

A Determined Justice

"100 Years" Part II

Sourcing Rare Earths



Spring 2011 Volume 101 Number 1

Mines

Colorado School of Mines Magazine



Plugging Macondo



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Arthur Silk Photography



MolyCorp

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After marking *Mines* magazine's 100th anniversary in the fall/winter issue by highlighting the years 1910 – 1960, Part II covers the remaining years.

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The bottom kill for the Macondo blowout required that two alumni hit a target the size of a dinner plate from a three mile distance with a drill operated from a floating platform a mile above the sea floor. Read how they achieved this incredible feat.

28 A Determined Justice

The daughter of a migrant farmworker, Terry Fox '89 didn't remain at the same school for a whole academic year until she was a sophomore in high school. However, she graduated salutatorian of Brighton High, excelled at Mines, earned a J.D. and, in January, was sworn into the Colorado Court of Appeals.

Cover: Macondo relief well drilling operations with the rig Bill McElduff '82 and Donal Fitterer '88 worked on while drilling Relief Well #1 in the foreground. ("Plugging Macondo")



Praise for Bridge Building

The fall/winter issue was one of best magazines Mines has ever published. I especially liked the article “Constructing a Landmark,” featuring Dave Zanetell '87. It was extremely well written and informative about a great engineering achievement.

Clint Eddy '62

Congratulations! This is the best issue in my memory (which, alas, is not as good as it was when I was at Mines 50 years ago).

Terrific articles, well written, very well (alright, extremely well) illustrated.

Within a day of receiving my hard copy, I had read it cover to cover and pulled the article on the new Hoover Dam Bypass Bridge and distributed it to my staff. I thought there were so many useful techniques and information on managing projects in that article that I wanted my engineers to add them to their arsenal of skills.

Well done!

Name withheld by request

Thank you for the very informative and enjoyable article about the construction of the Hoover Dam Bypass Bridge. Mr. Zanetell and his team have provided a practical and aesthetically pleasing solution to a problem others avoided. All of the participants, the crews, the contractors, the suppliers, the designers and the managers share the accomplishment.

It is appropriate for Colorado School of Mines to claim some reflected admiration. Large, visible projects like this bridge can be pointed to with pride by the school and held up as an example of the best Mines can offer.

As I look at the photos provided with the article, I see another useful and visible project completed by Mines graduates. On the Nevada side of the canyon, what looks like a big concrete silo is the surface structure of the visitor's elevator shaft constructed by Frontier-Kemper Constructors. The company also refurbished the overflow spillways on both sides of the dam.

I point these projects out because there are many important infrastructure projects involving Mines graduates that are not highly visible. These include highway tunnels,

subways, water tunnels, storm water storage tunnels and many mining-related facilities. Mining seems to be in low regard at Mines

these days. Perhaps you could address that by highlighting some of these less visible projects.

Frontier Constructors was founded by Mines graduates Dyke Howell '63 and Dan McFadden '63. They later merged with Kemper Construction to form FKCI. Mines graduate Denis McInerney '66 was also part of FKCI. Coach Marv Kay '63 worked for Frontier Constructors on at least two projects that I recall.

All of the above played football at Mines. The Mines fight song, as I recall, included the following lines:

“If you want a bridge to Mars,
or a ten foot shaft to hell,
we'll do the job up smartly,
and we'll do the job right well.”

John Kyffin '73

Comment on “A Rough Road to Riches”

Excellent article. I worked with Tim [Marquez] in The Netherlands. Great to see that he has done so well. Lovely family.

John Thompson

Comments on the new website:

Great job! Congratulations.

Don Wilson '58

Just a quick email to say that I really like your new format, as well as the content. I read every print version, typically on an airplane. I haven't read it online yet, but it looks compelling. Maybe once I have an iPad.

Good work and keep it up.

Greg Davoll '89

The online edition of *Mines* magazine is a wonderful addition to Mines' resources and a strong testament to the work of your staff. I browsed through some of the content this morning and particularly enjoyed the video link to freshman Max Schulze's unicycling endeavors. This

semester I have seen Max climb and descend the stairs of Meyer Hall en route to his classes, as well as witnessed some of his exploits around-about-and-through some of Mines' unique architectural structures. He possesses a rare combination of athletic prowess that many Miners should recognize and appreciate.

Keep up the great work.

**Chuck Stone,
Senior Lecturer, Physics**

Great work on the new site! I've been reading some of the old issues, as older publications have always been interesting to me. I did want to make a couple small suggestions for the archive page. Firstly, let visitors know that they can right-click on the magazine to download a pdf copy, and secondly, explain that directly clicking on archived magazines will take 1-2 minutes to load depending on the visitor's connection.

**Derek Sava
Database/Analyst, CSM Foundation**

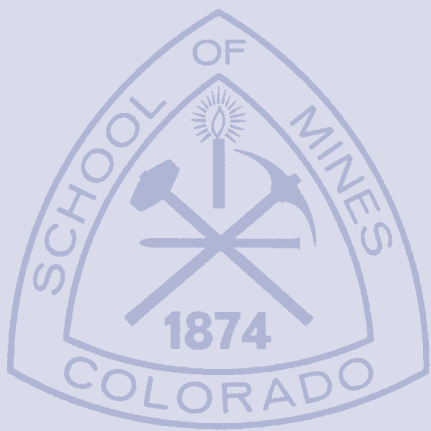
Editor's note: We followed these suggestions. We also moved the PDF files to a faster server and download times are much shorter.

Promises Overlooked

Congratulations to *Mines* magazine for serving the Mines community for 100 years. I read with interest the letter in Inbox titled, “More on Bierstadt Restoration.” Noticing that an expanded article with photos and maps would be offered on your website, I followed up there. Although, I found the text printed in the magazine, I failed to find the expanded article and images.

**Rex Rideout,
Electronics Specialist, Geology and
Geological Engineering**

Editor's note: In our first launch of the site, this was regrettably omitted. We've corrected our error and Fraikor's letter, maps and photographs—which together provide a considerably more detailed account than our own original article—may be found at minesmagazine.com under Departments > Inbox.



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Dear Readers,



It took a fellow alumnus months to convince Bill McElduff '82 that the role he and his colleague, Donal Fitterer MS '88, played in completing the bottom kill of the blown out Macondo oil well would be of interest to readers of *Mines* magazine. Listening to Bill's voicemail, it took me all of 10 seconds to decide it would be. Read "Plugging Macondo," and I think you'll agree.

"Sourcing Rare Earths and Critical Minerals" discusses how researchers and professors at Mines are tackling the international concerns about China's near monopoly on the supply of rare earths. These concerns were recently inflamed by an announcement on Dec. 28 that the country would be cutting exports by 30 percent in 2011.

Shifting from rare earths to a profile of a rare individual, "A Determined Justice" focuses on the life of Terry Fox '89, who grew up the daughter of a migrant farm worker. Despite the disruptions to her early education caused by constantly moving, she worked hard and performed well academically. After attending Mines, she earned a Juris Doctorate and launched a highly successful legal career, which has led to one of the most influential legal positions in the state with her recent appointment to judge on the Colorado Court of Appeals.

There is plenty of other content to interest you in this issue: Inside Mines includes details of a new intercollegiate mine safety competition held at Mines this year. We also report on career day, the new student health facility soon to be built, and the induction of three individuals into the 13-school Golden Buffalo Battalion Army ROTC Hall of Fame. New Frontiers reports on some interesting experimental technology for landmine detection, and Spotlight profiles Rod Eggert, whose expertise on rare earths has put him in high demand lately.

Turning to the back pages, don't miss the letter from the new president of the alumni association, John Howe '83, which discusses structural changes in the functions of board members. The first of two profiles focuses on Dick Banks '53, who spends countless hours each year sharing his passion for cycling with elementary students through a church-sponsored Bike Club he established 15 years ago. Equally inspiring, our profile of John Grubb PhD '08 recounts how an adjunct professor in the Mining Engineering Department is fulfilling a lifelong ambition to teach after retiring from a long and successful career in the mining industry.

There is more online-only content on the *Mines* magazine website than ever before. We recently launched a new podcast, started posting video content and redesigned the entire site, so stop by minesmagazine.com and take a look.

Finally, many thanks for the complimentary feedback concerning the fall/winter issue. It was a fun edition to put together, and we were delighted with the positive response. Lastly, the readership survey mentioned in the last issue is still in the pipeline—we plan to send it out via email before the end of May. Please take a few moments to respond when it arrives—we truly value your opinion.

Nick Sutcliffe
Editor and Director of Communications
Colorado School of Mines Alumni Association

Need to update your address? Log in to minesonline.net and edit your contact information.

Mines is published three times a year by Colorado School of Mines and the CSM Alumni Association and distributed to alumni, the campus community and friends of the school. *Mines* magazine is a critical communication serving the Colorado School of Mines community. Its mission is to keep readers informed about the school, to further the goals of the school and the alumni association, and to foster connectedness.

Comments and suggestions are welcome. Contact us by mail, *Mines* magazine, P.O. Box 1410, Golden, CO 80402; phone, 303.273.3294; or email magazine@mines.edu.

Visit the *Mines* magazine website at minesmagazine.com

Campus News

Mines Hosts First Collegiate Mine Rescue Competition

Hosted by Mines in February, the First Biennial Collegiate Mines Emergency Response Development Exercise (MERD) broke new ground: Professional miners have competed alongside college teams in MERD events for decades, but this was the first intercollegiate event of its kind ever held in the U.S.

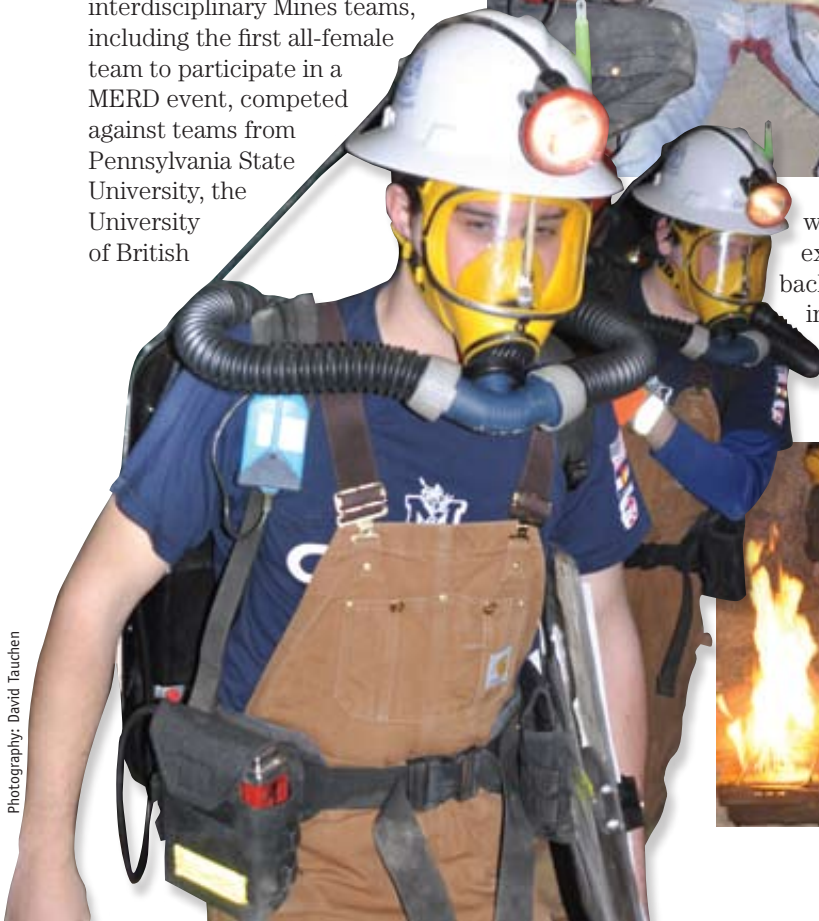
Five teams from four universities gathered for two days at Edgar Mine in Idaho Springs for the MERD competition, which was followed by a series of timed mine rescue challenges. Two interdisciplinary Mines teams, including the first all-female team to participate in a MERD event, competed against teams from Pennsylvania State University, the University of British



Columbia and the University of Arizona.

Mines' student chapter of the Society of Mining Engineers planned the event to coincide with the national SME conference held in Denver every two years. Mining engineering senior and SME chapter president Collin Smith was heavily involved in planning the inaugural intercollegiate MERD and Skills Challenge, along with State Mine Rescue Coordinator and Mine Safety Trainer Harry Lovely. Mines has a long history of partnership with the Colorado Division of Reclamation, Mining and Safety's (DRMS) Mine Safety Training Program, which has been conducting training sessions at the Edgar Mine for more than 35 years.

During the competition, teams were evaluated as they rotated through various exercises, including underground mine rescue, backup rescue and incident command duties. Tasks included smoke exploration, a confined space maze chase, firefighting, rope rescue work and patient extraction. In addition to traditional mine safety and rescue training provided through the Colorado



DRMS, MERDs were developed in accordance with Mine Safety and Health Administration (MSHA) standards to give mining students and professionals hands-on, experiential training in as realistic and unpredictable an emergency setting as possible.

The Mines women took 2nd and the men 3rd on the first day of the MERD, and Mines won the timed patient extraction challenge and the confined space maze race on day two. Harry Lovely presented the winning teams with plaques recognizing their achievements. “The MERD and Skills Challenge events for the student teams help instill a strong safety ethic and important skill sets for dealing with potential mine emergency situations they could face in the future,” he said. “These students will carry this important safety ethic along as future leaders of the mining industry.”

To cap off the two-day competition, the campus chapter

of SME organized a talk by Layne Christensen Company driller Jeff Hart about his remarkable contributions to the rescue of the 33 miners trapped in Chile’s San Jose Mine for 69 days last fall. Hart was called in from a U.S. Army water well site in Afghanistan to act as chief driller for the team that made up “Plan B” of the rescue operation. It was his team that finally reached the miners, providing them with a 26-inch wide, 2,300-foot-long escape shaft. A Denver-based contractor, Hart gave a sobering account of the challenges and complexities of the Chilean rescue operations, reinforcing the critical role mine rescue challenges and MERDs play in preparing students for the field.

—Trisha Bentz Kendall



Photos of the competition, as well as video and audio of Jeff Hart’s talk can be found at minesmagazine.com under “Web Extras.”

Fourth Largest Spring Career Day

Mines hosted the fourth largest Spring Career Day on record in February. A total of 1,700 students and recent graduates attended the event in the Student Recreation Center, where 145 organizations staffed booths with about 400 recruiters. “Typically one-third are alumni,” said Jean Manning-Clark, director of career services, who makes alumni-recruiters easy to spot by giving them a special sticker to wear.

After May Commencement, the spring and fall career days are the next largest regularly held events on campus. Planning begins at least a year in advance and in the final four months beforehand, Manning-Clark and her full-time staff of four work flat out.

They get assistance from a team of about 12 student employees, and on the day of the event, Blue Key puts in a total of about 120 volunteer-hours. “They run the show,” says Manning-Clark. “I don’t know what I’d do without them.” In return, the Career Center makes a big donation to the organization, says Manning-Clark. “So career day is helping keep the M lit,” she laughs.

The Career Center tries to anticipate demand from recruiters, but that hasn’t

been so easy lately. Events generally sell out well in advance. This spring, five recruiters were turned away, and another three waitlisted companies squeaked in at the last minute when a snowstorm caused three cancellations.

Some employers come looking for graduates to employ full time, but quite a few come looking for interns. *U.S. News and World Report* published a study in March that ranked Mines second in the nation for the number of undergraduates who had held internships prior to graduation.

It’s still early spring in Colorado, but Manning-Clark and her staff have already turned their attention to the Fall Career Day on September 13. “We’ll see 185 to 190 organizations with about 750 recruiters,” she says. “Fall is always larger.” Last September, 180 companies and 3,150 job seekers attended.



At the University of Colorado, Boulder, where there are six times as many students, fall career day is smaller. “They have 170 booths,” says Manning-Clark. She admits it’s a different market, but there’s some pride in her perennially upbeat voice.

For employers planning on attending Fall Career Day, registration will open May 17, and she is anticipating they will sell out by the end of June. The pride is back when she adds, with a laugh, “Two years ago we sold out in two days.”

First Annual Army ROTC Hall of Fame Ceremony



Photography: Robert Pearson

of the annual 10th Mountain Division Ski-In and their challenging annual veteran's climb to a 10th Mountain Division hut.

After Bud Isaacs earned his professional degree in petroleum engineering from Mines, he was commissioned as a second lieutenant in the U.S. Army Corps of Engineers. His service included combat operations in Vietnam as a first lieutenant with the 101st Airborne Division, for which he was awarded a Silver Star, Bronze Star with Valor, Combat Infantryman's Badge and Purple Heart.

Left: Hugh Evans (right) acknowledges Wendell Fertig's posthumous induction into the ROTC Hall of Fame. Below: Inductees Bud Isaacs (left) and Hugh Evans attending the event.

Following his military service, he held several positions in the petroleum industry, before founding V.A. Isaacs and Associates in 1985, and RIM Companies in 1989. Mines awarded him a Distinguished Achievement Medal in 2008 for his leadership in the oil and gas industry, and for his service to the school. Bud and his wife, Kaye, are members of the Mines Century Society. Bud is active in a number of community and professional organizations, including the Denver chapter of the Society of Petroleum Evaluation Engineers and Boy Scouts of America.

At an event held at the University of Colorado, Boulder in November, the first eight individuals inducted into the 13-school Golden Buffalo Battalion Army ROTC Program Hall of Fame included two Mines alumni and one professor. The ceremony included Hugh W. Evans '49, Vernon "Bud" A. Isaacs '64, and the late Colonel Wendell W. Fertig, a former Mines student who served as executive secretary of the alumni association and faculty member. Each was honored for his personal and professional accomplishments, and for serving as role models for former, current and future Army ROTC Cadets.



Hugh Evans came to Mines to earn his professional engineer of mines degree having previously served during World War II with the famed 10th Mountain Division, which specialized in Alpine warfare and played an important role in the Italian Campaign of World War II. His military honors include a Silver Star, Purple Heart, Bronze Star and the Combat Infantryman's Badge. He went on to a successful career as a leader in the global mining industry, while maintaining close connections to Mines as a member of the school's board of trustees for eight years and the alumni association board for five. In addition to contributing his time, Hugh and his wife, Ann, are members of the Colorado School of Mines Century Society, which recognizes extraordinary lifetime giving to Mines. In 1979, Hugh was awarded Mines' Distinguished Achievement Medal. Today, he is the chief organizer

Colonel Wendell Fertig attended Mines in the 1920s before accepting a commission as a second lieutenant in the Army Reserve and going on to serve as a civil engineer with mining companies in the U.S. and the Philippines. Col. Fertig served as commander of the 10th Military District in World War II and was later assigned to MacArthur's General Staff for his remarkable accomplishment building a 35,000-strong resistance force on the Japanese-occupied Philippine island of Mindanao during the last few years of World War II. Following the war, he helped develop the Army's Psychological Warfare Center, and received a Distinguished Service Cross for his actions in combat. He served as professor of military science at Mines from 1947 to 1950, and served on the Mines alumni association board in the 1960s and 70s. He was awarded an honorary doctorate from Mines at his Army retirement ceremony in 1950.

One of the first four universities in the country to adopt the Reserve Officers' Training Corps in 1919, Mines' ROTC program is now Company B of Buffalo Battalion, which is administered from the University of Colorado, Boulder campus.



—Trisha Bentz Kendall

New Comprehensive Student Wellness Center Named

With construction soon to begin on the new student health center to be situated on the northwest corner of Elm and 18th Street, the future facility was named the W. Lloyd Wright Student Wellness Center, after former Colorado School of Mines physician Dr. W. Lloyd Wright.

Once completed in the spring of 2012, the \$2.8 million, 9,000-square-foot facility will offer students a full range of medical, dental and counseling services under one roof. It will also include flexible conference and meeting space, an outdoor courtyard and a second-floor patio.

Construction of the W. Lloyd Wright Student Wellness Center will be largely funded by 1956 alumnus and CSM Foundation Board of Governors Secretary F. Steven Mooney, and his wife, Gayle, through their Galena Foundation. The Mooneys chose to name the facility for Steve's uncle, Dr. Wright, to honor his service to Mines and the broader Golden community.

Dr. Wright practiced in Golden from 1946 until 1980, serving as Mines' part-time campus physician, and later as medical director at Coors Brewery. He then served as medical director at Rocky Flats until 1988. In retirement, Dr. Wright and his wife, Jodie, moved to Paonia, Colo., where they've remained active in their community.



Chris Peters/Peters Photography

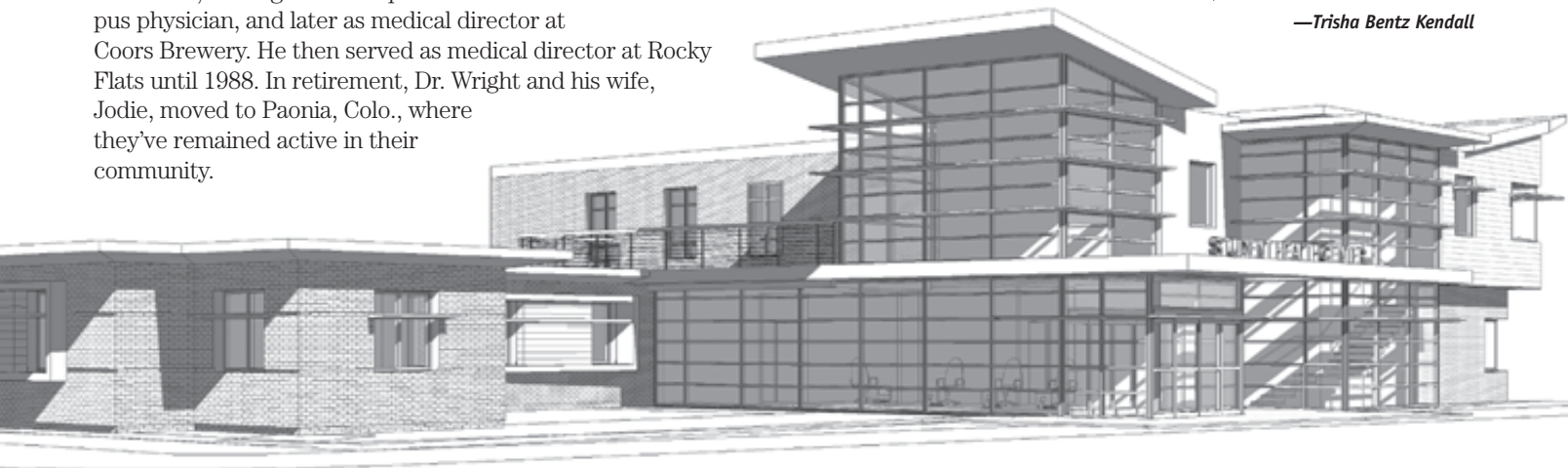
Dr. Wright speaks at the luncheon.

At a December luncheon, more than 180 family members, friends and former patients paid tribute to the Wrights. "I'm honored and humbled to have the new wellness center named for me," said Dr. Wright. "The new center will be an excellent facility for Mines students." Dr. Wright was awarded the Mines Medal in 1986 for his contributions to the campus community.

"Our campus will benefit enormously from having one facility where the elements of professional and compassionate health and wellness services come together," said Ron Brummett, director of student services. Designed to complement existing campus architecture, the ground floor of the LEED-certified facility will house the Mabel M. Coulter Student Health Center and a student health benefit program office. The second floor will include student disability services, a dental clinic, and academic and therapeutic counseling services.

When work begins, it will bring the total number of major construction projects under way on campus to four. All told, they add up to a quarter-million square feet (five football fields) of new construction, at a cost of \$100 million.

—Trisha Bentz Kendall



In Brief...

Terence Parker has been named executive vice president and provost. Parker, who came to Mines in 1994, has served as Engineering Division director since 2006. During that time, student enrollment in the graduate program in engineering and the annual research award level has more than doubled. Undergraduate student enrollment has also increased, with more than one-third of Mines' student population majoring in engineering. **Steven Castillo**, who previously served as provost, has undertaken a special assignment reporting to President Scoggins.

The Colorado School of Mines Board of Trustees elected trustee **James Spaanstra** chairman of the board through December 2012. Spaanstra, who has served on the board since 2008, is a

partner in the law firm of Faegre & Benson. He has been in private practice for more than 30 years, developing one of the largest and most diverse environmental practices in the Rocky Mountain region.

Josh Sharp, assistant professor of environmental science and engineering, received an NSF Faculty Early Career Development award for his research "Cleaner Water Through Microbial Stress: An Integrated Research and Education Plan," which focuses on how biological processes can impact water quality and how to use microbes to clean contaminated sediments and water supplies.

In January, **A. Keith Turner**, emeritus professor of geological engineering, was presented the Roy W. Crum Distinguished Service Award by the Transportation Research Board (TRB), which is part of the National Academies, for his contributions to transportation research.

Pankaj K (PK) Sen, professor of engineering, was named a fellow of the IEEE, the world's largest professional association for the advancement of technology. Sen was nominated for "leadership in arc flash hazard research and electrical safety curriculum." He is Mines' site director for the Power Systems Engineering Research Center, an NSF Industry-University Cooperative Research Center.

A Sound Approach to Landmine Detection

During 2009, landmines were cleared from an area more than five times the size of Paris. During that same year the *Landmine Monitor*, which was created in June 1998 by the Nobel Peace Prize-winning International Campaign to Ban Landmines, reported 3,956 casualties from the devices globally.

Placed just inches underground, landmines can lie dormant for decades before killing or maiming their victims. Because children are more likely to veer off the beaten path, they make up a disproportionate number of the casualties. And while antipersonnel landmine use has dropped dramatically since the 1997 Ottawa Treaty banning their use, there remain 39 non-signatory states (the U.S. is one), and many thousands of square kilometers of land remain uncleared.

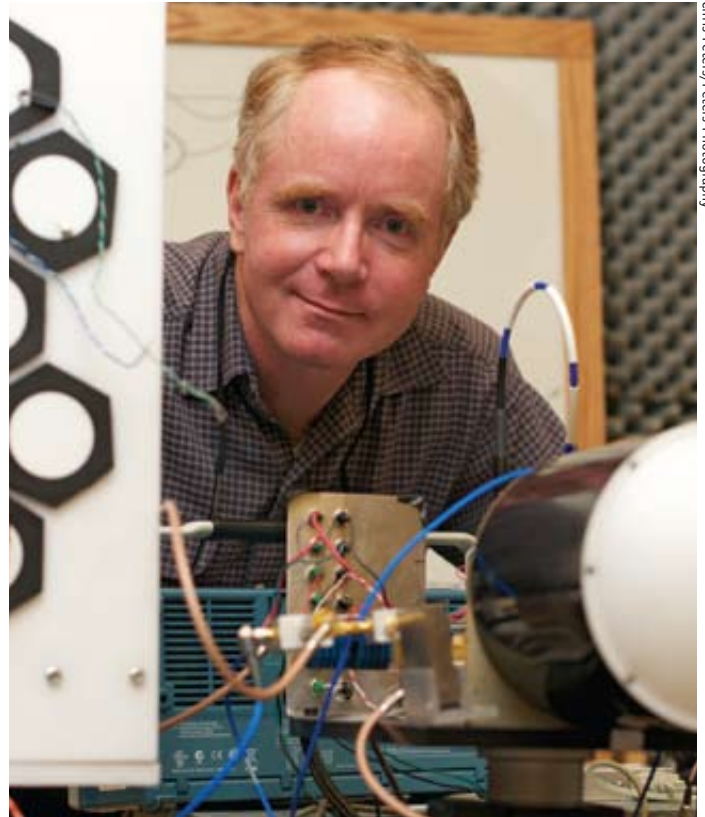
By design, antipersonnel landmines are difficult to detect. Typically made of plastic, the firing pin is sometimes the only metal component, which can render ground-penetrating radar and metal detectors ineffective. The United States military sometimes employs heavily armored vehicles that flail the ground to intentionally detonate antipersonnel mines, after which they send in trained dogs and specialists with sensitive probes. Other protocols exist, but they are all time consuming, dangerous and expensive, so alternatives have long been sought.

Funded by the Army Research Office, physics professor John Scales and a number of students and colleagues may have come up with a safer and less expensive approach. “We gently shake the ground with low-frequency sound waves, and a sensitive microwave vibration sensor looks for signatures that are consistent with a buried landmine,” Scales explains.

One of the most novel aspects of the technology is the use of a special “nonlinear sound array” to generate the sound. Skipping over the physics behind the phenomena, the technology exploits certain characteristics of air to create a powerful and remarkably defined column of sound waves: “It’s like walking through a flashlight beam,” says Scales. “Standing off to the side, you don’t hear anything, but when you get in the beam, it’s really loud.”

As the beam of sound is slowly panned across a field, it shakes a limited area. As it does so, a sensitive microwave motion sensor connected to a computer interprets the resulting data in an effort to distinguish between the acoustic signatures of irregularly shaped rocks and regularly shaped plastic mines. “For buried objects, the useful range is likely about 20 meters, with a ground penetration of 10 centimeters,” says Scales.

Two separate papers in the *Journal of Applied Physics* describe Scales’ combination of these technologies: one



Chris Peters/Peters Photography

addresses a super-sensitive, homemade microwave vibration sensor, while the second focuses on the nonlinear acoustic methods for getting energy into the ground.

Ultimately, he envisions the technology mounted on the front of a vehicle; for now, the prototype—made using off-the-shelf technology—is mounted on a simple cart purchased at The Home Depot that Scales’ team beefed up with heavy-duty wheels and struts. Its price tag: \$30,000.

The Army will be conducting some rigorous tests soon, but whether they are successful or not, Scales won’t be filing any patents. In keeping with his lab’s policy, all aspects of his team’s research are freely available via the web. “Our goal is simply to see whether this combination of technologies—the nonlinear acoustics and the microwaves—can be successful,” he says. “If it can be, there are lots of people out there who can make it cheap and make it fast.”

Brian Zadler PhD ’05 worked on the landmine detection system’s amplifiers and nonlinear array during his postdoc at Mines. “When you learn the statistics of how many mines are still buried on beaches, fields and roadways, and how many civilians are injured and killed every year, sometimes from decades-old mines, it’s startling... Developing technology for humanitarian de-mining is a worthy way to spend your time,” he says.

“There are hundreds of millions of landmines worldwide; they represent a huge public health and environmental cost in developing countries,” says Scales. “If we could make even a dent in this problem, I’d be very happy.”

— Jennie Lay



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Investing in Mines

An investment in knowledge always pays the best interest.

—Benjamin Franklin

Mines Awarded HP Catalyst Grant

Mines received a \$150,000 grant to participate in HP's Catalyst Initiative, a social innovation program designed to develop more effective approaches to STEM education worldwide. The project will explore the use of tablet PCs in enhancing learning at Mines.

Frank and Susan Kowalski will lead the initiative and continue to develop a teaching model that utilizes "digital ink," a special pen that enables students to write directly on computer screens to respond to questions and provide professors with

immediate feedback through web-based software created by Mines students.

"This funding from HP puts us at the forefront of efforts to shape the way education and, ultimately, society evolve," said Frank Kowalski. "We have been successfully using this technology in physics and chemical engineering classes for several years, but this award will help us apply it to other subjects and instructional styles."

The Galena Foundation contributes \$1.4 million; The Adolph Coors Foundation supports faculty with \$275,000; Other recent gifts

Colorado School of Mines recently received 12 large gifts:

The Adolph Coors Foundation contributed a total of \$275,000 to support the William K. Coors Distinguished Chair in Chemical Engineering and the Herman F. Coors Professorial Chair in Ceramics.

Harry D. Campbell '42 made the final \$157,769 pledge payment on his \$700,000 commitment to Marquez Hall.

William F. Guenther, Jr. '42 made a \$100,000 payment toward his pledge in support of the Guenther Endowed Scholarship Fund.

Hess Corporation contributed \$200,000 toward their \$1 million pledge to the Marquez Hall building project and \$55,000 to support the Department of Petroleum Engineering and the Department of Geophysics.

Harold M. '68 and Patricia Korell contributed \$195,427 to provide marketing support to the Colorado School of Mines Foundation.

John P. '52 and Erika Lockridge made gifts totaling \$200,000 to support the Department of Geology and Geological Engineering, the Geology Trail and scholarships for the basketball team.

F.H. Merelli '59 made gifts totaling \$120,000 in support of the Petroleum Engineering Department and The Mines Fund.

At the recommendation of **F. Steven '56 and Gayle Mooney**, the **Galena Foundation** made pledge payments totaling \$1.4 million to support the Department of Geology and Geological Engineering, student scholarships and capital projects on campus.

Protonic Capital, LLC contributed \$200,000 to establish the Protonic Capital, LLC Fuel Cell Center Graduate Fellowship and Equipment Fund.

Schlumberger made a \$250,000 payment toward their \$1 million commitment to the Marquez Hall building project.

The Viola Vestal Coulter Foundation contributed gifts totaling \$103,000 in support of scholarships, fellowships, the Coulter Instructorship in Mineral Economics and the Coulter Health Center.

Martin Zinn contributed five rare mineral specimens to the Colorado School of Mines Geology Museum.

Other recent gifts of \$25,000 and more from individuals, corporations and foundations:

The Alcoa Foundation contributed \$70,000 toward a \$370,000 pledge to support a recycling, solid waste and public policy initiative in the Division of Economics and Business.

Aqua-Aerobic Systems, Inc. contributed \$75,000 to support the Advanced Water Technology Center (AQWATEC).

The ARCS (Achievement Rewards for College Scientists) Foundation contributed \$35,000 toward scholarships.

Bill Barrett Corporation made a \$41,667 payment toward their \$125,000 commitment to the Marquez Hall building project.

The Boettcher Foundation contributed \$25,000 toward the Boettcher Foundation Endowment for Distinctive Educational Programming.

Bonanza Creek Energy contributed \$25,000 toward their \$100,000 commitment to the Marquez Hall building project.

Steve '64 and Dollie Chesebro' contributed \$25,000 in continuing support for the Chesebro' Athletic Development Fund.

Marshall C. III '67 and Jane Crouch made \$60,000 in gifts and pledge payments to support Marquez Hall, geophysics scholarships, and research and faculty enhancement in the Department of Geology and Geological Engineering.

William K. Dalton '74 contributed \$26,747 to support the Department of Geophysics.

Frederick F. Dueser '49 contributed \$25,000 in gifts and pledge payments to support the Dueser Scholarship Fund.

Patrick J. Early '55 made a \$25,000 contribution to The Mines Fund.

Richard A. Edrich '82, MS '86, contributed \$25,000 to establish the Pamela Edrich Memorial Fund in memory of his wife, **Pamela Wood Edrich '82**.

Hugh '49 and Ann Evans made a gift of \$62,734 to Mines by donating appreciated securities to their charitable remainder unitrust.

Hershal C., Jr. '58 and Trudy Ferguson contributed \$30,000 in ongoing support for the Ferguson Athletic Scholarship Fund and the Geology Trail.

Tim '70 and Mary Haddon contributed \$25,000 to The Mines Fund.

Al Ireson '48 made \$30,500 in gifts to provide ongoing support to the Ireson and Family Endowed Scholarship Fund and The Mines Fund.

Claudia E. Jacobus contributed \$26,836 to the Dr. Carl L. Hiltrop Memorial Scholarship Fund, named in honor of her late husband, which supports athletes studying Chemistry and Geochemistry.

Brian G. Kirby '92 contributed \$50,000 toward graduate fellowships for students working in the Advanced Steel Processing and Products Research Center.

Richard I. Kuehl '47 set up a \$50,000 life income fund that will benefit the Richard and Marie Kuehl Scholarship Endowment.

The Li Foundation contributed \$42,000 toward the Li Foundation Fellowship Fund.

Marathon Oil Corporation contributed \$60,000 in support of the Marathon Center of Excellence for Reservoir Studies.

Mintec, Inc. made a \$50,000 payment toward their \$100,000 commitment to enhance the computer-aided mine design laboratory and contributed \$15,000 to support scholarships for mining engineering students.

Bill F. Oline '52 provided \$34,790 in continuing support for the Harry C. Kent Petroleum Geology Graduate Scholarship Fund.

Paul R. Peel contributed historical mining reports and claim maps to Arthur Lakes Library.

J. Don Thorson '55 contributed \$50,000 in support of the school's annual Leadership Summit.

James R. Weber '71 provided \$50,000 in continuing support for the Jack R. and Mary D. Weber Endowed Fellowship Fund.

The Williams Companies Foundation contributed gifts totaling \$29,500 in support of student groups, E-Days and scholarships.

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FACULTY

Rod Eggert

Professor and Division Director

Division of Economics and Business

In 2010, when industry and governments around the world woke up to the fact that China had developed a near monopoly on the production and supply of rare earth minerals, alarm bells were sounded. Unsure about what path to pursue next, industry and government leaders then went looking for experts to consult on the issue, and one of the people they quickly identified was Rod Eggert, director of Mines' Division of Economics and Business.

"I was one of the early writers on this topic," says Eggert, explaining that, in 2007, he was invited to chair a National Research Council committee that authored the book, *Minerals, Critical Minerals, and the U.S. Economy* (National Academies Press, 2008). His experience on this book sharpened his interest, and he's been researching and writing on the issue ever since.

In September 2010, he testified in front of the U.S. Senate Subcommittee on Energy, where he spoke on the many ways this family of elements at the bottom of the periodic table has become integral to materials used in modern electronics, weapons systems and alternative energy technologies. In January 2011, he traveled to Brussels to deliver a similar message to the European Parliament's Committee on Industry, Research and Energy.

Eggert is currently helping to consolidate Mines' activities related to rare earth minerals and other mineral resources, working in collaboration with Murray Hitzman and Thomas Monecke in the Department of Geology and Geological Engineering, Corby Anderson and Patrick Taylor in the Department of Metallurgical and Materials Engineering, and others on campus.

The area is a natural progression for Eggert, whose career has been centered on mineral economics for almost three decades. "I've been interested in the economics of mineral resources my entire career," says Eggert, who worked for Resources for the Future, a social science research organization in Washington, D.C., and taught at Penn State before coming to Mines in 1986.

He traces his interest in mineral economics to the Arab Oil Embargo of 1973 and 1974. The images of Americans queuing for hours to fill their vehicles with gasoline and the related plunge in the stock market came at an influential time in his education.



Chris Peters/Peters Photography

He was attending Dartmouth College and trying to decide on a major. "I was good in science but also interested in international affairs and public policy. Then I took a geology course, and that led me to become a geology major." After graduating in 1978, he attended Penn State, where he earned a master's degree in geochemistry and mineralogy, and a PhD in mineral economics.

While rare earths have occupied much of his time recently, Eggert has several other projects under way. He is in the midst of a study of the world's uranium supply for the next 30 years—where it will come from, what it will cost and how supplies might be constrained. He is also working with a team of faculty members and graduate students to assess the value of recyclable materials such as aluminum, steel, glass, paper and lead found in municipal solid waste.

Eggert also enjoys teaching. "I like the challenge of trying to organize and introduce material in a way that engages students," he remarks. "Over time, you probably have to answer almost every possible question about a topic and must do that on the spot, without the ability to research it and polish your answer," Eggert says. "You have to think on your feet." This semester, he is teaching Economics and Decision-Making.

In his free time, Eggert enjoys running and skiing. He lives in Littleton with his wife, Ruthann. Their son is a pilot in the Air Force, and their daughter is wrapping up her last year at New York University.

—Sandy Graham

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Mines ranked #7 in current Learfield Sports Directors' Cup standings

Colorado School of Mines was ranked seventh in the final installment of the 2010-11 Learfield Sports Directors' Cup NCAA Division II winter standings, as announced on March 31st by the National Association of Collegiate Directors of Athletics (NACDA). Among Rocky Mountain Athletic Conference institutions, Mines is in second place behind Adams State. Final 2010-11 Learfield rankings are scheduled to be announced on June 17. Complete standings and the scoring structure can be found on NACDA's website at nacda.com.

The Learfield Sports Directors' Cup standings, developed jointly by NACDA and *USA Today*, are determined by a scoring system that ranks success at the national level in 27 sports, although NCAA Division II schools are scored on only 14 (seven men's and seven women's) of those 27 sports to ensure equality among smaller schools. A high standing is therefore an indication of broad success across multiple men's and women's sports programs. Some highlights follow:

Men's cross country team placed fourth at the NCAA Division II Championships in 2010, earning its sixth consecutive top-10 finish at nationals. Sean Gildea, Mack McLain, Aaron Swift and Ben Zywicki garnered All-American honors. The Orediggers also placed third at both the RMAC Championships and the NCAA Division II Central Region Championships this season. Zywicki won the individual title at the Central Region Championships and was named USTFCCCA Central Region Men's Athlete of the Year.

The women's soccer team made its third straight appearance in the NCAA Tournament in 2010. Anna Evans earned All-American recognition as Mines finished the year with an 11-6-4 overall record (9-4-1 RMAC) and qualified for the RMAC Tournament for the fourth straight season.

The men's soccer team finished the 2010 season with an overall record of 17-2-2 (12-1-1 RMAC). Mines made its second consecutive appearance in the NCAA Tournament—third in program history—and won its first NCAA Tournament game. Ranked #1 in the country for four consecutive weeks early in the season, the Orediggers claimed both the RMAC regular-season and tournament titles. Tesho Akindele, Manville Strand and Chike Sullivan earned All-American recognition. Mines was ranked ninth in the final NSCAA top 25 national poll.

The Mines football team (9-3 overall, 8-1 RMAC) qualified for the NCAA Division II football championships for the second time in program history. The Orediggers, who were RMAC Co-Champions, were ranked as high as #16 in the nation this fall. Marc Schiechl, who became the all-time NCAA Division II career leader in sacks during the 2010 season, as well as Clay Garcia, Cody Renken and Robbin Vinnola earned All-American recognition.

Mines' 15th-place showing in 2009-10 marked the highest-ever finish for the Orediggers in the Learfield Sports Directors' Cup standings. Mines recorded a top-25 finish in 2006, as well, placing 22nd.



Anna Evans

Joel Bach



Ben Zywicki

Wayne State College (Nebr.) SID

Oredigger News & Notes...

- Men's and women's swimming & diving teams both placed first at the Colorado College



Cayla Wood

Ryan Marshall

Classic on January 21 - 23 in Colorado Springs, winning the Orediggers the combined team title with a score of 1,341 total points (women - 582; men - 759).

- Wrestling's Brandon Sheldon placed first in the 174-lb bracket when Mines hosted the Rocky Mountain Collegiate Open on January 29 at Lockridge Arena. Jesse Snider, who was ranked as high as fourth in the country earlier this season, concluded the regular season with an 8-0 individual record in the RMAC competition.

- The 2011 Athletics Fundraising Dinner and Auction will be held on Friday evening, May 20, beginning at 5pm in the Student Recreation Center, Lockridge Arena. For more information, please call 303-384-2254.



Clay Garcia

CSW Athletics

- The 2011 Athletics Hall of Fame / Homecoming football game will take place on Saturday, October 1, at 12:00 p.m. at Campbell

Field in Golden. The Hall of Fame induction banquet will take place on Friday evening, September 30, on the Mines campus. The 2011 Hall of Fame inductees will be recognized during a halftime ceremony at Saturday's game. For more information, please call 303-273-3360.

For complete schedules, rosters, results and statistics, please visit the Colorado School of Mines Athletics website: csmorediggers.com.



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Sourcing Rare Earths and Critical Minerals

Tackling the Supply Crisis

By Larry Borowsky

Who knew the U.S. economy was so deeply dependent on neodymium?

Until late last year, almost nobody did. Indeed, you would have been hard-pressed to find anyone who could name neodymium as an element, much less recognize it as one of the 17 rare earth elements that dangle like afterthoughts at the bottom of the periodic table.

Then in October, the Chinese announced plans to cut their production of rare earth metals and slash exports by roughly one-third. Since China currently accounts for about 95 percent of the world's rare earth output, the threat of global shortages suddenly loomed. Alarm bells rang in Washington and in the national business press, and globally, mining companies rushed to find new rare earth exploration projects and advance development projects as quickly as possible.

To understand how ubiquitous rare earth metals have become, look no further than the iPhone. It is powered by a permanent magnet made with the rare earth metal neodymium; the screen and display module are manufac-

tured with europium, yttrium and terbium; and the lens in the camera has a coating of lanthanum.

Consumption of rare earth metals isn't restricted to smart phones. They are in TV screens, computer hard drives and anti-lock brake systems. They are baked into aircraft engines and instrument systems, MRI and X-ray machines, and they are used in modern oil refining and water purification systems. Within a few years, rare earth metals such as europium, yttrium and terbium will be in almost every light bulb on sale at The Home Depot. And they are already incorporated into many defense systems, leading some analysts to attach national-security implications to China's announcement on rare earths.

Foresight and response

"I'm not sure I would use the word 'crisis' yet," says Rod Eggert, director of the Division of Economics and Business at Mines. "It's not clear to me that any consumers have actually been unable to obtain rare earths so far. But there is significant cause for concern. We've

entered a period of uncertainty.”

As chair of the National Research Council’s Committee on Critical Mineral Impacts on the U.S. Economy, Eggert has been well ahead of the curve on this issue. For more than two years, he has been warning leaders in industry, Congress and international trade organizations of the potential for global shortages in rare earths and other critical minerals.

And Eggert has helped mobilize leaders on campus about the issue. Drawing on the expertise of Eggert and other faculty, the university has launched a range of proactive initiatives months or years before newspaper reporters were forced to learn how to spell dysprosium.

In January, Mines debuted a new class devoted to the mining of rare earths and other strategic minerals—the only one of its kind in the nation. The Kroll Institute for Extractive Metallurgy is involved in several projects to conduct research in rare earth refining, recycling and exploration. Mines is a charter member of the U.S. Rare Earth Industry and Technology Association (RE-ITA), a partnership between universities and businesses that formed in 2010. And Eggert recently announced the creation of the Center for Critical Minerals and Materials, which will serve as an umbrella organization that coordinates research and educational activities across the Mines campus.

“We’re one of the few universities that has resident expertise throughout the entire material life cycle,” Eggert says. “There are universities that have skills in geology but not in markets, trade policy, R&D and other aspects. We can capitalize on a broad range of expertise that spans many departments and many aspects of this issue.”

The rise of rare earths

Rare earths, which are generally deposited together, are not actually all that rare. They occur widely, but in great diffusion, and there are only a few known deposits that are large and concentrated enough to support profitable mining operations. Another factor limiting supply is that they are difficult to separate from one another; rare earths tend to intermingle—with each other and with other minerals—and separating out a pure sample of any single element can be costly. A third limitation of supply is the infrastructure required to refine rare earths into usable forms, including the conversion of oxides to their metallic forms. This technology, which was largely developed in the United States

but now primarily resides in Asia, is relatively undeveloped because these materials had little economic value until recently.

Within the last couple of decades, elements such as dysprosium, neodymium, europium and yttrium have become essential to the manufacture of products in health care, energy, computing, consumer electronics and the auto industry, hence the alarm over the news from China. Interruption in supply could have significant impacts on the U.S. economy.

“We’re using a much larger portion of the periodic table than we were even 20 years ago,” says Eggert. “Many of these new uses are for elements that up until now have been used in very small quantities. So a new use or two can dramatically change the demand and temporarily overwhelm the ability of supply to keep up.”

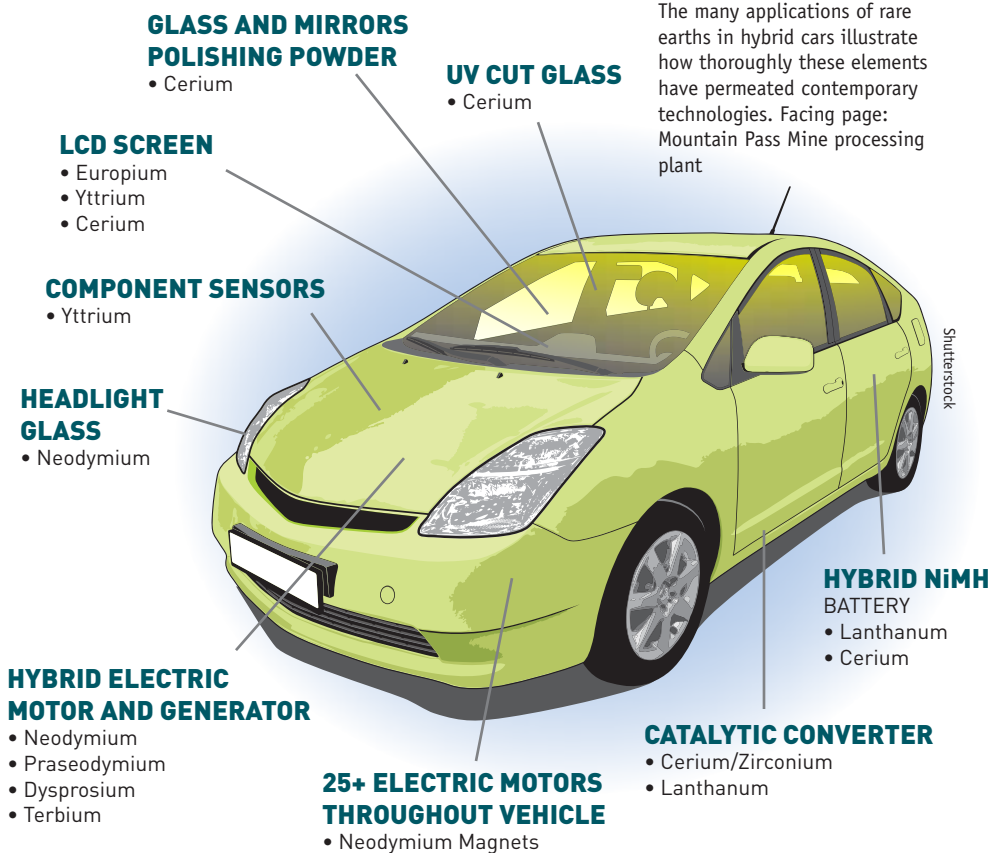
To date, the most important uses for rare earth elements have been in the manufacture of various kinds of permanent magnets, lighting and a range of optical and imaging applications. Rare earth magnets, which can include neodymium, dysprosium and samarium-cobalt, are up to three times more powerful than their conventional counterparts. This is particularly valuable in turbines and electric motors, which can be smaller and lighter, but pack the same punch. Fluorescent light bulbs and video

screens depend on fluorescence qualities in certain rare earths. In fact, the first commercial use of a rare earth metal was in color televisions in the 1950s. Europium, which glows red when hit with an electron beam, is still used today in LED and plasma TVs, along with another rare earth, terbium, which glows green. Other critical applications for rare earths exist in laser and X-ray imaging technologies, which make use of their interactions with high-energy waves.

Vital to growth industries

Not surprisingly, these special electrical properties of rare earth elements are helping to drive technological innovation in some critical sectors of the economy. Electrical motors made with rare earths are used in almost all hybrid cars, where space, performance and weight is at a premium. Most modern wind turbines, another global growth industry, also incorporate rare earth magnets. “A modern 3-megawatt wind turbine uses about a thousand pounds of neodymium,” says Vince Matthews, director of Colorado Geological Survey, adding that the U.S. produces almost no neodymium at present.

Energy-saving compact fluorescent



Shutterstock

light bulbs gain much of their brightness from rare earth phosphors, most commonly yttrium, terbium and europium. With the industrialized world rapidly moving from incandescent to fluorescent bulbs (the U.S. conversion is scheduled to be complete by 2014), this industry represents a built-in demand spike for rare earths. Some additional energy-related products that use rare earths include photovoltaic cells, nickel-metal hydride rechargeable batteries and energy-efficient windows.

Health care is another key industry that relies on rare earths. Imaging techniques such as CAT scans, MRIs, digital X-rays and lasers take advantage of the elements' optical properties. Computer and smartphone manufacturers employ rare earths in permanent magnets, hard drives and LED screens. The petroleum industry uses the metals as well—chiefly cerium, which serves as a fluid catalytic cracking catalyst.

A matter of national security

Important as rare earths are to so many diverse and vital sectors of the economy, much of the alarm over future supplies concern just one industry: defense. Military jets, guided missile systems, satellite communications and myriad other defense applications all now incorporate rare earths. As in the energy sector, rare earth permanent magnets have numerous uses. They drive the electrical systems found in planes, ground vehicles, satellites and communications equipment. These magnetic properties also play an essential role in the functioning of traveling wave tubes, which amplify signals from military satellites and other communications systems. Additionally, lasers, range finders, detection systems, night-vision equipment and a host of other military applications rely on rare earths' optical qualities.

The U.S. Department of Defense conducted a study of the global supply chain in 2009 and was concerned enough to propose a new oversight program, the Strategic Materials Security Management System, to monitor supplies of rare earths and other critical minerals. The Department of Commerce, Department of Energy and White House Office of Science and Technology Policy have also undertaken studies or developed strategic plans to address the danger of rare earths supply shortages.

Governmental concern about Chinese control of the rare earths market was piqued in 2005 when the China National Offshore Oil Corporation tried to purchase UNOCAL,

then the parent company of California's Mountain Pass Mine, which holds the largest known reserve of rare earths in the United States. After the Bush administration was asked by the House of Representatives to review the bid on grounds of national security, the sale was scuttled. Another Chinese state-owned company attempted to purchase the Mine in 2007 from Chevron, but Mountain Pass ended up being sold to Denver-based Molycorp Minerals. Located south of Las Vegas in the California desert, Mountain Pass was the world's largest producer of rare earth metals from the 1950s until the early 1990s. But rising costs and increased competition from China's state-subsidized mines caused Mountain Pass to reduce, and ultimately cease, production. By the mid-2000s, U.S. rare earth mining had virtually disappeared.

"We went from a situation where we had one dominant miner, which happened to be in the United States, to one where we have a dominant mining country," Eggert says. "And that country has now signaled it will reduce its supply to the rest of the world."

Threatened supplies, soaring demand

Demand for rare earths is steadily rising. The U.S. Congressional Research Service estimated worldwide consumption at 124,000 tons in 2010 and forecasts a rise to as many as 180,000 tons by 2012. However, China's exports are projected to drop below 30,000

tons this year. As a consequence, prices have skyrocketed. Neodymium oxide, used in the manufacture of rare earth permanent magnets, has gone from \$20,000 per ton in January 2010, to \$160,000 in January 2011.

While these are alarming numbers, they are not as dire as they may seem at first blush. Molycorp is producing again: "We're currently refining approximately 3,000 tons of rare earths per year from stockpiled ore," says Ross Bhappu PhD '88, chairman of Molycorp's board. Once they are fully operational, this number will increase. "We'll initially be producing about 19,000 tons a year when we restart, but we'll be quickly expanding our capacity to 40,000 tons by late 2013." Mount Weld Mine in Western Australia has now completed a concentration plant that will prepare concentrate for export to Kuantan, Malaysia, where a new processing plant is slated for completion by late 2011. Total production from the Kuantan facility will be about 20,000 tons per year.

Other projects are under development, but will take longer to come online. The Bokan Mountain deposit in Alaska has generated keen interest, and exploration has begun at sites in Wyoming and Idaho. Colorado Rare Earths plans to develop claims in Gunnison and Custer counties. Congress has gotten involved as well. Colorado Congressman Mike Coffman has introduced legislation that would create a national rare earth strategic stockpile, and Colorado Senator Mark Udall



is sponsoring a bill aimed at jumpstarting research and development.

Equally critical: research and education

Udall's bill is particularly important, according to Eggert, because it's aimed at more than just identifying and developing reserves. "Without good information about the material life cycle," he says, "it becomes

difficult for both private and public entities to make good decisions. I'm thinking about activities such as scientific and technical research that typically have been the domain of universities and federal laboratories, as well as private companies."

Plenty of problems remain to be solved. "The biggest challenge in recovering these metals is in refining," says Pat Taylor, director of Mines' Kroll Institute. "Rare earths tend to occur in conjunction with one another and are all very similar chemically, so separating one from the other is a big challenge. They're very difficult to reduce in a pure phase."

The Kroll Institute has research projects under way that relate to rare earths extraction and refining. It is also participating in a pilot recycling program to recover rare earths from fluorescent bulbs. The National Science Foundation-funded program was launched last year in conjunction with General Electric and the waste-management company Veolia (the nation's largest recycler of fluorescent bulbs).

Taylor has also taken the lead in one of the most important aspects of the drive to reactivate U.S. rare earths production: education. Because the industry has been essentially dormant for two decades, there is a gap in expertise. Metallurgists, chemical engineers and mining professionals who have specialized in rare earths are few and far between, and demand for trained personnel in the U.S. is rising.

That's why Taylor and colleague Corby Anderson developed the class Extraction and Refining of Rare Metals, which debuted in the spring 2011 semester. The first of its kind anywhere in the U.S., the course has been in the planning stages for more than two years. In addition to students, the course is also open on a noncredit basis to professionals in the mining industry who want to add to their expertise.

Such initiatives can't roll out soon enough for Molycorp. "We have a limited supply of chemical engineers and metallurgical engineers to draw from," says Bhappu. "As a nation, we haven't been turning out enough metallurgical engineers who are knowledgeable about rare earths. It's essential to reactivate those programs. China is educating thousands of specialists in this area. We need to have a fair number of grad students who are writing master's theses or PhD dissertations focused specifically on critical metals."

Karl Gschneider of Iowa State Univer-

sity's Ames Laboratory estimates that in the short term, "about 170 trained persons having PhD, master's and bachelor's degrees are required per year to quickly fill in the present void of technically trained personnel."

Beyond rare earths

Although they are central to the curriculum, Taylor's course is not only focused on rare earth metals. It also covers other scarce but critical minerals, such as lithium and tellurium.

"The present situation is not just about rare earths," says the Colorado Geological Survey's Matthews. "It's important to understand that. There are many critical minerals which the U.S. must import." The real question, he notes, is whether these critical minerals will remain available at a reasonable price.

"It's broader than rare earths," agrees Eggert, who points to platinum, palladium, rhodium, manganese and indium as other minerals facing supply risks. "Rare earths have shone a light on a broader set of issues."

Addressing those issues will require a multipronged approach, Eggert believes. "There are basically two ways to overcome supply risk. One is to develop alternative sources. The other is to substitute away from the at-risk elements in the design of materials. Mines has research activities in both areas. Another role for Mines is in better understanding the markets and life cycles of rare earths and other critical minerals. These are small, highly fragmented markets with limited information; they're poorly understood. Developing a more complete inventory of current production capacities, reserves, end-use markets and waste repositories will help us get our production back up to speed more quickly."

Outlook

Looking ahead, the most hopeful estimates say the U.S. can become self-sufficient in rare earths production by 2015. More cautious analysts forecast that it will take more than a decade.

But for industry, self-sufficiency isn't the issue. The problem will be fixed once there is a well-diversified global supply. Thanks to the work of governments, NGOs, universities and private corporations around the world, progress has been made; but there's plenty yet to be done, so expect to hear more on this topic from Mines, where expertise on rare earths and scarce critical minerals is, fortunately, in abundance. [M](#)



Photos: Shutterstock



Left: The Mountain Pass Mine, Newberry-Baker, Calif. Above: A small sampling of technologies manufactured using rare earths metals.

“The Magazine is to be a monthly paper devoted to technical articles, an abstract of new books and current articles, school affairs, athletics and alumni notes ... It is expected that the Magazine will be the means of bringing the members of the Association closer together.”

**Colorado School of Mines Magazine Editor, Jay Lonergan 1905
October 1910, inaugural issue**

100 Years



Celebrating a Century of Mines Magazine

Part II: 1970 – 2010

By Nick Sutcliffe
and
Bill Eckley

As in part I, our survey of the last five decades of Mines magazine is generated with a broad brush: excerpts are only from those issues published in the first year of each decade. Complete text of every article referenced below may be read on the redesigned Mines magazine website (minesmagazine.com). Our special 100-Year Archive includes fully searchable PDF files comprising every issue of Mines magazine published during the first year of each decade since 1910 (108 issues; 5,000 pages).

Part I of this article ended with the following, taken from the 50th Anniversary Issue of *Mines* magazine published in October 1960:

The MINES Magazine has recorded the activities of these men for a half century, and we look forward to the next half century in which *The MINES Magazine* will continue to play an important part in recording the events of an astounding era.

Given that these words were written before the Apollo program, at a time Mines when computers were the size of an average living room and construction of the Interstate Highway System had barely begun, they seem to resound prophetically across the intervening decades. It was already a period of rapid change, but could the author have had a sense of just how astounding the next 50 years would be?

This article's journey through a half-century of *Mines* magazines provides an interesting lens through which to view the acceleration of technology.



1970

Environmental concerns and energy are the major themes in the issues from 1970. In the August issue, the article titled “Pollution Causes Climate Change” discusses concerns about industrial particulates in the atmosphere cooling the planet by increasing cloud formation and shielding solar radiation, while also pointing to the concerns of atmospheric scientists that growing amounts of CO₂ in the atmosphere may ultimately cause average global temperatures to rise. The need for environmental stewardship and capping population growth are the key points he aims to make: “It has become obvious that we can no longer afford to operate under the assumption that infinite growth is possible on a finite planet.”

The impact of energy consumption on the environment is addressed in the February issue in the article, “Air Pollution and Atomic Power,” by C.K. Viland '29. It's an environmental case for nuclear power that highlights the safety of the industry and aims to undermine “unfounded prejudices” surrounding nuclear power.

Another article seeks to dissolve prejudice against offshore drilling in the wake of a blowout in the Santa Barbara Channel earlier that year. Found in the November issue, “Offshore—Petroleum and the Environment,” argues that it is “imperative to the nation's domestic security and economic growth that the seaward search for

oil and natural gas continue.” The author makes the case with arguments related to topics familiar to modern readers, including dependence on foreign oil, the adequacy of government regulation, use of blowout preventers, sophisticated drilling technology and a strong past safety record.

1980

When one fast-forwards 10 years to 1980, it is clear that changes at *Mines* magazine are under way. There are fewer technically oriented articles, and the issues are shorter. It was an inevitable development: As professional journals evolved to meet the needs of increasingly sophisticated and compartmentalized technical fields, the role *Mines* magazine had been playing was undermined.

The May issue, which came out a little more than one year after the partial meltdown at Three Mile Island, includes two articles focused on nuclear power. With public support for nuclear power at a new low, both authors make the case for continued expansion of the sector. “It is my hope that the lessons learned from this traumatic event will provide the basis for a stronger, safer and more viable nuclear industry in the U.S.,” writes Bernhard Cherry in “Aftermath of Three Mile Island.” Similarly, Irving Shapiro’s article, “Nuclear Option,” states, “By any comparative standard, nuclear power is surely one of the safest bets we could make. It may prove to be less hazardous than the use of coal-fired plants.” The accident had a powerful impact on public opinion and was a major contributor to the stagnant global growth of nuclear power in the decades that followed.

Other interesting articles from the year’s issues discuss geothermal energy, wave power, oil shale, and the economic impact of federal mining regulations. The April issue includes a discussion of the future of China’s oil industry in which the author points out that China’s petroleum industry dates to at least 3,000 B.C.

1990

Derek Wilson’s “Campus Computing in the 1990s: Building an Environment for People,” found in the October issue, predicts the future architecture of the campus computing environment and points out that “High speed, full function access to the campus network from faculty and student homes will become an issue for many.”

Wilson, who continues to head up information technology on campus, underscores the importance of the National Science Foundation’s work integrating the nation’s regional computer networks, which had grown organically during the ‘70s and ‘80s. In what may be the first reference to the term “Internet” in *Mines* magazine, Wilson explains, “The NSFNET and the regional networks create the Internet, an international ‘network of networks.’” He points out its reach by recounting how a professor kept in touch with campus over the network using “electronic mail” during a recent semester in Holland.

The May issue features a story about tunnel construction that was part of extending I-70 through Glenwood Canyon—the last stretch of highway needed to complete the Interstate Highway System as originally conceived. The company building the tunnels, Frontier Kemper Constructors, was founded by Dyke Howell ‘63 and Dan McFadden ‘63, and several alumni worked on the historic project.



2000

The magazine greeted the new millennium with features titled “Crow Native American Earns a Mines Ph.D. in Geology,” and “Colorado School of Mines in the 21st Century.” The late Robert Sorgenfrei, librarian/archivist of Arthur Lakes Library at the time, wrote a number of interesting historical essays for the magazine during the year. Two of these relate to *De Re Metallica*, the handbook for mining that was published in 1556, a copy of which is carried at the head of the academic procession at every Mines commencement. In April the school and the alumni association entered into an important new agreement to produce *Mines* magazine jointly. The first collaborative issue, which came out in August, included features titled “Smart Feet Help Diabetics Avoid Surgery,” “Students Help Develop Better Heart Valves for Children,” “Stones that Fall from Heaven,” “Visions of Africa” and “For Applied Anything, Mines is the Best.”



2010 AND BEYOND

The contemporary *Mines* magazine is a far cry from most issues published during the 20th century. The publication was primarily a source of technical information for a highly specialized group of professionals during most of that period, keeping them up to date with the latest research and technology of the extractive industries. Today, the school is a far more diverse institution, and it would be inappropriate for the magazine to publish anything resembling a technical paper.

Instead, during 2010, *Mines* reported on the careers of faculty and alumni, including a national leader in cancer research, the

former director of the NSF and the owner of an oil company who is pouring millions into philanthropy. The magazine also discussed the high number of women currently in student leadership positions and the remarkable success of the school’s various athletic programs in recent years. *Mines* also delved into more traditional topics like steel research, mine safety, capital construction and the building of the Hoover Dam bypass bridge. During

the past year the magazine, which has been online since 2007, also launched an updated website and recently ventured into audio podcasting and videos.

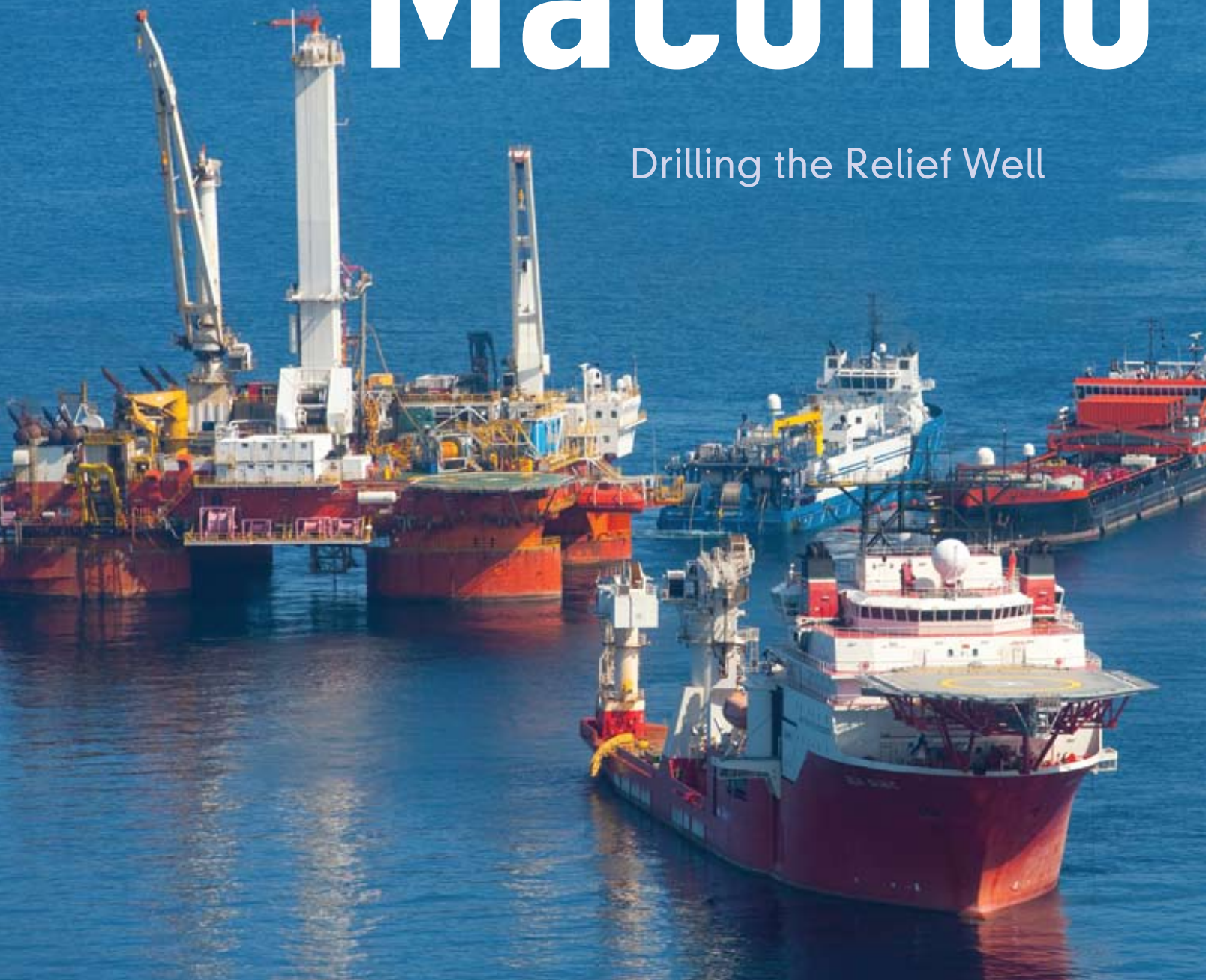
What purpose does this all serve? It’s a question open to debate, but a few things are self-evident. Colorado School of Mines matters to many. The school’s alumni, students, faculty, staff, administrators and friends constitute a complex global community of interwoven relationships and shared values. By featuring stories about their lives and accomplishments, by reporting on research and providing news about campus, *Mines* magazine fosters these connections; the publication—and the alumni association that has kept it vital for more than a century—is an integrating force for the broader Mines community, strengthening the school and enriching the lives of those it serves. It is an important endeavour, and one we look forward to continuing with another century of *Mines* magazine. **M**



PLUGGING Macondo

By Lisa Marshall

Drilling the Relief Well



In the days following the fiery April 20 blowout of BP's Macondo well off the coast of Louisiana, TV viewers across the world watched dismayed at the images of crude oil spewing unabated into the Gulf of Mexico. Their widespread reaction: feelings of utter helplessness.

Mines alumni Bill McElduff '82 and Donal Fitterer MS '88 reacted differently. "I told my 10-year-old daughter 'I have to go out there and help fix the problem,'" recalls McElduff, who watched the underwater footage with his family from his home in Houston, Texas.

As one of a half-dozen engineers in the world who specializes in drilling relief wells, McElduff soon received a one-sentence email, "Do you want to help with Macondo?" Meanwhile, Fitterer—one of three in the world who specializes in using electromagnetic ranging tools to locate wells—was summoned to the Houston offices of BP from his home in Ithaca, N.Y.

The two were old friends having worked together on numerous occasions before, but the stakes had never been so high. The next four months spent on a football field-sized drilling rig called Development Driller III was a career-defining collaboration for both. To kill the rogue well, they had to hit a target the size of a dinner plate from their floating platform three miles away. And with the world scrutinizing every development, they couldn't afford to make mistakes.

"We could watch our progress on the Fox News Channel ticker tape," laughs McElduff, an affable Southerner with a warm Texas drawl. "We all understood the implications of what we were doing."

But they were also confident they could accomplish the goal: "We never had any doubts," said the more reserved Fitterer.

The evolution of relief wells

As far back as the early 1900s, relief wells have been drilled as a last-resort cure for taming blowouts caused by fires, natural disasters or other oil-field mishaps. Initially, drillers would simply bore another vertical well adjacent to the problem well, relieving pressure from and ultimately depleting the reservoir. But that approach could take months, with oil continuing to spill.

In 1934, after a massive blowout



Donal Fitterer (left) and Bill McElduff collaborating on another project in March.

created a lake of burning oil near Conroe, Texas, engineers took a different approach to tame the gusher. They developed survey techniques and directional drilling tools to intersect the problem well from an angle. They then pumped water in to kill the flow of crude. The new tack was a success, and the directional drilling industry was born. In the late 1980s, electromagnetic ranging tools and processes were developed and incorporated into the modern relief well drilling techniques.

Since then, advances in both surveying and directional drilling technologies have enabled an elite squadron of specialized troubleshooters to kill rogue wells around the world from a safer distance and far faster than they once could.

As a relief well engineer for Boots and Coots—considered the go-to company for out-of-control oil and gas wells—McElduff has made his office everywhere from the blazing-hot Syrian desert to the wind-ripped Mauritanian Sea, spending roughly 10 months a year away from home.

As a wireline engineer, computer programmer and ranging specialist with technology pioneer Vector Magnetics, Fitterer has helped tame more than 20 problem wells, from a blazing blowout in the oil fields of Bangladesh to a hurricane-damaged underwater gusher off the coast of Egypt.

He's quick to point out that the president of Vector Magnetics, Rahn Pitzer '87, is also a Mines grad, and says it's no coincidence that the school churned out three leaders in such a specialized, pressure-cooker field.

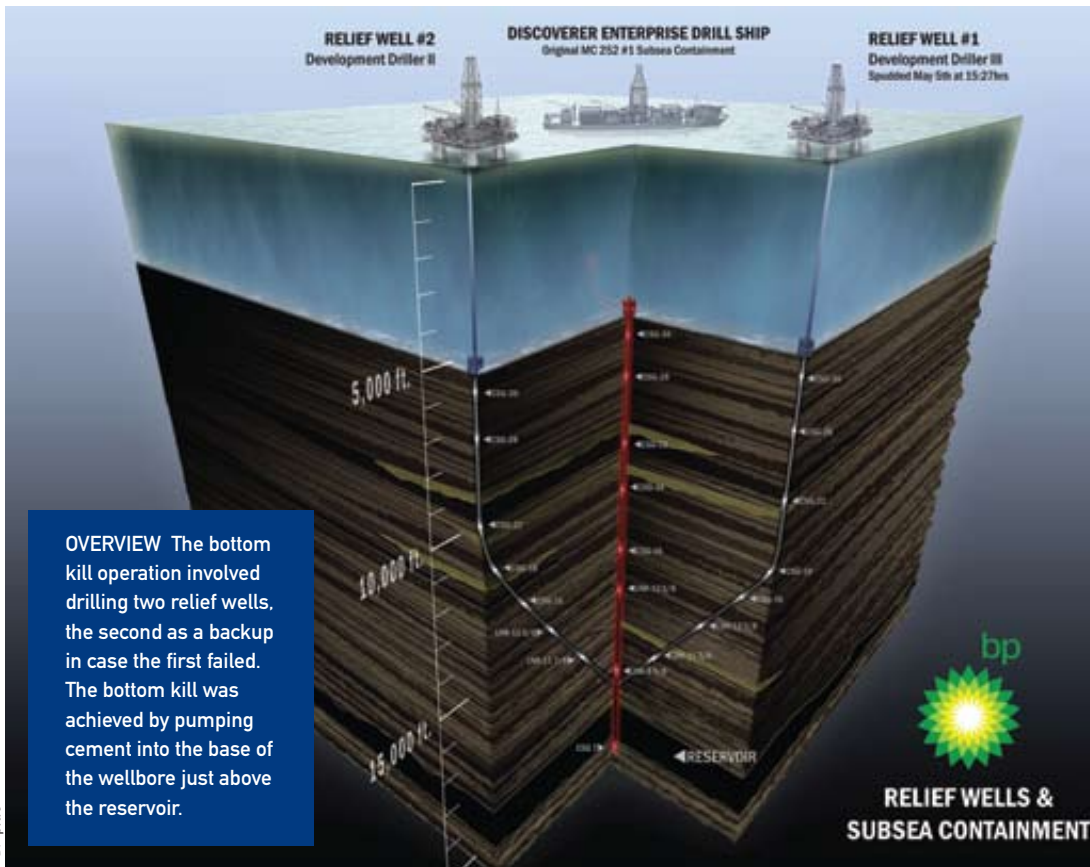
"The number one thing I learned at Mines was the ability to focus on exactly what needs to happen to get the job done," says Fitterer. "They are very big on giving you too much to do, so you have to make a decision as to what is most important. That prepares you for the type of work we do."

A national emergency

Graduating six years apart at Mines, McElduff and Fitterer never knew each other at Mines, but their interdependent skills have brought them together on jobs repeatedly. The two were just wrapping up a routine drill on a rig 30 miles off the coast of New Orleans when the tragedy on the Deepwater Horizon began to unfold.

"We could see the glow from the fire and we knew there was an emergency," says McElduff. "We figured we'd be on it sooner or later."

The April 20 fire that killed 11 men and triggered the largest off-shore oil spill in U.S. history prompted a relief response that many have likened to the D-Day armada. More than 8,044 vessels carried



OVERVIEW The bottom kill operation involved drilling two relief wells, the second as a backup in case the first failed. The bottom kill was achieved by pumping cement into the base of the wellbore just above the reservoir.

47,848 responders into the gulf, shadowed by a phalanx of media who commenced tracking every move of those the world was counting on to plug the leak.

While officials from BP and the federal government worked around the clock to stem the blowout as quickly as possible, the crew of the Development Drill III rig began drilling a relief well on May 2. The bad news: It would take months to move methodically at an angle through roughly 13,000-feet of rock buried beneath 5,000 feet of water. The good news: It would provide a final and permanent solution, TV viewers were assured.

But many remained skeptical. "That's the typical response to relief wells," says Fitterer. "People don't believe you can do it until it happens."

Careful aim

For roughly six weeks, the Development Driller III bored downward in the direction of the blown out Macondo well. Then, as the drill bit drew near its target—about 300 horizontal feet—and a perfect aim became imperative, the 10-person specialized relief well team moved into place.

At its helm was John Wright, senior vice president of technology at Boots and Coots, a somewhat legendary character considered

to be the godfather of modern relief well drilling. McElduff, Wright's second in command, served as the lead directional drilling engineer. His job was to guide the bit for the final stretch. Fitterer's job was to tell McElduff where the bit was and where it needed to go—information he provided using state-of-the-art ranging tools.

"It's a bit like driving blind with somebody next to you using instruments to tell you where the road is," Wright told NPR in a September interview.

Positioning is achieved using a 300-foot-long assembly, which includes a 30-foot-long cylindrical beryllium copper tool equipped with a transmitter and receiver on opposite ends. Invented by Vector Magnetics, the device emits a current that sets up an electromagnetic field when conducted by the well casing. By interpreting data on the electromagnetic field picked up by the receiver, Fitterer can calculate the precise distance and direction to the blown out well.

It only takes him two or three hours to collect these measurements, but they must be taken every 30-60 feet, and getting the equipment into place at the extreme depths at which they were operating was a very time-consuming process: 24 hours to withdraw the drill bit; 12 hours to lower the

ranging tools, take measurements, and retrieve the equipment; and another 24 hours to lower the drill bit back into place. As a result, in the final approach, progress moved at a rate of 30 feet every 2 1/2 days.

But precision is everything in this business.

Equipped with distance and bearing to the well, as well as the drill's current orientation (determined from instruments mounted on the drill string) McElduff fine-tuned the drilling plan. Then, standing next to the driller who was seated in a futuristic control-chair complete with joystick and a complex panel of instrumentation, McElduff directed the bit's progress as it bored through rock three miles away.

Movement in the drill rig further complicated their work. "This is a floating rig, so it is moving," McElduff

says. "If the rig is moving, the bit is moving, and the rougher the seas get, the harder it is to control the bit." At one point, tropical storm Bonnie shut down relief well operations for two weeks.

Slaying the dragon

On August 4, BP officials announced that their "top kill" was holding and the flow of oil from the blown out well had stopped—for now. Their mission on board the Development Driller III didn't change. No one could predict if, or how long, it would hold. A "bottom kill" via the relief well remained the only way to permanently fix the problem.

Their work continued until, on Sept. 17, the nation heaved a true sigh of relief as workers finished pumping mud and cement down the relief well and into the base of the Macondo well.

"Psychologically, it's important for people in the gulf to understand that there is a stake in the heart of this beast," said retired Coast Guard Admiral Thad Allen to reporters that day.

How does it feel to be a dragonslayer?

Fitterer and McElduff modestly shrug off the title.

They just feel lucky they could do something to help, they say. [M](#)

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How Persistence and Hard Work Helped the Child of a Migrant Farmworker Become a Colorado Court of Appeals Judge.

By Nick Sutcliffe

When Terry Fox '89 tells groups of inner-city children to aim high, that with hard work and persistence they can achieve their most ambitious dreams, she speaks with more authority than most. She was recently sworn in as a judge of the Colorado Court of Appeals—one of the most influential legal positions in the state and a world removed from her childhood, growing up the daughter of a migrant farmworker.

Moving constantly throughout her education, it wasn't until Fox began her sophomore year of high school that she actually spent an entire academic year at one school. Nevertheless, she graduated salutatorian from Brighton High School, went on to earn a degree from Colorado School of Mines and, after attending Houston's South Texas College of Law, launched a challenging and successful legal career. As part of a continuing focus on the accomplishments of alumni, *Mines* magazine brings you this profile of Fox's life and career.

Early years

Though she was born in the United States, she actually spent most of her first eight years living with her grandparents in Mexico. However, she then returned to the U.S. with her two sisters and mother, who was determined to give her daughters an American education. Her father, who worked for a mine in Chihuahua, remained behind—Fox only saw him twice more before he died of a lung-related disease.

"We moved about every six months, through Colorado, New Mexico and Texas," says Fox. Migrating with the harvests, every new location meant a new set of faces; there was never any real sense of community. "The place we stayed the most was just one room with a kitchen area and one bed that the whole family had to sleep on," says Fox. "There was a toilet outside but no shower facilities, so we'd bathe in a 'tina' or a large bucket, warming the bath water on the stove."

Perpetually the newest girl in her class, she stopped trying to make friends with other students. Instead, she focused on academics. "I received positive reinforcement from my teachers and as long as my teachers were encouraging, I felt like school was a good place to be," she explains.

In seventh grade, she competed with the school's math team at the University of Texas at El Paso. "That's the first time I ever saw a college campus," says Fox, who was immediately entranced. "I asked a lot of questions: 'What is this place, who lives here, why do they live here, and how do they get here?'" Her teacher, Harry Segapelli, told her, "Keep up the good

grades, and you'll find a way to get back here."

"I ended up somewhere better—at Mines," says Fox, "but he planted the seed."

Leaving home

When she received the offer to attend Mines, her mother said she couldn't go. "It's so ironic," Fox remarks. "She came to this country so I could be educated here, but then she felt that a high school education was good enough. She thought I belonged at home until it was time for me to marry. For my mother, my duty first and foremost was to my family, and taking a job at a local K-Mart was, to her, an improvement from our work in the fields." Fox enrolled at Mines anyway. "We didn't see eye to eye for some time," she says.

Fox thrived at Mines. The first person in her family to attend college, she majored in chemical engineering and minored in public affairs through the McBride Honors Program. She was on the honor roll all four years; joined the honor society, Tau Beta Pi; and immersed herself in campus life, serving as president of the Society of Hispanic Professional Engineers and vice president for the Society of Women Engineers.

She also met her future husband, Jordan Fox '89, another chemical engineering major. "We had all the same classes," she says. After graduation, it didn't take them long to tie the knot: "We graduated on a Friday and were married a week later," says Fox.

They both landed jobs in Houston; Terry's was with Vista



A Determined Justice

Chemical, where she spent a substantial amount of time with the company's environmental lawyers. "The more I worked with them, the more I was intrigued by the regulatory scheme," she says.

Law

As a way of exploring this interest without giving up her job with Vista, she began taking night classes at Houston's South Texas College of Law. Before long she'd charted a new career path and was back at school full time. She was soon joined by Jordan, for whom law was already a career plan.

After remaining on the dean's list three years and graduating in the top 5 percent of her class, Terry landed a prized yearlong clerkship with the Texas Supreme Court. When that ended in 1994, the couple relocated to Colorado, where Terry spent five years working for the natural resources department of Holland & Hart. Looking for courtroom experience, she then moved on to the Office of the Colorado Attorney General under Ken Salazar, where she jumped in at the deep end—a month after starting the job she was arguing a case in front of the Colorado Court of Appeals.

Two years later she moved to the Public Officials Unit of the office, where she and two other lawyers had responsibility for representing the governor, lieutenant governor, secretary of state, treasurer and attorney general—an interesting opportunity for a graduate of the McBride Honors Program. "This gave me an opportunity to defend officials who were engaged in creating public policy for our state," she said.

It also gave her the opportunity to try cases in federal court, which, combined with her background in natural resources and her technical education, helped her secure a highly desirable post in 2004 at the U.S. Attorney's Office for the District of Colorado. "This is probably one of the most desirable legal jobs in the state, maybe even the nation," she says, when we spoke in December, shortly before she left the office. More than 800 applications were received for her job.

Reflections

There is a pattern to Fox's career progression. She's loved every job she's ever had, but she keeps moving on. "I've always had this idea that once I get too comfortable with something, it's probably a good time to take on a new challenge," she says. Holland & Hart provided an introduction to the fundamentals of legal work, while her two subsequent positions have given her ample courtroom experience. So is her move to the State Court of Appeals similarly motivated?

The answer is yes and no. The scope and responsibility of the job are greater than anything she's taken on to date, so in that respect it will be a stretch. At the same time, after living an extroverted life of a trial lawyer and a more clois-

tered existence as environmental counsel to corporations, she's opted for a middle path: time in court listening to legal arguments and interacting with attorneys, but also solitary time to reflect on the law, weigh the merits of each case and draft opinions.

Can she imagine a day when she doesn't feel challenged by her new job? "I don't know if I'll ever reach a comfort zone, because the work that a court of appeals judge does is so interesting and so varied. The legislature keeps changing statutes, so there's always going to be a new challenge and a new interest."

Looking back at her childhood, she can't pinpoint qualities that predicted a legal career. "I could always see being an engineer," she says. "If there's a scientific aspect to a case, it keeps me really intrigued. I was always like that as a child. I was always interested in figuring things out, but I never knew that the law would be a career for me."

Still in her mid-40s, Fox's career progression has been rapid, which she partly attributes to good networking. "I've always been good at keeping good professional contacts," she says. "If there was a job I was interested in, I let people know that if an opportunity ever came up, I'd be interested."

I asked her what she considers her greatest achievement, expecting her to say her appointment to the bench. I was wrong. "I think just the fact that I was the first in my family to attend and graduate from college," she says. "It has opened so many doors for me."

Perhaps in appreciation for the role Mines has played in her life, she served on the school's board of trustees for almost two years before resigning in October 2010 when her appointment created the potential for conflict of interest. She gives back to her community in many other ways, including serving on the boards of the Colorado Supreme Court's Bar Admissions Law Committee and Attorney Regulation Committee. In 2009 and 2010, she served on the Regional Selection Committee for the Truman Scholarship Foundation, and she is a member, and has served as a board member, of the Colorado Hispanic Bar Association.

She's also frequently asked to speak: She's delivered the keynote address at Mines' Continuum Celebration that honors graduating women, and she's delivered speeches to Colorado Youth at Risk and Manual Mentors Program.

She particularly welcomes opportunities to address disadvantaged youth, generally in the classroom, to whom she delivers different versions of the same message: "Just because you come from a humble background, you don't have to limit yourself. If you are willing to work really hard, you can make it."

It's a message many young people would respond to with cynicism, but not when it comes from her. As she says, "I'm not just saying it. I've actually lived it." **M**



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Patent Attorney, Principal
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1981



Doug Swartz
Patent Attorney, Principal
B.S., Mining Engineering,
Minor in Metallurgical
Engineering, 1982



Brad Knepper
Patent Attorney, Principal
B.S., Electrical Engineering,
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The Network

Restructuring for Growth

A message from John Howe, CSM Alumni Association President



Before launching into the important business prompting this letter, I'd like to take a moment to introduce myself, having only recently taken over as president of the Colorado School of Mines Alumni Association.

I graduated from Mines in 1983 with a BS in geophysical engineering, after which I obtained a law degree from the University of Colorado in 1989. I live and practice in Grand Junction, Colo., where I was initially involved with the association at the section level. I was first appointed to the board in 2005 to fill the remainder of my predecessor's term, and last year served on the association's executive committee as the president-elect.

In addition to being an alumnus, I have another important connection to Mines—as a parent. My daughter, Katharine, is a freshman studying environmental engineering, which has provided a refreshing perspective on the school. We have all seen many changes take place at Mines over the years, but having a sharpened interest of late, I'm more confident than ever that Mines' significance and reputation in the earth, energy and environmental fields remain undiminished, and I am proud that my daughter is attending.

The alumni association has changed as well. Over the time of my involvement, we have grown as an organization, offering new services, benefits and events, and we will continue to do so. However, as with most nonprofit organizations, our resources are limited. We depend on alumni support, and I encourage you to become an active member of the association.

The important business alluded to above concerns a change that has recently been made to the association's structure. For years, CSMAA has operated with a board primarily consisting of regional representatives responsible for alumni in a specific geographic area, where they help organize activities and encourage involvement with the alumni association and the school. However, while the association has members all over the world, we do not have large concentrations of members in a single region, with the exception of the Front Range and Houston areas.

To better serve alumni, we have moved to a structure in which directors will oversee critical functions of the association, such as communications, programming, professional development, support for admissions and recruiting, volunteer development, alumni recognition, campus relations, enhancement of the student experience, young alumni and development. We will strive to have these directors be as geographically diverse as our membership. In addition, the board will continue to include two student representatives (graduate and undergraduate); a director appointed by the school's board of trustees; and the association's five officers.

I'm confident that the new structure will provide a better framework for board volunteers to dedicate their energy and enthusiasm in practical ways that match their interests and skills. In time, with myriad possibilities for remote collaboration, this new structure will also open up a range of flexible opportunities for alumni to volunteer in ways that are personally meaningful.

With these changes presenting so many opportunities for growth, I'm particularly pleased to be representing you as president over the coming year. I invite your involvement and support.

Life Members

The Colorado School of Mines Alumni Association gratefully acknowledges its new Life Members, welcomed between February 1, 2010, and January 31, 2011.

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Richard S. Anderson '83
Leslie J. Armentrout '96
William R. Arnold '89
Bentley F. Badgett II '74
Timothy J. Barelli MS '09
H. George Beggs, Jr. '69, MS '77
Brooke S. Bell '80
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Nathaniel G. Brown '07
Juan Martin Bulgheroni '97
Stacy L. Carrera PhD '05
James P. Chonka '79
Robert L. Cline ME '81
Mark F. Coolbaugh '78
Derende M. Coover '91
C. Mitchell Cox '85
Alan W. Czarnowsky '75
Taylor S. Day '10
Scott A. Dickson '95
Emily L. Dunham '06
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Stephen A. '85, MS '89 and Dee W. '85, MS '90 Erickson

Marc D. Ernest '74
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Christoph M. '97, PhD '00 and Tatiana M. '00 Goss
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Laura A. Mauro '04, MS '10
Michael D. McGehee '81
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Scott E. Moravec '73
Jaime Eduardo Moreno MS '04
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James R. Weber MS '71
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J. Steven Whisler MS '84
Rachel S. Wilde '00
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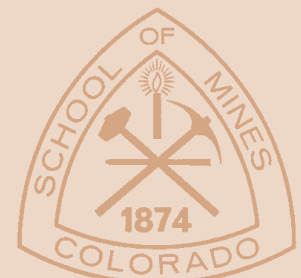
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Fast Forward

Class Notes
Weddings
Alumni Profiles
Passings

1954

Arden L. Bement, Jr. is director and D. A. Ross Distinguished Professor, Nuclear Engineering at Purdue University. (Read his interview in the 2010 fall/winter issue, available at minesmagazine.com.)

1955

Robert A. Metz is a vice president, chief geologist and director for United Mines and lives in Tucson, AZ.

1956

Charles E. Stott, Jr. is working for Brigus Gold and lives in Evergreen, CO.

1959

Dean O. Gregg is working for Miller Brooks Environmental and lives in Huntington Beach, CA.

Charles H. Reiling is owner/broker of Veritus Realty Group and lives in Bellevue, WA.

1962

Don F. Wakefield 

1963

Richard E. Baxter 

Donald W. Bennett 

John W. Peters is a senior mining specialist for Skeltt and Loy and lives in Mechanicsburg, PA.

1964

John C. Schmidt 

Barrett E.G. Sleeman is CEO for TheMAC Resources Group and lives in Point Roberts, WA.

1965

C. Jefferson Babcock is chairman for Amaxa and lives in Hampshire, IL.

Keith S. Olson 

William G. Rankin Jr. is chairman for UQM Technologies and lives in Golden, CO.

1966

Edward B. Reynolds is president of Reynolds Energy and lives in Katy, TX.

1967

Richard C. Clark is working for BND Consultants and lives in Hammond, LA.

Bob Jensen has retired and is enjoying full-time traveling in his motor home while visiting national parks, friends and classmates.

1968

Steve C. Brady is a vice chairman for GeoBiotics and lives in Skaneateles, NY.

C. M. Holmgren is a senior engineer for Gaffney, Cline & Associates and lives in Katy, TX.

1969

Jerry T. Laman is a program specialist for the state of Texas and lives in Austin.

Thomas M. Mauro is owner of Allied Consulting and lives in Denver, CO.

1970

Gary J. Colaizzi is owner of Greencell Concrete and lives in Arboles, CO.

James S. Herb is a sales and marketing manager for Michigan Wire Processing and lives in Lowell, MI.

1971

Rodney J. Eichler is president and chief operating officer of Apache Corporation and lives in Centennial, CO.

Robert F. Lucht is president of Petroleum Testers, and lives in Cheyenne, WY.

Charlie McNeil and his wife, Judy, were named 2010 Man & Woman of the Year by *The Villager*, a newspaper serving south Metro Denver. A link to the article is provided on minesmagazine.com under Web Extras.

Robert R. Roberts is risk & reliability engineer for Roberts & Roberts Risk Engineering & Management, of which he is the sole proprietor. He lives in San Diego, CA.

Robert W. Wiley is a head of research for Apex Spectral Technology and lives in Sugar Land, TX.

1972

Christopher H. Cox 

David L. Frederick is working for Garnett Corporation and lives in Tulsa, OK.

Thomas J. Holloran is president of ICT Economics and lives in Parker, CO.

Michael G. Long 

William J. Ruppert, Jr. is president of Ruppert Comann Associates and lives in Centennial, CO.

Oral D. Staman is a team manager - planning & requirements group for the Federal Aviation Administration and lives in Bellevue, WA.

Thomas A. Watkins is an exploration manager, USA for Entree Gold (US) and lives in Houston, TX.

 denotes an individual who has recently posted photos on minesonline.net

Weddings



H. Scott Bromley '09 and **Jaime L. Thorpe '10** were married on November 6, 2010, at Washington Park United Methodist Church in Denver. The ceremony was followed by a reception at Mount Vernon Country Club in Golden. In attendance were 27 Mines alumni and 19 current students. The couple now resides in Houston, TX.



Samantha Bauer '06 and **Brandon Richardson '07** were married on September 20, 2008, in Estes Park, CO. Seven Mines alumni were in the wedding, including **Gary Bauer '74**, father of the bride. Many other Mines graduates attended.



Christopher Howard '07 and **Brandy Laudig '08**, **MS '09** were married on April 24, 2010, in Las Vegas, NV. Many Mines alumni and students were in attendance. The couple honeymooned at Machu Picchu in Peru and shortly thereafter settled down in Northglenn, CO.



Adrian Sikorski '01 and **Alix Hardy** were married on November 20, 2010, in North Adelaide, Australia. Three alumni were among their international guests.



Caleb Alan Ring '08 and **Jacqueline Jayne McFarland** were married August 7, 2010, at Holy Ghost Catholic Church in Denver. Five alumni served as groomsmen and several others were in attendance.



Benjamin Zapp '08 and **Katie Johnson** were married on September 18, 2010, at the Calvary Episcopal Church in Golden, with the reception following at The Golden Hotel. The couple now resides in Golden.



Sara Eickelman '09 and **Christopher Eklund '09** were married in Golden at St. Joseph's Catholic Church on October 23, 2010. Their reception was held at Fossil Trace Golf Course.

To include your recent wedding in *Mines* magazine, email details to magazine@mines.edu, and include a selection of high-resolution digital images.

1973

James L. Green is a project engineer for Rocky Mountain Arsenal and lives in Thornton, CO.

Carl M. Jensen is a consulting chemist for Jensen Technologies and lives in Golden, CO.

David M. Schwartz is a vice president of sales for Geomage and lives in Houston, TX.

Gregory K. Staff is a vice president for Babcock Eagleton and lives in Cypress, TX.

John M. West is working for Pajarito Scientific Corp. and lives in Arvada, CO.

1974

Gary L. Bauer is a senior vice president, operations for Northern Offshore and lives in Lakewood, CO.

Charles A. Dowdell is a program administrator for City of Waco Solid Waste Services and lives in Fort Worth, TX.

Ronald D. Drake is a senior program manager for EPC Consultants and lives in Arroyo Grande, CA.

Robert C. Koltz is a senior process engineer for Bechtel Group and lives in Longmont, CO.

C. Brock O'Kelley is a technology director for Molycorp Minerals and lives in Golden, CO.

1975

Robert J. Green is manager - production for BHP Billiton Petroleum and lives in Farmington, NM.

Frank J. Koss is working for Hewlett-Packard Company and lives in Plano, TX.

Richard D. Rein is a study manager - Jansen Project for BHP Billiton Petroleum and lives in Evergreen, CO.

Rodney W. Roberts is a resource manager for Halliburton Energy Services and lives in Missouri City, TX.

S. Arthur Stewart is Denver manager of engineering for New Tech Engineering and lives in Littleton, CO.

1976

Steven R. Gasser is a smelter manager for ASARCO and lives in Oro Valley, AZ.

Michiel J. Hanou is an earth sciences lead/consultant for Chevron and lives in Lafayette, LA.

Andrew T. Hunter is a research program manager for H. R. L. Laboratories and lives in Woodland Hills, CA.

Alumni

Fast Forward

David Stuart has retired from Husky Energy and is now living in Peachland, BC, Canada.

Richard P. Wilson, Jr. is working for Wilson Metallurgical Labs and lives in Webster, TX.

1977

Bruce K. Clements is president - Cerro Verde for Freeport-McMoRan Copper & Gold and lives in Prescott, AZ.

Andrea T. Hart is a project manager for Nemont Telephone Cooperative and lives in Billings, MT.

Steven C. Phifer is an environmental engineer for Springfield Coal Company and lives in Cypress, TX.

Michael D. Pope is a construction engineer for Los Alamos National Laboratory and lives in Santa Fe, NM.

Michael E. Ward is gulf coast operations supervisor for Pierce and Petersen Company and lives in Katy, TX.

Thomas W. Windle is a senior software engineer for Terrago Technologies and lives in Berkeley Lake, GA.

1978

Tariq I. Ahmad 

Michael L. Gamblin is president of Cambridge Resources and lives in Oak Ridge, TN.

Brady J. McConaty is president of Tabula Rasa Energy and lives in Houston, TX.

Juan C. Rodriguez-Ovejero is an SHE regional manager for DuPont Company based in Aviles, Spain.

Frederick N. Williams is a fuel engineering manager for ZionSolutions and lives in Rowe, MA.

1979

John W. Childers is an independent contractor for Golden Gate Graphics and lives in Lone Tree, CO. 

Raquel Omaira Diaz is manager, oil marketing for Alberta Department of Energy based in Calgary, Canada.

Robert R. Griffee is an operations manager for CrownQuest Operating and lives in Farmington, NM.

Marcia Keefer 

Gene D. Krist is president of CFM Company and lives in Littleton, CO.

Laurence G. Martin is a chief geologist for Comstock Mining and lives in Sparks, NV.

Andrew J. O'Connor is a principal for Fargo Lane and lives in Irvington, NY.

Bruce R. Rogers 

1980

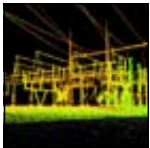
Clifford N. Coury is a senior vice president and senior investment management consultant for Morgan Stanley Smith Barney and lives in Salt Lake City, UT.

Jeffrey B. Jennings is a geological engineer/economist for Harris, Brown & Kelmer and lives in Bismarck, ND. 

Alan B. Ketcham is a project supervisor for AtMALL Corporation and lives in Colorado Springs, CO.

Timothy W. Lyons is a professor of biogeochemistry for the University of California - Riverside and lives in Riverside, CA.

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Profile

Imparting His Passion for Bikes, and a Whole Lot More

“When a kid has a bicycle ... it’s liberating, it’s freeing,” says Dick Banks ’53, who has devoted a lot of time over the last 15 years to giving kids bicycles.

In 1996, working through First United Methodist Church in Tulsa, Okla., he and some friends established the Bike Club at the nearby Eugene Field Elementary School, situated in a relatively high-crime neighborhood near the church.

Twice a year, in the fall and the spring, Banks leads a weeklong program that begins with about 20 students picking used bikes he has repaired. The students, who either cannot afford bicycles or have lost them to theft, also receive new backpacks and helmets.

Those who follow Banks on a series of five daily rides of up to 15 miles, learn the laws for cyclists, and come to grips with basic safety and cycling etiquette are allowed to keep the bikes and riding gear. “You give a kid a bike or you give a kid 50 bucks, and there’s not the respect for it that there is if that child has earned the bike,” says Banks. “There’s a great amount of pride and a feeling of accomplishment.”

At Banks’ home, used bicycles are stored in a garage workshop. On the kitchen table is a tool he uses to straighten wheels. “I love to fix bikes,” he says. “I love to get bikes that are in rough shape and fix them up and then see those kids ride them.” Cash donations and bikes come from church members and bicycle shops. Sometimes, Banks finds bikes left on the patio at his home.

“My wife is the real hero in this. She puts up with all the bikes and mess,” he says.

The Bike Club program is open to fourth and fifth grade students, who must apply and be approved by their teachers. “There’s a lot of bad stuff going on and there’s a lot of mean stuff going on,” Banks says. “But they can rise above it, and I think I can help them rise above it.”

The rides take place on park trails along both sides of the scenic Arkansas River. “It’s like a little bit of freedom, because we get to just get away,” says Tatyana Pizana, 10.

At the end of the session, students compete in races and attend a pizza party—and get T-shirts, award certificates and words of praise. “At home, they do not get a lot of encouragement,” says Banks, who has two sons and seven grandchildren of his own.

School Principal Cindi Hemm sees a difference in students who participate in the Bike Club. “Their attendance increases.



Courtesy of United Methodist Church

Their fitness ability increases. Their awareness of their community increases,” she says.

Third-grader Donovan Williams says he had a bike before, but it was stolen from his home. He’s looking forward to riding to school with the bicycle he received from the Bike Club. “I’m going to care about it a lot,” says Williams.

When he’s not riding and repairing bikes, Banks keeps things ticking along at the business he founded 42 years ago to provide exploration software and consulting to the energy industry. “One megabyte of memory on a mainframe cost \$1.5 million back then,” he laughs.

Banks graduated from Mines as a geophysical engineer. During his education, he worked at Foss Drug, which closed several years ago after 94 years of operation. “Heinie Foss is the Bike Club’s largest financial supporter,” says Banks, who is a cousin of Foss.

After graduating, Banks spent two years in Okinawa at the tail end of the Korean War. When he was discharged, he returned to school to earn a master’s in petroleum engineering from the University of Texas at Austin.

He may have a business to run, but these days Banks leaves plenty of time for working on or riding bikes, a hobby that is clearly keeping him fit. “Oh, 25 or 50 miles would not be a problem,” he says. “You hit a pace and you stay with it.”

And leading the young riders keeps Banks young at heart as well. “I am 79, but not when I am on a bike ... When I’m on my bike,” he says, “I’m 18 again.”

—John Gordan, reprinted courtesy of the United Methodist Church

Alumni

Fast Forward

Ronald H. MacDonald is an agent for Cali Williams Real Estate and lives in South Jordan, UT.

John T. McCarthy is a vice president of operations for Comet Ridge Resources and lives in Castle Rock, CO.

Jane M. Obradovic is working for Baker Hughes and lives in Houston, TX.

C. Linda Slater is a geologist for Stone Energy Corporation and lives in Morgantown, WV.

Richard P. Smiley is drilling manager for Quantum Resources Management and lives in Spring, TX.

Danny M. Stone is a Rockies drilling manager for QEP Energy Company and lives in Westminster, CO.

Bryan P. Vaughn is president of Pro-Tec Coating Company and lives in Findlay, OH.

Catherine V. Woldow 

Mark A. Wolf is a nuclear compliance director for Honeywell Specialty Materials and lives in Paducah, KY.

Editor's Note: Alumni from classes 1981 to 2010 who have recent updates online or have uploaded photos to minesonline.net over the last six months are listed below. In addition, all class notes published in *Mines* magazine in the last four years are available on the site. When you visit, take a few moments to enter your latest information and upload some photos—we'll then list you here in the next issue of *Mines* magazine.

Instructions for viewing class notes and photos online

If you have never logged in to minesonline.net:

1. Go to minesonline.net and click the red "First Time Login" link at the top right of the homepage.
2. Enter your name and select the green circle next to your record (if your name appears twice, select the record that lists your degree).
3. Enter your authenticator ID. (Printed above your name on the back cover. Can't find it? Email CSMAA@mines.edu.)
4. Create your username and password, then confirm/correct contact information on the subsequent pages.
5. Click "My Stuff" tab and select "Class Notes" to begin your search.
6. To view photos, you may need to click on the individual's hyperlinked last name when you arrive at the class notes results page.

If you have previously completed first time login:

1. Click the red "Login" link at the top right of the homepage.
2. Enter the username and password you created for yourself.
3. Update information if necessary. Go to #5 above.



Have a smartphone with a QR reader app installed? If so, this code takes you directly to My Stuff.

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1981


Leland D. Cress
Edwin E. Downer, Jr.
Clinton L. Harman
Jere B. Harper
Steven E. Irminger
Laura S. Klein
Don R. Ledbetter 
Michael G. Malsam
Folorunsho K. Ojebuoboh
Donald G. Porterfield
Michael L. Ruggiero
George Taniwaki
David R. White
Scott C. Zifferer

1982

Timothy A. Berg
Lynn Boone Henry 
Dennis A. Caruso 
M. David Cloutre
Scott W. Fromme
James K. Jones 
Todd M. Lasnik
David W. Marcum
Ronald L. Miller 

1983

Kristi M. Accarrino
Bryan W. Bachman
Gregory A. Bruce
Susan M. Buller
Mark C. Canfield
Richard M. Cieslewicz
Tye R. De Mass

Douglas A. Donato
Joel A. Eacker
Charles E. Edmund
Celia McMullen Hadden
Byron E. McLendon
Carey L. Russell 
Gary J. Sanchez
Lee T. Shannon
Michael A. Teel
Diana L. Visser
Ronald J. Wood

1984

William H. Dears
Michael James Glen
Michael S. Haynes
Michelle P. Ingersoll
Edward C. Kilduff
Jeffrey P. Lee 
Rodney A. Montney
William C. Sanstrom
Bret R. Siepman
Gregory Norman
Smallwood
Michael L. Stewart
Gregg A. Tripp
Jeffrey K. Warmann
Brenda J. Wolfe

1985

Elden L. Altizer
Sallie L. Blake
Casey A. Brown
Paul C. Docherty
Michael P. Kozak
Michael N. Mears

Cynthia M. Pascua
James M. Thorson
George H. Wayne, Jr.
Robert F. Woods

1986

Richard A. Alexander
Stephanie E. Benjes
Gregory B. Cederstrom
Patrick F. Daniels
Lewis D. Dennis 
John W. Felten
Peter C. Gillis
Thomas Goebel 
Eric S. Isaacson
Timothy M. Marsh
Commander Eric J. Martins
Lyal D. McCormack 
Gregory E. McIntosh
Julee A. Nugent
Oscar E. Orihuela
John T. Pinckney
Heidi Linch Reynolds
Earl B. Wolfe
Michael E. Wotovitch
William D. Yearous 

1987

Kelly P. Coleman
Peter C. Dillingham
Gordon L. Fellows
Troy A. Hofer
Clay L. Hoes
Nancy J. Lynch
Todd M. Pottorff
Paul E. Seyler

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Pamela L. Spath
Mike C. Wood

1988

Grant J. Bayless
Timothy M. Deignan
Andrea J. Gallagher
Rolando Grebe
Brian K. Johnson
Christian S. Kendall
Mark B. Kuettel
John E. Larson
Gary J. Lundberg
Gerald R. Mendez
A. Scott Moore
Erin J. Nelson
Brian P. Shea

1989

Geoffrey M. Arbogast
William R. Arnold
Scott E. Biagiotti
Dino A. Domenico
Terry Fox
Peter T. Hutchinson
Betsy L. LeaRussa
Paul McElligott
A. Peter Schipperijn
Michael J. Young

1990

Michael M. Davis
Bill R. Hanson
Stephen W. Miller
Kenichi Murakami
Timothy L. Sullivan
Shawn D. Young
Salah A. Zugail

1991

Wendy E. Cowley
Brad A. Davis
James H. Ruble III
Trey White

1992

Christopher E. Elmer
David C. Haines
Cynthia C. Hoppe
Matthew H. Main
Victor T. Massey
Keith Eugene Miller, Jr.
George E. Ogden III
Penny J. Pettigrew
Robert E. Poirrier, Jr.
Rick V. Rosser, Jr.

1993

David J. Anderson
Leslie A. Baski
Mark R. Gwaltney
Richard P. Lane
Robin Simmons
Russell E. Stands-Over-
Bull
Bradley B. Williams

1994

Gillian H. Cain
Scott K. Pozder
Corey F. Hartwig
Robert Patlovany

1995

George D. Langstaff
Mark E. Maloney
Jeff S. Piquette
Hatem Rakrouki
Brian C. Wiesner
Norio Yuki

1996

Andrew D. Aichlmayr
Diana K. Anderson
Ramon C. Bargas
Gary R. Campbell
Miguel A. Contreras
Darvin H. Jones
Kendra L. Lema
Diana Light
Anjali K. MacDonald
Gloria J. Philpott
C. Jason Pinto
Craig T. Sakata
Raul D. Varela
Christina R. Vessely

1997

Richard A. Ernst
Scott L. Foss
Christopher M. Gilbert
Karen E. Harris
Megan L. Keefe
Fernando A. Menendez
L.
Matthew Sarles
David M. Scobel
Michelle J. Shah
Scott E. Sheely
Jason M. Tracewell
David B. Wait
Dale A. Znamenacek

1998

Matthew Todd Anderson
Thomas P. Cawley IV
Joseph A. Dodds
Michael P. Dolan
Michael D. Fields
Toby J. Harkless
James C. Harr
Jonathan P. Jaffe
Raul E. Lema
Ronald R. LePlatt, Jr.
Robert W. Potter
Frederick S. Wegert

1999

Robert D. Clark
Abraham M. Emond
Corinna A. Fenton
Daniel J. Grunwald
David R. Hammond
Samuel B. Johnson
Aaron M. Martinsen
Edward J. McDonald III
Thomas H. Phare
Raphael R.G.M. Pieters
James A. Plutt
Matthew J. Showalter
Michael D. Spruiell
Nathan A. Wanstrath
Russell S. Wurth

2000

Pedro L. Alonso Lopez
Magdalena Boogaard
Jason A. Brucker
Capt. Joseph I. Gilbert
Nathaniel P. Graf
Grant W. Kaster
Mark C. Moon
Nickolus R. Pigott
Christophe G.P. Ponsart
Lia N. Sedillos
Jacob W. Shumway
Christian J. Sutton
Jafar Tabaian
Matthew J. Willeford
John D. Zeise

2001

Jacob J. Benson
Jonathan E. Buczkowski
C. Kirk Craig
Christopher D. Edwards
Brian K. Hayden
Burt A. Holland
Clinton M. Johnson
Nathan M. Mascarenas
Galín W. Nelson
Paula A. Oransky
Michael T. Seman
Channing L. Sparks
Merle J. Van Houten
Nathaniel R. Walker
Kevin M. Walters

2002

Marco I. Alvarez-Bastos
Jessica J. Della Croce
James R. Hawbaker
Kevin C. Janowski
Anna R. Merritt
Scott A. Merritt
Anthony M. Phillips
Leslie A. Piggott
Anders D.C. Rasmussen
Lora B. Saeler
Ryan D. Waterbury

2003

Danny D. Allen, Jr.
Christopher M. Bradley
Matthew H. Budin
Justin H. Carlson
Brian McCauley
Patrick E. Mohr
Douglas R. Morris
Julia D. Oakes
Shawn P. O'Keefe
James Robert Oltmans
Adam J. Pennell
John H. Pfahl
Rebecca R. Rasmussen
Adam C. Rowe
Timothy S. Sorensen
Kathryn H. Soto
Drake A. Tilley
Mark R. Williams
Hector A. Wills

2004

Alfred T. Aird
James D. Biren
Jamon D. Bowen
Jose L. Caceres



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 Jason D. Gibbs
 ComTony Hahn
 Nathan P. Hart
 Heath R. Kirin
 Richardo Labo Fossa 
 Johnny Lee
 Richard J. Parker
 Jarred Z. Tarkington
 Angela K. Yoshino

2005

Justin D. Anderson
 Benjamin Z. Anglen
 Lars-Erik Boehnke
 Michael W. Breon
 Kathryn Kangas Carney
 Nicholas D. Fetig
 Matthew D. Hermsen 

Brandy Howard 
 Lon A. Hutt 
 Sahar A. Idwan
 Candra H. Janova
 Nicolas G. Jonard
 James E. Kopp
 Blake E. McMullin 
 Christopher W. Mielke
 Andrew M. Montano 
 ChangSoo Moon
 Michelle A. Moorman
 Rebekah Mullen
 Christopher E. Schneider
 Piers T. Wendlandt
 Christine White
 Andrew T. Zimmerman

2006

Edy M. Barillas
 Tiffany D. Burton 

Sean T. Cavanagh
 Andrew N. Cavendor
 Stephanie L. Cook
 Theodore J. DeKowzan 
 David L. Graham
 Scott M. Greenburg
 Ronald Gutierrez 
 Piper L. Howell
 Eric R. Hower
 Donald Lee Keck II
 Jennifer E. Leisch
 Jennifer M. Livermore
 Matthew E. Mientka 
 Jason K. Millheim
 Sammy R. Nelson
 Aaron J. Oakley
 Rachel R. Stecklein
 Austin A. Wagner
 Phillip P. Zelenak

2007

Abdulaziz M. Alfakhri 
 Laurie R. Derrick
 Richard M. Diaz
 Daniel M. Frary
 Heather N. Frenier
 Matthew P. Hergert
 Joel W. Longtine
 Haley M. Martinez
 Ryan T. Mills
 Jonathan K. Nahil
 Lawrence D. Nemetz
 Melanie A. Peddle
 Christopher M. Seick
 Lindsay A. Seick
 Daniel K. Steele
 Nikolas A. Sunde
 Desiree T. Wentland

2008

Luis A. Agapito Tito
 Breanna L. Alexander 
 Sean M. Brune
 Teresa Lynn D'Eletto
 Alexis G. Dobrinen
 Joel N. Duenow
 Andrew S. Gerlings
 John W. Grubb
 Adam M. Hanna 
 Dustin R. Jabin
 Jason C. Kaufman
 Brent A. Koren
 Joshua M. Lau 
 Mariya Lein
 George C. Luzniak Jr. 
 Roberta D. Martinez-
 Hernandez
 Alvaro M. Montenegro

Profile

Retiring to a Second Career

You're 60 years old. You've had a successful engineering career, spanning four decades and several continents, and you are retiring as president and chief operating officer of a mining company with a thousand employees. Businesses are clamoring for your expertise as an independent consultant, and job offers come in from South America and Africa. What would you do next?

Finding himself in just this situation, John Grubb PhD '08 decided to go back to school, earn a doctorate and fulfill a long-term goal of teaching future mining engineers.

A 1969 graduate of Virginia Tech, Grubb began teaching at Colorado School of Mines when he enrolled in the doctoral program in 2006. His mining engineering courses were so successful that he was asked to stay on as an adjunct professor after he graduated. He accepted the job, but, after weighing the salary against other tax considerations, he took the position as a volunteer.

"My industry was very good to me," Grubb says, simply. "Now I want to give back."

He's now teaching classes in mine ventilation, coal mining methods, mine management and mineral resource development. Holding a PhD is important for his credibility, but Grubb's greatest resource in the classroom is his experience.



Chris Peters/Peters Photography

During his 40-year career, he's managed more than two dozen mines and overcome countless challenges. At a copper and gold mine in Papua New Guinea, he prevented closure by solving some complex environmental problems; and when he realized a Zimbabwean mine was simply too dangerous to operate, he made the tough decision to close it down.

Students value the wealth of experience he brings to the classroom: "He drew on his own real-life experience to put together detailed scenarios of what they might encounter. I use some of the principles I learned from him every day in my current job," says Brandon Sullivan '09, a former student who now works as a mining engineer at West Elk Mine in Somerset, Colo. "He prepared me better for entering industry than any other professor at Mines. Any time I had a question, he had an answer."

While Grubb brings the real world to students, he also brings students to the real world, organizing and paying for numerous student field trips. "Being in a mine is part of the education of a mining engineer," says Grubb.

"To actually see what we were learning about, that was huge for a lot of students," says Sullivan. Grubb and his wife have also donated some new equipment to the mining engineering department, providing students with access to state of the art technology.

Lizeth Chamorro, a graduate student in mineral and energy economics who worked for nine years in the mining industry, says Grubb's course expectations are high but rewarding.

"The fact that he doesn't take money to teach... he just wants to share his life experiences," Chamorro says, "I think it's really remarkable—and really valuable."

Henry V. Mowry 📷
 Connor J. Moyer
 Laura E. Nicholas
 Michael Phillips
 Amanda Schulte
 Danielle R. Sheffield
 Ivayla M. Tomova
 Brandon M. Turman
 Daniel I. Welsh
 Wentz R. Wensel
 Benjamin N. Zapp

2009

Ahmed A. Alsaleh
 Alex S. Bentz
 Don A. Burton
 Arianne Dean
 Cesar E. de la Riva
 Espinoza

Megan E. Freienmuth
 Matthew R. Harris 📷
 Sean P. Harvey
 Brittney L. Blake Hyden
 Jared D. King
 Kaitlin J. McGovern
 Luca Morandi 📷
 Jaclyn J. Raskay
 Joseph A. Ricotta
 Yegor G. Se
 Daniel B. Seaver
 Mark L. Wiley
 Bryson D. Wolfe

2010

Jason K. Alden
 Masab Algannas
 Ahmed AlZayer
 Marilou A. Canon

Beng Soon Chuah
 John C. Claus
 Jessica L. Craig
 Emilyyanne Dalton 📷
 K. Daniel Kite
 Jacqueline S. Lagen
 Barrett A. Lavergne
 Michael P. Marlow
 Anthony J. Montalvo
 Austin J. Powell
 Megan E. Reimer
 Aaron M. Swift
 Michael T. Tedeschi
 Arthur C. Wardlaw III

2011

Joseph R. Zeimen 📷



On October 30, 2010, a group of 23 alumni from classes 2001 to 2004 who are former members of the Fellowship of Christian Athletes club gathered in Evergreen, Colo., for a reunion. A list of attendees is provided on minesmagazin.com under Web Extras. 📄



Sarah Bisque '10, who has a father, two uncles and a grandfather who attended Mines, had an unexpected guest at her graduation party in December.



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Passings

“Like a bird singing in the rain,
Let grateful memories survive in time of sorrow.”

—Robert Louis Stevenson



RALPH E. ANDERSON '52 of San Antonio died on August 6, 2010. Ralph was born in 1930 in Richmond, Ill., and attended Richmond-Burton High School. A member of the Blue Key International Honor Society, he graduated from Mines with a professional degree in petroleum refining engineering before embarking on a 41-year career

with Amoco. His first job was for Amoco's Research & Development Department in Whiting, Ind., after which he moved into marketing and refining. He held positions in Chicago, New York, Australia, Singapore, London, Zaire, Iran, Taiwan and Papua New Guinea. In 1993, Ralph retired as president of Amoco Chemicals Far East, having previously served as general manager of mining for Amoco Corporation, president of China American Petrochemical Company (an international business venture of Amoco) and vice president of administration for Amoco Minerals Company. In his retirement he enjoyed oil painting, woodworking, gardening, golf and fly fishing. Ralph is survived by his wife, Margaret; son, Douglas; two daughters, Christine and Ardella; and five grandchildren.



JOHN "JACK" POWELL BABCOCK, JR. '45 of Rialto, Calif., died on March 14, 2010. Jack was born in 1923 and grew up in Paris, Ill. A member of Beta Theta Pi, he graduated from Mines with a professional degree in petroleum engineering before serving in the U.S. Navy as an electronics, radio, radar and sonar technician. After being

discharged, he worked as a civil engineer for the highway department in his hometown of Paris, but soon moved on to start his own business, Techicraft, designing and installing television antennas, and signal distribution and high fidelity systems. In 1950 he married Ruth McKinzie. The couple moved to California in 1955, where they settled in Rialto and Jack began a 42-year career with Lockheed Aircraft Service in Ontario, Calif. An electronics aerospace engineer, he contributed to the design of numerous military and commercial aircraft, but was particularly proud of his contribution to the hospital configuration of the C-130. In the 1980s he was selected to serve on a team that assisted with the design of a personal jet for King Hussein I of Jordan, who Jack met. He retired in 1997 when Lockheed closed its Ontario operation. Known for his integrity, honor and devotion to his wife and family, Jack was predeceased by his wife after 52 years of marriage. He is survived by two daughters, Melinda and Pamela; three grandchildren; and three great-grandsons.



REAL JOSEPH BALTHAZAR '62 of Mammoth Lakes, Calif., died on August 21, 2010. Real was born in 1932 in Albans, Vt., close to the Canadian border, where he grew up with his two sisters and his mother during the Great Depression. His father died in 1937. Drafted to serve during the Korean

War in 1950, Real actually served in Europe as an interpreter because of his fluency in French. In 1953, he joined the merchant marine as a seaman on the Great Lakes until 1958 when his captain persuaded him to go to college. He was 26 when he enrolled at Mines and began work on his degree in metallurgical engineering. Real went to work in the California aerospace industry with Sargent Air Rite Aerospace Company and served as a titanium expert on the Apollo program. In 1979, he moved to Hughes Aircraft Company where he focused on failure analysis before transitioning into the rapidly growing field of computers. Passionate about skiing, climbing, hiking, biking and nature, Real retired to Mammoth Lakes in the 1990s. He is survived by his longtime friend, Suzan Carne; sisters, Mariette Moreau and Gil Marie Balthazar; and nieces and nephews in England, Texas and Vermont.



ROBERT GERALD "BOB" BRUNGER '42 of Murrysville, Pa., died on December 22, 2009. Born in 1921, Bob attended both Denver Christian School and South High School. A member of the Tau Beta Pi honor society at Mines, he met and married Alberta Ham before graduating with a professional degree in metallurgical engineering.

After working briefly for Alcoa in Denver, he enlisted and served as a naval officer in the South Pacific during World War II. One of his assignments was serving as commander of an LST, a landing ship capable of delivering a large number of vehicles directly onto a beach. After the war, Bob returned to Alcoa and was transferred to Lafayette, Ind., where he worked for many years and was active in a number of civic organizations. He was later transferred to Pittsburgh, where he was promoted to vice president. After retiring from Alcoa, he was involved in a variety of business pursuits. He developed a vacuum system for dispensing liquids that was the forebear of current medication dispensing processes. Bob was an avid tinkerer, inventor, sports enthusiast and lover of good steak. He was predeceased by his wife, Alberta, and is survived by two sons, Ronald and Robert; brother, Wilbur; sister, Barbara; three grandchildren; and longtime friend and companion, Bonnie Iezzi, and her four children and six grandchildren.



JOHN P. DAVIS '56 of Tonopah, Nev., died on January 26, 2011. Born in New York in 1934, John grew up in Santa Barbara, Calif., and attended Laguna Blanca High School. A member of the Alpha Tau Omega fraternity, he graduated from Mines with a professional degree in mining engineering and worked in the mining industry until the early

1960s. John graduated from the University of California Davis School of Law in 1972, and opened a law practice in Minden, Nev. He became a justice of the peace in Smith Valley in Lyon County, Nev. In 1990, John beat Paul Parraguire in an election for district judge of the 5th Judicial District. He was well-respected as a fair

justice; lawyers, clerks and other judges all mourned his passing. John loved the outdoors and owned a plot of land in Nye County, Nev. He also enjoyed hunting and riding horses, and could often be seen running in Goldfield, Nev., during his lunch breaks. He is survived by his friend of many years, Yvonne Jensen, with whom he shared a deep commitment.



JULIAN L. DAVIS '69 of Lewiston, Idaho, died on October 23, 2010. Julian was born in 1935 in Colorado Springs, Colo. While working alongside his father in uranium mines, he developed a lifelong interest in the mining industry. In 1952, he joined the U.S. Navy and served in the Korean War. He married Patricia Montague in 1959, and 10 years

later, now the father of four daughters, earned his professional degree in mining engineering. Julian was employed by Mapco Inc. and Anaconda Copper. One of his life goals was to mine gold in the Buffalo Hump mining area, a quest started by his father and grandfather. Julian succeeded and enjoyed many years at "The Hump." He was fascinated by Spanish and Native American languages, and also enjoyed researching his family's lineage, successfully tracing his family back to the early 1300s. Julian is survived by his daughters, Bridgette Cook, Patti Gomez, Grace Davis Lasco and Andre Johnson; his brother, Winston; and numerous grandchildren, great-grandchildren, nieces and nephews.



GLENN M. FEDDERSON '49 of El Dorado, Ariz., died on October 24, 2010. Glenn was born in 1922 in Rushville, Mo. During World War II, while serving as a navigator in the Army Air Corps, he was captured and spent two and one-half years in Germany's Stalag Luft III (POW Camp for Airmen #3), which was depicted in the films *The Great*

Escape and *The Wooden Horse*. While attending Mines in the years after the war, he joined Sigma Nu fraternity, and the Blue Key and Tau Beta Pi honor societies. After earning his professional degree in geological engineering, Glenn worked briefly for Shell Oil Company. During his 35-year career in exploration and production with Murphy Oil, he contributed to the discovery of several major oil deposits, spending 10 years overseas in England, Europe and the Middle East and rising to the role of vice president of exploration and production. A member of the American Association of Petroleum Geologists, Glenn enjoyed travel, golf and contract bridge. He is survived by his wife of 60 years, Edith; daughters, Kathryn Feddersen Vincent and Patricia Feddersen Seybold; and three grandchildren.



LAWRENCE A. GARFIELD '50 of Stewartville, Minn., died on November 11, 2010. Lawrence was born in 1921 in Canton, Ohio, and moved to Fort Collins, Colo., with his family as a young boy. He graduated from high school in 1939 and later enlisted in the Army Air Corps, serving overseas during World War II in New Guinea as a mechanic and

salvage specialist. After being discharged, he returned to Fort Collins, where he married Mary I. Aanes in 1946. The couple lived in Golden, Colo., while he attended Mines and earned a professional degree in mining engineering. At Mines he was a member of the track team. He was employed for many years as a mining engineer in Colorado, Kansas, Oklahoma and Michigan. Following his retirement, Lawrence and Mary lived in Idaho before moving to Stewartville in 1997. Lawrence was a member of Grace Evangelical Free Church in Stewartville and enjoyed drawing, woodworking and wood burning, writing, gardening and time spent with

his family. Mary predeceased him in 2006. He is survived by his daughters, Laura Jobses and Mary Linde; sons, James, Daniel and Scott; 21 grandchildren; and 10 great-grandchildren.



PHIL HALSTEAD '54 of Littleton, Colo., died on May 4, 2010. He was born in 1933 in Flushing, N.Y., and earned a professional degree from Mines in geological engineering. His specialty of integrating data from diverse disciplines resulted in his contributing to the discovery of billions of barrels of oil and trillions of cubic feet of gas in the United

States and overseas. He was employed with Chevron as a geologist and a seismic interpreter before joining Statoil, the Norwegian state oil company, as manager of exploration during the company's formative years. He assisted in Statoil's initial success of finding reserves in excess of 1 billion barrels of oil and oil equivalents. Upon his return to the United States, he provided geological, geophysical and petrophysical consultation and mapping services from his Denver-based consulting companies, Halstead Reservoir Services and Halstead Exploration. He published on the use of seismic stratigraphic techniques for reservoir mapping. Using these techniques and others, he was responsible for determining oil and gas reserves for governments and oil industry clients. Phil was a member of the Societies of Exploration Geophysicists and Petroleum Engineers as well as the America Association of Petroleum Geologists. He is survived by his wife, Sheila; son, Duncan; daughters, Kaitrin Kuchera and Megan Richardson; and six grandchildren.



OWEN KINGMAN '42 of Grand Junction, Colo., died on August 22, 2010. Owen was born in 1917 in Fort Collins, Colo. A member of the Sigma Alpha Epsilon fraternity, he graduated from Mines with a professional degree in geological engineering.

During his career, he worked in Colorado, Tennessee, New York and Utah for various companies, including New Jersey Zinc, Tennessee Copper Company, Cities Service Minerals and Bendix Field Engineering. Strong supporters of both the visual and musical arts, Owen and his wife, Margaret, were very active in their community, particularly in Scouting. Owen loved poetry and could recite a long repertoire of poems from memory. He was also the Grand Junction section president for the CSM Alumni Association. In one of his last conversations with Margaret, he said, "At 92, I have no regrets. We did what we wanted to do, enjoyed life, our family and our friends to the fullest. There is nothing that I would take back or undo." He is survived by his wife and his sons, Owen William, Richard Scott and John Edward Ellis '80.



GEORGE L. MILLER '50 of Littleton, Colo., died on April 8, 2010. Born in 1924, George served in the U.S. Army from 1942 to 1945 and was discharged as a master sergeant. A member of the Sigma Nu fraternity, he graduated from Mines with a professional degree in petroleum refining engineering. In 1946, he married Virginia Lindberg, with whom

he had five children. George worked for the Pure Oil Company for 10 years, and for UOP in Des Plaines, Ill., for 25 years. While with UOP, he lived in Japan for five years and spent six years in Saudi Arabia, where he was advisor to Dr. Abdulhadi Taher, the governor of Petromin. After leaving Saudi Arabia, George became project manager of the Solvent Refined Coal Program in Denver before it was closed for budgetary reasons. He then worked in Balikpapan, Kalimantan, Indonesia, for a year as chief engineer for Procon-

Alumni

Passings (cont.)

Pertamina on a refinery expansion project with Bechtel. At the end of his career, George taught project management courses to Saudi engineers in Saudi Arabia, Bangkok and Kuwait. He retired in 1985 and devoted himself to visiting grandchildren and traveling. George is survived by his wife of 63 years, Virginia; three sons, Craig, Todd and Dean; and daughter, Lynn.



FRANK M. MONNINGER '49 of Sequim, Wash., died on November 6, 2010. Born in 1924 in Provo, Utah, Frank grew up in Berkeley, Calif., and later moved to Denver, where he graduated from East Denver High School. He spent one year at Mines before enlisting in the Army Air Corps' 8th Air Force. During World War II he flew 30 missions as a navigator in B-17s stationed in England. Toward the end of the war, he became involved with a program to develop SHORAN, an experimental system that was designed to ensure accurate bombing during inclement weather. Experimental flights put him in Paris, France, on V-E Day. After the war, he returned to finish his professional degree in metallurgical engineering at Mines. Frank was a member of the Sigma Alpha Epsilon fraternity. He spent his entire career in the mining industry working for several companies, including a five-year post in Chuquicamata, Chile, working for the Anaconda company. Frank was promoted to president of Montana operations for Anaconda and received an honorary degree in metallurgical engineering from Montana Tech in 1973. A member of the Mining and Metallurgical Society of America and the American Institute of Mining Engineering, he also operated as an independent consultant for several years. Frank is survived by his wife of 64 years, Trella; son, Steve; daughter, Kathy; one grandson; and one great-granddaughter.



RALPH E. MUSGROVE '51 of San Antonio died on June 29, 2010. Born in 1928 in St. Charles, Mo., he graduated from Mines with a degree in metallurgical engineering and served in the U.S. Army at Edgewood Proving Ground in Maryland. After his discharge, he worked for Climax Uranium Company in Grand Junction, Colo. He also spent several years in New York City and then worked for Elcor in Midland, Texas; Braun Company in Los Angeles; and ended his career at Valero in San Antonio. He was a member of the American Institute of Chemical Engineers. Ralph is survived by his wife of 59 years, Jennie; his daughter, Karen Musgrove; one grandson; his favorite grandcat, Freddie; and numerous in-laws, nieces and nephews.




JAMES H. PITTINGER '49 of Oklahoma City, Okla., died on October 8, 2010. Born in 1925, James was an aviation cadet in the U.S. Navy and attended Cornell University. After returning from World War II, he transferred to Mines, where he graduated with a professional degree in geological engineering. James then spent 19 years with Shell Oil as a geologist, serving in a variety of roles in Oklahoma, Texas, New York and The Hague. In 1965, he was elected president of Shell Pipeline Corporation, Houston. Three years later he became president and chief executive officer of APCO Oil Corpora-

tion in Oklahoma City. He spent four years as an independent oil consultant prior to becoming president of Tonkawa Refining Company in 1977. His last position prior to retirement was president of Cyril Petrochemical Corporation in Cyril, Okla. Honored as a public affairs fellow at the Brookings Institute in Washington, D.C., James served in the U.S. Department of the Interior. He was an active member in numerous petroleum professional groups, most notably serving as director of the American Petroleum Institute, the National Petroleum Refiners Association of America and the Independent Petroleum Association of America. Mines awarded him the Distinguished Achievement Medal in 1968. James was also a member of the Westminster Presbyterian Church in Oklahoma City. He was predeceased by his former wife, Viola, in 2005, and by his longtime companion, Margaret Ann Cheek, in 2010. James is survived by three sons, James '72, Robert and Lyndon; daughter, Crystal; five grandchildren; and four great-grandchildren.



ALLAN "AL" G. PROVOST '62 of Lakewood, Colo., died on June 20, 2010. Born in 1936 in Alberta, Canada, Al dropped out of high school to work in the Canadian oil fields. He later moved to Sacramento, Calif., where he attended junior college and earned his high school diploma. At Mines, it took him only three years to earn his professional degree as an engineer of mines.

After graduation he worked for Patrick Harrison Construction in Canada. In 1964, he took a position as a project manager and chief engineer for BorTunCo Boring and Tunneling Company in Houston; a year later, he joined United Construction in Detroit as vice president and project manager. He married Christine Baer, the sister of a former classmate, in 1965. Three years later he was recruited back to Patrick Harrison Construction to help launch an American branch in Denver. Al served as vice president and general manager of the new company—Harrison Western—which would go on to become one of the most respected and well-known construction and tunneling companies in the world. In 1978, Harrison Western was acquired by FJC Lilley, Scotland's largest civil engineering and construction company. Al stayed on as president, piloting the company through a number of massive public works projects, including the Milwaukee Metropolitan Sewerage System Deep Tunnel project and a subway tunnel project for the Metrorail in Washington, D.C. In 1988, Al became the sole owner of Harrison Western as Lilley began to divest its assets. He was a member of the Mining and Metallurgical Society of America and the Society for Mining, Metallurgy and Exploration. He attributed much of his success to his Mines education and expressed appreciation by creating two endowed scholarships: the Niles E. Grosvenor Scholarship in Underground Mining Engineering and the Allan G. Provost Endowed Scholarship in Mining Engineering. In recognition of his professional accomplishments, Mines awarded him the Distinguished Achievement Medal in 1984. Al never gave up his Canadian citizenship and frequently returned to Canada for recreation and to visit family. He was an avid reader and enjoyed hunting and fishing. Al's first wife, Christine, died in 1986. In 1993, he married Sue Waters, who survives him. He is also survived by four sons, Donald, David, Douglas and Christopher; two daughters, Jennifer Provost

and Kristine Zuber; four stepchildren, Darrell Watters, Rob Watters, Kim Watters Banwart and Don Watters; and 17 grandchildren. 



WILLIAM "SUGAR" FLETCHER SHELTON '43 of Austin, Texas, died on April 14, 2010. He was born in 1921 in Denver and grew up in Canada and the United States. He graduated from Mines with a professional degree in petroleum engineering and was a member of Beta Theta Pi (president his senior year), Scabbard and Blade, Theta Tau,

Blue Key International, student government and Reserve Officers' Training Corps (ROTC), graduating as a second lieutenant in the U.S. Army. Bill was a left-handed forward on an ice hockey team and a tennis doubles champion for Mines. After graduation, he joined the Army Corps of Engineers and later the Army Air Corps. Upon graduation from fighter school, he and his squadron were sent to Lubbock, Texas, for glider pilot training. In March 1945, they participated in Operation Plunder Varsity, flying gliders that carried troops and equipment across the Rhine into Germany. After the war, Bill's petroleum engineering career began with Humble Oil in Texas and Louisiana. In 1954, he moved with his family to Caracas, Venezuela, where he worked for Creole Petroleum Corporation, a subsidiary of Exxon. He retired in 1984 after 30 years with Creole that included serving as executive secretary to the president and assistant secretary/treasurer of the corporation. While in Venezuela, Bill and his wife, Jean, were active in the North American Association, of which Bill served as president. He was an avid golfer, playing to a 10 handicap. He was also a voracious reader and considered words his pastime. Bill is survived by his wife, Jean; daughters, Amanda Allen and Lisa Jaubert; three grandchildren; and two great-grandchildren.



FLOYD LA VERN STEWART '43 of Greenwood Village, Colo., died on May 5, 2009. He was born in 1921 in Littleton, Colo. A member of the Sigma Alpha Epsilon fraternity at Mines, he graduated with a professional degree in petroleum engineering, and shortly thereafter married Dorothy Stewart. Floyd served as an aviation engineering officer during World War II before beginning his career in the petroleum industry. He worked in the United States, South America, the North Sea, Iran, Italy, the Persian Gulf, Southeast Asia and Tunisia. Before starting his own consulting company in 1977, Floyd worked for Standard Oil of California, Pure Oil Company and Amoco International. He was a member of the Society of Petroleum Engineers and a registered professional engineer in California, Texas and Colorado. Both of his sons and one daughter-in-law are Mines graduates—Collin '72, MS '77; Arthur '75; and Paula Fedec Stewart '76—all of whom survive him. He is also survived by three grandsons and one great-granddaughter. He was predeceased by Dorothy in 2004.

ing officer during World War II before beginning his career in the petroleum industry. He worked in the United States, South America, the North Sea, Iran, Italy, the Persian Gulf, Southeast Asia and Tunisia. Before starting his own consulting company in 1977, Floyd worked for Standard Oil of California, Pure Oil Company and Amoco International. He was a member of the Society of Petroleum Engineers and a registered professional engineer in California, Texas and Colorado. Both of his sons and one daughter-in-law are Mines graduates—Collin '72, MS '77; Arthur '75; and Paula Fedec Stewart '76—all of whom survive him. He is also survived by three grandsons and one great-granddaughter. He was predeceased by Dorothy in 2004.



EDWARD M. WARREN '49 of Evergreen, Colo., died on November 11, 2010. Edward was born in 1925 in Barberton, Ohio. He graduated from Mines with a professional degree in geological engineering. As a student, he was a member of the Alpha Tau Omega fraternity. Much of his career was spent working as an independent geologist and

with small oil companies. Edward was heavily involved with the CSM Alumni Association, serving on the Past President's Committee; chairing the alumni golf tournament; and serving on the board of directors as a member, director, secretary, treasurer, vice

president and president. He was also active in the Reunion Giving Program and the Reunion Planning Committee. In 1985, he received the Outstanding Alumnus Award in recognition of his work. Edward is survived by his wife of 60 years, Pat; son, David; daughters, Susan Verde and Carol Arnold; seven grandchildren; two great-granddaughters; and his sister, Ida Mae Meacham.



RONALD V. WIEDENHOFT of Littleton, Colo., died on August 14, 2010. Born in 1937, Ron taught art history at Mines and was a professor emeritus of the Division of Liberal Arts and International Studies. In addition to his teaching role at Mines, he helped close down 15th Street east of Illinois,

which bisected the area now known as Kafadar Commons. He also helped preserve the staircase in Stratton Hall when remodeling plans called for its removal. Ron earned a bachelor's degree in civil engineering from Cornell; completed postgraduate studies at Technical University in Munich, Germany; received a master of arts degree from the University of Wisconsin; completed further postgraduate studies at the Free & Technical Universities in Berlin, Germany; and ultimately completed his doctorate at Columbia in New York. From 1994 to 1995, he served as a visiting Fulbright Professor at the Technical Universities of Vienna and Graz, Austria. From 1993 to 1998, he served as the chair of the Working Party on Urban Traffic Problems, International Federation for Housing and Planning for The Hague, Netherlands. He is survived by three children and his second wife, Emily Fritz Randolph.

JOHN R. WITT '53 of Missouri City, Texas, died on April 5, 2010.

John was born in 1930 in St. Joseph, Mo. At Mines he was a member of the Sigma Alpha Epsilon fraternity and graduated with a professional degree in metallurgical engineering. He was called "Dick" while at Mines, but returned to using "John" after his military service. He worked for Caterpillar after graduating and spent 21 years in the Army Corps of Engineers with the rank of lieutenant colonel. John served at six duty stations in the United States, earned a master's degree in civil engineering at Texas A&M in 1960, and served from 1964 to 1967 on the Reserve Officers' Training Corps (ROTC) staff at Mines. He served three duty assignments in the Mediterranean Division, advising local military in Iran, Pakistan and Saudi Arabia, and he served one tour in Vietnam. After retiring from the military in 1975, he worked for Union Carbide in Connecticut and Houston as a project manager, and then joined Eltech, a start-up manufacturing firm, as chief engineer. He is survived by his wife of 50 years, Jeanne; son, Jack; daughters, Katy Cox, Libby Witt and Peggy Ballard; and four grandchildren.

—Compiled and edited by Oliver Dewey

Also In Memoriam

Daniel I. Ash '87, '91	March 3, 2009
Ricardo A. Broce '61	February 3, 2011
Vance P. Burton '57	January 13, 2010
Francis J. Carrigan '65	March 2, 2009
Douglas R. Cook '52	May 16, 2010
Russell M. Corn '57	May 19, 2010
Joseph M. Dahdah '08	April 19, 2010
Paul J. Ellis '59	April 27, 2010
Frank A. Gill '62	February 14, 2010
Glen R. Graves '55	December 21, 2001
Hugh D. Graham '48	January 19, 2004
George E. Jaynes, Jr. '40	August 3, 2007
Jack D. Powers '39	October 2, 2008
Albert H. Sjogren '73	May 30, 2005
Alfred T. Stone, Jr. '51	April 10, 2005
Ronald A. Wedemeyer '64	February 2, 2000

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