geophysics

Colorado School of Mines

Spring 2002

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Greetings from the Department Head

It is our pleasure to publish this Spring 2002 newsletter to give you a glimpse of life in the Department of Geophysics at Colorado School of Mines.

Some activities have become traditions – count on them and join us when you are able. One of these is the Geophysics reception luncheon immediately following the commencement ceremonies in May and December. The entire Department – faculty, staff and students – gathers to honor graduating students and returning alumni.

Another activity is the CSM luncheon at the annual SEG meeting. This year the meeting is in Salt Lake City, and the luncheon will be held on Tuesday, October 8.

Thanks for all the positive feedback on our last newsletter. We hope you like this one equally well. In our next issue, we would like to feature more alumni. So as you read the great article by Susan Perrell, think about what you might contribute. We need to hear from you!

Best regards,

Terence K Young

Green Center
Home of the
Department of Geophysics
– Photo by Derek Wilson

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New Graduate Students Welcomed to CSM

Left: The Homestead Property; Center: Kasper explains the early history; Right: Examining the relics.

CSM Geophysics graduate students are a culturally diverse group, and for many their arrival on the CSM campus is their first venture to Colorado. In order to familiarize themselves with their new location and with each other, last fall's new grad students traveled to Florissant, Colorado, under the leadership of fellow student Kasper van Wijk. While on retreat, they stayed at "The Nature Place" which provided good hiking paths, wildlife and great views of famous Pike's Peak. They even received a lesson in early American history by visiting an original homestead on the property. Everyone agreed that this was a great introduction to their CSM tenure.

Geophysics Students Help Build Frisbee Team

– Jonathan Woolley

Not many people know much about the sport invented thirty-two years ago called Ultimate Frisbee. At the collegiate level, Ultimate Frisbee has grown into an extremely competitive club sport. Over two hundred colleges compete in various tournaments each spring culminating in sectional, regional, and national playoffs that are governed by an international body, the Ultimate Players Association.

Five years ago as a freshman majoring in Geophysics here at CSM, I was introduced to the sport of Ultimate Frisbee. Several friends and I went on to create the Colorado School of Mines Ultimate Frisbee Team, now called "Entropy."

The CSM Ultimate Frisbee team has continued to grow from rather lackluster beginnings that included a first-year showing at sectionals in which CSM did not win a single game, to the 2001 season, in which Entropy took fourth place in the Southwest region and ended the season ranked 34th in the nation.

Entropy: CSM Ultimate Frisbee Team. GP students Jon Woolley (1st row, far left), John Jackson (2nd row, 2nd from left), Don Keighley (2nd row, far right), and Mike Rumon (back row, 4th from left).

Four geophysics students (Jon Woolley, Don Keighley, Mike Rumon, and John Jackson) are playing for Entropy this season, and have helped the team to its best season start yet. At this writing, we are currently ranked 18th in the nation and hope to compete at nationals in May.

I am now a geophysics graduate student and I am proud of the team at Mines. For such a small school to compete at this level is quite an accomplishment. Colleges with 3,000 students compete directly with colleges of 30,000+ students.

Wish us luck with the rest of our season!

Our own Canadian star Alison.

Giving mutual encouragement: Joe, Rick, Suzie, Liz, John, Prof. Young and Alisa.

Prof. Batzle–always on thin ice.

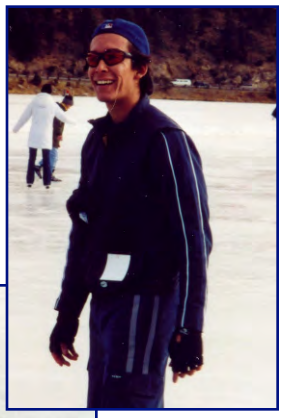
The Ice Follies

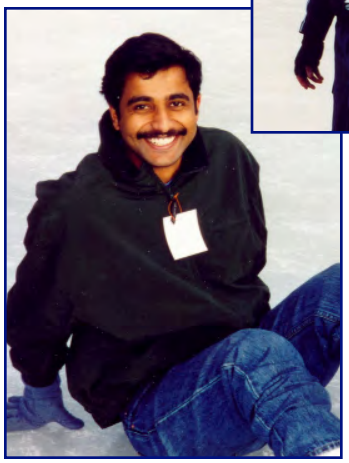
— *our own Olympics* —

Evergreen Lake is the site for the Department's annual ice skating party. This year over 100 people tested the ice and joined the fun.

The skating was followed by hot chocolate and a fantastic meal at the nearby home of Professor Ken Larner and his wife Nancy, giving everyone a chance to nurse their bruises.

Hadi–forgot the skates; remembered the camera.





Top: Cruisin'-Carlos; Bottom: Kumar–not yet ready for the quadruple jump.

Mila & Kasper perform their ice dancing routine.

Prof. Yaoguo Li and sons, along with Profs. Terry Young, Ken Larner and Max Peeters.

Sarah, Suzie and Liz "Who made this a graduation requirement?"

Ludlow: Symbiosis of Geophysics and Archeology

— Michael Ewing, Shawna Leavitt, and Joe MacGregor

In April of 1914, innocent men, women, and children were shot and burned to death in an historical event that is now known as the Ludlow Massacre. Coal miners went on strike to raise their $1.68-a-day wages and improve the safety conditions. The miners and their families abandoned the coal company-controlled housing and town of Ludlow to move into a tent colony to the north. As tensions rose, the tent colony was attacked and burnt to the ground (killing those who were not able to escape).

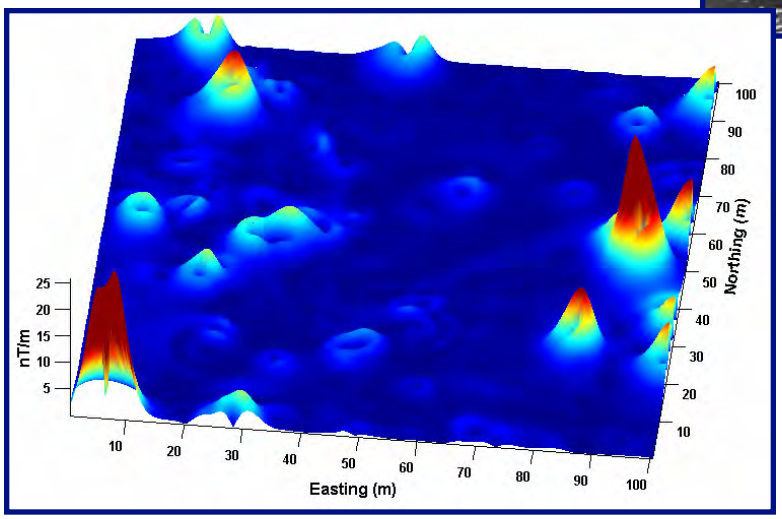
Today the University of Denver's Archeology Department is attempting to piece together the events through excavation in the area of the tent colony. The CSM Geophysics Department is aiding in their search with the use of magnetics. The remanence of the fires and the various metallic tools and frames all generate magnetic anomalies. The measured magnetic anomalies can therefore assist in locating the individual tent sites for excavation.

Blackhawk GeoSciences donated a G-858 (cesium vapor) magnetometer for the project. This instrument is sensitive to changes as small as 1/100,000 of the magnitude of the Earth's magnetic field and weighs less than 30 lbs. The students collected data in the field and then returned to the school to process them.

The design of the course allowed students to develop a suite of MatLab functions for processing magnetic data; some of the functions included operations for upward continuation, Butterworth filtering, and total gradients. Once the operations were tested on synthetic datasets, the Ludlow data were analyzed. The figure below is the computed total horizontal gradients, which shows linear alignments of anomalies that are consistent with those expected for the layout of the tent colony.

The most recent group of students to explore the Ludlow area was from Dr. Yaoguo Li's Spring 2002 Advanced Gravity and Magnetic Exploration course.

Tent colony erected north of Ludlow.



The magnetic data acquired at Ludlow site was processed by students using the programs they developed in class. This image shows the total horizontal gradient, which can indicate the locations and edges of possible tent sites.

FIELD CAMP

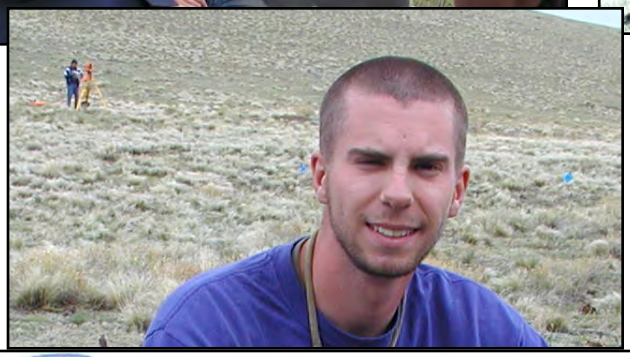
Geophysics field camp continues to be the highlight of the undergraduate educational experience. Between their junior and senior years, students head for South Park, Colorado to apply what they've learned by actually acquiring, processing, interpreting and integrating data from a broad spectrum of geophysical methods such as seismic, gravity, magnetic, electrical, electromagnetic, and ground penetrating radar.

To set the stage, the field camp begins with a week of geologic mapping. Then students look beneath the surface, spending a week in the application of various geophysical methods for shallow subsurface characterization. During week three, attention turns to deeper geophysical investigations. Veritas provides state-of-the-art vibroseis equipment and crews, and Sercel provides expert instruction in the use of their latest recording technology. In the final week, everyone returns to campus to interpret and integrate all the geological and geophysical information, before presenting a final report to the faculty and then celebrating the end of camp with an all-department picnic. The interaction among students, faculty, and experts from industry is a fantastic experience for everyone.

The Department of Geophysics is grateful for the generous support provided by Veritas, Sercel, and Talisman Energy that makes it possible to offer a state-of-the-art field experience to undergraduates. We are also very grateful for the generous financial assistance provided to CSM "campers" by Harvey Klingensmith, President of El Paso Oil and Gas, Canada.

The Geophysics field camp attracts participants from outside the department. Last year, we enjoyed the participation of alumna Diane Brownlee, who directs the Ellison Miles Geotechnical Institute in Dallas. During Summer 2002, a highlight of the camp is the participation of students and faculty from Universidad Central de Venezuela (UCV), arranged by another alumna, Mariangela Capello, a manger in PDVSA. Perhaps you'd like to participate next year. Join us!


CSM



Ticket to Anywhere

by Susan Perrell

No, we're not talking sex, drugs, and rock and roll, we're talking about a Mines geophysics degree.

Warning: If deep in your heart you absolutely know that you want to be a geophysicist forever and ever, then good for you—turn the page now. I don't want to distract you with a few snippets from the infinite career possibilities that your Mines GP degree will provide you – like, for instance, protecting endangered species, auditing oil tankers, lobbying Congress, building commercial software, reversing global warming.

If, however, you are a little bit like I was in 1970-something—slightly glazed over with 12-page linear systems homework problems and sometimes feeling like you are driving down one of those enchanting old city streets in Florence that just keeps getting narrower and narrower until you are firmly stuck in a crack between two buildings—then read on!

Halfway through my GP BSc., I remember wondering if my friends back east attending large liberal arts colleges would graduate to a broad universe of prestigious and respectable career choices while I would be permanently wedged into the seclusion of arcane nerdom. Well, let me tell you, thankfully, a geophysics career is not only way cool, but it is carte blanche to a whole universe of fun, eclectic, challenging, and fulfilling jobs that most of those dumb liberal arts majors will never even know about!

Yes, like many others in my class, I graduated into the standard petroleum exploration job so I could quickly get out of debt and buy a shiny new red sports car. The highlights of being an entry-level geophysicist at Mobil included field assignments in West Texas in August (120 degrees) and Gulf coast swamps in July (120 percent humidity). It was HOT, unfamiliar, challenging, and sometimes dangerous. (To hear about the dangerous parts, you will have to buy me a beer.) I loved it. Back in the office in Dallas, I explored exotic sedimentary basins like Norton in Alaska, the US Atlantic, and the Norwegian North Sea with teams of really talented geologists and geophysicists.

Susan M. Perrell is a 1981 graduate from the CSM Department of Geophysics and currently Vice President of Management Systems and Information for CH2M Hill in Santa Ana California. We thank Susan for agreeing to share her career experiences in this article. You may contact Susan at sperrell@ch2m.com.

During those first career years I fell in love with the new digital 3-D seismic imaging and interpretation workstations that were changing everything about petroleum exploration. I jumped from Mobil (rather conservative about technology at the time) to Sohio (technology-crazed at the time) where my team developed one of the first interactive 3-D seismic workstations. I became an evangelist for this new technology and flew around showing other explorationists how to use it. I moved to a full-time technology evangelist position at ARCO's Plano Technology Center, transferring technology out of R&D and into operations. ARCO then sent me to Bakersfield to work on an exotic 3-D seismic research project—imaging below vertical thrusts.

Just after selling our house and moving across the country, my new project was threatened with a shut down! Federal and state agencies thought that our dense seismic activities would impact endangered species and habitat! I was an endangered species idiot at the time—but surely, I thought, can't we (geophysicists, crew, 20-ton vibrators, blunt-nose leopard lizards, kit fox, and kangaroo rats) all just get along?

Answering that question took some industry soul searching, change, and then some serious evangelizing. We trained over 100 crew members in habitat recognition, species identification, encounter preparedness, and reporting procedures. We brought in botanists and wildlife biologists to boss us around. We created bilingual training materials, hosted field train-

ing sessions and tested our crew's new knowledge and skills. Our seismic program was redesigned to minimize, measure, mitigate, and report environmental impacts. Our performance impressed regulators and soon my company decided that this geophysicist should be an environmental engineer for our pipeline company in LA.

On my first day in LA, I stumbled onto our large groundwater contamination clean up at a former refinery site. There was a bunch of expensive environmental consultants muddling around and it was a great opportunity for an engineer with a petroleum geoscience background to help out. After working several groundwater projects, I transferred to ARCO's corporate remediation group. I managed multi-million dollar Superfund and other assessment and remediation projects all over the US, most of them involving contentious issues, public relations and outreach, regulatory agency negations, and legal battles.

Environmental, health, and safety policy became the focus of my work, and I moved into a corporate policy consultant position in the public affairs group at ARCO. I commuted to Washington DC to work with lobbyists, trade groups, environmentalist groups, congressional staffers, and the Administration on legislation. I had always liked the writing and evangelizing part of my job: now it actually was my job to write and evangelize! I helped to develop legislation and build political alliances, including some astonishingly unlikely ones, to forward our agenda. I developed policy positions, speeches, and congressional testimony, and briefed our executives and CEO.

Washington amazed me. Flying out to my first mission there, I expected to land in a swarm of lazy, stupid bureaucrats. Certainly there are some of those in Washington and certainly they could use a whole lot more Mines geophysics grads to straighten things out. But most of the folks I worked with in Washington worked relentlessly hard, long, hours, and I found both Democrats and Republicans to be very smart and articulate about their views—and profoundly crafty about promoting them. I wouldn't trade my experience there for anything!

I left public policy to become fabulously rich (hah!) in the software industry by co-founding a start-up for environmental information management. This was just before the dawn of the dot.coms, but the software industry had already gone crazy. We raised a million dollars, hired an engineering staff, developed our first version of our first product, and launched with great hoopla. Our investors were wonderful people, but the expectations for hockey-stick revenue growth in our brand new market were not achievable—by us or by our competition. After a grueling four years, with only small successes, our start-up turned into a start-down. It was my first career failure and I was totally horrified. Where did we screw up? Oh my, that is a two-beer story. We'll have to slouch down into the dark corners of the Ace High Tavern (does it still exist?) for that one. But the career of a Mines GP goes on! And two years later I am still discovering how very much I learned from that experience.

Today I'm at CH2M HILL, a venerable, 12,000-employee, $2B engineering firm, where I provide Management and Information Systems solutions for all kinds of clients around the world. I have an eclectic job (surprise!) that leverages much of what I've already done while providing new management consulting and leadership opportunities. My work incorporates environmental, health and safety management, management systems, project management, marketing, PR, sales, policy, industrial processes, and most importantly, information technology. I love the challenges of creating, selling, and delivering different products and services to different clients and industries.

And last but certainly not least, I have a family who somehow puts up with my whacky career, travels, annoying habits, and continual transformations. They tell me they wouldn't have it any other way. Oh, and lest I forget, my husband and I arranged our first date while debugging a computer program together in the Green Center. Thank you, Colorado School of Mines Geophysics Department!

Physical **Acoustics** *Lab*

— John A. Scales

In the Physical Acoustics Laboratory (PAL) we study the properties of waves in rocks and other complicated materials. We specialize in the use of non-contacting ultrasonic methods that exploit lasers to both excite and detect waves. The reason we're interested in the properties of waves at such high frequencies (compared to seismic waves) is two-fold. On the one hand it is important to know the frequency dependence of material properties over many orders of magnitude in order to check theoretical work on "up-scaling" of the microscopic properties of rocks. By using resonance and wave propagation we can study frequencies from a few KHz up to hundreds of MHz.

Professor John Scales takes measurements using the newly acquired optical bench and other NSF-supported equipment in the Physical Acoustics Laboratory.

On the other hand, and this may seem surprising in the year 2002, there are many aspects of wave propagation in heterogeneous media that are not well-understood. This is especially true when it comes to multiple scattering, that is, when waves bounce around repeatedly. If there is strong multiple scattering it turns out that seismic waves propagate diffusively, like heat, rather than ballistically, like true waves. In the laboratory we can analyze the physics of wave propagation with precision and clarity that would be impossible to obtain in the field. If we want to try to exploit multiply scattered waves in field data it is crucial that we understand the theory. Applications of these new ideas to seismic and radar field data are in the planning stage, but laboratory measurements have proven to be invaluable in our understanding.

Students in the PAL interact with other groups in the department, especially Professor Batzle's Rock Physics Laboratory, and the theoretical group of Professor Snieder. For example, Snieder and his students have developed a new technique that uses multiply scattered seismic waves to detect small changes in material properties. Key measurements illustrating this theory were carried out in the PAL. Further, laser-based methods may open up new areas of rock physics measurements. Other groups on campus are also interested in utilizing non-contacting ultrasonic methods in a variety of applications, especially in the characterization of material properties where it is impossible or impractical to use contacting sensors. This could be at the very small scale or with samples that are too fragile to attach sensors to, or in hostile environments such as quarry blasts, mines or combustion chambers. It may even be possible to use lasers to remotely detect land mines.

In the Lab we feel fortunate to be able to use cutting edge technology to study the fundamental aspects of wave propagation while at the same time doing research that may have a long-term impact on geophysical exploration, near-surface characterization, materials science and other problems of economic and social important.

Major funding for the PAL has been provided by the Army Research Office and the National Science Foundation.

Professor Scales has created an impressive, total-immersion environment for graduate research. John and his students share an office adjacent to their lab on the "garden level" of the Green Center. Serious conversations are conducted there as well as on fast-paced bike rides to the "M" and back. This intense interaction has led to research breakthroughs and exemplary publications from this team of professor and students.

EPICS
Risk in the Geosciences

– Roel Snieder

What is the likelihood that Olympus Dam in Estes Park might fail, causing another catastrophic flood of the Big Thompson Canyon? What are the chances of doing real-time, look-ahead tomography to identify potential zones of rock failure ahead of a state-of-the-art tunnel-boring operation? What are the odds of finding a huge, economic gas deposit under the Columbia Plateau basalts in Washington State?

These are some of the questions sophomores were asked to analyze in the EPICS 251 class (Engineering Practices Introductory Course Sequence) taught last semester by Professors Roel Snieder and Terry Young, along with teaching assistant Erin Wallin.

The students carried out projects for three external clientsthat focussed on risk in the geosciences. The first group worked on a project for the Bureau of Reclamation studying the risk of a Front Range dam collapse with a fairly large population downstream. The students came to the conclusion that raising the dam in order to accommodate a catastrophic run-off did not make sense because economical pressure to use the increased storage capacity would lead to an even higher risk. As an alternative, they proposed a monitoring and warning system that could reduce the impact of a dam collapse.

The second group carried out a project for NSA Engineering. This company, based in Golden, Colorado, uses seismic methods in engineering projects. One of their projects is a seismic system for tunneling operations that creates an image ahead of the drilling device. The students studied alternative configurations of the seismic sources and the geophone locations in order to improve the resolution of the images. With NSA-personnel they carried out a field experiment in the Edgar Mine that is operated by CSM.

The third group of students worked for a resource investment company that is based in Golden to assess the feasibility of exploring a hydrocarbon reservoir that is located under thick basaltic layers. The costs of drilling and the likelihood of successfully producing such a reservoir are different from a reservoir in sedimentary rocks. After a crash course in well-log interpretation and formation evaluation from Prof. Max Peeters, the third group of students reviewed log data provided by their client and decided they could only support one of the three play concepts hypothesized for this high-risk area.

The students worked with enthusiasm on these projects and ended the semester with presentations to their clients–who all expressed pleasure at the students' creativity.

Roel and Terry plan to teach another section of EPICS 251, again focusing on risk and uncertainty in the geosciences but using a different collection of projects. Perhaps you have a project to offer? If so, contact Roel or Terry at rsnieder@mines.edu or tkyoung@mines.edu.

One EPICS group studied dam collapse risk prevention and preparedness for the Bureau of Reclamation.

Some Things in Life ARE Free!

SU

Seismic Unix (SU) is a self-contained software environment for seismic research and data processing that is compatible with all Unix and Unix-like operation systems. CWP Research Associate John Stockwell, SU co-developer and project manager, maintains the software and implements its many updates and improvements.

SU is freely distributed on the Internet, and you may access it at http://www.cwp.mines.edu/cwpcodes. There are currently 2200 installations of SU in 55 countries.

Samizdat Press

The Internet archive, Samizdat Press, offers a free collection of books and lecture notes that you may download. Samizdat was begun by John Scales at CSM and Martin Smith of New England Research as a vehicle for distributing technical documents of interest, at no cost to the user. Check out the list of Samizdat Press offerings at the web site: http://landau.mines.edu/~samizdat.

Research Teams Promote Student Learning and Productivity

A-TEAM

"A-Team" stands for the A(nisotropy) Team – a group of professors and students from the Center for Wave Phenomena (CWP) and the Reservoir Characterization Project (RCP) doing research in seismic anisotropy.

Guided by professors Ilya Tsvankin and Ken Larner, the A-Team works on practical methods of processing and inversion of seismic data for realistic anisotropic, heterogeneous subsurface models.

Almost exclusively, the seismic exploration method has been founded on the simplifying assumption that the earth behaves as an isotropic medium. That is, the fact that the speed at which seismic waves travel might depend on the propagation direction, previously had been considered to be of little importance or too complicated to take into account in exploration practice.

Among those who attend the weekly A-Team seminar are (back, left to right) Kumar Gautam, Reynaldo Cardona, Pawan Dewangan, Debashish Sarkar and Zhu Yaping; (front, left to right) Ilya Tsvankin, Petr Jílek and Andrés Pech. Not pictured are Dong-Jie Cheng and Ken Larner.

The work within the A-Team over the past decade has led to a number of breakthroughs that show not only how to correctly process seismic data in the presence of anisotropy, but also how to derive the parameters of the anisotropic subsurface which carry crucial information about lithology and fracture networks.

The main focus of the current A-Team research is anisotropic parameter estimation and imaging using multi-component multi-azimuth 3-D reflection data, with emphasis on analysis of mode-converted PS waves.

The group has been remarkably productive, publishing dozens of papers and sometimes filling entire sessions at SEG meetings with its presentations. The importance of the A-Team results is widely recognized by the exploration community and government agencies.

For pioneering work in seismic anisotropy, Professor Ilya Tsvankin has been awarded the Virgil Kauffman Gold Medal of the SEG, and CSM alums Tariq Alkhalifah, Andreas Rueger and Vladimir Grechka have received SEG's Clarence Karcher Award as outstanding young scientists. The team actively participates in the research program of the U.S. Department of Energy, currently collaborating with colleagues from Stanford and the Lawrence Livermore National Laboratory on a large DOE project aimed at exploration and development of naturally fractured reservoirs.

One of the main reasons for the group's success is active interaction both among A-Team members and with many research groups around the globe, in particular with geophysicists in companies sponsoring CWP and RCP. Although the main attraction of the weekly A-Team seminars may be the famous anisotropic cookies, the seminars are also known for their sometimes heated discussions and informal atmosphere that foster creativity and help students to embark on new projects.

Studying research problems in a small-group atmosphere has proven beneficial to graduate students in the Department who enjoy the opportunity to learn from each other and the comradery that results. The A(nisotropy)-Team is one such group and is described here by Professor Ilya Tsvankin.

CSM Geophysics Group Attends SAGEEP 2002 Conference

– Sarah Shearer

During the week of February 10th thru 14th, geoscientists from near and far inundated Las Vegas, Nevada, to attend the SAGEEP 2002 Conference on the Application of Geophysics to Engineering and Environmental Problems. Eleven CSM undergraduates and four graduate students attended, along with numerous alumni and professionals, affording the students plenty of networking opportunities. The Colorado School of Mines was also well represented by an information booth on "college row".

By day–our undergraduates gathering at the CSM conference booth; and by night–making friends at the Las Vegas Star Trek Experience.

Participating in a professional conference is a great opportunity for students to learn about current investigations, techniques, and equipment being used in industry and among research facilities. With a variety of topics such as geophysical investigations conducted under extreme conditions, groundwater and mine mapping and monitoring, and infrastructures investigations, students were able to attend talks that related to past classroom case studies and environmental interests.

Relating several of the presentations to their senior design projects, students also listened to talks about UXO and GPR applications. From this exposure, students were able to evaluate their educational experience against the demands of industry, realizing that a Mines education provides a strong background to pursue a variety of careers.

Spreading the Word...

Always on the lookout for new talent, the Department of Geophysics was highly visible at the CSM Minority Engineering Conference attended by local high school groups. Pictured here are geophysics students Begoña Ruiz and Jessica Sigala, staffing the Department booth. They are surrounded by enthusiastic CSM hopefuls who are displaying the previous issue of our newsletter!

Schlumberger 'Loans' Lesley Evans as Visiting Professor

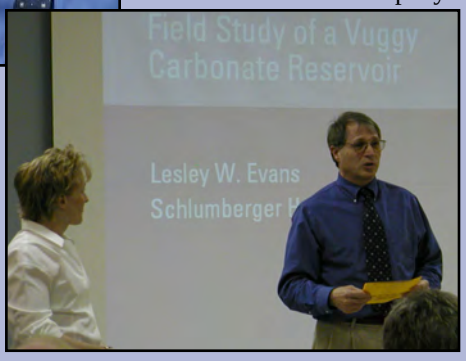
Professor of Petrophysics and Borehole Geophysics, Max Peeters, will be at the Curtin University of Technology in Perth Australia as a visiting professor during the Fall 2002 semester. During that time, Schlumberger has generously agreed to make Lesley Evans, one of their leading petrophysicists, available to the Department.

Lesley has more than ten years experience in petrophysics and has published more than 17 articles. She will be a full faculty member, give courses, advise the six petrophysics students and direct the Center for Petrophysics. Considering that the majority of our undergraduate students is female, it is gratifying that we will again have a female faculty, albeit temporarily.

Schlumberger has been a strong supporter of programs at Mines. Last summer, Schlumberger's Kami Norlin made a hug impact as a participant in the Minority Engineering Program. The company recently established scholarships for women in geology and geophysics at CSM. We are grateful for Schlumberger's contributions to Mines!

Lesley Evans

Max Peeters recently hosted Lesley on campus as a Heiland Lecturer.



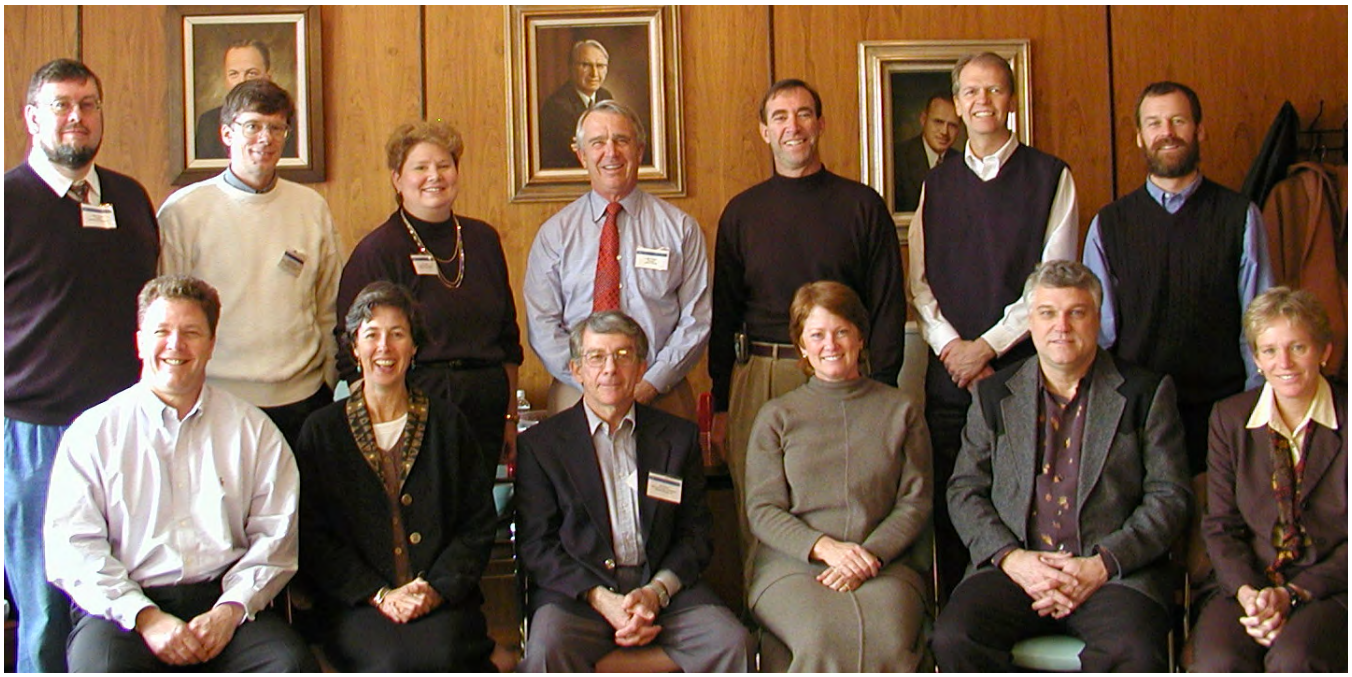
Lesley Evans graduated from Rice University with a BA in Geophysics, and completed a MSc from the University of Colorado in geology studying ice sheet/climate interactions in Baffin Bay, Canada. She joined Amoco Production Company in 1989 as an operations geologist working tight gas reservoirs in southwest Wyoming. She spent one year at Amoco's Petrophysical Training Center in Tulsa, Oklahoma, where she worked on the Lance Reservoir in the Jonah Field for pay prediction and completions effectiveness. Lesley joined Schlumberger's reservoir modeling team in 1998 to broaden her experience and to apply her petrophysical skills. Her first three years with Schlumberger were spent modeling complex carbonate reservoirs–particularly the natural fractures and vugs utilizing image logs. For the last year, she has been back to working on tight gas sandstone reservoir characterization in the Rockies.

Shell Foundation Grant Applied to New Lab

Thanks to a gift of $25,000 from the Shell Foundation, the Department of Geophysics has teamed up with CSM's Computing Center to design a new computational lab consisting of a cluster of Linux workstations. Shell's grant has been incorporated as "seed money" in a proposal for matching funds to complete the lab. The Department will use the lab for instruction in Python and Java. The lab will be available during prime time for instructional use by other departments. During off-peak hours, the lab will be used for large-scale computational experiments in geophysical research. The department's next project is installation of an interpretation and visualization lab.

Shell and the Shell Foundation have been generous sponsors of geophysics education and research at CSM. We are grateful for discretionary monies from Shell Foundation that enable us to undertake important projects of this kind.

Imagine this room with a cluster of Linux workstations and Geophysics faculty members teaching Python and Java, or students working on large-scale computational experiments.



The Visiting Committee

The Department of Geophysics is both privileged and honored to have such a distinguished panel of experts appointed by the Board of Trustees to serve as our Visiting Committee.

The Committee visited campus in late February to observe and to interact on all levels—with geophysics students, staff, faculty, and CSM administration. The Department appreciates the effort of this group to seek improvements for our benefit.

Visiting Committee members have the opportunity during lunch for more casual interactions with students and staff.

Pictured top row, left to right:

- **Dr. Peter Annan**, President, Sensors and Software (Ontario)
- **Dr. Mike Ritzwoller**, Professor, Dept. of Physics, CU (Boulder)
- **Dr. Kay Wyatt**, Phillips Fellow Emeritus, Phillips (Bartlesville)
- **Mr. Jim Payne,** CEO Chairman, Nuevo Energy (Houston)
- **Mr. Harvey R. Klingensmith***, President,El Paso Oil and Gas Canada (Calgary)
- **Mr. Gary Jones**, President, Schlumberger WesternGeco (Gatwick, England)
- **Mr. Rob Kendall**, Sr. Geophysicist, Veritas (Calgary)

Pictured bottom row, left to right:

- **Mr. Richard Degne**r, President, PGS Onshore (Houston)
- **Dr. Rosemary J. Knight**, Professor, Dept. of Geophysics, Stanford University
- **Mr. Mo Crous**, Mgr. Exploration Technology, Talisman Energy (Calgary)
- **Ms. Karen Ostrander-Krug**, CSM Trustee (Golden)
- **Mr. S. Rutt Bridges**, CEO, BigHorn Center for Public Policy (Colorado)
- **Dr. Mary Lou Zoback**, Chief Scientist, USGS (Menlo Park, CA)

Not pictured:

- **Mr. George Wood,** President, Sercel (Houston)
- **Dr. Yoram Shoham,** VP, External Relations, Shell (Houston)

* Committee Chairperson

The *Faculty* at Work

The Faculty Retreat is an annual summer event during which faculty members from the Department of Geophysics get away to consider some of the deeper philosophical issues that don't get adequate attention during the weekly faculty meetings of the fast-moving academic year.

Past retreats have been held at various venues near and far. During the most recent two years, the faculty has gathered in early July at the Carriage House of the Boettcher Mansion on Lookout Mountain. As this photo collage reveals, the setting is a pleasant one both indoors and out. Some of the heartier souls such as John Scales and Roel Snieder arrive on bicycle.

During Summer 2002 the faculty will attend the traditional retreat in July plus a "computer programming bootcamp" in August, immediately before the start of Fall semester. Faculty members have committed to mastering Python and Java before geophysics students switch from C++ to these computer languages in 2002-2003.

Cyclist John Scales arrives.

Max Peeters presents.

Ilya Tsvankin, Roel Snieder, Tom Boyd and Ken Larner talk business.

Peter Hoekstra, Norm Bleistein, Tom Davis and Mike Batzle.

Tom Boyd, Gary Olhoeft and John Scales continue the discussion out-of-doors.

Ken Larner – is that a *red* pen he's holding?

Professor Kaufman: A Perfect 10

– Terry Young

Professor Alex Kaufman, a perfect 10? Nearly. (If you don't believe me, check out the beach picture!)

Alex Kaufman turned 70 this year, and he is celebrating with some fantastic accolades from the undergraduates for his outstanding teaching. Professor Kaufman sets the standard for excellent teaching in a department with some other very fine professors. His presentation and explanation of difficult subject matter is superb. He is expert at using oral examinations in all of his classes to make test taking a valuable extension of the teaching and learning experience. This approach greatly enhances the maturity of students with respect to their ability to articulate and defend their ideas on technical subjects.

Dr. Kaufman and his wife, Irina.

Alex teaches four different undergraduate courses required of every student majoring in geophysical engineering. Last year, his course evaluations contained high praise. In a separate survey given by the department, 90% of the undergraduates gave him a perfect 10. One student commented, ". . . he's one of the world's finest professors and people." Another said, "He's the best teacher in the department." A third put it more succinctly: "Teach forever!"

When asked what Professor Kaufman could do to improve his teaching, one student wrote, "Nothing . . . the Kaufman learning experience in its entirety should not be missed." These comments are indicative of those given by students in their exit interviews, expressing the way class after class of students feel about the truly life-changing experience of learning from Dr. Kaufman.

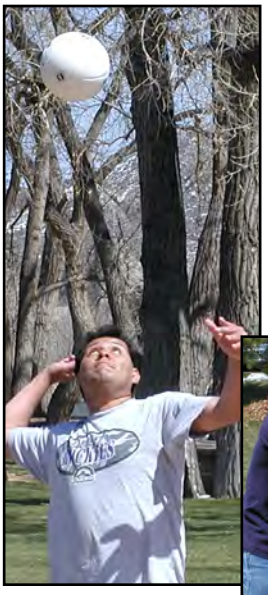
Perhaps the best comment was made by a young woman trying to decide between majoring in Geology or Geophysics. At first she mentioned that perhaps she should study Geology, because she had not done so well in her latest physics class. Then, after thinking a moment, she said, "Oh, but you have that Russian professor who fixes everybody in the area of physics and mathematics!"

Students used digital wizardry to include Alex in their "hunks of field camp" calendar.

On the slopes with Terry Young.

Alex Kaufman immigrated from Russia to the U.S., by way of Canada, with his wife Irina and his son Dimitri. Dimitri is now a cardiologist in the Denver area. Alex is in his 25th year of teaching at CSM. Since 1992, Professor Kaufman has written four geophysics textbooks that have been published by Academic Press and Elsevier, and he is now completing a fifth.

The **Celebration** Begins



GP Day is one of those miraculous rites of Spring. The Department of Geophysics adjourns its regular program in favor of a picnic and volleyball at Lyons Park in Golden. The **SSG** (Society of Student Geophysicists) unveils its newly

GP Day!

printed t-shirt, and blue jeans are the uniform of the day. By nightfall, however, squirt-gun-carrying coeds are gloriously beamed into evening gowns, and guys into jacket and tie, for a formal banquet in which undergraduates and graduate students join together to roast the faculty in very good taste. The toast of the evening at last year's GP Day was the appearance of Professor Batzle in a tuxedo. Who would've guessed he'd be out on parole . . . .

Graduation 2001

Department of Geophysics

B.S. Degree

- Gregory David Benson
- Holly Dawn Hindle
- David August Hollema
- Erin Rae Kock
- Justin James Modroo
- Suzanne Kay Moore
- Anthony Stephen Nalepa
- Theodore Leigh Royer
- Angelina Christine Southcott
- Joseph Aaron Teff
- Whitney Jane Trainor
- Amy Nicole Walker
- Jonathan Andrew Woolley

M.S. and M.E. Degrees

- Luis Henrique Amaral
- Tagir Edgartovich Galikeev
- Ronny Hofmann
- James Allen Kovats
- Carlos Moita
- Micah Reasnor
- Mehmet A. Sunnetcioglu

Ph.D. Degree

- Sverre Brandsberg-Dahl
- Raul Cabrera-Garzon
- Luca Duranti
- Edward Jenner
- Jérôme H. Le Rousseau
- Gwenola Michaud

Ed, Sverre and Jérôme sporting their caps and gowns.

Bittersweet day for classmates Suzie and Justin.

Mehmet is cheered by well wishers.

December graduates Tony Nalepa (left) and Jon Woolley (right) are congratulated by Tony's brother and CSM alum Chris Nalepa.

Whitney gives graduate Amy a send-off.

Alumni – What have *you* been up to?

We don't stay students forever—and one might wonder what's next for these squirt-gun-bearing grads who terrorized their fellow students during GP Day activities. Give us some examples of a CSM engineer's "life after college" by sending us an email or letter and even a picture with an update on your current activities—we'll even accept a full-page article! We'd truly like to hear from you (tkyoung@mines.edu).

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– Photo by Derek Wilson