The Magazine of Colorado School of Mines

Volume 95 Number 2
Spring 2005

The Best Little Truck Stop in Afghanistan
page 24

Rx for Success
page 28

What to do about CO₂
page 16
The Band Plays On

I was delighted to see the article on pages 28 and 29 of the winter 2005 Mines magazine on the CSM band. I was student director of the band in 1957-1958. My description of our non-traditional uniform allowed my wife to sit up and notice when the band appeared briefly on “Extreme Makeover.”

The only difference I detected from our appearance in 1957-58 was the hard hats – we still used the traditional style with brim all the way around. I hope that nighttime performances are still assisted by carbide lamps attached to the hats. They were great for torchlight parades. I impressed my somewhat more musical children by telling that our principal concert appearance was for the Sowbelly Dinner of the Colorado Mining Association. One more thing – in those years, when the undergraduate female attendance of CSM maxed at six, the band was all male – but the largest man in the band played clarinet, and the smallest was the bass drummer!

Musically yours,
Clarence B. (C.B.) Drennon, Geol.E. 1958
Fairlawn, Ohio

Do You Remember the Astor House?

The Astor House in Golden was purchased by Ida Goetz at the turn of the 20th century and was run as a boarding house until 1950. Now a museum, the history of the house is being researched by volunteers. We have a particular historical interest in the 1867 to 1908 time period. We would like to identify the textbooks being used and the nature of the classes at the School. For instance, we would like to be able to say, here is what Mines students did in 1905. Any students who had a relationship either as a resident or boarder at the Astor House in any time period could be of significant help. Please contact me if you have any stories to relate.

Thank you.
Charles Amen,
Astor House Volunteer
amenc@aol.com
720-870-1800
About Our Cover:
The cover depicts CO₂ molecules, part of the Earth’s problem when viewed as greenhouse gases, but also possibly part of the solution if harnessed and used to reclaim more fossil fuels. Read more about it in “Peak oil and global warming – is there a common solution?” on page 16.

Contents

Letters 2
Mines Chalks Up Interest in Middle School Math
Two professors teach teachers how to get children excited about math and science 6
Short Takes 10
Notes & Quotes 14
Peak oil and global warming – is there a common solution?
Can CO₂ be both the problem and the solution to greenhouse gases and dwindling oil supplies? 16
Athletics 20
Evans Recalls 60 Years of Service to Mines 22
People Watch
The best little truck stop in Afghanistan 24
Rx for Success
Alumni in the medical professions say Mines was a prescription for success 28
CSMAA Honors Six 33
Staying Connected 34
In Memoriam 36
Philanthropy at Mines 39
On the Move 40
Go Orediggers! 47

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By Karla Gordon

The effort to mold future scientists, mathematicians and engineers begins early, and Colorado School of Mines is helping with the effort. As a former director of the National Science Foundation (NSF) said, “We cannot expect the task of science and math education to be the responsibility solely of K-12 teachers while scientists, engineers and graduate students remain busy in their university laboratories.” Over the past three years, four projects at Mines, funded by the NSF, the Colorado Commission on Higher Education, the Colorado Department of Education and others, have focused on providing middle-school teachers with instruction in mathematics and science in order to improve the educational experiences of middle-school students. The goal is to help teachers develop hands-on classroom learning environments that illustrate how mathematics can be applied to earth science and engineering.

Each of the four projects holds eight- to 10-day workshop sessions designed around a theme and that demonstrate hands-on activities to illustrate the value of math and science in real-world problem solving. Cathy Skokan BSc Geop ’70, MSc Geop ’72, PhD Geop ’75, one of the program directors, says that in the real world, math and science are always at work in concert. The activities for participants include building bridges out of Popsicle sticks, re-engineering a diaper, designing a water filtration system using sand, learning how to do an energy audit and inventing musical instruments. At the end of the workshop, each participant receives $500 to purchase supplies to take back to their schools. Teachers then use ideas and materials from the workshops in their middle-school classrooms.

Professors Barbara Moskal and Skokan direct and coordinate the workshops, but they’ve recently delegated the responsibility of teaching the workshops to graduate fellows. Doing so allows them to travel and present the project at conferences in an effort, Moskal says, “to share our methods and results with respect to K-12 outreach with our national and international colleagues.” Last year, the professors went to Florida, Utah, China and India; this year they’ll go to Oregon, Australia and Poland. In addition, graduate students promote the program by making presentations about the workshops at national conferences.

All of the projects also include follow-up classroom visits from CSM faculty or graduate students in which the teachers receive assistance in implementing hands-on mathematics and science instruction. In the GK-12 Learning Partnership project, graduate students provide direct support in the classroom to a given teacher for 10 to 15 hours each week. In the Physical Science & Mathematics project, students provide help in the classroom for one hour every other week. The appropriate amount of support needed is currently being scientifically analyzed.

Keith Hellman, one of the CSM graduate students who spends time in several schools each week, says the most exciting aspect of the experience is that “students can ask very insightful and very motivated questions.” Hellman has been surprised, he says, “by how much work it takes to be a good teacher and how much pressure teachers are under to show progress on assessments. Our culture does not do enough to reward, encourage and assist the people who, arguably, have the most influence over our future.”

Skokan explains that middle schools rather than high schools were chosen as partners because middle-school teachers often don’t hold degrees in the subjects they teach, so they may lack content knowledge. These teachers need an opportunity to learn and understand the concepts they are required to teach. Further, research shows that middle school is a crucial time for kids. Moskal, the GK-12 Learning Partnership project director, says that it’s during the middle-school years that students may opt out of the academic classes that are prerequisites for advanced science and mathematics courses in high school and beyond. “Students from low-income families are at an even greater risk of displaying weak mathematical and scientific knowledge when compared to their middle-class peers,” Skokan adds. To increase the number of students who continue their education into higher mathematics and science, she says, “It’s important to provide activities that excite students. By showing kids that there are meaningful, real-world applications, we stand a better chance of not only holding their interest, but also that they might pursue...
math and science into their adult lives.*

The project includes a number of tools to determine whether or not it is effective. Participating classroom teachers take tests before and after the workshops and also provide daily feedback. Mines faculty meet regularly with teachers in focus groups and there is also an independent evaluator from the University of Colorado School of Education. Also, there will be Colorado Student Assessment Program (CSAP) data to indicate the impact of these programs. Agata Dean BSc Eng ’04, a graduate fellow involved in the project, plans to write her master’s thesis on the effect of these programs on CSAP scores. Students Leanne Miller and Tina Ziomek are focusing their master’s theses on educational projects that are designed to improve middle-school students’ learning of mathematics and science.

Moskal and Skokan believe the benefits of the project are far-reaching. In addition to the approximately 5,500 young students they estimate the project has reached, CSM graduate students also get an opportunity to improve their verbal communication skills both in teacher workshops and in the classroom. While the Mines students are offering valuable materials and knowledge to classroom teachers, in return, they are gaining pedagogical knowledge and teaching experience, which is important because many of the participating graduate students are considering careers in education. Graduate students Leanne Miller and Michael Ewing also have learned to write grant proposals to fund and develop technology camps for middle-school students. Miller and Tamara Hockett BSc Eng ’04 have been successful in assisting the participating teachers in writing grant proposals for classroom supplies. At least three of the student-written proposals have been funded so far. Perhaps more importantly, as Keith Helman points out, “the most rewarding aspect is simply the opportunity to help.”

Karla Gordon is a freelance writer in Evergreen, Colo.

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Toilers Tackle Mobile Networks

The Toilers, a mathematical and computer sciences research group of four professors and approximately 15 students, currently has five National Science Foundation (NSF) grants, all concerning various aspects of mobile networks. Last fall, Professors Tracy Camp and Mike Calagros and BSc Math & Comp Sci '99 organized a NSF-funded meeting related to the networking of sensor systems focus area at NSF. Simulai...content of 10 different packages developed by members of the Toilers has been requested from and shared with more than 280 researchers at 189 research labs and universities in 34 countries.

Energy Mission

Dag Nummedal, director of the Colorado Energy Research Institute at Mines and Board of Trustees member David Wagner accompanied Colorado Governor Bill Owens, Denver Mayor...on the 2005 Colorado-Alberta Energy Partnership Mission to Calgary in April. The delegation met with Canadian companies and government officials to encourage partnership and investment opportunities in Rocky Mountain energy and technology.

All Dressed Up, Somewhere To Go

For area high schools girls who couldn’t afford a prom dress this spring, Mines women looked in their closets and found more than 50 formal evening gowns to donate to the local 6th Annual Prom Dress Exchange. CSM’s assistance with the project was sponsored by the Diversity Committee in honor of Women’s History Month.

Student Chapter a GEM

Mines student chapter of the Society for Mining, Metallurgy, and Exploration (SME) was awarded the Government, Education and Mining (GEM) award in February at the SME annual conference. To increase the public’s awareness of mining-related industries, students:
• Visited elementary schools and gave tours on campus
• Participated in E-Days competitions
• Gave tours of CSM’s experimental Edgar Mine in Idaho Springs.

M Ishra, a professor in the Metallurgical and Materials Engineering Department, was cited “for distinguished contributions to education and research in high temperature electrochemical and pyrometallurgical materials processing, and for outstanding achievements in adoption of surface engineering technologies for improved tribology.”

From Brooks Field to State Capitol

Members of Colorado’s Senate and House of Representatives extended their “heartiest congratulations” to the 2004 Mines football team at the State Capitol in February. The official commendation cited the Orediggers for:
• Completing their best season in School history and winning their first conference championship since 1958
• Finishing the regular season undefeated and advancing to the NCAA Division II playoffs
• Having Head Coach Bob Stitt honored as the 2004 Division II American Football Coaches Association Regional Coach of the Year in Region 5, and the d2football.com Southwest Regional Coach of the Year
• Having quarterback Chad Friehauf win the 2004 Harlon Hill Trophy as the top player in Division II, with the single season record for completion percentage and total offense.

International Recognition for Illangasekare

Tissa Illangasekare has been named a Fellow of the American Geophysical Union (AGU), an international society that advances the understanding of Earth and space for the benefit of humanity. AGU has more than 41,000 members in over 130 countries. Illangasekare, the Amax Distinguished Chair in the Division of Environmental Science and Engineering, will accept the honor and certificate at the AGU meeting in New Orleans in May. Each year no more than 0.1 percent of the AGU membership may be elected Fellows.

In addition, the Asian Institute of Technology has selected Illangasekare as a member of its Academic Advisory Panel, comprised of up to 18 eminent academics from around the world.

Mishra Named Fellow

Brajendra Mishra has been named a Fellow of ASM International, The Materials Information Society with a worldwide membership of 36,000.
To Good Health!

Mines hosted its 15th Annual Wellness Day in March at the Ben Parker Student Center. This year’s theme was “The Five Dimensions of Wellness: Physical, Emotional, Spiritual, Social and Intellectual.”

Visitors to the event, which featured 35 local vendors, had the opportunity to gather health information and benefit from screenings, as well as meet local wellness experts, as featured 35 local vendors, had the opportunity to gather health information and benefit from screenings, as well as meet local wellness experts.

Wellness Day visitors, which was held at the Ben Parker Student Center, received a $2,000 grant to increase their outreach to students in local middle schools. Their project, called SWE-ET Links (SWE-Engineering and Technology Links), will be funded by the ExxonMobil Program Development Grant. In their request to the national SWE Program Development Grant Committee, Mines SWE members said, “Not only do we hope to further educate young students about what engineering is, but we also hope to create a greater sense of confidence for girls in math and science.”

Asteroid Kenlarner

An asteroid discovered in 2001 finally has a name. It’s Kenlarner, in honor of University Emeritus Professor Kenneth L. Larner GeopE’60, PhD GeoP’70 who retired in 2004 from Mines after serving for 36 years as the Charles Henry Green Professor of Exploration Geophysics.

Joe Dellinger and William G. Dillon, geophysicists and members of the Fort Bend (Texas) Astronomy Club, discovered asteroid Kenlarner at the George Observatory in Brasos Bend State Park, Needville, Texas.

Dellinger describes the asteroid as “a chunk of rock approximately two kilometers across” and explains that it “generally takes about four years of following an asteroid before it becomes permanently numbered and eligible for naming.”

In the official citation to the Committee on Small Body Nomenclature, the international body of astronomers that approves proposed minor planet names, Larner is described as a “world-renowned exploration geophysicist recognized for his quiet leadership skills.”

Then and Now — and How!

Marvin L. Kay EM’63 emeritus professor of physical education and athletics, delivered the Faculty Senate Distinguished Lecture in February.

“My Personal Academic, Then and Now — and How?” emphasized that driving for excellence in athletics not only impacts the educational experience of individual students, but also elevates and broadens the reputation of the entire institution.

The Faculty Senate Distinguished Lecture Award, established in 1990, gives the Mines faculty the opportunity to annually recognize one of their outstanding colleagues. They select a lecturer admired and respected as an educator, as well as a person known for having stimulating ideas to convey and an ability to communicate these ideas effectively.

Kay retired in 2004 as director of athletics, a position he had held since 1995. From 1969 to 1995, Kay was the Oredigger head football coach, and he is the all-time winningest coach in School history with 84 wins. In addition to the Faculty Senate Distinguished Lecture Award, Mines has also honored Kay with a Mines Medal in 2003, and the Alumni Association named Kay “Outstanding Alumnus” in 2002.

Dust a Real Danger to Space Missions

Dust is more than a housekeeping challenge for space exploration missions to the moon and Mars. Apollo moon missions revealed the existence of dust resembling volcanic ash, which penetrated sensors, door seals, spacecraft machinery. Significant problems with dust have also caused motor bearings to fail on Mars rovers. With no method of reducing the effects of this dust for future missions, extended stays on the moon or Mars would be at risk.

Researchers at the Space Research Partnership Center at Mines have been awarded a $14.6 million contract to work with three NASA centers, five universities, and seven industry partners to meet the dust challenge. M. samai M. alwagai, associate professor in the Mining Engineering Department, heads the project, focusing on special technology for spacecraft.

The Orediggers, Mines’ local chapter of the Society of Women Engineers (SWE), has received a $2,000 grant to increase their outreach to girls in K-12 grades. Their project, called SWE-ET Links (SWE-Engineering and Technology Links), will be funded by the ExxonMobil Program Development Grant. In their request to the national SWE Program Development Grant Committee, Mines SWE members said, “Not only do we hope to further educate young students about what engineering is, but we also hope to create a greater sense of confidence for girls in math and science.”

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Multicultural women in the fields of math, science and technology. Rising Stars are women of color under aged 30 who are helping shape technology for the future.

Trujillo '00: a Rising Star

Chontel M. Trujillo BSc CPR '00, an environmental/chemical engineer and project manager for IBM in Boulder, Colo., was recently recognized in Women of Color Magazine (Nov/Dec 2004 issue) as a "2004 Rising Star of Technology." The award was presented at the Women of Color Technology Conference in Atlanta at a national industry convention that recognizes the contributions of accomplished

Bickart Named ABET Fellow

Ted Bickart Hon Mem '99, CPRS president emeritus, received a 2004 Fellow of Accreditation Board for Engineering and Technology (ABET) award. He was honored for his leadership within the Institute of Electrical and Electronics Engineers (IEEE) for accreditation activities, for his contributions to the integration of computing programs into ABET and for his lengthy service as a program evaluator and member of the Engineering Accreditation Commission (EAC). Bickart is currently an alternate member of the EAC and active in ABET’s international activities as a program evaluator.

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Mollison ’58 Inducted into Hall of Honor

Jim Mollison Geol E ’58 was inducted into the South Dakota Highway Hall of Honor in 2004. During the 20 years he worked in the transportation industry, Mollison left a lasting and valuable contribution by continually promoting highway funding, communication, cooperation, legislation and professionalism. He actively promoted and hosted annual gatherings and meetings of both the American and Western Associations of State Highway and Transportation Officials for the purpose of improving communication and relations between Department of Transportation officials in South Dakota, North Dakota, Wyoming and Montana. His efforts facilitated the development of a multi-state group called the Bread Basket, which resulted in a significant improvement in the formula share of federal highway funds going to each of the states in the coalition. This improvement first occurred in the late 1980s, but continues to affect highway bills to this day.

N. A. Tech. Inc. Commercializes Technology

Native American Technologies Company (N.A. Tech. Inc.), a Golden, Colo., Native American-owned and operated small business, has received the Outstanding Phase II Transition Award. The award is presented annually to small businesses that achieve success in commercialization of technology developed in a National Association of Small Business Innovation Research (SBIR) project. N.A. Tech. Inc. is one of 13 companies nationwide to be so honored. Terry McNulty, BSc Math '77, MSc Math '78, PhD Math '79 is the company’s chief technology officer. He taught at CSM for 17 years before helping to found N.A. Tech. Inc. The company has turned its knowledge about welding into a technology for bending metal into shapes without using any applied force. The award was presented by Downbreaker Company, which provides business advisory to Navajo SBIR. Phase II recipients under a contract from the Office of Naval Research.

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Mullinax ’47 Publishes WWII Memoria

James A. “Pete” Mullinax Geol E ’47 has recently published Foes by Fate…Friends by Choice, an account of his experiences in World War II. Mullinax was a B-17 pilot during one of the most intense air battles of the war. He was shot down and became a prisoner of war in Germany. Mullinax not only survived, but made friends with many Germans. As he says, the book “demonstrates the significance of the horrors of war and the ability to be at peace - not only with yourself but with those who are fighting against you. This is the miracle and gift of humanity.”

Three Alumni Receive SME Awards

Raymond L. Lowrie MSc Min Ec ’72 was presented with the Society of Mining, Metallurgy and Exploration President’s Citation for leading SME’s Professional Registration Committee through its most challenging year and for editing SME’s award-winning, best-selling SME M Ining Reference Handbook. The handbook was recognized in 2004 as an Outstanding Academic Title by Choice Magazine, a publication of the American Library Association.

Mullinax ’47 Publishes WWII Memories

James A. “Pete” Mullinax Geol E ’47 has recently published Foes by Fate... Friends by Choice, an account of his experiences in World War II. Mullinax was a B-17 pilot during one of the most intense air battles of the war. He was shot down and became a prisoner of war in Germany. Mullinax not only survived, but made friends with many Germans. As he says, the book “demonstrates the significance of the horrors of war and the ability to be at peace - not only with yourself but with those who are fighting against you. This is the miracle and gift of humanity.”

Three Alumni Receive SME Awards

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Bickart Named ABET Fellow

Ted Bickart Hon Mem ’99, CPRS president emeritus, received a 2004 Fellow of Accreditation Board for Engineering and Technology (ABET) award. He was honored for his leadership within the Institute of Electrical and Electronics Engineers (IEEE) for accreditation activities, for his contributions to the integration of computing programs into ABET and for his lengthy service as a program evaluator and member of the Engineering Accreditation Commission (EAC). Bickart is currently an alternate member of the EAC and active in ABET’s international activities as a program evaluator.

Trujillo ‘00: a Rising Star

Chontel M. Trujillo BSc CPR ‘00, an environmental/chemical engineer and project manager for IBM in Boulder, Colo., was recently recognized in Women of Color Magazine (Nov/Dec 2004 issue) as a “2004 Rising Star of Technology.” The award was presented at the Women of Color Technology Conference in Atlanta at a national industry convention that recognizes the contributions of accomplished
Energy issues appear daily in newspapers, magazines and television news across the nation and the world. It didn’t use to be that way; rather, abundant cheap energy supplies were generally taken for granted with only intermittent disruptions, such as the Arab oil embargo in the ’70s and occasional power failures such as the black-out in some Great Lakes states and adjacent Canada two years ago. Today, however, our nation’s and the world’s attention is focused on the imbalance between the rate of new hydrocarbon discoveries and the rate of production, making many predict that a global peak in oil production is just around the corner. Equally disturbing is the geographic imbalance between the location of the world’s major oil and gas supplies and the largest markets, with attendant security concerns. Finally, the direct linkage between increases in global temperature and industrial production of CO₂ has now been demonstrated beyond any reasonable scientific doubt (Fig. 1). Prudent management of risks related to dislocations of climate-related economic activities requires mitigation against further rapid climate change.

These three problems are real and very serious, yet accelerated implementation of the proper technology and policy could greatly reduce their negative impacts. Industry understands that these issues are real, serious and - solvable. For example in 2004, Lord Browne, chief executive of BP, noted: “Global warming is real and needs to be addressed now. Rather than bash or mourn the defunct Kyoto Protocol, we should start taking the small steps to reduce carbon dioxide emissions today that can make a big difference down the road. The private sector already understands this and its efforts will be crucial in improving fossil fuel efficiency and developing alternative sources of energy. To harness business potential, however, governments in the developed world must create incentives, improve scientific research and forge international partnerships.” Similar views are also expressed by Lord Oxburgh, chairman of Shell. “No one can be comfortable at the prospect of continuing to pump out the amounts of carbon dioxide that we are pumping out at present... with consequences that we really can’t predict but are probably not good.”

CO₂ emissions to the atmosphere can and must be reduced to mitigate global warming. Removal of some atmospheric CO₂ can be aided by planting trees and use of agricultural land management practices that more effectively retain carbon in soils. Also, it can be achieved by creating growing market demand for CO₂ in the oil industry. It is this latter approach that offers the greatest potential for linking climate change mitigation to increased recovery of oil from existing fields, hence a delay in the date of “peak oil.”

A number of progressive energy companies already have engaged in production practices that use CO₂ as a means of extracting more oil from underground reservoirs. For example, here in the Rocky Mountains, ChevronTexaco has applied CO₂ for enhanced oil recovery (EOR, or IOR for “improved” oil recovery) at the giant Rangely Field in Colorado since 1986. Amoco began similar CO₂-EOR at Baroil in Wyoming in 1987 (Fig. 2; the fields are now owned by Merit Oil) and Anadarko began CO₂-EOR at Patrick Draw and Salt Creek fields in Wyoming in January 2004. In the
The value and the potential of CO₂-EOR are rapidly becoming global. I believe, is the use of CO₂ injected deep enough in the atmosphere is a goal in itself. Ironically, in spite of this, further growth of the CO₂-EOR industry in the U.S. today is curtailed by the lack of CO₂. This is because the current industrial sources for CO₂ are underground natural reservoirs where CO₂ is separated from natural gas (methane) during the production process. In contrast, much larger quantities of CO₂ are released directly into the atmosphere from coal-burning power plants, other industries and automobiles. As an example, in Wyoming - a leading U.S. energy producing state - the production of CO₂ from the large natural gas field at LaBarge is about 10 million tons per year, whereas the release from the coal-burning power plants within the state amount to about 90 million tons per year. The 10 million tons of natural CO₂ will be consumed by plants and sea, whereas the 80 million tons of anthropogenic CO₂ are wasted. To further emphasize this irony, the map in Fig. 3 shows how the existing CO₂ pipelines in the central Rocky Mountain region run very close to several of the region’s largest power plants. The current cost of separation of pure CO₂ from power plant flue gas and the cost of compression for deep subsurface injection are the primary factors holding back the use of anthropogenic CO₂ for EOR.

Several analyses of global trends in the use of primary energy sources conclude that coal will remain a major resource. We will continue to burn it, but hopefully in cleaner ways than in the past, such as through the use of integrated gasification combined cycle (IGCC) power plants. Huge and rapidly developing economies, such as those of China and India, are presently increasing their energy consumption at rates of nearly 10 percent per year. They view the situation as having no choice but to continue exploiting their domestic sources of coal because of both economic and security reasons. At the recent World Energy Congress in Sydney, Australia, Kjell Bendiksen, director of the Institute for Energy Technology in Norway, emphasized this point by declaring that “the enormous short-term energy demand growth in the developing countries will, in all probability, be covered almost exclusively by fossil fuels. For that reason, the world needs to develop and deploy low-emitting technology on a very large scale.” To achieve this “policy and fiscal mechanisms are generally overemphasized and the need for new technology is critically underrated.”

Two of the largest energy issues identified at the outset were global warming due to CO₂ emissions and the declining rate of oil reserves replacement through exploration. These two issues make a strong case for coupling these issues via technological, economic and regulatory mechanisms because one problem is, in fact, part of the solution to the other. CO₂ is a resource that the world no longer can afford to waste by emitting it into the atmosphere. Business, government and the technology community need a change in mindset, where CO₂ no longer is considered only an undesirable greenhouse-gas (which it is to be put away (sequestered) at huge costs both in dollars and added energy consumption, but the potential driver behind a “revolution” in the world’s oil production scenarios. A cap and trade bill, probably modeled after the pending McCain-Lieberman amendment to the energy bill, is one mechanism whereby the economic incentives for CO₂-EOR would grow through the added value of earned carbon credits. Similar approaches have greatly aided the world’s effort to reduce acid rain.

For carbon credits to work, and to enable this proposed scenario to achieve significant mitigation of global warming, the source of CO₂ must, of course, be anthropogenic. The current practice in the EOR industry of using CO₂ that is co-produced with natural gas from subsurface reservoirs is economically attractive in today’s business world where the only added value is that of incremental produced oil. With proper accounting for the costs of global warming through the added value of carbon credit trades, however, anthropogenic sources would soon become the option of choice for the CO₂-EOR industry. Making such CO₂ sources attractive to industry is one of those “underrated technology needs” referred to in Bendiksen’s quote above. A major research and development effort is needed now to produce pure CO₂ from flue gas at prices that are competitive with today’s CO₂ delivered from underground gas reservoirs.

The most promising technology for enhanced oil recovery on a global basis, I believe, is the use of CO₂ injected deep enough in the oil fields to achieve pressures sufficient for miscibility between CO₂ and oil. There are many other EOR technologies in existence, but CO₂ has the unique advantage that curtailing its emissions into the atmosphere is a goal in itself. Ironically, in spite of this, further growth of the CO₂-EOR industry in the U.S. today is curtailed by the lack of CO₂. This is because the current industrial sources for CO₂ are underground natural reservoirs where CO₂ is separated from natural gas (methane) during the production process.
Basketball Teams Qualify for RMAC Postseason Tournament

By Greg Murphy
Sports Information Officer

For the first time in School history, both the Colorado School of Mines men’s and women’s basketball teams qualified for the postseason Rocky Mountain Athletic Conference (RMAC) tournament in the same season. Despite losses in the opening rounds from both teams, there were several reasons for both teams to be proud of their performances this season.

The women’s squad, led by second-year Head Coach Paula Krueger, recorded the best season in School history as she led the team to a School-record 16 wins against nine losses. In addition, the team posted the third best record in the RMAC (13-6) and the 13 wins were the most conference wins in School history. And this was despite a staggering amount of injuries to her squad that forced all four seniors on the team to average more than 30 minutes per game. After starting the season 1-2, the Orediggers ran off a School-record nine straight wins, including an overtime triumph over four seniors on the team to average more than 30 minutes per game.

Despite a 14-7 record on Feb. 5 following a loss to Nebraska-Kearney, the Orediggers went 5-1 over their last six games, including nationally ranked Minnesota Duluth in December. With a 14-7 record on Feb. 5 following a loss to Nebraska-Kearney, the Orediggers went 5-1 over their last six games, including nationally ranked Minnesota Duluth in December.

The men’s team, guided by fourth-year Head Coach Pryor Orser, finished with a 14-7 overall record. The Orediggers followed up a 1-2 start with a nine straight wins, including an overtime upset of then No. 1-ranked Metro State in Volk Gymnasium on Nov. 27. The Orediggers tumbled to fourth seeded Fort Hays State in the first round as well as a three seed in the RMAC Wells Fargo Shootout.

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Two Wrestlers Earn All-American Accolades

Five wrestlers competed at the 2005 NCAA Wrestling National Championships on March 11-12 and two grapplers earned All-American honors for their performances. The two All-American performances helped Mines finish 19th overall as a team with 17 points.

Senior 165-pounder Peter Jenson led the way as he earned All-American status for the first time in his career with a fifth-place showing. He went 4-2 with one fall during the championships.

In addition, junior heavyweight Derek Thompson picked up All-American honors for the second straight year by placing eighth in his weight class with a record of 2-3 with one win on the fall.

Jenson and Thompson were the fifth and sixth All-Americans coached by third-year Head Coach Steve Kimpel.

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Mines with 2,067 points.

Kummer Shines at Swimming National Championships

CSM junior Travis Kummer earned four All-American honors at the 2005 NCAA Division II National Swimming and Diving Championships March 9-12 at the YMCA Aquatic Center in Orlando, Fla.

Kummer placed seventh in the 200-yard breaststroke in the finals (2:04.47) on Friday. Kummer’s four All-American performances during his four years at Mines included three top 10 finishes and one in the top 20. Kummer also helped the distance medley team to an All-American showing in the 200 breaststroke with a time of 2:04.47.

In addition, the women’s distance medley team placed 16th in a time of 1:42.39, two spots out of All-American status.

For the men, senior Jared Peacock finished sixth in the 800-meter run in 1:53.00 to earn All-American accolades. Peacock also helped the distance medley team to All-American honors with a sixth place showing in 1:49.00.

Kummer was named the North Central Region Player of the Year.

Senior Peter Jenson earned All-American honors after placing fifth in the nation at the NCAA II Wrestling Championships.
Hugh Evans EM ’49 traces his interest in mining to his days as a young boy when the Evans family would vacation in Grass Valley, Calif., on the North Star Mine property. Those summer months stimulated a lifelong fascination with mining, and an interest in devoting his career to the field.

This interest ultimately developed into a 60-year relationship with Colorado School of Mines. Evans was a student in the 1940s, then a benefactor, Board of Trustees member, Alumni Association board member and recipient of Mines’ Distinguished Achievement Medal (1979). He came full circle as a student when he briefly held the position as Mines’ oldest doctoral candidate.

Evans’ eight years of Board service concluded April 1. As President John U. Trefny stated, “Mines has been extremely fortunate to have had the guidance of Hugh Evans for the better part of the last decade. His knowledge of the School and the resources industries, and his commitment to the possibilities the future holds for Mines have been tremendous assets to our campus and its students.”

Ironically, Evans’ long-term relationship with Mines almost never happened. He first planned to attend MIT or Cal Tech, but then, as he relates, “Uncle Sam invited me to join the armed forces in World War II.” Evans’ college aspirations were put on hold while he served in the 10th Mountain Division, the only division-strength American military unit trained specifically for mountain and cold weather warfare. This unit suffered heavy losses during its 114 days of combat, but was responsible for crippling or destroying enemy defenses. Evans’ combat record shows he earned the Silver Star, a Purple Heart and the Combat Infantryman’s Badge.

This military service brought Evans to Colorado and into contact with CSM. The 10th Mountain Division trained at Camp Hale, Colo. While stationed there, Evans became convinced that Mines was the place for him. “I learned that this school was much more practical from a mining standpoint than MIT or Cal Tech. I was more of a down-to-earth type engineer as opposed to an esoteric scientist. And I was not disappointed. I got an excellent education that enabled me to pursue a career in mining.”

He fondly recalls that one of the practical lessons he drew from his “excellent” Mines education was that the tools of the trade could be used for “multiple purposes.” During Evans’ sophomore year he was hired as a night security officer at the local reformatory for boys. He would be locked in at 7 at night and let out at 7 a.m., “which was very conducive to studying.” During his tenure at the reformatory, “I learned that my rock-testing kit could also be used to see the locks off of doors” Hugh had loaned his kit for rock identification to the kids to play with. They managed to file their way through the reformatory’s padlocks. Evans and his co-workers spent hours driving across the fields of Golden in Buttercup, a used 1937 Chevy sedan that he had knocked the top off of, searching for his runaway charges.

On a more serious note, Hugh also remembers some of the more important matters he learned at the School as a student, varsity wrestler and founding leader of the Glee Club. He gained valuable lessons in getting along with his peers under difficult circumstances, particularly in the “unique exercise” that was mine surveying.

Evans leaves the Board with a dream for Mines’ future. He states, “The School has all the various elements in place to be the center for mining and sustainable development. We have excellent departments dealing with the social, economic, cultural, business and political aspects of this industry. We have very good departments dealing with environmental issues - chemical and water pollution and other issues associated with the industry. The School is taking a lead in research into renewable energy. And we promote a hands-on, practical approach to basic industries.”

These interrelated programs, Evans argues, enable Mines to turn out graduates that have the tools and understanding to make sound decisions, the kind of skills needed for miners to work for the mutual benefit of industry and the communities in which mining interests operate.

Evans provides an analogy. Years ago he worked on a Navajo reservation where the prevailing custom when a man died was to knock a hole in the south wall of his hogans, remove the body through the opening and then abandon the dwelling. “Living” it as a place for the man’s soul to reside. Since hogans were traditionally made of log and mud, the Navajo did not consider them permanent living structures. At the time, a well-intentioned home construction program for the Navajo was exacted by the U.S. Government. The program, which sought to establish durable, long-term housing, ran counter to cultural norms and consequently met with limited success.

Relating this experience to mining, Evans argues, “That’s where Mines is so important. Our students understand that efforts to develop a mining property have to be worked out in cooperation with industries and the people who are on the ore.”

Evans also sees that major challenges confront Mines in the years ahead. Colorado, he posits, is the last supportive financially of higher education of any of the 50 states. TABOR and Amendment 23 are combining to drastically diminish state revenues for higher education.

“Dr. Trefny and the Board,” Evans says, “have done all they can to reduce costs and be more efficient and fortunately we do have, have had, and will continue to have strong support from alumni and others. But we’re at the point now where we are no longer cutting fat but cutting bone.”

Hugh and his wife of 55 years, Ann, have been extraordinarily generous to Mines over the years. They have been members of the Mines Century Society at the Silver level since the Society’s inception in 1996, and because of their leadership support for the Transforming Resources campaign, they will be recognized at the Gold level this fall. Yet, Evans modestly shrugs off compliments regarding his support of the School. “My gifts to the school are actually investments, I contribute to the school through a charitable remainder trust. This is a sound investment. My wife and I get income from these gifts. The remainder then goes to the School when we pass on. It’s a win situation, supporting the School and at the same time providing security for myself and my wife in our elderly years. I have found out that this is a very useful tool for me and for the School and I would strongly encourage others to look into it.”

Despite his history of service to both his country and his alma mater, Evans objects to special commendation. He says, “I know our generation has been tagged as the Greatest Generation. That’s probably suspect. We’re pretty much the same as other generations. Looking back, we seem to have reacted reasonably well to external circumstances.”

“I’m pretty optimistic about the young people I see and what they’re doing and what they’re trying to do. They have very different problems. So many things are being dumped on them. I think they have tremendous challenges ahead. But, I see young people struggling with these issues and trying to give back to society.”

Hugh Evans for the better part of the last decade. His knowledge of the School and the resources industries, and his commitment to the possibilities the future holds for Mines have been tremendous assets to our campus and its students.”

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“Sounds like a challenge,” retorted the command group. “Why the Tiger Battalion?” The liaison officer answered, “The only way to get the engineer equipment there is by parachute.”

“The Best Little Truck Stop in Afghanistan

Expeditionary engineering at its best

By Maj. Joseph E Staton BSc CPR ’89 and Lt. Col. Michael F. Crall, PE

One cold day in March 2004, the secure phone rang in the Fort Bragg, N.C., headquarters of the 27th Engineer Battalion (Combat) (Airborne). The voice on the other end outlined a mission: rapidly deploy by air with a tailored engineer battalion engineer mission force to construct a forward operating site in a remote area of Afghanistan near the Pakistan border. “Can you do it?” asked the joint task force liaison officer. The site capabilities were to include an airfield with the ability to put up five C-17s on the ground simultaneously, accommodate 14 rotary wing aircraft including a matted taxiway, an 80,000-gallon refueling point, and a 500-man base camp. “By the way,” the liaison officer answered, “The only way to get the engineer equipment in, “this is a non-permissive environment; the road network is virtually non-existent, you must have a short take-off and landing capable airport in 72 hours, and your mission force must secure itself.”

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The decisive operation was the expansion of the runway to C-130/C-17 capability. The technicians and surveyors stayed 24 to 48 hours ahead of the construction crews to finalize site layout of the landing zone, taxiways and base camp. As the landing zone was being expanded, the light equipment platforms encountered numerous obstacles that had not been apparent in the initial reconnaissance reports. No water was available within 10 kilometers and the extremely large rocks in the dirt/sand material made soil-strength readings difficult. Although the airstrip was constructed without water, achieving the required C-130 and C-17 soil-strength and surface functionality would require more than 35,000 gallons of water per day. Reconnaissance of an area three kilometers south of FOS Carlson yielded a potential water source in a wadi under a lime rock outcropping. After digging down six feet, water pooled allowing a water distributor to upload and deliver water to the construction site. The cycle time was one hour per 2,500-gallons, requiring the distributor to run continuously. A mounted security force protected the route and upload site for the first 30 construction days.

Because of the large rocks that were two to six feet below the surface, dynamic cone penetrometer (DCP) readings used to determine the soil-bearing capacity became a concern. The Engineer Technical Letter, published jointly by the Army and Air Force, defines construction standards that include dimensional and soil-strength requirements. High, potentially inaccurate DCP readings were a concern because it was believed that the strength of the soil between the large rocks might not support C-130 loading. Although the engineering mission force was experienced and deemed the runway ready for use, they decided to consult with others to make sure. Luckily, the battalion had brought along a portable video teleconference kit. The kit gives battlefield engineers the ability to seek engineering expertise in the United States through teleconferencing. The engineers in Afghanistan teleconferenced with engineers in Mississippi and Florida. Based on the analyzed data, it was determined that the runway was suitable for both C-130 and C-17 landings. The construction effort continued culminating with the assault landing of a C-130 after three weeks on the ground. Where nothing stood before, there was now an operational C-130 assault landing zone.

For over two weeks, soldiers were rationed six bottles of water and one meal-ready-to-eat per day. Critical sustainment supplies were supposed to arrive on locally contracted trucks starting by Day 3. Unfortunately, the first trucks did not arrive until Day 14. The engineering mission force coordinated for daily re-supply of critical water, fuel and food using air assets. For over two weeks, soldiers were rationed six bottles of water and one meal-ready-to-eat per day. Shaving and bathing were not an option. The battalion required daily re-supply from a combination of C-130 parachute deliveries, CH-47 helicopters and air-lane aircraft. The engineers in Afghanistan teleconferenced with the battalion in Mississippi and Florida to work out a re-supply plan. Critical sustainment supplies were supposed to arrive on locally contracted trucks starting by Day 3. Unfortunately, the first trucks did not arrive until Day 14. The engineering mission force coordinated for daily re-supply of critical water, fuel and food using air assets. For over two weeks, soldiers were rationed six bottles of water and one meal-ready-to-eat per day. Shaving and bathing were not an option. The battalion required daily re-supply from a combination of C-130 parachute deliveries, CH-47 helicopters and air-lane aircraft.

Finally, locally contracted truck loads of essential supplies started arriving and continued through the remainder of the build-up. The Vertical Construction Platoon, initially acting as the headquarters security force, began construction of the base camp. With the completion of 8-foot force protection berms, initial guard towers and bunkers, the battalion moved from foxholes to environmentally controlled Alaskan tents by Day 24 – a major improvement to force protection and quality of life, especially since the daily temperature reached 120 degrees F.

By Day 30, the joint Task Force could project combat power from an expeditionary site across southeastern Afghanistan. FOS Carlson was now capable of landing C-130 aircraft, parking 10 rotary wing aircraft on a matted taxiway, fueling rotary wing aircraft from a 40,000-gallon refueling point and was growing to support an additional 300 personnel with quality-of-life enhancements. After 120 days, FOS Carlson was built to the master plan standard and a C-130 successfully landed. FOS Carlson consisted of a 7,300-foot runway, 5,200-foot taxiway, parking for five C-17/C-130 and 14 helicopters and an 80,000-gallon refueling point. The base camp could house up to 500 soldiers in climate-controlled tents and provide food, showers, laundry and morale support. The only support center in the region, FOS Carlson gained the reputation as “the best little truck stop in Afghanistan.”

We had successfully shaped terrain to enhance the maneuver of the Joint Task Force. FOS Carlson enabled combat operations in this remote region of Afghanistan at a time and place of the joint Task Forces choosing. The success of this operation can be credited to the warrior ethos of the airborne engineer soldiers, the versatile organizational structure of a corps’ airborne engineer battalion, and our aggressive engagement in the area of operation. The future expeditionary engineer force is here, it’s now and it works.
dogs and probes is a slow, tedious, often dangerous process.

Modroo's research proved that GPR can find humans buried beneath snow, but the technology is still a long way from being implemented for avalanche search and rescue operations. GPR units cost about $30,000 each and are designed for exploration. What is needed for search and rescue is a system that could fit on the skids of a rescue helicopter that would fly over avalanche sites. Designing a prototype could cost as much as $1 million, says Modroo. He has presented his research at two international conferences, but has no takers so far.

"If my research continues, we could develop software to interpret data that could make GPR more user-friendly," Modroo says. "It's a technology I know will get implemented eventually, but it's expensive and there's not much motivation to do it right now. But I see it evolving."

People watch

Justin Modroo BSc Geop '01, MSc Geop '04 combined his love of skiing with academics when he earned a master's degree at Mines last year, proving once again that athletics and intelligence go well together. In 2004, Modroo was ranked 6th in the world in big mountain free (more commonly known as "extreme") skiing. He has skied competitively since he was in elementary school and now that his studies are completed, he's back on the circuit.

But before graduation last December, Modroo's focus was on ground penetrating radar (GPR) and its possible use for finding avalanche victims. GPR is commonly used to image the Earth's subsurface to find electrical wires or to detect water tables. Modroo's research proved it can also be used to detect bodies beneath snow. "Snow and ice make a great medium for using GPR," says Modroo. "The contrast between electrical conductivity in snow and for humans is great." Modroo proved the ability of GPR to locate bodies by burying a dead pig and beaming radar at it. He discovered that a single GPR antenna wired to a laptop could distinguish the pig from snow, backpacks, logs, even dirt clogs. The sooner an avalanche victim can be located, of course, the more likely the victim is to be found alive.

Currently, avalanche victims are searched for using rescue dogs and 8-foot probes. Some back-country skiers wear personal beacons that emit a signal that can be pinpointed in case of an avalanche; however, use of the beacons is not widespread. No beacons were detected by rescuers in Utah in the massive avalanches that occurred in January. Searching for victims with
Mines alumni in the medical profession — doctors, veterinarians, nurses, physical therapists, emergency medical technicians and dentists — agree: Their prescription for success includes the excellent education they received at Mines.

"An engineering degree is a good basis for medical training because it teaches you how to think, how to problem solve and how to look at a problem from multiple angles," says Erika Nelson-Wong BSc Phy '92, a physical therapist. Engineering is the application of basic sciences, adds David Liu BSc Met & Mat Eng '03, a medical student. "For me, it was studying the structure and properties of materials. The same basic principle pertains to medicine; it is the application of basic sciences toward the treatment of human disease."

Family physician Alfred Po-Hung Wu Geop E '72 compares electrophysiology, the study of the electrical properties of the heart, with mapping the surface of the Earth while searching for oil. The mathematical approach is the same: mapping downward (or inward) based on surface data.

A Mines education provides more science and mathematical knowledge than a typical pre-med course, according to alumni. Wu says his degree made him stand out from his peers when applying for medical school. A member of the medical school admissions committee later told Wu it was his recommendation from a mathematics professor that made him memorable.

"Engineering principles can be applied in all facets of life and medicine is just one example," says Thomas Milner BSc Phy '81, MSc Phy '86, who is a professor in the biomedical engineering department at Texas at Austin. "Engineering forces you to think analytically and learn problem-solving approaches that can be applied to a broad range of disciplines," Timothy Judkins BSc Chem Eng '03, a medical student, says engineering graduates also "provide diversity to medicine, which is dominated by people with biology backgrounds."

Engineering and medicine have more in common than one might think. "Both are very methodical and deal with problem-solving," notes David Graham BSc CPR '99, MSc Chem '02, a student at Albany Medical College. "Each has diagnoses and methods of treatment. Both require a great deal of thought and experience to succeed. A doctor needs to be able to think about a problem and create solutions."

Harry Temple Jr. PE '69, a dentist who spent two years as a petroleum engineer before changing careers, also see similarities in the two careers. "I'm a dentist so I'm still drilling, just on a smaller scale." Temple is a prosthodontist, which, he says, "uses a bit of engineering, strength of materials and a whole lot of common sense."

The study of the human body also can be compared to the study of chemical engineering. The heart is the pump, the vasculature system the pipes, the scrubbers/filters are the kidney/lungs and the CPU...
Rx for Success

[central processing unit] is the brain. "Each has intrinsic factors similar to their engineering counterparts, such as resistance, pressure and flow properties," David Graham says. "Both employ great technologies that must be understood and applied. A foundation is needed in order to fully appreciate the complexities of man and the tools used to heal him/her. The body is an engineering masterpiece; as such, medicine is the application of engineering principles in order to provide symptomatic relief in some form."

Daniel Johnson BSc Geop '83, an internist with subspecialty in hospice and palliative medicine, advises students contemplating medical careers to "broaden the way in which you approach medicine – far beyond a scientific endeavor. Learn as much as you can about people, their passions, culture and diversity."

Geology is also like medicine, notes Mikyong "Mikki" Hand BSc Pet '91, MSc Engr Sys '97, a family physician, "in that it comprises memorizing lots of structures and then putting them together into a system and trying to make inferences about how/why a system is the way it is." She compares the natural log decline that describes drug clearance from the body as being the same basic decline in production from oil reservoirs.

"I think the heart of any good education is teaching a student to be an adult learner and Mines does that very well," says John Blackwell BSc Eng '91, a doctor who specializes in interventional radiology. "Recognizing what you do not know, subsequently learning that information and applying the knowledge responsibly are the keys to succeeding in both engineering and medicine."

Peter Stout MSc Env Sci '94, a forensic toxicologist, says the pharmaceutical field includes a lot of chemical engineering in both production and molecular modeling. But he says that "not enough young doctors have a clue about chemistry. And most toxicologists don’t have a good grounding in differential equations or statistics." At Mines, Stout was required to take more math than he would otherwise have chosen. "But I don’t think you can ever have too good a grounding in math and chemistry." Paramedic Andy Jensen BSc Eng '98 agrees that what he learned in math classes at Mines makes the medical calculations required for his job easy for him.

"One of the most significant ways Mines prepared me was through the numerous hands-on lab courses," says Toni Bowden BSc CPR '95, a dentist in the U.S. Navy. "It was there that I was able to actually ‘see’ and experiment with things like titration rates, effects of different mechanical forces and especially Auto-Cad."

"Engineering is such a versatile field," says Bowden. "Learning dynamics, statics and physics are just a few of the basics of how the human body functions." Bowden sees a lot of similarity between engineering and dentistry. "For instance, when determining the type of dental restorative to use in a tooth, I have to consider the mechanical, electrical and thermal properties of the material and how it may be affected by the person’s chewing habits (or biting forces) and saliva," she says. "Also, from a physiological standpoint, the human jaw works like a hinge – a class III lever system – so understanding the fulcrum and load is always important when trying to diagnose patient discomfort."

Few of the Mines alumni now in the medical fields expected to follow the path they eventually took. Michael Taravella BSc Chem '77, an eye surgeon, planned to become an engineer, but changed to medicine because he wanted more contact with people. Erika Nelson-Wong chose physical therapy also for the people contact. Gregory Meyer PRE '58, a psychiatrist, was an aeronautical engineer for eight years before deciding he needed a new challenge. Mikki Hand went to medical school after discovering a shortage of women physicians in Alaska, where she was a petroleum engineer.

"Engineering is good for pretty much any career simply because you learn to problem solve whatever the problem may be," says Daniel Matlock BSc CPR '99, a doctor of internal medicine.

"Both professions [engineering and medicine] exist to improve the human condition," adds Blackwell, "either improving our quality of life as a consumer of the engineered product or as a patient seeking a cure for their disease."

"I have nothing but great things to say about Mines and my education there," says Mikki Hand. "Engineering school was much more difficult and challenging than medical school." Scott Pauls BSc CPR '81, an emergency room doctor agrees. "Academically, engineering was more difficult than medical school."
A new CSMAA executive board took office in February. From left, Roger Nowell ’71, treasurer; Kathy Altman ’80, president-elect; Lori Stucky ’97, secretary, and Alan Mencin ’79, president.

Bob Pearson ’59 had a meal with the Mines baseball team, which was competing in Ellensburg, Wash., in March.

Virginia D. Carroll ’98
Alex Chisholm ’57
David D. Crichton ’97
Meredith M. Crichton ’98
Jeremy K. Lee ’01
Brady J. McConaty ’78

A new CSMAA executive board took office in February. From left, Roger Nowell ’71, treasurer; Kathy Altman ’80, president-elect; Lori Stucky ’97, secretary, and Alan Mencin ’79, president.


Staying connected

CSM Alumni Association

Officers
Alan J. Mencin BSc CPR ’79
President
Kathleen A. Altman BSc Met ’80
President-elect
Roger Nowell MSc Geol ’71
Treasurer
Lori Stucky BSc Eng ’97
Secretary

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Scott Gustafson BSc Geop ’77
John Howe BSc Geop ’83
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New Life Members
Gina M. Morrison ’85
J. Doug Neighbors ’89
Pierson M. Ralph ’48
Erik Reisel ’96
Richard A. Ruggiero ’78
Charles G. Weakly ’86

Boston, Mass.
Mines fared well at the Indoor National NCAA Division II Track and Field meet. David Price ’95 and Jim Beldman ’00 were on hand to cheer and take photographs.

New section coordinator Kiran Patankar ’99 hosted his first section event in the Philadelphia area in February. In attendance were Kevin Thompson ’99, Tom Battle ’83, Greg Kard ’87, Nancy Ballout ’97, Jay Horvath ’81, Bill Martin ’89, Geoff Arbogast ’89 and Jaime Guzman ’94, ’96.

New section coordinator Kiran Patankar ’99 hosted his first section event in the Philadelphia area in February. In attendance were Kevin Thompson ’99, Tom Battle ’83, Greg Kard ’87, Nancy Ballout ’97, Jay Horvath ’81, Bill Martin ’89, Geoff Arbogast ’89 and Jaime Guzman ’94, ’96.

Las Vegas, Nev.
A group of alumni met in Las Vegas in March to watch the March Madness basketball games together. Clockwise from right, Steve Harvey ’63, Jay Edwards ’66, Bob Pearson ’59, Bill Wahl ’54 and Boyd Watkins ’64.

Spokane, Wash.
Several Miners met for breakfast during the Northwest Mining Conference in Spokane. Attendees included Henry Bates ’41, Don Bennett ’63, Mike Dreher ’69, David Hebb ’73, Steve Harvey ’63, Mike Master ’82, Troy White ’91 and Sasha Karpov ’80.

Central Washington
Bob Pearson ’59 had a meal with the Mines baseball team, which was competing in Ellensburg, Wash., in March.

Gulf Coast

Bone Valley, Fla.
The Bone Valley group held its annual picnic in February this year. CSM President John Trefny and new alumni director, Anita Pariseau, also attended. The day included a field trip to a phosphate plant.
EIRLING "SWEDE" BAKOWSKY, BSC '52, died peacefully at home Jan. 29 at age 79. Quick with a smile and comfortable with conversation, Arndt had the qualities of a man who enjoyed life. He enjoyed reading and sharing poetry or a good story, and was always the first to figure out an innovative way to "fix" something. His days were filled with gardening, carving wooden ducks, flying a good joke, and the occasional outing in his '59 MGA. Before retiring, he served as a combat infantryman in the Pacific during World War II. At MIn, he was a member of Sigma Phi Epsilon. In 1951, he married Bernie Kallenbach. During their 54 years together, they raised two sons and a daughter. Both sons, Stace BSc Min '76 and David, also attended MIn. In 1987, his daughter. Both sons, Stace BSc Min '76 and David, hunting and playing on the family's 11 acres near Bremerton. After graduating from Mines, Bakewell became a hydrologist for the U.S. Geological Survey, traveling throughout Washington and the developing states. His work involved detailed studies of area streams, water flow and the effect on area fish populations. He also served in the Army Reserve until his discharge in 1967. Bakewell met his future bride, Audrey June Ayer, in Colorado and they married in 1961. After retiring from the USGS, Bakewell pursued his dream of owning a ranch and raking cattle on a 140-acre ranch in Crawford, Colo. There, he and Audrey built their home and worked the ranch through long hot summers and bitter cold winters. Bakewell enjoyed the outdoors and was especially fond of spending his free time carving and woodworking. Survivors include his mother, sisters, two nephews, a niece, two grandchildren and a grandnephew. His wife, brother and father predeceased him. William J. "Bill" Domoracki MSc Geol '86 died July 25 from cancer. He was 45. Domoracki was a research assistant professor at University of South Carolina Earth Sciences Research Institute (ESRI-USC). In addition to his MSc degree, he held an undergraduate degree from State University of New York, Polytechnic, and a PhD from Virginia Polytechnic Institute and State University. Domoracki joined ESRI-USC in 1995 with an extensive background in reflection seismology and applied geophysics. He was responsible for seismic reflection data processing and operation of the institute's environmental geophysics laboratory. Prior to joining ESRI-USC, Domoracki was at the Regional Geophysics Laboratory at Virginia Tech where he researched and interpreted seismic data and supervised the seismic facility. His work involved deep crustal and shallow high-resolution seismic reflection data. During his career he authored and co-authored several USGS and VSP seismic surveys for crustal and environmental applications. He also acquired, processed and modeled numerous gravity and magnetic surveys. Domoracki was a member of the Geological Society of America, Society of Exploration Geophysicists and European Association of Geoscientists and Engineers. Lloyd E. Elkins Sr. Pet E '34 died Dec. 17 at the age of 92. Elkins, a native of Golden, Colo., was a member of Sigma Phi Epsilon Tau Beta Pi, Sigma Gamma Epilson and Scabbard and Blade while at MIn. He also played basketball. In 1948, he graduated from the Harvard School of Advanced Management and in 1963, received an honorary doctorate in science from University of the Ozarks. Elkins joined Stanolind Oil and Gas in 1951 and remained there for 43 years. After retirement, he opened a private petroleum consulting office and subsequently was chosen as a member of the prestigious Arbitration Board selected to divide rights to massive oil properties in Prudhoe Bay, Alaska. Although active in several professional societies and received many awards including CSJM's Distinguished Achievement Medal. He was named to the Engineering Hall of Fame at Oklahoma State University and at University of Tulsa. He was a prolific writer of technical papers and was recognized authority in secondary and tertiary recovery of oil. Elkins also served as president and board member of Family and Children's Services for many years and was one of the first Tulsa Library Hall of Fame honorees. He was a founder of the Tulsa Petroleum Club and a member of Tulsa Country Club and Kiwanis Club. An active churchman, he served in elder and trustee positions. He was also an avid bowler and supporter of CSM. Elkins is survived by his wife of 70 years, Virginia, a daughter, a son, six grandchildren and 12 great-grandchildren. George R. Goebel MSc Ph '79 died Dec. 31 in Knoxville, Tenn. He was 58. Goebel spent more than 27 years in the nuclear industry. He provided consulting support to the Department of Energy in geothermal exploration, upgrade, oversight of a large program. He was recently recognized for his performance as a technical consultant on the DOE's national Highly Enriched Uranium Vulnerability Study. He also served as project manager for criticality safety-related projects at several facilities including Paducah, Portsmouth and Lawrence Livermore National Laboratory. Goebel is survived by his wife, Carol, a son, a sister and his mother. Edwin F. Gorcecy Pre '50 died Dec. 15 in Texas. He was 82. Following graduation from MIn, Gorcecy worked at Monsanto Chemical Company for 30 years until retirement in 1987. He also served in the U.S. Army during World War II in the Philippines and Leyte Gulf. In 1947, Gorcecy married Ruth Christine. In addition to his MSc degree, he also holds a bachelor of science in chemistry from Wooster College. Gorcecy was an active member of the First Presbyterian Church of Texas City, the Boy Scouts of America, Troop 219 and Toastmasters International. Gorcecy is survived by his wife, two sons, two daughters, a sister, nine grandchildren and two great-grandchildren. George E. Morehouse EM '49, MSc Geol '50 died at his home in Grand junction, Colo., Nov. 7 at age 87. He had lived in Grand Junction since 1951. Morehouse was born in Tribune, Kan., and spent his youth in Idaho and Washington. He married Ruth Caban in 1942 in Seattle. Morehouse attended University of Washington and summered mining in Alaska to earn tuition. He joined the Army and served as a captain during World War II before graduating from Mines and became a U.S. citizen in 1963 while serving in the U.S. Army. Morehouse spent most of his life working in the mineral industry as an engineer, geologist and consultant in several western states. He was a member of the American Institute of Mining Engineers, the Geologic Society and Professional Engineers. He also spent 20 years researching, George spent their retirement years traveling to their favorite places in Alaska, Montana and along the Oregon coast. In between travels, Morehouse was chairman of the Dinosaur Museum. He is remembered for his love of the outdoors, whether hunting, prospecting, riding horses, hiking or fly-fishing. Morehouse is survived by his wife of 62 years; a son, two daughters, two sisters and two great-granddaughters. Robert H. Muench Pet E '50 of Careters, Ariz., died Sept. 13 at age 79. Muench was born in Colorado and served in the U.S. Army during World War II. Upon being honorably discharged, he attended Mines. After graduation, Muench moved to position with the Arabian-American Oil Company and moved his family to Saudi Arabia for the next 30 years. During this time, Muench and his family enjoyed traveling abroad and was able to experience some of the world’s best golf courses. An avid golfer, Muench also loved to read, play golf.
In Memoriam

Charles Morton Strand Pet '62 died Nov. 12 at age 64. Strain was born and raised in La Junta, Colo., where he was an Eagle Scout and member of the Koshare Indians. After graduation, he worked as a petroleum engineer in the Rocky Mountain region before earning an MBA from Harvard School of Business Administration. Strain then worked for Exxon subsidiaries for six years, primarily in Venezuela, before moving to Houston in 1972. There he became an energy analyst for several regional brokerage firms. In 1991 he formed his own company to provide research and investment banking services for small public oil and gas companies. Strain was a certified financial adviser, a member of The Institute of Chartered Financial Analysts, the Society of Petroleum Engineers, Houston Energy Finance Group and Houston Producers Forum. He was also a member of Memorial Drive United Methodist Church. Strain was a loving husband, father and grandfather who always made family a priority. He is survived by his wife of 43 years, Ruth, two sons, a daughter and five grandchildren.

Frank W. Todd EM '41 of Denver died Jan. 4 at age 87. Todd began his college career at University of California at Berkeley where he was a member of Phi Delta Theta. He then moved to Colorado to attend Mines and was outstanding track-and-field athlete. After graduation, Todd worked as a mining and mechanical engineer and was employed by Adolph Coors Company for 25 years. Todd is survived by six children, 16 grandchildren, 12 great-grandchildren and his wife of 60 years predeceased him.

Elsworth B. Watson Pet E '31 of Santa Fe, N.M., died April 28, 2004, at age 96. A Denver native, Watson graduated from East High School before attending Mines. During his college years, he was a member of Sigma Phi Epsilon, ROTC and was editor of the Prospector. After graduation, he worked for the Jones and Laughlin Steel Mills in Aliquippa, Pa. During World War II, Watson served as first lieutenant in the 5th Army, stationed in the Aegean Islands. After the war, he worked for Mountain Bell for 37 years, retiring in 1972. Watson was a member of the Telephone Pioneers, was active in his church and the Briarcliff Service of New Mexico. He was a 32nd degree Mason and a Shriner. Watson is survived by a son, a daughter and six grandchildren.

Frederick "Fritz" Weggan PE '39 died peacefully at home Dec. 27 surrounded by his family. He was married in 1939 in Colorado and entered CSM at age 21. At CSM he played tuba in the band, became a second lieutenant in ROTC and was editor of the Oredigger. He met his future wife, Virginia Miller, because her father owned the paper that published the Oredigger and they married in 1939. After graduation, Weggan worked first as a laborer and then as an engineer. He was called into service in 1941. In 1942 he was hired by Stearns-Roger and was an employee for 40 years. During that time he supervised the building of power plants in Montana, Kansas, Wyoming, North and South Dakota, Texas and Utah. He also traveled to Israel to consult on a nuclear power plant. Weggan retired as assistant manager of the power division in 1982. He was a lifelong supporter of CSM and a charter member of the School. He was a deacon at his church, in which he was a member of the Kiwanis Club of Golden, and was past-president of the School’s Kiwanis Club. He was a Shriner and a charter member of Rolling Hills Mason and a Shriner. Watson is survived by a son, a daughter and six grandchildren.

In Memoriam

Arthur H. Scudamore Pet E '37, a retired chemical engineer, died Nov. 10 at the age of 90 in Texas.

Charles Morton Strand Pet '62 died Nov. 12 at age 64. Strain was born and raised in La Junta, Colo., where he was an Eagle Scout and member of the Koshare Indians. After graduation, he worked as a petroleum engineer in the Rocky Mountain region before earning an MBA from Harvard School of Business Administration. Strain then worked for Exxon subsidiaries for six years, primarily

Recreation Center Committee

Recreation Center Committee Members are all dedicated to improving the athletic program at Mines. They have donated countless volunteer hours, made contributions to specific team and program needs, and even established endowed athletic scholarships to support the academic pursuits of varsity team members. Most recently, McNeil and Isaacs have made financial commitments to the recreation center project: McNeil has pledged $150,000 and Isaacs $150,000 to help with construction. Mines will recognize their gifts by naming rooms in the recreation center in their honor. Any contribution to the center of more than $50,000 will be similarly acknowledged.

As a former football player at Mines, Isaacs said, “I appreciate how important the opportunity to participate in sports and recreation is to a student’s education. Athletic activities build confidence and mental and physical wellbeing. The recreation center will offer students an unparalleled venue for these activities.”

“There are many benefits the School and the Golden community will derive from the CSM recreation center,” added McNeil, who served as president of the School’s Men’s Tennis body for the 1970-71 academic year. “For example, the center will allow the School to greatly expand its services to high schools throughout the state for athletic tournaments and other events, exposing Mines to an audience we otherwise would not have attracted to campus.”

Recreation centers are increasingly important features on campuses worldwide. As today’s applicants evaluate the overall campus experience - especially social and recreational opportunities - in choosing a school, a recent study of 700 colleges and universities conducted by the National Intramural-Recreational Sports Association indicated that nearly half of all CSM students named social and recreational activities as their top priority. McNeil has pledged $150,000 and Isaacs $150,000 to help with construction. Mines will recognize their gifts by naming rooms in the recreation center in their honor. Any contribution to the center of more than $50,000 will be similarly acknowledged.

The New Mines recreation center will house a 2,500-seat competition arena, a 25-meter swimming pool and aquatics area, a large recreational gymnasium, a climbing wall, a cardiovascular and weight room, an indoor jogging track and ample space for students to socialize.

Mines has already raised $20 million of the $25 million needed for the project, including the land upon which the facility will be situated. The School is counting on the generosity of its most loyal friends and alumni - and the dedication of committee members like McNeil and Isaacs - to raise the remaining funds.

“A comprehensive program of athletics, recreation and fitness activities is integral to the Colorado School of Mines experience,” said President John Trefny. “The entire Mineys community is grateful for the recreation center committee’s gifts and efforts to appeal to their peers in the resources industry for additional support.”

Recreation Center Committee Members

For more information on the recreation center project, please contact any member of the committee or Rod M. Coll through the CSM Foundation at 303-273-3161.
technical excellence in completing the First Materials Science Research Joint Implementation Plan with the European Space Agency.

Dennis A. Pfeifer BSc Geop, MSc Geop ‘94 is a senior geoscientist at Chevron Feynco in Galveston, Texas. Bryan D. Propp BSc Phy/B is a quality assurance manager for ConocoPhillips in Beaumont, Texas. Randall P. Suits BSc Min is an account manager for Nalco Company BPG in Anchorage, Alaska.

John L. Strobel BSc Eng is a software engineer for Intelligent Software Solutions in Colorado Springs, Colo.

Patrick W. Mahan BSc CRI is a senior account manager for FN Global in Denver, N.Y.

Kara L. Martin BSc CRI is a senior quality manager for BAE Systems in Irving, Texas.

Ramu N. Anjaney Bsc Mth is a business development manager for Schlumberger O&M in Jakarta, Indonesia.

Robert L. Townsend BSc Eng is president of Peak Engineering Group in Castaic, Calif.

Lauren T. Tray Bsc Mth married Erica Turk in April 2004 in Alameda, Fla.

1996

Randall L. Bianco BSc, M Eng

Eng’96 is a reservoir engineer for Petroleum-Midex in Venezuela.

J. Eric Burdett BSc Pet is a senior drilling advisor for K & M Technology Group in The Woodlands, Texas.

Joseph T. Dohm BSc Pet is drilling superintendent for Hess & Payne BDC in Tulsa, Okla.

Shanna A Eng/ American Petroleum Institute

Brazil.

David C. Ditchon IV BSc Eng is a principal application engineer for The Timco Co. in Canton, Ohio.

Brian R. Darlton BSc Min is an engineering manager for Petroleum-Drilling Systems in Denver, Colo.

Rahmat S. Tajar BSc Pet is an attorney for Jackson Walker in Dallas.

Christopher R. Harris BSc CRI is a senior advisor for Point West Group in Salt Lake City, Utah.

Shan A. Jergensen BSc Geol is a geologist for Mineral Exploration in Denver.

John Andrew Johnson BSc Met, MSc-Met & Mat Eng’96 is a metallurgical and branch head at the Royal Air Warfare Center in China Lake, Calif.

Ronal D. Loewen Bsc Mth is in technical marketing for Firestone Semiconductor in Austin, Texas.

Jennifer L. Manley BSc CPR is a geologist for the U.S. Geological Survey.

Kirk L. Roberts BSc Met, MSc Mat Eng’00 is a senior engineer for Baker Hughes in The Woodlands, Texas.

1999

All Tam Bsc Pet is a student at Kuwait University.

Mohan Dangi Bsc CRI, MSc

Eng & Env’96 is a registered Mining Engineer in Korea.

In July their first child, Lewis, turned 2 in October. Dad earned an MBA in August.

Brazil. A. Goodkind BSc Math, Bsc Econ, MSc Min Ec’97 is an operations research consultant for Schneider Logistics in California.

Magi L. Lovatt BSc Geol, MSc Eng/ Tech Mgt’98 is a geologist for Mining Industry Management in Denver.

Patrick A. Magee BSc Pet is a senior drilling engineer for Unocal Thailand.

Nigel D. Phillips BSc Geop is a research associate at University of British Columbia.

Craig T. Sakuda BSc Eng is a laboratory manager for Johns Manville in Littleton, Colo.

Scott C. Van Sickle BSc Mth is a sales engineer for The Acacia Group in Colorado Springs, Colo.

Renee, born Oct. 25.

Brian A. Kibler BSc Eng, MSc Mat Eng’96 is a process engineer for Saudi Aramco in Saudi Arabia.

Galaham Urun MSc Min’00 is an engineering development coordinator at TurkPetrol Petroleum International.

Brett C. Williams BSc CPR, MSc Met & Mat Eng’99 is a senior engineer for Nielsen Minerals in Denver, Colo.

Traci D. Kletke BSc CPR is a sales representative for Mutual of Omaha in Aurora, Colo.

Mark E. Trim Bsc Bsc Mth works for Jacobs Associates in San Francisco.

Cree B. Turnquist BSc Eng, MSc Met & Mat Eng’00 is a consultant for Engineering Systems in San Jose, Calif.

Julie M. Neale MSc CRI is a process engineer for Vestas USA in Colorado Springs, Colo.

Mohan Javed Iqbal M Eng Pet is a manager of reservoir engineering for Oilfield Petroleum Pakistan.

Brian R. Kizer Bsc Bsc Mth, Eng’98 is a system engineer for Northrop Grumman in Evergreen, Colo.

Julie M. Neale MSc CRI is a process engineer for Vestas USA in Colorado Springs, Colo.

Mohan Javed Iqbal M Eng Pet is a manager of reservoir engineering for Oilfield Petroleum Pakistan.

2001

Katrina Britton BSc Chem Eng and Alex Yancey Bsc Pet were married Oct. 8 in Traverse City, Mich.

Jill M. Hudson BSc Pet and Eric Strayer were married Oct. 8 in Traverse City, Mich.

Jill M. Hudson Bsc CRI, MSc

Eng & Env’96 is a registered Mining Engineer in Korea.

Erin is a specialist for Accenture in Chicago.

Robin L. Taylor Bsc Bsc Mth is a technical consultant for Biologics in St. Louis, Mo.

Mohan Javed Iqbal M Eng Pet is a manager of reservoir engineering for Oilfield Petroleum Pakistan.

Brian R. Kizer Bsc Bsc Mth, Eng’98 is a system engineer for Northrop Grumman in Evergreen, Colo.

Julie M. Neale MSc CRI is a process engineer for Vestas USA in Colorado Springs, Colo.

Mohan Javed Iqbal M Eng Pet is a manager of reservoir engineering for Oilfield Petroleum Pakistan.

2005

Ron Favorites are in Anchorage where Katrina is a reservoir engineer and Alex is a
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**A Note from the Alumni Office:**
Your support enables Mines to continue providing a world-class education.
E-Day 2005 included the cardboard boat races and this group included the most participants on board.