers prepared material on our field trip stops and we videotaped their presentations at the outcrops for future use in the classroom. Seven undergraduate students conducted independent research as part of our new program. One participated in a REU project in Rhode Island and the other six conducted a variety of independent projects at UNO. Two of these projects have produced abstracts for national meetings and others are anticipated. Finally, we have supported two visiting faculty to provide role models and classes relevant to our minority students. It is too early to assess the full success of most of these new initiatives but the independent research has clearly given our students an improved attitude about themselves and what they want to do with their future.

URL: <http://www.geology.uno.edu>

**ED71B-0054 0830h INVITED POSTER**

**Building Pathways into the Geosciences for a Hispanic Community of Learners in El Paso**

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Our goal is to expand minority participation in the geosciences at the University of Texas at El Paso (UTEP) by increasing the number of Hispanic students

who major in either Geological Sciences or a new interdisciplinary program in Environmental Sciences. UTEP has an enrollment of ca. 15,000 students of which 70% are Hispanic and 10% are Mexican Nationals and is one of the largest Hispanic-serving institutions in the country. The demographics of the UTEP student body (85% of whom come from the El Paso region) reflect those of our dominantly Hispanic metroplex of more than 2 million inhabitants on both sides of the US-Mexican border.

We are taking a two-pronged approach to building a community of aspiring geoscientists in El Paso. First, we are establishing an outreach program to enhance awareness of the geosciences among local high school students. The centerpiece of this program is a two-week summer camp for high school juniors that will expose 75 students and 15 teachers to a variety of topics in the geosciences and demonstrate how the biology, chemistry, and physics covered in high school courses integrates with geoscience. Second, we are building a Research Experience for our undergraduates by offering stipends to college students in exchange for progress towards a bachelors degree in Geological or Environmental Sciences and participation in research with geoscience faculty and graduate students. Since January, 2002, we have had 7 undergraduate students, 15 high school students, and three teachers participate in our program.

**ED71B-0055 0830h INVITED POSTER**

**Promoting Diversity in the Atmospheric Sciences through the Penn State Weather Camps for Middle/High School Students and Teachers**

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Two one-week resident summer camps have been organized that provide student and teachers with hands-on instruction, demonstrations, and classroom interaction. Students entering the 8th through 10th grades are selected from a pool of applicants, with special efforts made in having traditionally underrepresented ethnic groups (African-American, Hispanic, and Native American) and women participate in the Weather Camp. Although the 2001 session included 8 out of 33 students from traditionally underrepresented ethnic groups, the 2002 session included only 1 such student. During the first year approximately 1/2 of the students were female but in the second year only 1/4 were female. The Weather Camp for Teachers was launched during the summer of 2002 with 24 teachers participating in the course. Three educators were from school districts with high populations of underrepresented students and a fourth was from a district serving mentally disabled students. Surveys completed by the teachers and students indicate the participants' educational/career goals and interests, access to technological resources, and teaching methods. Survey results, camp highlights, and strategies for attracting more students and teachers from traditionally underrepresented groups in 2003 will be presented.

**ED71B-0056 0830h POSTER**

**Shaking up the future of Hispanic students in rural southwest Arizona: A collaborative research/teaching effort creating a bridge between students and the geosciences.**

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Arizona Western College, Yuma, Arizona, serves the largely Hispanic population of rural southwestern Arizona. The majority of our students are first-generation college students who frequently lack strong educational role models. We are constructing a geoscience education program for recruiting and mentoring Hispanic and Native American students from Yuma and La Paz counties, Arizona. This program will be structured around faculty-mentored, undergraduate research on the seismicity and related geologic phenomenon of the Salton Trough of southeastern California and northern Mexico. Yuma-area students are well-suited for this program, because they have strong footholds in the cultures and languages of the region. Our chief goal is to provide educational opportunities in geoscience for historically underrepresented minorities of southern Arizona and California. Ultimately, this should lead to leadership roles in the geoscience for Hispanics in the largely Hispanic communities of the desert southwest.

Importantly, this geoscience education program has the support and collaboration of science educators from across the educational spectrum in southern Arizona and California, and northern Mexico.

**ED71B-0057 0830h POSTER**

**Earth Science Pipeline: Enhancing Diversity in the Geosciences**

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Our initial efforts to recruit and retain students from under-represented ethnic groups were guided by results from a survey of students in our introductory geology courses. Among students from under-represented ethnic groups, the most common reasons for NOT majoring in geology were (1) lack of exposure to geosciences, (2) lack of knowledge about careers in geology, (3) a student's perception that he or she is not a "science-type" of person, (4) the difficulty of science, (5) the fact that the student had no friends or family members that had majored in geology, (6) the lack of role models from their ethnicity in geology, (7) boredom with science. The first reasons listed above were rated as "very important" to the greatest number of students [45%], and the following reasons were considered "very important" to decreasing numbers of students [down to 20%]. Issues related to prestige, religion and gender role models were considered "very important" to <10% of the students.

To address the two most common reasons for not majoring in geology, we made presentations about the geosciences and careers in geosciences at local schools. We have presented in science classes, to students in Project UPBEAT, as well as to students in the Advancement Via Independent Determination (AVID) program at local high schools. We also participated in the Earth Science portion of a Science Olympiad for high-achieving middle and high school students, offered consulting for science fair projects and led students on field trips to the San Andreas fault and Pisgah Crater. We hired CSUSB students from both our introductory and upper-division geology courses to help with these outreach activities. Several of these students were from under-represented ethnic groups, and they thus served as role models for the pre-college students from those ethnic groups. These outreach assistants have also continued taking geology courses, and some have become geology majors or minors.

A total of 44 presentations/field trips/other activities with students were conducted during 2001-02, resulting in over 4300 contact hours with more than 2300 pre-college students. The majority (66%) of the students at these events were from under-represented groups. Responses on evaluation forms indicate that presentations that provided hands-on experiences for students were more likely to influence students to consider majoring in the geosciences than were more traditional presentations, such as slide shows.

We have also engaged in teacher development, to better prepare teachers to provide more exposure to the Earth Sciences for pre-college students. We conducted a week-long field trip to Owens Valley for local high school and middle school teachers, as well as various one-day workshops.

To address students' perception that they are not "science-type" people, we recruited and hired 15 student research assistants, many of whom were students from under-represented ethnic groups from our introductory geology courses. We trained these students to help us begin monitoring deformation across the San Andreas and San Jacinto faults near our campus, using the Global Positioning System.

To address the difficulty with science that many students expressed, we hired students who had done well in our introductory geology courses to serve as tutors for those courses during subsequent quarters. The presence of these tutors (some of whom were from under-represented ethnic groups) in the laboratory session made it easier for students currently taking the class to get their questions answered promptly, thus making their experience with geology more pleasant and effective.

## ED71B-0058 0830h INVITED POSTER

### Mentoring Through Research as a Catalyst for the Success of Under-represented Minority Students in the Geosciences at California State University Northridge

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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 to research in the geosciences 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. The Catalyst Program provides significant financial support to participants to allow them to focus their time on their education. New participants first complete a specially designed course that introduces them to peer-mentoring, collaborative learning, and geological research. Students of all experience levels then become members of research teams, which deepens academic and research skills as well as peer-mentor relationships. The program was highly successful in its inaugural year. To date, undergraduates and graduate students in the program coauthored six abstracts at professional meetings and one conference paper. High-school students gained first hand experience of a college course and geologic research. Perhaps the most important impacts of the program are the close camaraderie that has developed and the increased ability of the Catalyst students to plan and execute research with greater confidence and self-esteem.

## ED71B-0059 0830h INVITED POSTER

### The Geoscience Diversity Enhancement Program (GDEP): Building an Earth System Science Centered Research, Education, and Outreach Effort in Urban Long Beach, California

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The Geoscience Diversity Enhancement Program (GDEP) is an NSF-OEDG funded project at California State University, Long Beach (CSULB). Program goals include increasing awareness of geoscience careers, and the availability and accessibility of research experiences, to area high school and community college faculty and students from underrepresented groups. Begun in fall 2001, GDEP involves faculty leadership within three CSULB departments; geological sciences, geography, and anthropology, as well as five community colleges, and one of the largest K-12 school districts in California, Long Beach Unified. In addition, linkages to CSULBs outreach and student orientation activities are strong, with the facilitation of staff in

CSULBs Student Access to Science and Mathematics (SAS) Center. During the first year, program activities centered around three major objectives: (1) creating the CSULB leadership team, and developing a robust and sustainable decision-making process, coupled with extensive relationship-building with community college and high school partners, (2) creating an evaluation plan that reflects institutional and leadership goals, and comprehensively piloting evaluation instruments, and, (3) designing and implementing a summer research experience, which was successfully inaugurated during summer 2002. We were very successful in achieving objective (1); each member of the leadership group took strong roles in the design and success of the program. Several meetings were held with each community college and high school faculty colleague, to clarify and reaffirm program values and goals. Objective (2), led by project evaluator David Whitney, resulted in an array of evaluation instruments that were tested in introductory geology, geography, and archaeology courses at CSULB. These evaluation instruments were designed to measure attitudes and beliefs of a diverse cross-section of CSULB students. Preliminary analysis of survey results reveals significant differences among ethnic groups in their perceptions and understanding of geoscience disciplines. Objective (3), the summer research experience, was also very successful: more than 25 faculty and students participated in the experience. Our preliminary analyses of the impact of the summer research experience show that research work combining field experiences, ready access to faculty mentors, and a team approach to investigations appeared most valuable to program participants.

URL: <http://www.csulb.edu/geography/gdep>

## ED71B-0060 0830h INVITED POSTER

### SF-ROCKS: Reaching Out to Communities and Kids With Science in San Francisco

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The SF-ROCKS program at San Francisco State University (SFSU), funded by a grant from the NSF-OEDG program, aims to increase the number of traditionally underrepresented students who enter college as geoscience majors through a multi-faceted collaborative watershed research project that provides teacher training, student education, and several tiers of mentoring relationships. In partnership with the San Francisco Unified School District and the City College of San Francisco (CCSF), SFSU Geosciences Department faculty guide urban high school students and their teachers in field-based research projects in the Islais, Yosemite, and Mission creek watersheds in southeastern San Francisco. SFSU and CCSF students assist teachers in the classroom and help to mentor their students. The collaborative program has a research base at SFSU and during the next several years will involve five high schools in communities that have highly diverse populations and ongoing environmental problems. Our goal with each high school is to focus earth and environmental science teachers on the geologic setting around their school, and to provide teachers and their students with relevant resources via teacher workshops, frequent interactions with college faculty and students, and an interactive web site and GIS database.

During the summer of 2002, project scientists worked with 9th grade Integrated/Environmental Science teachers at Phillip and Sala Burton High School on a multi-layered, hands-on mapping and sampling partnership designed to identify and monitor environmental hazards and watershed characteristics in the Yosemite Creek watershed. The watershed - within which Burton High School is located - provides an interdisciplinary focus for collecting and analyzing rocks, soils, water chemistry and rainfall characteristics. SFSU faculty incorporated concepts and data from the project into ten watershed-theme lesson plans that are now part of the year-long Integrated Science curriculum at the high school, which serves more than four hundred 9th grade students of diverse ethnic backgrounds. The lesson plans and other materials are available on an interactive web site (<http://sf-rocks.sfsu.edu/>) and water, soil, and mapping data collected by the students will be compiled and displayed on a GIS map database. Six undergraduate student interns also received training during the summer and are key to the program success because they help to administer weekly lesson plans and assist in project evaluation. The SF-ROCKS program aims to provide a pathway to increasing diversity in the geosciences by acquainting high school students with opportunities in the field and by fostering mentoring relationships among university, community college and high school students and instructors that will encourage high school students to study geoscience at CCSF and at SFSU (or at other colleges).

URL: <http://sf-rocks.sfsu.edu/>

## ED71B-0061 0830h POSTER

### U.S./South African Undergraduate Education and Research Workshops

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Deep South African mines (2 to 3.5 km below land surface) have provided unique opportunities for research investigating geochemical and microbial processes in deep subsurface environments. The environments encountered in these mines range from prolific biofilms to hot saline water emanating from gas-rich boreholes. This venture is an outgrowth of ongoing research funded by the NSF Life in Extreme Environments Program as the Witwatersrand Deep Microbiology Project. A workshop for U.S. and South African underrepresented undergraduates was held in December 2001 and is being repeated in December 2002. The main purpose of the workshops were to provide a field and laboratory research experience for underrepresented undergraduate students from the United States (U.S.) and South Africa (S.A.) in the fields of earth, biological, and environmental sciences and engineering. Additional purposes included continuing the exchange of scientific, educational, and biotechnological efforts, and to discuss and explore opportunities for expanding the educational, research and biotechnological efforts. The workshop goals were to recruit and engage undergraduate students in unique and exciting research not normally available to them. The workshops offered state-of-the-art experimental opportunities on specific scientific topics, including subsurface biogeochemistry and microbial ecology. The workshops strengthened scientific and technological collaborations between the South African and U.S. academic communities and South African mining companies. The mines welcome opportunities to host underrepresented student education initiatives and are forthcoming with refreshments, mining gear, underground transport and geologists. We successfully demonstrated that a workshop with underground activities involving students from both nations was safe, feasible, and career enhancing. Student activities included chemical analyses of groundwater, enrichment for iron- and sulfate-reducing bacteria and methanogens, and DNA extraction and amplification for molecular characterization of groundwater, biofilm and sediment microbial communities. Students worked in pairs while being immersed in a cultural, scientific and interdisciplinary atmosphere that relied on teamwork. Student's experiences covered the inception of a project through the formal presentation at a scientific symposium. They expanded their knowledge base and their field and laboratory skills. The students gained an appreciation for interdisciplinary research through this one-week immersion in biogeochemistry of the subsurface and developed international networks among themselves and with established scientists. Student surveys and comments demonstrated positive impacts on underrepresented undergraduate students. A niche was found and a path was demonstrated for fostering scientific, educational, and technological collaborations involving South African mines, faculty and students from U.S. and S.A. universities, government and industry. This workshop provided the basis for the development of an undergraduate educational program to facilitate the transfer of innovative technologies and increase the retention of underrepresented groups in the fields of earth and biological sciences and environmental sciences and engineering.

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