

Spring 2010 Volume 100 Number 1

Mines

Colorado School of Mines Magazine

10-Year-Old Donates Petrified Lightning

Women Leaders Close the Gender Gap

Energy Drives Innovations in Steel

Cracking Cancer's
DNA Code

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Of the 3,500 different grades of steel that currently exist, 2,600 have been developed in the last 20 years, and the pace of innovation is quickening. With a changing energy landscape driving demand for new formulations, many manufacturers are turning to Mines' Steel Center for research and collaboration.

22 Cracking Cancer Code

Without a biology degree to his name, Joe Gray '68 is heading up the of Life Sciences Division at Lawrence Berkeley National Laboratory, and he's a highly respected cancer researcher. He's also about to launch a clinical study that takes a radically different and highly individualized approach to treating breast cancer.

26 What Gender Gap?

While still outnumbered 3 to 1, women at Mines presently occupy about half the student leadership positions on campus. In this article, *Mines* tries to make sense of these surprising statistics by looking at some of the school's efforts to improve the environment for women.

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Unconventional Gas and Ground Water

I completed my master's in environmental science and engineering and now work in the environmental field in close connection with the oil and gas industry. I was sorry to see that your article on unconventional gas did not mention the potential impacts of hydraulic fracturing to drinking water, or what Mines is doing to study or address problems in this area. Several documentaries and even local news sources have shown the negative impacts to drinking water linked to this type of gas production and Congress is currently looking at whether to return this practice to regulation under the Safe Drinking Water Act. It would be socially responsible to present this aspect of gas recovery in your magazine and it could potentially highlight Mines' role in protecting America's water resources, while enabling the future of energy in America. I would like to see *Mines* follow the inspiring credo I read in airports and hear on the radio of "Earth, Energy AND Environment."

Jason Deardorff '08

Editor's Note: Covering groundwater-related issues would have certainly strengthened the article, and links will be placed in the archived online edition to sites where readers can obtain more



information on this subject. Protecting water resources is an important

part of the Unconventional Natural Gas Institute's mission, with Environmental Science and Engineering Division faculty positioned to play a critical role.

While water issues are, regrettably, not covered in the article, environmental issues related to the reduced carbon emissions from natural gas are prominently discussed. Speaking more broadly, in recent years Mines has faithfully echoed the school's commitment to the environment, devoting about half the feature stories in the last 10 issues to subjects related to the environment, primarily through coverage of energy technologies.

I enjoyed the latest issues of *Mines*. Keep up the good work. The article about Ryan O'Hayre was particularly interesting. Did you know that his mentor, Dave Ginley, is also a Mines graduate? Early '70s, I believe.

John Trefny, president emeritus

Editor's Note: A regrettable omission. Dave Ginley '72 will also be awarded a Distinguished Achievement Medal this year at Commencement.

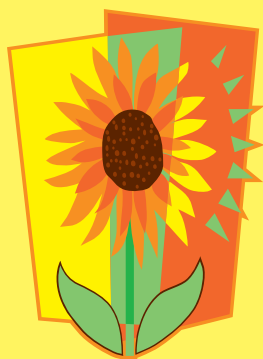
I just read the excellent cover story article in *Mines* magazine about Ryan O'Hayre's fuel cell/PEM research. Keep up the great work with the magazine. I sincerely applaud the service you provide to our Mines campus and the larger scientific community.

Chuck Stone, senior lecturer, physics

To Anita Pariseau, Executive Director, CSMAA

I just wanted to let you know that I'm very impressed with changes in CSMAA over the last five years. I feel the alumni association is, for the first time since I graduated, for alumni and not for the alumni association itself. I have enjoyed the Grand Canyon rafting trip, Leadership Summit, CEO panel, annual bike ride, as well as other alumni events. I'm looking forward to this year's events, especially the networking series. I guess that is also why I decided to volunteer and give some of my time to CSMAA. I would like to say thank you to you, Liz, Serena, Nick and your staff for listening to our needs and wants.

Darek T Bruzgo '95



Golden Natural Market

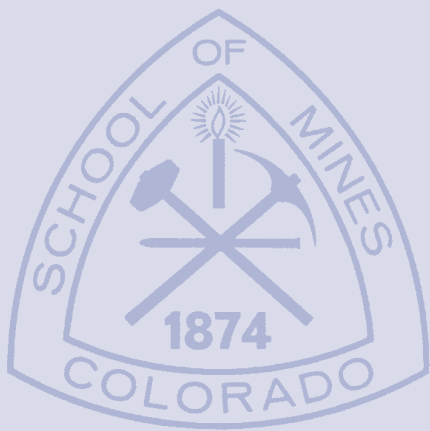
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Spring 2010
Volume 100 Number 1
magazine.mines.edu

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Printing

American Web
CPM Number # 40065056

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

Mines is published quarterly by Colorado School of Mines and the CSM Alumni Association for alumni 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 writing to *Mines* magazine, P.O. Box 1410, Golden, CO 80402; or call 303.273.3294 or 800.446.9488, ext. 3294 between 8 a.m. and 5 p.m. M-F, MST; or email magazine@mines.edu.

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Dear Readers,



I'm particularly pleased to present this spring issue of *Mines* magazine; it's packed with compelling stories about remarkable people in diverse walks of life. *Mines* pride will run a little deeper if you take the time to read them.

The cover story on Joe Gray '68 chronicles the career of a remarkable scientist who, after making several pivotal contributions to cytogenetic research, is now working on the very front lines of the fight against cancer. He's about to launch an unprecedented clinical study that will treat breast cancer with individualized and targeted treatments based on the unique DNA signatures of each patient's tumor.

In another feature story, we report on the decades-long effort to encourage and support female students at Mines. While women still only make up a quarter of the student body, they occupy about half of the student leadership positions. This story discusses this surprising statistic. Also, in this issue's Spotlight section, read about Jaime Thorpe, Mines' third female student body president.

"The New Age of Steel" looks at how changes in the energy sector are creating demand for new formulations of highly specialized steel, which has the industry increasingly looking to the school's Steel Center for solutions.

Don't miss the Inside Mines story about Kiefer Stumpp's lucky find, and his generous donation to the Geology Museum. (You'll also learn what happens when lightening hits damp sand under just the right conditions.) In our Inside Mines report on Midyear Degree Convocation, we also reflect on the dramatic increase in undergraduate applications for next year. In other stories we cover the increasingly popular pre-med program and the recently-overhauled energy minor.

New Frontiers reports on how a graduate student, assisted by his advisors and the school's supercomputer, made history by modeling hydrate nucleation for the first time. In Scoreboard, we discuss how Mines ended the fall semester ranked seventh in the nation in the NCAA Division II Learfield Sports Directors' Cup standings.

We offer two engaging profiles in this issue. Jack '70, MS '71, PhD '77 and Karen '84 Krug, who recently retired from the oil industry, are now making wine and farming cattle on Whidbey Island, Washington (see some great photos online). James Johnson '03, a NASA space shuttle flight controller, is doing the same job as those largely credited with bringing the Apollo 13 crew safely back to Earth in 1970. His average workday involves rehearsing for just such eventualities.

We look forward to hearing your feedback on this issue. Please write anytime to the address found in the lower left corner of this page, or email: magazine@mines.edu.

Nick Sutcliffe

Editor and Director of Communications

Colorado School of Mines Alumni Association

Campus News

Lucky Strike for the Geology Museum

Kiefer Stumpp, 8, was on a hike with his parents west of Eldorado Canyon when something just off the trail caught his eye. “We thought it was smelting waste at first glance,” says Kiefer’s mom, Donna. But after a closer look, her husband, Peter, realized his son had discovered fulgurite—a rare find.

Sometimes referred to as “petrified lightning,” fulgurite is a root-like hollow tube of natural glass formed when lightning strikes moist sandy soils and creates intense heat. If the electrical charge heats silica to temperatures exceeding 3,000 degrees, sand fuses to form glass. “It was likely formed in a matter of a single second,” says Bruce Geller, director of the Geology Museum, adding that a mineral found in

fulgurite, iron silicide, is so rare that the only other place it is found is in meteorites.

After Kiefer’s initial discovery in spring 2008, the family returned to the site twice, collecting the surface pieces first and then digging down for the rest. In its entirety, the specimen is almost 10 feet long and weighs in at 11 pounds—the largest and most complete specimen found in Colorado, according to one local fulgurite expert.

“We used soft toothbrushes to carefully dust off all of the little pieces,” says Kiefer, now 10. It was he who came up with the idea to donate the fulgurite to the Geology Museum. “We’ve been bringing Kiefer to the museum for years now,” says Donna. “It just seemed like a natural home for our discovery.” A self-professed “nerdy family,” the Stumpps have long been keen on geology and interested in Mines. Kiefer plans to one day teach geology at the school; he already maintains his own collection of rocks and minerals. And his uncle Hans, Peter’s brother, is a 1986 geology alumnus.

Geller will assemble the fulgurite for a special display in the museum. The family held on to a couple of small pieces and plans to have one cut and polished. “We can’t wait to see what the glass inside looks like,” says Kiefer. Depending on impurities in the silica, the glass



Peters Photography

Kiefer Stumpp examines a piece of the fulgurite he found while hiking with his family.

can take on a variety of colors.

“We think it’s important to be part of the scientific community here,” says Donna, “and Mines’ museum has been a unique place to encourage Kiefer’s love of geology.”

“As the museum’s youngest donor of such a specimen and quite the geology enthusiast, Kiefer is helping build our collection,” Geller says. “We are honored that the Stumpfs chose Mines to house their discovery.”

The Stumpfs’ gift makes them members of

the Friends of Colorado School of Mines Geology Museum, a distinguished group of supporters that includes Martin Zinn, who recently donated five specimens for display; David Oreck, who gave the school a rare and much sought-after pyrrargyrite specimen; and Gayle Price Vannatter, whose large collection of minerals originates from Bolivia, Mexico, Morocco, Peru and the U.S. NASA will also be named as a friend of the museum after a donation of an Apollo 15 lunar basalt moon rock comes through from the agency later this year.

Degrees Conferred, Admissions Applications Soar

As degrees were conferred in December, the number of prospective students vying for the same privilege was heading off the charts.

At Midyear Degree Convocation 178 bachelor’s, 167 master’s and 20 doctoral degrees were awarded. Denver Mayor John Hickenlooper, who received an honorary degree at the ceremony, encouraged graduates to apply their scientific knowledge to solve real-world problems through collaboration and innovation. Student body president Jaime Thorpe urged her classmates to stay connected: “As engineers and scientists, our collaborations with institutions like Mines, and with each other, may serve as a critical variable in addressing the grand challenges of our era.”

All indications are that Mines’ newest graduates will find themselves in high demand: among December 2008 bachelor’s degree recipients, 86 percent reported that they had either found employment or gone on to graduate school by the end of last summer; among master’s and doctoral degree recipients, 96 percent reported a similar status.

Despite such positive numbers, the



December graduates pose on campus.

40 percent jump in undergraduate admissions applications seen this year is still dramatic—10,000 students are jockeying for only 950 spots. At the graduate level, applications for next year are up an additional 13 percent over the 40 percent increase seen for the current academic year. Provost Steve

Castillo attributes increasing interest in Mines, and ever-higher demand for its graduates, to the university’s focused mission: “We’re at the right spot in terms of offering education and research programs that align with our world’s greatest challenges and opportunities right now,” he says.

Pre-med at Mines

Colorado School of Mines isn't an obvious choice for pre-med, but that is slowly changing. When the school's Bioengineering and Life Science Minor Program was given a kickstart in 2001, a pre-med track was formalized. Today it's one of six in the bio and life sciences.

Joel Bach, associate director for BELS, advises students interested in the pre-med track and serves as faculty advisor for the student-run Pre-Medical Society. "Medical schools are increasingly looking for students with a strong science and engineering background," he says. "And now that we've got a solid set of course offerings in the life sciences, we are just the institution to prepare students for those pursuits."

Dr. Stuart E. Bennett '66, who earned his degree in petroleum refining engineering at Mines, is now a dentist. "The problem-solving skills of an engineering education are superior to a purely scientific background for preparing students for medical school," he says, "and as the technology of medicine continues to advance at a rapid pace, an engineer's solutions-oriented approach is increasingly important."

Despite admission to medical school being highly competitive, Mines graduates have been achieving nearly 100 percent placement on their first or second try. Bach credits student success to the unified curriculum, bolstered by mock-interview sessions and a formalized recommendation process. Another factor may be the success of the Pre-Medical Society. Mellisa Wu, president of the student group, helps bring doctors, nurses, medical students and alumni to campus to provide advice and assistance to students interested in medical careers.

Wu says, "The course offerings and Pre-Med Society here allow students to explore their options while pursuing other degrees ... it's a good choice for motivated students with an interest in the medical field." Wu is a biomedical and biochemical engineering student pursuing a master's degree and hopes to attend medical school after Mines.



Mellisa Wu and Damian Illing, both enrolled in the BELS pre-med program, talk with Assoc. Prof. Joel Bach.

The increasing bio and life science offerings, as well as the BELS pre-med track, are attracting a new group of students to the school. Sarah Engel, assistant admissions director, says, "The bio and life science offerings through BELS are our fastest growing areas on campus. They are attractive to pre-med students and to students, women in particular, who want to work in the health care profession and use their math, science and problem-solving skills to help people live healthier lives."

Bach is excited about growing student interest: "We're definitely attracting more students with medical school ambitions, and it's great to know that they're thinking of us for these reasons and that we have what it takes to prepare them for their future careers."

Damian Illing, student trustee and a senior majoring in chemical engineering, was recently accepted into the University of Colorado School of Medicine. He says Mines has given him an excellent preparation for the challenges of a medical career, chiefly because it has taught him how to learn, and how to think critically and solve problems.

Revamped Energy Minor Launched

A three-year rollout of the newly configured Energy Minor Program is under way at Mines, offering a range of new options to students. A survey conducted last spring showed great interest in such a program, and a committee led by now-director Jim McNeil got to work. They removed prerequisites that made the old energy program prohibitive for many and created five new courses to unify the minor. “An interdisciplinary energy minor was a twinkle in many of our eyes for some time,” says McNeil. “Growing student interest, paired with the university receiving NSF funding for the Renewable Energy Materials Research and Science Engineering Center, gave us the push we needed to take off running.”

The program requires an Introduction to Energy course, followed by options in renewable, fossil and general tracks, enabling students to craft a set of electives that also fulfills some core course requirements for their major. Students come together in their senior year for a writing-based Global Energy Policy capstone course, which challenges them to apply technical knowledge to real-world problems. In its initial semester, the Intro to Energy course enrolled 36 students, 21 of whom plan to complete the 18-credit hour minor, and two of whom will pursue a 12-credit hour “area of special interest.”

Mechanical engineering major and varsity volleyball player Grace Bol is leaning toward the renewable track.

“Even with my mechanical coursework and athletics obligations, fitting the minor into my schedule is achievable,” she says. “Having a background in energy will allow me to make a positive impact and give me a leg up as I look to career options.”

“Our goal is to create socially literate students who can work effectively under social, political, legal and environmental constraints,” says McNeil. “And our learning objectives ensure that they will develop depth in their understanding of energy technology, while gaining a broad perspective on the complex role energy plays in modern society.” More information on the program is found at energyminor.mines.edu.



Energy minor director Jim McNeil with Introduction to Energy students.

Peters Photography

In Brief...

Stewart A. Bliss and **Mohan S. Misra** PhD '86 joined the **Mines Board of Trustees** January 1. Appointed by **Governor Bill Ritter**, the new trustees will serve through December 2013. Bliss is a senior consultant with Faegre & Benson LLP in Denver. Misra is founder and chief executive officer of ITN Energy Systems.

Mines' first-ever **Diversity Week**, themed “Celebrate (You)niqueness,” took place in January, kicked off with events on Martin Luther King, Jr. Day, and brought speakers on a variety of topics to campus. Learn

more about the student-initiated event at magazine.mines.edu.

A new undergraduate “area of special interest” in **space and planetary science and engineering** was approved in November. The 12-credit-hour program offers courses from across disciplines related to space, astronomy and the planets.

A \$1.2 million commitment from **Newmont Mining Corporation** is making possible a new multidisciplinary center. The **Center for**

Innovation in Earth Resources Science & Engineering (CIERSE) will focus on educating new professionals and developing solutions to mineral resource industry challenges.

The **U.S. Department of Energy** announced a \$33.8 million investment in a **National Advanced Biofuels Consortium (NABC)**, led by NREL and the Pacific Northwest National Laboratory, with Mines as a partner. NABC will lead research to develop biomass-based sustainable and cost-effective hydrocarbon fuels.

Investing in Mines

An investment in knowledge always pays the best interest.

—Benjamin Franklin

Tony Corbetta: A Lifelong Connection to Mines

A lifelong supporter of Oredigger athletics, Mines alumnus Tony Corbetta recently established an endowed scholarship to benefit varsity athletics. A varsity athlete himself, Tony played football for Mines for a year and a half before his education was interrupted in 1943 by military service in World War II. Returning to Mines in 1946, Corbetta went on to graduate with a metallurgical engineering degree in 1948. Corbetta built a career as a sales engineer with CF&I Steel Corporation, where he worked until his retirement in 1983. He is a member of the CSM Alumni Association, has served as a reunion volunteer, and is a member of the Heritage Society and President's Council. A resident of nearby Wheat Ridge, Corbetta is a regular at Mines alumni and sporting events.

In a recent interview, Corbetta talked about his gift, his career as a student-athlete, and some of the lessons he took away from his years at Mines.

What did you learn from your own participation in athletics?

Playing football helped me focus and was an important balance to my schoolwork. When I was playing ball my grades were just as good and maybe better than when I wasn't. I think the same was true for my teammates, and it still holds true for today's student-athletes.

What were the most important lessons you learned from your Mines experience?

The ability to stay with the studying—and there was a lot of that! My classmates and I liked to say that we felt like we were studying at the Royal Academy, and our camaraderie and persistence helped us get through it. In the end, graduating from Mines opened a lot of doors for us that might not have been opened otherwise.

Even though I was trained as an engineer, I spent my career in sales. I enjoyed that my job required me to be a self-starter—something I learned how to be at Mines.



Tony Corbetta '48 is a regular attendee of Mines sporting events.

Stuart Alden

If you had to give a piece of advice to current Mines students, what would you tell them?

I like to say “don't try to put on the dog”—meaning don't be a show-off. Do your job well, be honest and be yourself.

What motivated you to establish the Anthony F. Corbetta Endowed Scholarship?

Most importantly, I have two wonderful daughters, Dianne and Patty, who supported me in setting up a scholarship at Mines. And the more I thought about it, the more I realized what a tremendous bond I have with the school. A scholarship is a great way to acknowledge that—and I know that as an endowment its benefits will last for a while.

Mines Faculty Receive Alcoa Foundation Grant for Recycling Study

Supported by a \$370,000 grant from the Alcoa Foundation, faculty members in Mines' Division of Economics and Business are investigating the impact of public policy on solid waste recycling in the U.S. The study examines how increased recycling can not only reduce municipal waste volume but also reduce greenhouse gas emissions.

Division Director Rod Eggert and Professors Dan Kaffine and John Tilton are examining alternative methods for increasing recycling—including deposit-refund systems, pay-as-you-throw policies, and extended producer responsibility—and assessing their relative cost-effectiveness. Their goal is to identify the specific environmental and economic benefits that derive from greater recycling to inform public and private decision-making about solid waste disposal and carbon management.

“Increased recycling has the potential to reduce greenhouse gas emissions because recycling of materials like aluminum, steel and plastics typically requires less energy than primary

production of the same materials,” says Eggert. “The support we’re receiving from the Alcoa Foundation will enable us to quantify the carbon savings that result from higher rates of recycling for these elements of the solid waste stream, and help to create appropriate recycling incentives for individuals, corporations and municipalities.”

Clear Creek Athletics Project Progresses with Alumni Support

Dramatic improvements to the athletics fields south of Clear Creek are giving Mines Athletics a major boost. Thanks to the generosity of alumni and friends, the Stermole Track & Field Complex and Crouch Field Events Complex will set the stage this season for the first home track meet at Mines in nearly 20 years. And work will begin this spring to replace Mines’ natural turf football



Catherine May

New playing fields viewed from Mt. Zion.

field with a state-of-the-art artificial surface. The new gridiron will be named Harry D. Campbell

Field and will be ready for the 2010 season opener in August.

There are many ways to connect the dots between the recent success of Mines athletes (see Scoreboard) and the generous support funneled into these programs by numerous alumni and friends. Many additional opportunities for philanthropic involvement exist, including scholarships and facility enhancements. To learn more about how you can help, contact Marv Kay 303.273.3363 or Tom Spicer 303.273.3300.

Harold M. '68 and Patricia M. Korell complete \$1.25 million pledge; Other recent gifts

Colorado School of Mines recently received 16 large gifts:

A \$100,000 gift from **Lonnie L. and Maria E. Abernethy** will provide continuing support for graduate fellowships in ceramics.

The Adolph Coors Foundation contributed a total of \$322,000 to support the William K. Coors Distinguished Chair in Chemical Engineering and the Herman F. Coors Professorial Chair in Ceramics.

The Alcoa Foundation contributed \$150,000 toward a \$370,000 pledge to support a recycling, solid waste and public policy initiative in the Division of Economics and Business.

Steve '64 and Dollie Chesebro' contributed \$100,000 to the Clear Creek Football Project.

Marshall C. III '67 and Jane Crouch made gifts totaling \$120,500 in support of Marquez Hall, geology teaching and research, and the geology museum, as well as a new alumni engagement initiative.

Devon Energy Corporation contributed \$100,000 toward their \$500,000 pledge to the Marquez Hall building project.

EnCana Oil & Gas (USA) Inc. contributed \$400,000 toward their \$2 million pledge to the Marquez Hall building project.

ExxonMobil made gifts and pledge payments totaling \$50,000 to support the Oil Shale Symposium and their \$236,000 pledge to improve elementary mathematics and science instruction in the Meeker School District.

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

Harold M. '68 and Patricia M. Korell contributed \$800,473 to complete their \$1.25 million pledge to Marquez Hall.

F. Steven '56 and Gayle Mooney contributed \$500,000 toward their \$1 million pledge in support of scholarships, teaching and research in the Department of Geology & Geological Engineering, and the Clear Creek Football Project.

Shell Oil Company contributed \$100,000 for several departments and programs, K-12 initiatives, student organizations and fellowships.

A \$170,049 gift from the estate of **James R. Thoma '55** established the Grace and James Thoma Petroleum Engineering Merit-Based Scholarship Fund.

The Timothy and Bernadette Marquez Foundation made a \$500,000 payment on its \$10 million pledge for Marquez Hall.

Gifts totaling \$280,000 from the estate of **John G. Underwood '53** will support the Department of Petroleum Engineering and Marquez Hall.

A total of \$464,473 in bequest distributions from the estate of **Herb '39 and Dodie Young** will provide continuing support for the Herbert L. and Doris S. Young Environmental Symposium lecture series.

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

Aqua-Aerobics Systems, Inc. contributed \$37,000 to support the Advanced Water Technology Center (AQWATEC).

ArcelorMittal contributed \$46,000 to support the Metallurgical and Materials Engineering Department, the Minority Engineering Program and student groups.

The ARCS (Achievement Rewards for College Scientists) Foundation contributed \$32,500 toward scholarships for seven students.

Chesapeake Energy Corporation contributed \$25,000 toward the Chesapeake Energy Scholarships.

Hugh '49 and Ann Evans contributed \$21,196 in unrestricted support for the university.

The Halliburton Foundation contributed \$35,000 in support of geology and geological engineering scholarships and the Summer Minority Engineering Training and Challenge programs.

Al Ireson '48 made a \$38,500 contribution in continued support for the Ireson and Family Endowed Scholarship Fund and The Mines Fund.

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

John '52 and Erika Lockridge continued their support of the Blaster Endowed Scholarship Fund with an \$80,000 contribution.

F. H. Merelli '59 contributed a total of \$80,000 in support of the Department of Petroleum Engineering and The Mines Fund.

Microsoft Corporation contributed \$40,000 toward research and curriculum development on the Microsoft Windows HPC platform.

Bill F. Oline '52 contributed \$41,725 to the Harry C. Kent Petroleum Geology Graduate Scholarship Fund.

Al Provost '62 contributed \$90,000 toward the Harrison Western Professorship of Metallurgical and Materials Engineering, which he established in the name of his company.

Earl L. Rau '42 established the Earl and Virginia Rau Scholarship Fund with a \$25,000 contribution.

Thomas C. '36 and Mary Snedeker made a \$50,000 contribution in support of the Department of Petroleum Engineering.

Michael R. '83 and Patricia K. '83 Starzer made a \$25,000 contribution to The Mines Fund.

Peter and Donna Stumpp, and their son **Kiefer**, contributed fulgurite specimens to the Colorado School of Mines Geology Museum.

Alice M. Tolen contributed \$25,000 in continuing support for the Delbert F. Tolen Scholarship Fund, named for her husband, who graduated from Mines in 1957 as a petroleum refining engineer.

The Viola Vestal Coulter Foundation contributed \$35,000 to support the Coulter Chair for Mineral Economics.

Fun-Den Wang, professor emeritus of mining, contributed gifts totaling \$40,000 to support The Mines Fund and mining research at the school.

Grace Wanner contributed \$39,000 and dedicated all other gifts made in memory of her husband, **Jack '48**, toward Marquez Hall.

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

Ra Helps Grad Student Make History

It was just before Thanksgiving, 2008, when Mines doctoral student Matthew Walsh sat down at a keyboard in the chemical engineering building, typed in a few final instructions for the nearby supercomputer Ra, and took off for his holiday vacation.

By the time he returned in January, he and his 7-foot-tall, 14-foot-long virtual colleague had made history.

"I'm lucky," says Walsh, 29, whose resulting scientific research paper, "Microsecond Simulations of Spontaneous Methane Hydrate Nucleation and Growth," appeared in the November 2009 issue of the prestigious journal, *Science*. "I am just a guy who pressed go."

Humility aside, Walsh's groundbreaking study (co-authored by faculty advisors Carolyn Koh, E. Dendy Sloan, Amadeu Sum and David Wu) marked the first direct simulation of the nucleation, or birth, of a natural gas hydrate, a historic breakthrough in the 70-year-old field of hydrate research, and a shining example of how the power of supercomputing has begun to make the impossible possible in energy research.

For decades, the oil and gas industry has been at once intrigued by and frustrated with hydrates—mysterious crystals of burning ice that form spontaneously on the sea floor, in the permafrost, and inside oil and gas pipelines. On the one hand, they are a colossal nuisance, slowing flow inside pipelines to a halt and, in a few dire cases, causing deadly explosions. But on the other hand, they are an enormous untapped resource, with the tiny cages of water molecules containing a wealth of methane and other gases. "By some estimates, there is more energy trapped in these natural gas hydrates worldwide than all the conventional fossil fuels combined," explains Walsh.

Until now, researchers using conventional laboratory technologies and computers have been able to learn much about the circumstances under which hydrates form (under high pressure and low temperatures) and their physical make-up (a crystalline structure in which water molecules form polyhedral cages around methane molecules). But because their birth is a rare event that happens in a few nanoseconds at a random location, two questions have eluded scientists: What happens at the molecular level to spark hydrate creation, and how fast do they grow?

"We wanted to study, not where and when, but how? How do the water and the methane molecules rearrange themselves to form a hydrate," explains Walsh.

The 2008 arrival of Ra—a supercomputer capable of processing 23 trillion operations per second—brought the unanswerable question within reach.

Over the course of several months, Walsh and his colleagues



L to R: Amadeu Sum, Matt Walsh '03 and David Wu

designed a complex simulation in which they would provide Ra with the number of water molecules and methane molecules, the temperature and pressure, and Ra would use Newton's Second Law of Motion (force equals mass times acceleration) to paint a tantalizing mathematical glimpse at what would happen as those thousands of molecules bounced around each other.

In real time, Ra calculated for two months, simulating just two microseconds (two one-millionths of a second) of molecule interactions. But in the world of molecular computer simulation, two microseconds is a relative eternity. By the time Walsh had returned from winter break, something extraordinary occurred. A hydrate was born.

"It was amazing," recalls Walsh. "The conventional wisdom had always been that you can't simulate it."

Within weeks, fascinated engineering students and curious oil and gas industry experts were logging on to YouTube to witness Walsh's water and methane molecules engaged in a chaotic dance, culminating with the former enslaving the latter in an elegant cage, and more cages blossoming from its faces as time stepped on. Within 10 months, Walsh was basking in a career coup.

"It is very unusual for someone at this stage of their career to get a publication in *Science*," says co-author and advisor Wu.

Adds Carolyn Koh, a study co-author and co-director of the Mines Center for Hydrate Research, "His creativity, innovation and perseverance really pushed us toward this discovery."

Ultimately, Koh says, such research will advance the path toward helping oil and gas companies devise a chemical inhibitor to prevent the formation of hydrates in pipelines, scientists create hydrates to use as vessels for transporting hydrogen fuel, and alternative energy seekers devise ways of extracting the dormant untapped resource from our ocean floors.

But for Walsh, there is not time to celebrate. There is work to be done. In the coming year, he and his advisors hope to perform more simulations that more closely reflect the temperature and pressure inside a pipeline, and mine the data even further to see just how fast a hydrate forms under those revised circumstances.

"We now have a qualitative understanding of how a hydrate forms. I would like to reach the quantitative level," he says. "These movies are admittedly cool, but they are not quite the hard science I am after yet."



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Mines Tied Seventh in NCAA Division II Ranking

Colorado School of Mines was tied for 7th place in the 2009-10 NCAA Division II Learfield Sports Directors' Cup standings at the end of the fall semester. The December 23 rankings, which include 125 institutions, reflect performance in a maximum of seven sports for men and seven for women; Mines' 208 points were earned by four: men's cross country (85), women's soccer (73), men's soccer (25) and volleyball (25). Mines shares the 7th-place position with Metro State, making them the top-ranked colleges in the Rocky Mountain Athletic Conference. Complete standings, as well as the scoring structure for the Learfield Sports Directors' Cup, are found at nacda.com. The Learfield Sports Directors' Cup was developed as a joint effort between NACDA and *USA Today*. Oredigger fans eager to see how the school stacks up in the final 2009-10 standings must wait until their release on June 23, 2010. In the 2008-09 season, Mines finished 62nd out of 232

institutions with 285 points. To date, Mines' highest-ever finish in the final standings was 22nd in 2005-06.

Contributing the most points to Mines' mid-year tally was the men's cross country team, which finished 3rd out of 24 teams at the NCAA Division II Cross Country Championships in 2009. The squad's 3rd-place showing was the highest-ever finish by an Oredigger cross country team (male or female) at the championships.

Mines' 2009 women's soccer team also had an outstanding season, qualifying for the NCAA Division II Championships for the second consecutive time. The Orediggers proceeded to win their first-ever NCAA Tournament match with a victory over Regis University in round one. In round two they defeated 12th-ranked Fort Lewis, before advancing past 4th-ranked Metro State (via penalty-kick shootout) in round three, winning the Central Region title. The Orediggers' berth in the Elite Eight was the farthest a Mines team had ever advanced in NCAA tournament play. The team finally fell to Michigan's Grand Valley State, concluding a season that saw 11 new program records, including single-season victories (19). Mines

finished 2nd in the RMAC (13-3-0) and concluded the year with a 19-5-1 overall record.

For the second time in program history, the men's soccer team qualified for the NCAA Division II Championships in the 2009 season. The Orediggers finished second in the RMAC (11-2-1) and concluded the year with an overall record of 15-3-4. All three losses were against Fort Lewis, the eventual NCAA Division II national champion.

The 2009 Mines volleyball team compiled a 22-10 overall record this fall, while posting a 13-6 mark in the RMAC. In addition to establishing new single-season program records for overall and conference victories, Mines recorded a new program record with nine consecutive matches won this fall. The team, ranked as high as 10th in the Central Region this fall, tied for 3rd place in the RMAC East Division and qualified as the 5th seed for the RMAC Tournament. By earning the number 8 seed in the NCAA Division II Central Region Tournament this season, the Mines volleyball squad reached NCAA post-season competition for the second time in program history.



Erica Siemers

Finishing 3rd in the nation in NCAA Division II, Mines' men's cross country pack is here led by Mack McLain during the RMAC Championships—Ben Zywicki and Aaron Swift follow.



Kohlenstein Named Central Region Coach of the Year

Frank Kohlenstein, Mines' head men's soccer coach, was named the National Soccer Coaches Association of America / Mondo Central Region Coach of the Year in December. In his 12th season as head coach at Mines, Kohlenstein led the Orediggers to the NCAA Division II Men's Soccer Championships for the second time in program history. The Orediggers finished the 2009 season with a record of 15-3-4 overall (11-2-1 RMAC) and were 18th in the final NCAA Division II 2009 rankings. This was the second consecutive year that Kohlenstein was named RMAC Coach of the Year, and the fifth time in his career he has earned the recognition.

Oredigger News & Notes...

- Women's basketball player Brecca Gaffney was named RMAC Female Player of the Month (all sports) for December 2009. The Orediggers' Brecca Gaffney and Katie Carty earned back-to-back RMAC East Division Player of the Week honors (Dec. 7 & 14).



- Men's basketball player Drew Hoffman earned Second Team Academic All-RMAC honors for the 2009-10 season. The Mines men's hoops squad also landed three consecutive RMAC East Division Player of the Week selections this winter (Dale Minschwaner, Jan. 25; Sean Armstrong, Feb. 1; Brett Breen, Feb. 8).



- The Oredigger football team landed four All-American selections during the fall of 2009, including Zach Meints, David Pesek, Adam Saur and Marc Schiechl.

CSM Athletics Home Schedules – Spring 2010



BASEBALL

Mar. 26	Colorado Christian	3 p.m.
Mar. 27	Colorado Christian	12 p.m.
Apr. 7	Colorado Christian	6 p.m.
Apr. 9	Mesa State	6 p.m.
Apr. 10	Mesa State	1 p.m.
Apr. 11	Mesa State	12 p.m.
Apr. 21	Colorado Christian	6 p.m.
Apr. 23	Regis University	6 p.m.
Apr. 24	Regis University	1 p.m.
Apr. 30	CSU – Pueblo	6 p.m.
May 1	CSU – Pueblo	1 p.m.

GOLF

Apr. 10	Bob Writz Invitational Castle Rock
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OUTDOOR TRACK & FIELD

Mar. 27	CSM Open
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SOFTBALL

Mar. 20	Western N.M. University	12 p.m.
Mar. 21	Western N.M. University	11 a.m.
Mar. 27	Adams State	12 p.m.
Mar. 28	Adams State	11 a.m.
Apr. 2	Metro State	12 p.m.
Apr. 3	Metro State	11 a.m.
Apr. 7	UC – Colorado Springs	2 p.m.
Apr. 24	Chadron State	12 p.m.
Apr. 25	Chadron State	11 a.m.

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

STUDENT

Jaime Thorpe

Senior, **Chemical Engineering**
President ASCSM

“Coming to Mines from out of state, far away from everyone I knew, was the best choice I ever made,” says Jaime Thorpe, a senior on target to graduate this May. It built her confidence and offered the opportunity to redefine herself. “It allowed me to become the person I want to be, rather than the person I was,” she says. “I have certainly developed more as a leader than I ever thought possible.”

The third female president of the Associated Students of Colorado School of Mines, Jaime’s involvement in student government began in her freshmen year when she ran and won the position of class officer. In her junior year, she served as ASCSM treasurer, chairing a 14-member budget committee that allocated more than \$600,000 in funding to various student activities. And that same year, she planned Homecoming parade and campaigned for the position of president. “I have always been interested in taking charge,” says Jaime, “Mines has just nurtured my desire and allowed it to grow.”

Ultimately, Jaime would like to run for elected office. “We need more engineers in government,” she says. And not just to bridge the gap between technical professionals and legislators: “Engineers are better at doing things efficiently,” she says, “and the government is so darn inefficient!”

She knew she wanted to study government when she made up her mind to come to Mines, and the McBride Honors Program in Public Affairs was critical to her decision. “If McBride wasn’t here, I don’t think I would have come,” she says. “I’ve always been exhilarated by government,” she says, adding with a laugh, “Just going to state capitols excites me.”

Along with her McBride classes, her first-hand experience in student government has shaped her views on leadership. The idea of “taking ownership” is fundamental: “It is my fault when I don’t follow up with people enough and make sure that they are doing their jobs,” she says. She believes leading should be like conducting: “The conductor makes sure that everyone works together to create the finished product, and though he is not playing an instrument himself, he has to have a working knowledge of how to play each part, to make sure what he is asking of everyone is realistic.”

According to Sara Post, editor of *The Oredigger*, Jaime has done well: “She has really had to learn how to get a lot of different



Peterson Photography

perspectives together at the same table, something most ASCSM presidents have to be able to do, but I think she has become particularly good at it. With the curveballs we’ve been thrown this year, it’s really been impressive.”

Last summer Jaime travelled to Eastern Europe with the McBride Honors program, visiting five countries in two weeks. Of the many memories she came back with, she particularly recalls the day they spent with children from a Romanian orphanage, touring the home, sharing a delicious meal and laughing as they rode bicycles with the children through the countryside to visit a monastery. “They have so little and they are so happy,” she recalls. “We were supposedly there to brighten their day, but for all of us it was a really uplifting experience.”

Another high point was seeing the opera, *Don Giovanni*, in Prague. She’d studied it in a high school English class, and seeing a performance in the city where it premiered in the late 1700s made the production particularly meaningful. (A typically thrifty student, the ticket price also made an impression: “For students, it only cost about three dollars,” she recalls, delighted.)

Jaime has taken out loans to help foot the bill for her out-of-state tuition (\$26,404 for 2009–10). She was also awarded the Colorado School of Mines Alumni Association Houston Section Scholarship all four years. “My parents have helped out as well,” she says, “and they have been a tremendous support throughout my education, both emotionally and financially. Without them, I can’t imagine that I would have even made it to Mines, much less been able to graduate, or pay for it,” she says.

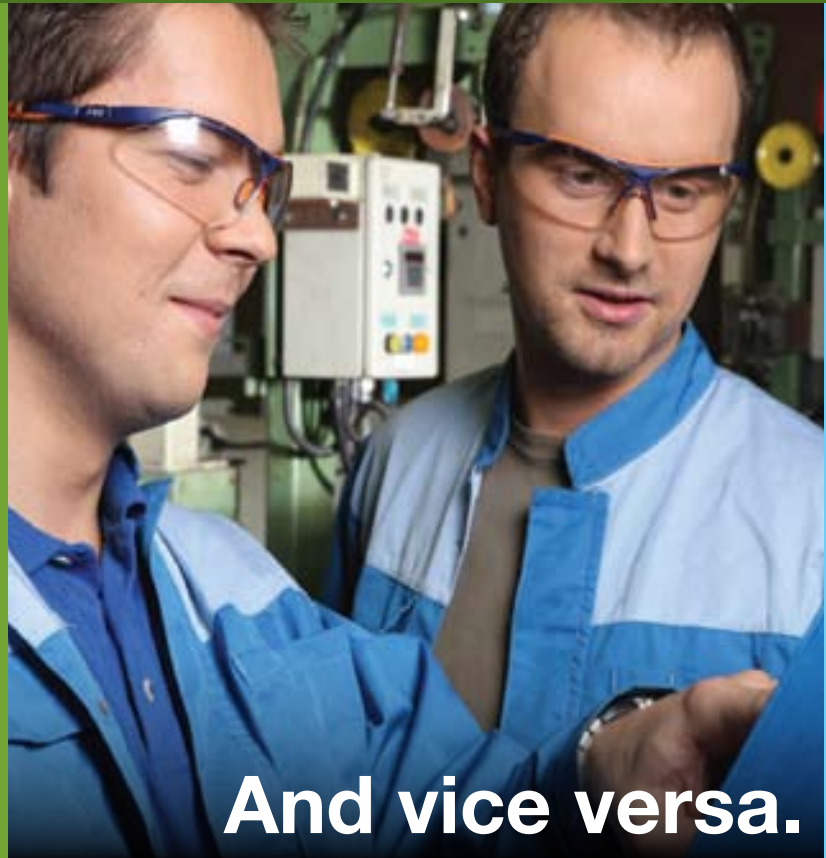
After graduation, Jaime’s short-term goal is to return to Houston and work in the energy industry—she has student debt to take care of. After that, who knows, but don’t be surprised if she comes knocking on your door looking for a vote.

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Lee Rothleutner '09 spot welds a thermocouple to a test specimen to record temperature changes during heat-treatment cycles.

Tyson Brown '08

The New Age of Steel

By Lisa Marshall

AS THE RAPIDLY CHANGING ENERGY LANDSCAPE CALLS OUT FOR A NEW GENERATION OF HIGHLY SPECIALIZED STEELS, MANUFACTURERS WORLDWIDE LOOK TO MINES' STEEL CENTER FOR LEADERSHIP.

As far back as 2100 B.C., resourceful metallurgists in Western Asia began melting iron and infusing it with carbon to make steel. Four-thousand years later, one might assume we know all there is to know about the metal that makes up 60 percent of our cars, 75 percent of our appliances, three-quarters of our buildings, and the bulk of our bridges and ships.

Not so, says David Matlock, director of the Advanced Steel Processing and Products Research Center (ASPPRC) and a professor of metallurgical and materials engineering since 1972. In an age when consumers and governments are clamoring for more fuel-efficient automobiles, and cleaner, more efficient energy generation, a renaissance of steel innovation is upon us.

"People assume it is an old, mundane material, but new things are happening all the time," says Matlock. "If you look at automobiles, wind towers, pipelines, nuclear reactors or oil rigs—the major components in all of those are steel-based, so you had better be using that steel as efficiently as possible." Twenty-five years after it was founded, ASPPRC remains a go-to resource for companies wanting to do just that.

Aside from formulating new steel processing techniques and testing them in a 10,000-square-foot mechanical testing lab, the collaborative university-industry research center also serves as an intellectual incubator, producing graduates with more hands-on knowledge about steel than any engineering school in the country. It remains

one of the only university centers to focus primarily on steel research, and as the need for innovation in the energy field escalates, it is poised to play a critical role.

"There is a lot of promise in steel. It is a very complicated material, so there is significant opportunity for future development," says Kip Findley, who received a bachelor's degree from Mines in metallurgical and materials engineering in 2001 and returned in 2008 to teach at the center. He explains that the specialized needs of the changing energy landscape are driving much of the center's work on advanced steel alloys.

HISTORY

ASPPRC was founded in 1984 by Matlock and his colleague, George Krauss, a university professor emeritus who remains involved with the center.

It was a time when interest in steel was fading among public agencies. "The government was retracting funding for steel in preference for other, more 'exotic' materials," recalls Matlock. The center emerged from the vacuum left behind; small steel companies needed to outsource their research needs, and larger ones needed highly trained professionals to man their research operations.

While initially the center relied on support from a five-year National Science Foundation grant and from its six charter members, more steel companies soon came knocking, and by 1989 the center was self-sufficient.

ASPPRC currently has 25 sponsors from around the globe, contributing about three-

quarters of its \$2 million annual budget (various other grants make up the rest). Sponsors include steelmakers, such as SSAB, U.S. Steel, Nucor, Timken, AK Steel, Severstal, POSCO and Gerdau Macsteel, as well as the heavy equipment, pipeline and car companies that use their products, such as Caterpillar Inc., Deere, GM, Hyundai and Toyota.

Like other such university research centers, ASPPRC is a collaboration among competitors. While some sponsors may compete head-to-head in the marketplace, they are all interested in helping the steel center maximize productivity. Matlock observes that sometimes the collaborative spirit the center cultivates can spill over into new business and technical partnerships.

"There is nobody in the nation that does it this well," says Paul DiMity, vice president of business development for long-time sponsor Gerdau Macsteel. "Both my customers and competitors are members [of the center], so we can drill pretty deep and get a sense of what the challenges are for the industry as a whole."

THE AUTO CHALLENGE: STRONGER, SAFER, 35 MPG


Top of mind among auto manufacturers and the steel companies who supply them is the question: How do we improve mileage, while still making a safe, strong car with all the bells and whistles consumers expect?

The pressure is on, as President Obama is floating a proposed mandate that would require cars to meet a 35.5 miles-per-gallon industry average by 2016. (Currently, the average hovers around 20.8 mpg.) Meanwhile, new safety regulations (which often require steel-reinforced body parts) and an affinity for more automation (seats, doors and windows powered by steel motors) has driven the weight of the average car up in recent years—the average topped 4,117 pounds in 2008, up from 3,744 ten years earlier.

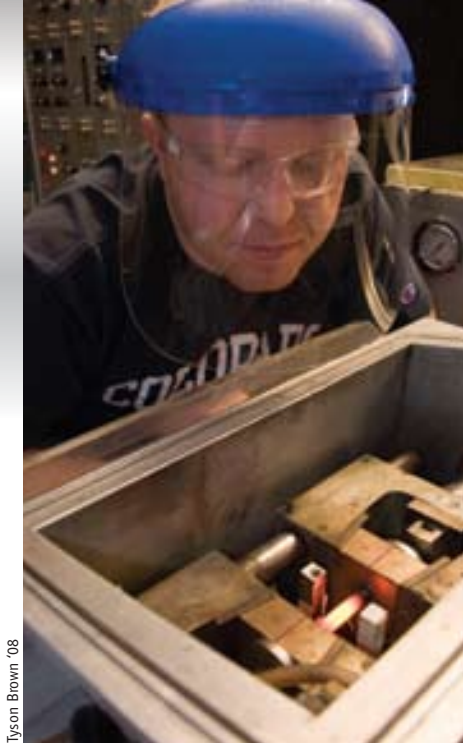
The more a vehicle weighs, the more fuel it requires, so car manufacturers are looking to the steel industry to develop stronger steels that achieve the same results at approximately the same cost, while using less material—a tall order.

Enter the steel center.

Since 2003, John Speer, a professor of metallurgical and materials engineering, has been working with students to formulate a process called "quenching and partitioning" (Q&P) in which steel is heated and cooled in

A photograph of David Matlock, an older man with white hair and glasses, wearing a light blue button-down shirt and a tie. He is sitting in a laboratory or industrial setting, looking towards the camera. The background shows some mechanical equipment and a yellow wall.

David Matlock established ASPPRC in 1984 with George Krauss.



Tyson Brown '08

Lee Rothleutner '09 compresses 1100°C-steel to study phase transformations seen during industrial forging operations.



such a way as to create a novel microstructure that is at once stronger and more formable than previous steels. "If you are trying to improve the strength of steel, one of the challenges is to maintain as much formability as possible, because it doesn't help if you have strong steel that you can't form into shapes," explains Speer. One sponsor from the Chinese steel industry, Baosteel, is currently evaluating the process in its own facilities, eyeing Q&P steels as next-generation lightweight materials for use in automobiles.

Meanwhile, Findley, in cooperation with colleague Stephen Liu and a team of graduate students, is exploring other advanced high-strength sheet steels and looking at ways to improve welding processes to ensure that these stronger steels remain reliably joined to adjacent parts over time. "As the alloy contents in these sheet steels are increased to make them stronger, they become less weldable," says Findley. "The welds ... are often more brittle than welds in prior generation steels."

Obviously brittle welds don't cut it in cars.

WIND, NUCLEAR POWER, OIL AND GAS

The push to lower carbon emissions is adding to the center's work in other ways as well.

The boom in wind energy is creating opportunities for center faculty to offer their expertise. According to the American Iron and Steel Institute, if wind power were to reach 6 percent of the U.S. energy supply, the additional infrastructure would require

at least 13 million tons of steel, specially formulated for diverse needs such as gear boxes and fatigue-resistant high strength towers.

Rick Bodnar, director of research and development for the steelmaker, SSAB North America, which is a longtime sponsor of ASPPRC has exposure to the wind industry: "Lots of our plates go into wind towers, so we are investigating higher-strength steel to make the plate lighter so it is easier to transport."


With interest in nuclear energy on the upswing, Bodnar is also anticipating the needs of the nuclear energy industry. He explains that new steel formulations capable of withstanding the intense heat created inside nuclear power plant reactors need to be developed. "Things are changing and companies need to be prepared," he says.

On the fossil fuel side of the energy industry, the kinds of steel needed for oil and gas platforms and pipelines are changing too. Oil companies looking for untapped offshore oil reserves beyond the continental shelf need equipment capable of operating at depths of 10,000 feet. The engineering challenges of boring through thousands of feet of bedrock from a platform situated two miles overhead are immense. Specialized steel can help, but it must be able to tolerate the constant fatigue of ocean waves and, despite salty sea air, require zero maintenance. "Anything you put in the ocean, if it requires maintenance, is very expensive," says Matlock.

On dry land, a boom in domestic natural

gas production requires an expanded distribution system in the form of more pipelines. One major initiative is the Rockies Express Pipeline: a proposed 1,679-mile, wide-diameter gas throughway that will stretch from Colorado to Ohio, connecting Rocky Mountain suppliers with major markets to the east. The project would require about 1.2 million tons of specialized plate steels able to withstand the elements and internal pressure for at least 25 years—another engaging challenge on the horizon for ASPPRC.

Along with supporting research, ASPPRC sponsors are overcoming these and other challenges by hiring Mines graduates; of the more than 170 graduate students to come through ASPPRC, a high percentage have ended up employed by sponsors and their related companies. And as Matlock points out, most of these students have been in the enviable position of having had several years to get to know and evaluate those companies before making employment decisions.

Shared among the steel center's diaspora—its faculty, students and sponsors—is an awareness of the importance of their work. Steel has been so ubiquitous for so long that it has been taken for granted. However, as society wakes up to the urgency and scope of our energy challenges, the role of steel is becoming clear, and ASPPRC faculty and students are excited about the contribution they can make. "There is a rich history in steel development that goes back many years, but there is still so much we don't know," says Speer. "It is always a good time to be studying steel." 

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Cracking Cancer Code

Internationally respected breast cancer researcher Joe Gray '68 is pioneering individualized therapy using DNA sequencing technology.

By Nick Sutcliffe

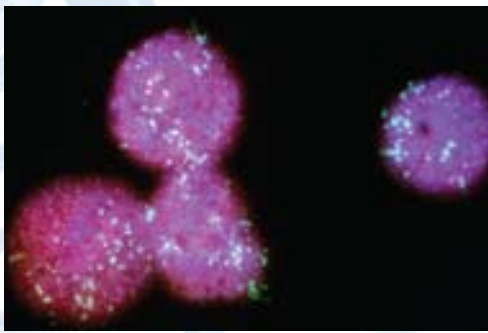
He heads the Life Science Division of Lawrence Berkeley National Laboratory, and he is a highly respected figure in the international cancer research community, yet Joe Gray '68 doesn't have a formal biological-anything degree to his name.

Recipient of a Distinguished Achievement Medal from Mines in 2005, Gray is a physicist.

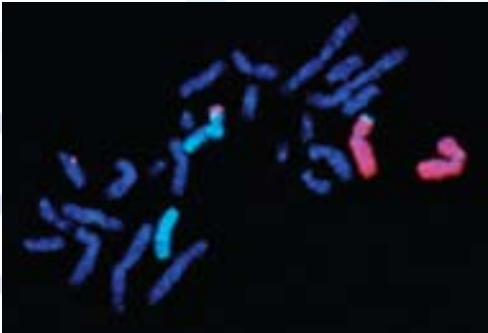
How highly regarded is he in the cancer research community? In 2008, when the much-publicized Stand Up To Cancer initiative raised \$100 million for research, the bulk of the proceeds were divided among five "Dream Teams" of scientists to fund some of the most ambitious research being conducted on cancer today. Gray was tapped to co-lead one of these teams.

He's achieved such standing through a long series of accomplishments, beginning in the '70s and '80s when he made pivotal contributions to cell analysis technology and cytogenetic research. In the '90s, he helped develop an inexpensive diagnostic now used to identify breast cancer patients whose tumors carry a particular genetic abnormality—an important indicator for selecting treatment. In the mid-'90s, he also helped develop a technology for analyzing genetic aberrations in cancer cells that is now used worldwide. Since then, he has continued to operate on the very front lines of the fight against cancer, organizing teams, rallying support and pushing forward with innovative research.

Courtesy Gray Lab, LBNI



Courtesy Gray Lab, LBNI



iStock



(Top to bottom) Fluorescent probes mark numerous copies of oncogene ErB-2 in these breast cancer cell nuclei—normal nuclei should only have two. • Probes make chromosomes 7 (red) and 11 (green) distinguishable from others (dyed blue) and the patch of red on one copy of chromosome 11, and patch of green on chromosome 7 indicate an aberrant exchange of DNA across chromosomes. • Fluorescent microscope

Norene K. Jelliffe, Gray Lab, LBNI



The Gray Lab team in their Berkeley facility.

The clinical study funded by Stand Up To Cancer is a good example. It's a new approach to treatment; one that literally maps out the mangled DNA sequence of each patient's tumor (no two cancers are the same) and individualizes therapy based on this unique signature. If successful, it could mark the beginning of a fundamental shift in cancer treatment.

He is also a key player in another program with game-changing implications. The Cancer Genome Atlas Project is a broad collaboration among many researchers involving massive volumes of data. Their objective is to map the fundamental genomic characteristics of 20 different cancer types. Gordon Mills, chair of the Department of Systems Biology at MD Anderson Cancer Center, the world's largest cancer research center, describes the first scientific paper to come out of the study as "spectacular ... It's changing how we are thinking about cancer, going from thinking about single molecules to pathways and networks ... it's had a major impact." He adds that "Joe was an important force in convincing the community to do this study. His vision and support were enough to swing a lot of people who would have said no otherwise."

Given that Joe Gray is such a pillar of modern genomic research—a pioneer who has helped pave the way for today's explosion of knowledge in genetics and cancer research—it's ironic that he began as a physics major at Colorado School of Mines, where there wasn't a single biology course offered.

"I sometimes refer to my scientific career as a random walk through science," Gray says with a smile. But in fact, he's had a purpose: "One of the things I've done in my career, more or less deliberately, is to change fields every now and then, so I could bring my skill set to bear on a new problem," he says.

After graduating from Mines, Gray knew he wanted to study particle physics. Explaining why he chose Kansas State for graduate school, he says, "Being a Mines engineer type, I didn't just want to study accelerator physics, I wanted to build the accelerator. Everyone else in the country had one built, and K-State had a hole in the ground, so I decided to go see how it went together."

However, soon after building the accelerator, he found he was tiring of low-energy particle physics: the theory was already worked out; his experiments went exactly as expected; and, as he puts it, "once you've looked inside one nucleus, the next one looks very much the same." At the same time, during his final year at Kansas State, an entirely different field of science had caught his attention.

He was sharing an office with several yeast geneticists. "They were having a grand old time," Gray recalls. "It was day one of yeast genetics, and they had thousands of different things they were thinking about. Also, the experiments they were doing had long-term relevance to the human condition."

So when an opportunity to work on a biomedical science project at the Lawrence Livermore National Laboratory came up, he jumped at the chance. They needed a cell analysis and sorting device built, says Gray, explaining that the new technology had not yet become commercially available. He was qualified for the job because, he explains, cell-sorting technology is very similar to the technology of particle accelerators.

Shortly after finding this unusual niche in the biological sciences, he made his first major contribution to the field. "It was literally a Friday afternoon eureka experiment," says Gray, recalling the first time he used cell-sorting technology to separate chromosomes. "I borrowed a cup of chromosomes from a friend at Berkeley, stained them with a DNA dye, ran them through the system and bang, the chromosomes were resolved and separable! All of this happened in one experiment." Prior to this discovery, separating chromosomes was a laborious process and didn't produce a very pure supply. By providing a means of sorting them quickly, Gray made an immediate and significant impact on the pace of research in numerous branches of genetic science.

In the years that followed, Gray continued to work on chromosomes, notably through his involvement in the National Laboratory Gene Library Project. Though he describes himself as a foot soldier in the initiative, it laid important groundwork for the startling contribution he made to the biosciences in the mid-'80s.

Essentially, the gene library project involved compiling and organizing various collections of DNA from all 23 human chromosomes. The general objective was to make the human genome more accessible and accelerate the pace of research. Isolating a

specific chromosome was hard enough; teasing one apart to study a specific portion was even more complex. However, using newly developed cloning technology and propagating copies in the gene library, it now only had to be done once.

Gray knew this was important work, but it didn't suit him; a man of action, he began thinking ahead, musing about novel ways the gene library could be used. The technique that he ultimately came up with was revolutionary, illuminating the geography of the human chromosome like never before. Developed in collaboration with his colleague, Dan Pinkel, the technique utilized an emerging technology called "chromosome painting" or more formally, fluorescence in situ hybridization (FISH)—a way of using fluorescently labeled fragments of DNA as probes to label a specific region of a whole chromosome.

The impact of their research was significant. "Prior to this, it took a very highly skilled person to recognize an individual chromosome. With this new technique, it became trivial, even for me," says the unpretentious Gray.

After the 1988 publication of their paper, chromosome painting took off. Multicolored processes were developed so that distinct areas of all 23 chromosomes could be rendered in contrasting colors. "It revolutionized the field of cytogenetics," says Gray. The ability to observe chromosomes in such sharp relief made prenatal diagnosis of certain diseases easier, and allowed other diseases to be linked to chromosomal abnormalities for the first time.

Over time, as the 3 billion base-pairs of nucleotide molecules that comprise human DNA have become better understood, FISH probes have become more specific, their value being particularly felt in the fight against cancer, where runaway replication of specific genes is an underlying problem. With a sufficiently specific probe, FISH analysis can indicate if a single gene is running amok, facilitating a more targeted approach to therapy.

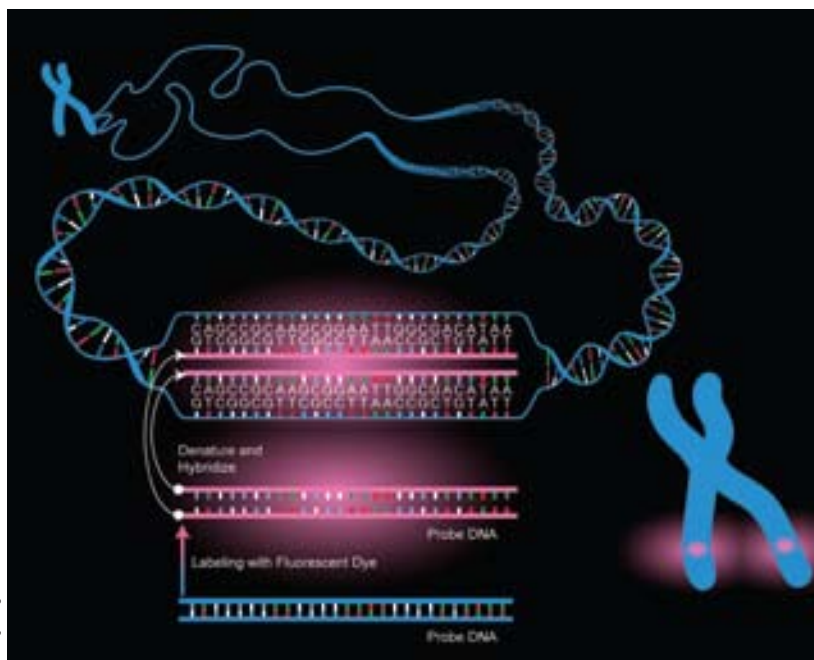
An example is breast cancer, where about 20 percent of cases are associated with excessive replication of a gene called ErB-B2,



Joe Gray '68, division director, Life Sciences Division, Lawrence Berkeley National Laboratory

located in chromosome 17. If this is the case, the drug Herceptin is generally considered the most effective treatment; but if ErB-B2 is not a factor, Herceptin is ineffective and may harm the patient. To positively determine the status of the ErB-B2 gene in tumors, tens of thousands of patients each year have tumor cells checked using a patented FISH-analysis that Gray and Pinkel developed.

The ability to zero in on a single gene with FISH is clearly of great value; but it also illustrates a drawback of the technique. FISH is valu-



Chromosome Painting (Fluorescent In Situ Hybridization)

1. Millions of probes (strands of DNA from a gene library) are fluorescently dyed and mixed with chromosomes to be labeled.
2. Heat is used to denature DNA, causing nucleotide chains to separate.
3. As the mixture cools, double-helix structure of DNA is restored, but with probes bonded to unique sections of the chromosome to which they correspond.
4. Once unbound probes are rinsed away, the ones insinuated into the structure of the chromosome make that region easily distinguishable under a microscope.



Courtesy of Lawrence Berkeley National Laboratory

able when you know what you need to study; it's not so helpful when you don't, particularly with regard to cancer.

Tackling this problem, Pinkel, Gray and colleagues came up with a different technique, turning FISH around in such a way that with one procedure, they could measure abnormalities across a cell's entire genome. Gray explains the modified approach, which they named comparative genomic hybridization (CGH): "Let's say we want to study a tumor genome, and we don't know which part of the genome is aberrant," he begins. "We grind up the tumor genome and label it one color, say red, and grind up a genome from a normal cell and label it a different color, say green, and then hybridize both of those back to normal [intact] chromosomes." The outcome is concentration-dependent: where the tumor cell has duplicated extra genes, the corresponding area of the normal chromosome will turn red; the normal chromosome will turn green where the tumor has lost DNA. "The beauty of this approach is you don't have to know where the tumor is aberrant," Gray points out. "It just maps it out for you."

CGH proved extremely effective, serving for well over a decade as the cancer research community's most comprehensive source of information on the genetic workings of cancer. After its development in the mid-'90s, CGH was significantly refined: Today, slides with as many as a million probes bonded in a microarray can be digitally scanned to map abnormalities at a million different points within the human genome.

Amazingly, DNA mapping technology has now advanced past even the most current CGH arrays: the latest devices can effectively sequence the human genome, nucleotide by nucleotide, in just a few days. (The Human Genome Project took 12 years to complete the task.) The Gray Lab recently acquired one. Pointing it out, he shakes his head, saying, "That thing is unbelievable."

After developing CGH, the focus of Gray's research turned more

exclusively to cancer. He says it is no coincidence that after losing his father to the disease in 1971, his work on chromosome analysis technologies allowed him to contribute toward understanding cancer. But it wasn't until CGH revealed the genetics of cancer in such detail and complexity that the disease itself became the primary focus of his work. He says he was struck by two things: how utterly scrambled cancer-cell DNA becomes, and how few similarities exist between patients' tumors.

Suspecting the latter might explain why not all patients respond the same way to a particular therapy, his most recent work has looked for ways to determine effective treatment, individualizing it based on the DNA profile of a tumor cell.


One of Gray's studies has systematically analyzed the sensitivity of 50 different breast cancer cell lines (colonies of self-propagating cancer cells that can be kept alive in the lab) to varying concentrations of almost one hundred approved or experimental cancer drugs. The genomic signature of each cell line—determined using CGH and, more recently, next-generation sequencing technology—can then be compared to their drug responses in order to identify those signatures that are strongly associated with response.

Although the study is not over yet—there are 400 cancer drugs on the market—Gray says patterns are emerging. "This drug works better when one set of genes is most active, that drug is more effective when another set of genes is most active," he explains. And the results are compelling enough to warrant clinical testing, which is the objective of the trials Gray is preparing to launch with support from the National Cancer Institute and Stand Up To Cancer.

Breast cancer patients who choose to participate in these studies will first have their tumors comprehensively analyzed. "The concept is to fingerprint the patient's tumor," explains Gray, "and then use the database of associations between genotype and drug response to select drugs that should be effective against the individual tumor."

It's a tremendously complex approach—the DNA sequence of a single cancer can occupy about a terabyte of memory (the hard drive capacity of about four average desktops). Given the volume of information, a central challenge of the study is managing and mining the information. "The computational area is a major weak link in the field right now," says Gray. "We have way too few people who are computationally sophisticated enough to manage the data we are talking about. ... I'm hiring as many of those people as I can find."

But despite this limitation, Gray is confident that there's a more effective approach to drug selection than is used today. Pointing to two graphs in a breast cancer textbook he's authored, he explains that each one corresponds to the genomic abnormalities in tumor cells from two different breast cancer patients. Both patients were given exactly the same clinical diagnosis, yet the graphs bear no resemblance to one another. "There's no reason to believe that these two cancers are going to respond the same way to therapy, but they are treated the same," says Gray. "Our goal is to fix that."

Asked whether he envisions a day when cancer is cured, Gray says, "I don't think there are any silver bullets." But he does envision a day when it's highly treatable; when the disease is so thoroughly understood that individualized treatment plans, adjusted over time to track cellular changes in tumors, can keep cancer in check for many years. "We can do things today that just two years ago seemed impossible—not to be dreamed of," says Gray. 

What



1 Sara Post, editor in chief for The Oredigger, senior class president; major: geology and geological engineering

2 Jaime Thorpe, president of ASCSM; major: chemical engineering

3 Autumn Triesch, Mines Activity Council Homecoming chair, Sigma Kappa vice president of Membership, ASCSM sophomore class representative; major: petroleum engineering

4 Kennda Lynch, president of CSM chapter of Students for the Exploration of Space, member of the CSM President's Committee on Diversity, NASA Student Ambassador; graduate student: environmental science & engineering

5 Dawn Jobe, president of American Association of Petroleum Geologists; graduate student: geology

6 Eryn Ammerman, president of SWE; major: engineering, electrical specialty

7 Emily Dalton, president of Student Athlete Advisory Committee; major: metallurgical and materials engineering

8 Sophie Hancock, president of CSM chapters of Society of Economic Geology and Phi Beta Delta International Honor Society; graduate student: geology

9 Marilou Canon, president of Professional Asian Society of Engineers and Scientists; major: chemical engineering

By Anne Button

Photography by Chris Peters

Gender Gap?

Women may still be outnumbered at Mines, but they are not outdone.

Women at Mines are used to being in the minority.

Sure, more women are enrolled today than ever before. And, at 25 percent, the proportion of women undergrads at Mines is much higher than the national average of 18 percent for engineering schools.

But still, walk around campus and it's obvious which gender is in the majority.

A closer look at the student body, however, reveals some interesting trends. Although women make up only a quarter of the student population, they currently hold about half of the student leadership positions; women currently serve as presidents of the student body, senior class, board of student organizations, and numerous honor societies and campus chapters of professional organizations. In addition, a disproportionate number of women serve as officers of these same organizations. It's also interesting to note that women have higher graduation rates (74 percent vs. 67 percent) and slightly higher grade-point averages (3.0 vs. 2.9) than their male peers.

What is behind these trends? What is propelling women into leadership on campus, and what accounts for their success in other areas?



10

11

12

10 **Ann Lott**, ASCSM treasurer, Sigma Kappa Sorority vice president of finance, and Up 'til Dawn treasurer; major: metallurgical and materials engineering

11 **Karley Adams**, Board of Student Organizations president, Order of Omega president, Civil Engineering Honor Society vice president; major: engineering, civil specialty

12 **Riya Muckom**, blogger for Office of Undergraduate Admissions, secretary of Pre-Med Society; major: chemical & biochemical engineering

“I started by writing an annoyed letter to *The Oredigger* about how many errors there were, and the next thing I knew I was a copy editor.”

—Sara Post

While there are no definitive answers to these questions, a concerted effort to improve the environment for women at Mines has been under way for a long time. For the last decade, many of these efforts have been led by Debra Lasich, the executive director of Mines’ Women in Science, Engineering and Mathematics program (WISEM). “It’s great to see so many women in leadership. We’ve made a lot of progress,” she says, encouraged by these trends.

Central to her work is an informal team—composed of both men and women—that works to create an environment comfortable for women at Mines. Her two closest collaborators in this group are Candace Sulzbach ’81 and Sarah Engel. A Mines alumna, Sulzbach is a lecturer in the Division of Engineering and the faculty advisor for the Society of Women Engineers (SWE); also, her daughter is currently attending Mines. Sarah Engel is an admissions officer who focuses on recruiting women.

“Women tend to approach the decision to go to engineering school a little differently than most men,” Engel says. “Being well-rounded is more important. I see them making more of an effort to find out, what will I do with my day when I’m an engineer? How will it affect people’s lives? And how can I be an engineer and still do all the other things I want to do?”

Lasich adds that she sees women doing more research before choosing engineering. For example, while less than a third of applicants to Mines are women, they make up more than half the prospective students touring campus.

Engel says, “We are doing a better job at defining what



Mines can provide women.” She often finds that the young women arrive on campus without a clear idea of what they can do with an engineering degree. “But often, as they listen to the possibilities, their eyes just light up with recognition that they can do this with their lives, and they can really change the world and make a difference. Those are the best days!” she says.

Helping them communicate this message is Riya Muckom, a freshman chemical engineering major who writes a monthly blog on the admissions web site, including posts on discovering rock climbing and joining the Ultimate Frisbee Club. She’s taken on responsibility as well, serving as an officer for the Pre-Med Society and training to become a student ambassador for prospective students. “When I visited Mines, each student emphasized how easy it was to get involved,” she says, “so I did.” Muckom is also a stellar student, attending on a full Florence Caldwell scholarship (named after the first female graduate of Mines 112 years ago).

A number of programs are in place to help support female students attending Mines. In Making the Connection, women who have been accepted for admission are teamed with current female students for a day on campus. The Graduate Women’s Forum, held four times a year, provides nonacademic, professional development opportunities for graduate students. Topics have ranged from financial planning to work/life balance. Women’s History Month is usually observed with mini-theater, portraying significant women’s accomplishments. And graduating women are celebrated at The Continuum, an event jointly developed by WISEM, SWE and the Alumni Association. “We call it the Continuum because we look at the past, present and future—current students, those who are graduating and alumni,” says Lasich.

To hear current students describe it, the efforts toward a cultural shift are working. Sara Post, a senior majoring in geologic engineering, says the climate at Mines encouraged



“Mines is amazingly welcoming to women.”

—Kennda Lynch

her to be far more engaged than she was in high school. “Women do seem to get really involved here,” she says. “I started by writing an annoyed letter to *The Oredigger* about how many errors there were, and the next thing I knew I was a copy editor.” And today she is the newspaper’s editor-in-chief, as well as senior class president and a member of SWE.

“Mines is amazingly welcoming to women,” says Kennda Lynch, a PhD student in environmental science and engineering. “There are lots of resources dedicated to making women feel welcome in a traditionally male field.” With engineering degrees from the Universities of Illinois and Colorado, and work experience at Lockheed Martin, Abbott Laboratories and NASA, Lynch knows something about traditionally male fields.

Lasich is not solely focused on serving the student population. “You can’t improve the institutional climate for women by working with students only,” she says. “Female faculty and staff are a big part of it.” While the ratio of female faculty members remains relatively low—the same is true nationwide in technical fields—more women than ever before are serving in leadership roles in the school’s administration. Currently, 40 percent of the president’s Executive Committee, and 70 percent of his cabinet are women.

Tony Dean, a professor in the chemical engineering department, has observed the number of women in positions of leadership grow during his 10 years at the school. “Campus efforts to increase diversity at these levels have worked because the women in these positions have been exceedingly competent,” he says. “And they’re role models. So now there are more and more in the leadership pipeline, also visibly demonstrating their competence”

Derek Morgan, associate dean of students and director of student activities, has seen expectations for women build over the seven years he’s been at Mines. “We expect women to do great things, because they already have done great things,” he says. “There’s more of a culture that celebrates women. It’s okay for women to stand out and lead.”

Both Lasich and Sulzbach received national awards this academic year for their work toward improving the culture for women at Mines: Lasich was recognized by the Women in Engineering ProActive Network with their University Change Agent award, and Sulzbach was named Outstanding Faculty Advisor of the Year by SWE at a ceremony in California.

Since becoming the faculty advisor to Mines’ SWE chapter in 2002, Sulzbach has seen membership increase by more than 50 percent. It’s now the largest student group on




“When I visited Mines, each student emphasized how easy it was to get involved, so I did.”

—Riya Muckom

campus and the second largest student SWE chapter in the nation. One way she’s built up the organization is by focusing on student leadership. She says all SWE activities are organized by its student officers, with Sulzbach offering guidance only when needed. (That may be a harder balance to strike this year as Sulzbach’s daughter, Eryn Ammerman, was elected chapter president.) The weekly SWE luncheon speaker series builds community and provides students with valuable information and networking opportunities. “Just yesterday our speaker was a chemical engineer who makes prosthetic devices,” says Sulzbach. “Attendance topped 200.”

“It’s this kind of thing—the opportunities to think about the impact of their work—our women are responding to,” adds Lasich.

Comparing Sulzbach’s experience at Mines in the eighties, with Muckom’s perceptions in 2010, it’s clear things have come a long way in 30 years. As a student, Sulzbach recalls that only 5 percent of the student body was female, women’s restrooms were few and far between and professors sometimes assumed women couldn’t do the work. Muckom, on the other hand, says “Honestly, most of the time I don’t even notice.”

Lasich isn’t complacent, but she is taking time out to celebrate the progress. “I’m not saying we are done making improvements, but the collective efforts of the entire community—administration, faculty, staff and alumni—have successfully created an environment where women are not only attending and working at Mines, but they are part of the leadership and thriving.” 

The Network

Life Members

The Colorado School of Mines Alumni Association gratefully acknowledges its new Life Members welcomed between February 1, 2009 and January 31, 2010.

Kimberley R. Alanis '04
 Brian A. Armstrong '00
 David W. Armstrong '70
 Sara A. Atkins '00
 Juma K. Attid '89
 Brandon R. Baker '04
 Chit Y. Bao '72
 Dustin E. '03 and
 Stephanie L. '03 Bennetts
 Robert H. Blanchard II '07
 Tiffany L. Brewster '07
 Leo T. Brown '02
 Jason A. Brucker '00
 Paul M. Brunner '76
 Justin D. Buck '04
 David R. Cassidy '89
 Christopher K. Chapman '00
 Christopher W. Clark '96
 Mark D. Cutright '80
 Deborah E. Dalby '91
 William H. Dears '84
 Laura E. Dieker '08
 John F. Dlouhy '74
 Eric R. Drennan '02
 Steven R. Enger '81

Andres S. Escalante '93
 Andrew B. Flynn '86
 Frederick J. II '85 and
 Susan P. Foss '85
 Andrew Geesen '86
 Mark A. Gefreh '07
 Dennis D. Gertenbach '74
 Jennifer R. Glennon '96
 Jason W. Goodall '96
 Christopher A. Green '06
 Jason E. Gumble '00
 Kevin J. Gunesch '00
 Thomas M. Haard '89
 Weston Hamilton '07
 Bruce D. Hansen '80
 Thor V. Haraldsen '07
 Todd M. Harwood '92
 James A. Heist '69
 Bruce Hinton '68
 Mark J. Hubis '82
 Frederick D. Jackson '94
 Jeffrey Jaco '02 and Tracy
 Gardner '96, MS '98
 Walrave T. Jansen '71
 Theron W. Jensen '90

Danny R. Jimenez '09
 Donald L. Kammerzell '71
 Julianne Bates Knutson '82
 Alyssa A. Kohlman '03
 Jeffrey M. Kramer '08
 Michael J. Liedtke '00
 Christopher G. Locallo '96
 Mark J. Ludwig '81
 Christopher T. Lynn '06
 Joshua C. Matthews '99
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 Michael J. McGlynn '07
 Robin L. McIntosh, Jr. '92
 Kelly D. Michals '08
 Christopher T. Mills '01
 Erica L. Mitchell '85
 Carlos Moita '01
 Paul E. Murray '99
 Levi A. Myers '05
 Erik B. Nelson '75
 Adam D. Noelck '07
 Samuel A. Pannunzio '04
 Angela E. Pearson '08
 Kent D. Peaslee '78

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 Penny J. Pettigrew '92
 Robert Pimentel '96 and
 Susanna Lopez '96
 Clayton S. Pluchek '85
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 Dante Ramirez Rodriguez '03
 Amanda E. Rebol '07
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 Todd M. Versaw '88
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CSM Alumni Association

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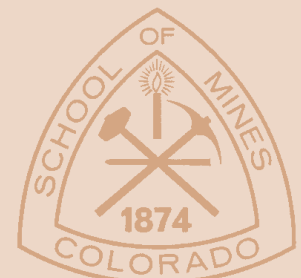
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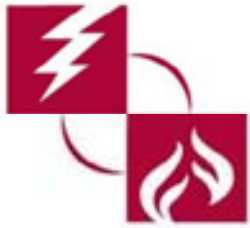
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Fast Forward

Class Notes
 Weddings
 Alumni Profiles
 Births
 Passings

1950

John R. Weyler is president of Industrial Development International and lives in Houston, TX.

1953

John Reitz retired after 32 years with Ingersoll-Rand in 1985. He and his wife are enjoying living in the mountains of Western North Carolina and celebrated their 57th wedding anniversary in 2009.

1959

James L. Payne is chairman and chief executive officer of Shona Energy Company and lives in Houston, TX.

1961

David P. Hill is a scientist emeritus for United States Geological Survey and lives in Palo Alto, CA.

C. Hall Swaim is a partner for WilmerHale and lives in Brookline, MA.

1962

Jaime M. Eisen is working for Sunny Isles Beach and lives in North Miami Beach, FL.

1963

Joseph R. Stano is a consultant for Three Nines Fine Ink and lives in Lakewood, CO.

1964

Ralph E. Townsend is a pipeline engineer for Forerunner Corporation and lives in Littleton, CO.

1965

Dale W. Peterson is a minister serving as director of special projects for International Christian Ministries. He lives in Arvada, CO.

1966

Robert D. Carson is CEO and senior portfolio manager at Carson Capital Management and lives in Englewood, CO.

Thomas E. Dimelow is a consultant for Genesis Gas & Oil and lives in Denver, CO.

John R. Schmedeman is managing director for JOHDI Properties and lives in Hot Springs Village, AR.

1967

Terrence A. Graham is working for Abaxial and lives in Fort Worth, TX.

Loren L. Pritzel is a technical advisor for UOP and lives in Cottonwood, AZ.

Richard W. Rhoades is a consultant for Enterprise Products and lives in Rifle, CO.

1968

Ronald D. Uchida is a global product manager for iBAHN Corporation and lives in Golden.

1969

Todd A. Brown is a business coach for ASAP Accounting & Payroll and lives in Telluride, CO.

George W. Condrat is a senior engineer at Loughlin Water Associates and lives in Salt Lake City, UT.

David V. Fitterman is a consulting geophysicist for Aviva Geotech and lives in Long Island City, NY.

Kirk R. Hindley is working for Northrop Grumman in information systems and lives in Arvada, CO.

Thomas O. Hiscox is vice president and executive advisor at Unimin and lives in Payson, AZ.

Thomas M. Mauro is working for Colorado Performance Excellence and lives in Denver, CO.

Peter S. Wyckoff is a field inspector for Tennessee Valley Authority and lives in Delta, CO.

1970

Charles W. Bloomquist is president of Resource Consulting International and lives in Lakewood, CO.

Fred E. Staible is VP, asset management for GDF SUEZ and lives in Houston, TX.

Lee E. Swartling is an area manager for Wagstaff and lives in Spokane, WA.

Donald Thomas retired in August 2009 after 39 years with UOP.

1971

James R. Black is a project manager for WorleyParsons and lives in Vancouver, WA.

John I. Brockardt is a COO for Country Specialties and lives in Marion, IA.

C. Kent Gestring is VP and general manager of SolarEnergyQuest and lives in Denver, CO.

Robert L. Hanlin is an instructor at University of Missouri at Kansas City and lives in Lees Summit, MO.

Craig W. Moseley is a senior process engineer for URS Corporation and lives in Golden.

Paul T. Treece is CEO of Intranomics and lives in Seal Beach, CA.

Weddings

Sarah Chase '07, MS '09 married Bryce Bartlett on September 18, 2009 in Rocky Mountain National Park (no photo).



Michael P. Mitchell '03 and Erin Militello were married on August 31, 2007 in Central Park in New York City.



Chuck Yarbrough '07, MS '08 and Courtney Harrison were married on July 11, 2009 at Columbine Country Club in Littleton, CO. In addition to many other Mines alumni, Caleb Ring '07, Nick Belden '07, Brandon Richardson '07 and Derek Ridgway '06 were in the wedding.



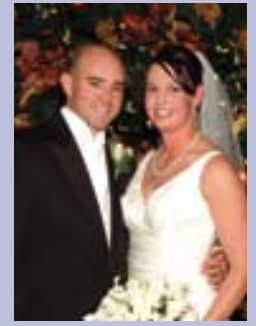
Ben Hildebrandt '08 and **Rachel Johnson '07** were married on November 7, 2009. Their outdoor ceremony took place at Boettcher Mansion in Golden overlooking the mountains.



Afshin M. Andreas '98 and Lisa R. Esmailzadeh were married July 11, 2009 in Murrieta, CA.



Joe Mahoney '86 and Rani Ahuja were married in a family ceremony that included their seven children on January 23, 2010 in Highlands Ranch, CO.

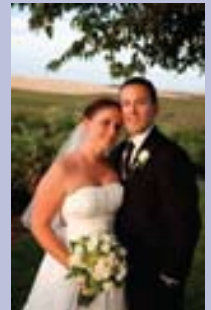


Kimberley Kaiser '04, MS '05 and Jack Alanis were married on December 19, 2009, at the Inverness Hotel in Englewood, CO.



Chris Seick '07 and **Lindsay Stauffer '07** were married June 13, 2009 on Chris' grandfather's ranch in Craig, CO.

Eileen Dale McFadden '04 and **Robert Michael Gower '04** were married on September 5, 2009 in Esparto, CA. The outdoor ceremony and reception, held at a winery in Northern California, were attended by several Mines alumni, including Eileen's father, Dale '76; uncle, Gene '73; and bridesmaid, Amanda Dolezal '05.



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

1972

Michael F. Conlon is president and CEO of Yuma Exploration and Production and lives in Houston, TX.

Willie R. Fields is a high school teacher and lives in Bakersfield, CA.

1973

E. Thomas Cavanaugh is a consultant and lives in Arvada, CO.

Scott E. Moravec is president of Eagle Information Mapping and lives in Cypress, TX.

1974

Gary L. Bauer is the Egyptian manager for Global Santa Fe Corp based in Cairo, Egypt.

John H. Cohen is an R & D manager for AGR Subcontracting and lives in Houston, TX.

Paul E. Dorr is vice president of Enduring Resources and lives in Denver, CO.

David L. Feavel is a partner for EXL Petroleum and lives in Houston, TX.

Kim C. Harden is a director for Energy Efficient Insulation and lives in Spring, TX.

Todd H. Malejan is managing counsel for Shell Oil Company and lives in Houston, TX.

Richard P. Mignogna is a professional engineer for Colorado Public Utilities Commission and lives in Golden.

Shane S. Mohammadi is a business manager for ExxonMobil and lives in Newport Coast, CA.

1975

David W. Ash works in application support for Clearwire and lives in Fairfax, VA.

Bruce R. Bergeson is president of Bergeson Technology Services and lives in Novi, MI.

Thomas H. Borer is vice president of distribution for Atlas Copco CMT USA and lives in Louisville, KY.

Luis V. Coppa is working for Ecology and Environment Inc. and lives in Arlington, VA.

Ian R. King is an assistant plant manager for Sasol Wax and lives in Fremont, CA.

Venkoba Ramachandran is a consulting engineer for RAM Consultants and lives in Scottsdale, AZ.

Thomas L. Watson is a project manager for Mission Support Alliance and lives in Pasco, WA.

1976

David E. Joseffy is an independent consultant living in Lakewood, CO.

Robert R. Mann is a senior petroleum engineer for Robert R. Mann Consulting and lives in Chieftland, FL.

Richard C. Ness is a technical manager for Olin Corporation and lives in Cleveland, TN.

Donald J. Parker is working for ConocoPhillips and lives in Lake Charles, LA.

Alumni

Fast Forward

John J. Peregoy is the owner of Peregoy Construction Services and lives in O'Fallon, MO.

Vasantkumar P. Thakkar is a senior fellow for UOP and lives in Elk Grove Village, IL.

Donald B. Tschabrun is a director of engineering for Jupangu International and lives in Littleton, CO.

John L. Waite is working for Wells Fargo Advisors and lives in Grand Junction, CO.

Richard P. Wilson, Jr. is a chief metallurgical engineer for VAM Drilling USA and lives in Webster, TX.

1977

Allen E. May is vice president of business development for Denali Oil and lives in Spring, TX.

Steven C. Phifer is a consulting engineer for Ameren Energy and lives in Staunton, IL.

Stanley G. Pitman is a staff engineer for Battelle Northwest and lives in Richland, WA.

David M. Vardiman is a project tech engineer for Deep Underground Scientific and Engineering Lab and lives in Woodland Park, CO.

1978

Tariq I. Ahmad is vice president of Pacific Energy & Mining and lives in Reno, NV.

Mark W. Berkstresser is an information architect for Chevron and lives in Houston, TX.

Kenneth H. Bond is a project manager for ITT Corporation and lives in Colorado Springs, CO.

Clarence D. Meis is a consultant for Tolmar and lives in Fort Collins, CO.

Peter R. Pawlak is a UC architect for Unifysquare and lives in Lake Tapps, WA.

Mitchell R. Whatley is a drilling coordinator for EnCana Oil & Gas (USA) and lives in Southlake, TX.

Mick R. Will is the Gulf region operations manager for BP and lives in Katy, TX.

1979

H. Thomas Bowles is a senior drilling engineer in offshore operations for BP America, based in Tripoli, Libya.

Glenn M. Campbell is working for General Dynamics Land Systems and lives in Rochester Hills, MI.

Cathy L. Farmer is a geoscience fellow for ConocoPhillips and lives in Richmond, TX.

Richard E. Fraley is a consultant for ConocoPhillips and lives in Farmington, NM.

W. Tyler Geiger III is a manager in process optimization and energy management for BASF Corporation and lives in Califon, NJ.

John F. Gnazzo is a chief software engineer for GTS System and lives in Eden Prairie, MN.

Peter M. Janak is a leading geophysicist for Statoil and lives in Fulshear, TX.

L. Douglas Poole is an instructor of mathematics at Mines and lives in Golden.

Susan Howarth Rhodes is deputy director of energy security and analysis for Sandia National Laboratories and lives in Albuquerque, NM.

1980

James C. Ferguson is a technical authority for BP and lives in Anchorage, AK.

Debra G. Lawless is the executive consultant for Rodan+Fields Dermatologists and lives in Monument, CO.

Michael S. Lynch is a corrosion and chemical engineer for Occidental Oman and lives in Durango, CO.

H. Deon Murphy is a program analyst for the U.S. Bureau of Reclamation and lives in Golden.

Matthew N. Plis is a mining engineer for the Bureau of Land Management and lives in Glendale, AZ.

Steven A. Ruehle is an engineering manager for BP America and lives in Bellville, TX.

Steven D. Smith is manager of downstream HS&E programs for ConocoPhillips and lives in Houston, TX.

Jerry K. Sommer is the president and founder of Source Energy Partners and lives in Highlands Ranch, CO.

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Bruce Kugler
Patent Attorney, Principal
B.S., Petroleum Engineering,
1981



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



Brad Knepper
Patent Attorney, Principal
B.S., Electrical Engineering,
1998



Matthew Ellsworth
Patent Agent/Technical Specialist
B.S., Engineering, with honors, 2003
M.S., Engineering Technology
Management, 2005
Top Graduating Electrical Engineer

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Profile

Spoiled Dogs, Pinot Noir and Black Angus Cattle

Jack and Karen Krug have escaped to a world of their own. Tucked away in the woods of Whidbey Island, Washington, on a small pristine farm, they are enjoying an early retirement that seems as far removed as it could be from their high-flying careers in the oil industry. Jack '70, MS '71, PhD '77, a petroleum engineer, and Karen '84, a petroleum engineer and lawyer, now refer to themselves as vintner/farmers, growing pinot noir grapes, making wine and raising Black Angus.

Karen explains: When they moved to Washington from Golden in 2004, both were looking for a rural life, but Jack was interested in farming and she wanted to make wine. So they compromised and began the work of planting vines and preparing pastureland. Jack enrolled in a six-month livestock advisor course at Washington State University to determine the most sustainable farming techniques for their land—a strong focus of their entire operation—while Karen joined the board of the Whidbey Island Conservation District (which she subsequently chaired). They also received assistance from scientists at a WSU grape-growing research program and a nearby vintner specialist.

More than five years into their new life, the Krugs are very happy. “There is a natural progression to what we do, depending on the weather and the crop or livestock needs,” says Karen. “It’s a healthy life, with lots of exercise and good-eating homegrown veggies. We are almost completely self-sustained,” she adds. They especially enjoy running Spoiled Dog Winery, named after their Australian shepherds, Blue and Carmie. Jack says, “It’s a lot of fun. Think of it being an applied chemistry class—but not 101.”

However, Jack is used to complexity. He enjoyed a long and successful career in the oil and gas industry, most recently as owner/partner of Golden-based Questa Engineering. Previously he headed up several companies in Russia and Kazakhstan, and was president of Chaparral Resources. Today, he still enjoys the odd short spell as an on-site rig supervisor, as it helps pay for winery and farm equipment and keeps his knowledge fresh.

When he isn’t working on an oil rig or on the farm, Jack enjoys woodworking and furniture making. He recently built a bathhouse, complete with a Japanese soaking tub and sauna, which was featured on the back cover of the



Fall/Winter 2008 edition of *Fine Homebuilding* magazine (see magazine.mines.edu for some spectacular photos and links to the article).

After graduating with her degree in petroleum engineering from Mines, Karen complemented it with a law degree from Lewis & Clark College of Law and developed a career as a petroleum negotiator, specializing in Central Asia. Today she continues to work part-time for a London-based law firm, primarily on projects in Kazakhstan, Uzbekistan and Turkmenistan. In April, she completes a one-year term as president of the Association of International Petroleum Negotiators, a position that will have taken her to five continents to lead workshops and conferences. Now, with the end in sight, she’s looking forward to devoting more time to selling wine.

The Krugs called Golden their home for 40 years, so when they uprooted and moved away in 2004, they had to leave a great deal behind: friends, family and close proximity to their alma mater. Their involvement with Mines over the years has been considerable; Karen was the school’s first alumna trustee (1996-2004) and she founded the Sister to Sister Scholarship to support female students at Mines.

They haven’t ruled out returning someday. But for now, they are busy building a new life and livelihood together (“retirement” really isn’t apt). And they encourage others to do the same: “The bottom line—find a passion to keep yourself entertained through retirement,” says Karen.

See more photos of the Krugs’ farm and winery on the magazine website: magazine.mines.edu.



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Editor's Note: Alumni with updates from classes 1980 to 2009 are listed below, and their information can be viewed online at minesonline.net. * In fact all class notes published in *Mines* for the last two years can be found on the site. When you visit, take a few moments to enter your latest information, and perhaps upload a photo. If you do, we'll list you here in the next issue.

*** Instructions for viewing class notes online**

If you have never logged in to minesonline.net:

1. Click the red "First Time Login" link at the top right of the home page.
2. Enter your name and select 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, or find it in a recent e-newsletter from CSMAA. Can't find it? Email CSMAA@mines.edu and we'll send it.)
4. Create your username and password, then confirm/correct contact information.
5. Click "My Stuff" tab and select "Class Notes."

If you have previously completed first time login:

1. Click the red "Login" link at the top right of the home page.
2. Enter the username and password you created for yourself.
3. Update information if necessary.
4. Click on "My Stuff" tab on left.
5. Click on "Class Notes."

Profile

NASA Flight Controller Prepares for the Worst

At space camp in high school, James Johnson '03 was disappointed that he wasn't selected to be an astronaut. Instead, he was put on mission control.

He had a blast (pun intended).

"It was kind of foreshadowing, I guess," says Johnson, who today is a flight controller for the space shuttle program at the Johnson Space Center in Houston, Texas.

As a specialist in electrical, environmental and consumables management (EECOM), it is Johnson's job to help maintain the crew's life support systems during flight. For those who recall the actual events or the 1995 film, it was largely the ingenuity of the EECOM team that brought the crew of Apollo 13 safely back to Earth after the famous line, "Houston, we have a problem," was transmitted from the stricken spaceship.

"Our mantra is train, plan, fly," says Johnson, who estimates that his team spends 80 percent of its time training. In between their roughly four flights per year, they run practice simulations—about three per week. "Our practice sessions are like a miniature Apollo 13 disaster. Over the course of eight hours, all hell breaks loose, and then we try to take care of the scenario," he says.

Johnson tells a story that's often repeated in the flight control world: As Neil Armstrong and Buzz Aldrin were descending toward Earth after their first lunar landing, they received an alarm that the system was overloading. Prior to

1981

Wanda J. Eaton
Steven M. Goebel
Jeane M. Goforth
Paul G. Grundy
Raye L. Musgrave-
Fischl
Vicki G. Niesen
Michael C. Purfield
Barbara J. Smith
Robert E. Tucker
Christopher M.
Walker

1982

Timothy A. Berg
Scott K. Burkholder
Brett Conrad
James F. Evans
Todd J. Fockler
Lisa M. Kelly
Michael R. Kennedy
Alan K. Kosley
John W. Roadifer
Kevin Smith

1983

Mark A. Allen
Rex A. Bigler

Peter Critikos
Cynthia L. Feyder
Jolene K. Kramer
Joseph A. Nenni
Thomas P. Young

1984

Michael E. Baldus
Sherry A. Barnett
Anna M. Gill
Michelle Konrad
Thomas K. Moffitt
Siegfried
Mundhenke
Eric J. Newman
Roberta R. Nolan-
Lobmeyer
Randal J. Winkler
Brenda J. Wolfe

1985

Jeffrey S. Castor
William G. Hill
Daniel M. Larson
Ann Mattson
Paul M. Schultz
Petko A. Zlatev

1986

Joel M. Ammons
David W. Barber
Todd R. Carroll
Kirsten L. Derr
J. Andrew Geesen
Faith E. Kay
R. Scott Lewis
Roy C. Long, Jr.
Mitchell S. Mather
Mohan S. Misra
Mark D. Mueller
Mark P. Post
Michael P. Riendeau
Kathleen S. Smith
John S. Sprackling
William J. Warren, Jr.
Daniel N. Wood

1987

Yavuz Atasoy
Annette Bills
Kelly P. Coleman
Lisa J. Cox
Scott B. Daves
Henry E. Heyser III
Denise M. Lytle
Mark J. Ollweiler
Michael E. Pavlich

Kurt A. Ranzinger
Randy L. Smith
Mary L. Spaid-Reitz

1988

Elizabeth A. Burch
John J. Christmann IV
Ellen Ewart
Wendy M. Gort
Gary E. Grove
John E. Larson
Tony F. Lucero
Monte L. Madsen
Robert T. Mero
Thomas A. Riccio
Chia-Chung Wang
Michael R.
Wichmann

1989

Donlon O. Hurtubise
Betsy L. LeaRussa
Steven L. Newman
Tina L. Pierce
John H.
Rheinheimer
Terrence N. Thom
William C. Wagner III

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the mission, the simulation team had worked on this exact failure, so they were able to immediately provide the solution.

Though he admits they are stressful, Johnson enjoys the marathon simulations, and when you talk to him, you understand why. The son of a United Airlines pilot, Johnson grew up with an interest in flight and space. He recalls wearing out his parents' VCR watching the movie, *Return to Flight*, about the first space shuttle mission following the Challenger disaster. By high school he was researching what made aircraft fly. "That's when I realized engineering was for me," he says.

After his high school space camp experience and during his first few years at Mines, Johnson says, "I thought flight control was really cool, though it still seemed a little bit out of reach." But during his sophomore year, Johnson found out that Mines' Cooperative Education program would allow



And there, on his toes, is exactly where Johnson loves to be.

him to work at Mission Control, while continuing to work toward his degree. Over the next three years, he rotated around different divisions within NASA's mission operations directorate, including two tours with the EECOM group.

Johnson says that the multidisciplinary aspect of his education has helped him the most. "Mines had me look at multiple aspects within engineering and work with students from other disciplines," he says, explaining that he never knows from day to day what engineering specialists he'll need to work with. His work now ties in with numerous specialties. "With every flight, we always have something that breaks or fails or creates a challenge. Not all of it makes the news—the average layperson doesn't really care about it. But you can rest assured, it's keeping us on our toes around the clock."



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Marisa Rydzy
PhD candidate, Geophysics

Renee Francese
Senior, Geophysics

MTM

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Marisa Rydzy's doctoral research starts by sending X-rays through tiny grains of sand—and *ultimately has the potential to unleash mountains of energy*. By characterizing the distribution of gas hydrates within these samples, she links pore-scale rock physics to field-scale geophysics to enhance our understanding of this emerging energy resource.

As Mines researchers like Marisa discern the critical details that characterize the earth, create energy and impact the environment, they contribute to major breakthroughs that help improve the quality of life for people around the world. Your gift to The Mines Fund, *no matter what size*, contributes to a solid base of support for the students and faculty who build big ideas at Colorado School of Mines.

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Class of 2030



Steve Grigel '01 and his wife, Kaycie, welcomed Luna Emma, on Jan. 9, 2010. Big sister Brook and the dog, Sultana, have already enjoyed cross-country skiing with her.



Abigail Kyoko was born Sept. 3, 2009 to **Jennifer (Ogawa) '05**, MS '08 and **Adam '02**, MS '03 **Berig**.



Jack Michael Swartzlander was born July 3, 2009 to parents **Mike '02**, MS '03 and **Ruthie '03 Swartzlander**.



Jesse Chuhta '99 and Laura McGee announce the birth of William, in July 2009. He joins big sister, Whitney.



Sarah (Marchwick) '00 and **Josh '00 Lau** welcomed Elliot Abraham on May 1, 2009. Atticus, 3, is enjoying his new role as big brother.



Jason '06, MS '08 and **Julie (Ruckman) '05 Lachance** welcomed Emery Ann on Dec. 2, 2008.



Katie (Cunio) '04 and **Adam '04 Marwitz** welcomed their daughter, Annabelle, on March 4, 2009.



Luke Spence '02 and his wife, Lisa, welcomed their first child, Dillan Thomas, on Feb. 5, 2009.



Mary (Larson) '00 and **Hobie '00 Troxell** are proud to announce the birth of their daughter, Anna Larson, on June 28, 2009.



Mary Anna was born on June 18, 2007 to **Angie (Hutchinson) '03** and **Tom '98 Hager**.

1990

Kirk A. Erven
Stephen A. Gornick
John H. Hill
Theron W. Jensen
Steven M. Lassek
Mark K. Reeves
Ward A. Whiteman
Scott A. Winn

1991

Robert R. Dyk
Andrea M. Faucette
Wayne R. Harris
Nicholas D. Hickson
Benjamin H. Houston
John D. Jensen
Samantha F. Meador
Keith W. Melcher
Thomas Mullins
Karen Vallance Peterson

1992

Gwen L. Barthel
James P. Froehlich

Monica M. Noble
Joshua F. Olmsted
Jon L. Powell
Elviera T. Putri
Samuel A. Rasmussen
J. Kyle Roudebush
John L. Strobel
Steven J. Tua

1993

Kelly M. Brown
Sara K. Brown
Quinton T. Hennigh
Dennis R. Horner
William T. Roberts
Christopher R. Stodden
Peter K. Thorne

1994

Thomas E. Collings III
Richard E. Duncan
Christian H. Ericksen
Andrew R. Freeman
Cheng-Ning Jong
James R. Piper

Samuel S. Roushar
Dennis M. Stull

1995

Kerry L. Aggen
Suzanne G. Berman
David J. Bihm
Andrew P. Carnes
Kevin D. Creel
Barry J. Gaston, Jr.
Steven N. Graese
Harvey A. Kamionka
Lynette L. Laffea
Katharine A. Misken
Joseph H. Morey III
Joshua J. Robbins
Glen G. Roussos
Adam C. Sayers
Georgette L. Siparsky
Lauren L. Torok
Scott J. Verhasselt

1996

Scott C. Cheeseman
Capt. Paul E. Deegan

Trevor R. Elenbaas
Shanna Carroll French
Michael J. Johnson
Paul J. Kos
Jess A. Peonio
Gloria J. Philpott
Robert A. Pimentel
C. Jason Pinto
Michael D. Quinn
Brian D. Stevens
Raul D. Varela

1997

Matthew J. Buckley
David D. Crichton IV
R. Jason Crowther
Jeffry T. Fisher
Ryan M. Giese
Kristopher G. Johnson
Andrew W. Johnston
Colin M. Matheson
Todd M. Mundorff
Clay E. Ost
Pamela A. Petranovich
Kelly L. Redden

Kari Susan Sanders
Ronald G. White

1998

Rashad Booker
Wesley C. Butero
Leslie A. Collins
Kevin H. Crist
Shawn D. Green
Ronald J. Keller
Steven J. Lytle
Travis T. Moore
Brian L. Mossberger
Thomas W. Payne, Jr.
R. Todd Perry
Brian J. Philippus
Hillary A. Saunders
Robert M. Schulz
Marc R. Schutt
Edward Stafford
Amber T. Vail
Bryan W. Walter
Randy A. Wampler
Cyndi M. Wheeler

Alumni

Fast Forward

1999

Jesse D. Chuhta
Brian A. Corff
Karen L. Dennis
Robert M. Fiore
Jeremiah E. Holland
Joshua S. Lewis
Daniel D. Matlock
Diane E. Reed
Matthew J. Sands
George Tumur
Andrew N. Winter

2000

Shayma A. Ahmad
James M. Beideman
Dawn R. Culley
Kevin J. Gomes
Kevin J. Gunesch
Shikha Hansen
Zane A. Kuenzler
Matthew D. Lengerich
Sean P. O'Reilly
Diane L. Oshlo
Kelly T. Taga
Hobie Troxell
Suwan Umnuayponwivat
Tandra L. Zitkus

2001

Claudianus K. Adjai
Shelan M. Golightly
Jason A. Lancaster
Carlos Moita
Reco V. Prianto
Corey A. Scheele
Angelina C. Southcott
Derek S. Swanson

2002

Amber N. Brinson
Jeremy N. Dillman
Christopher R. Hammitt
Elizabeth M. Moore
Stephen G. Redak
T. David Simmons
Luke J. Spence

2003

David H. Clements
Neil M. Flock
John P. Gabrielson
Nicholas L. Peterson
Samuel Quainoo

2004

Christopher L. Brown
Scott S. Brown
Joshua L. Burgher

Zeke D. Coleman
Shankari G. Haack
Angela K. Lemmerman
Ryan M. Ostoyich
Brian T. Philippi
Jason T. Stewart
Hossein Forough Tabrizi
Christopher Michael
Thompson
Graham P. Vlcek

2005

Rees G. Arnim
Ryan P. Cadenhead
Melissa S. Engbarth
Aaron M. Fiscus
Kevin A. Keil
Kristopher C. Koski
Michelle A. Moorman
John W. Thompson

2006

Luciana Ayala
Robert D. Cassel
Patrick A. Cordova
Matthew J. Lannon
Adam J. Meininger
Ronald W. Salomonson, Jr.
Wade W. Simmons
Leonid G. Tsuber

2007

Sharkhuu Amarjargal
Russell J. Dowling
Thor V. Haraldsen
Jacob W. Kirkley
Casey A. Korejwo
Ian P. Lewis
Cord A. Moody
Lawrence D. Nemetz
Caleb A. Ring
Christopher M. Seick
Travis K. Test
John H. Williams

2008

Mitchell J. Dziduch, Jr.
Dustin J. Haynie
Nicole E. Mosby
Marco A. Murillo
Hsiao-Po Nieh
Thomas L. Papiernik
Christopher C. Patton
Raul E. Rangel
Julianna Sipeki
Benjamin N. Zapp

2009

Abdullah M. Al Habab
Hamad Alghenaim
Alexandre W. Araman

Diron H. Baker
Timothy J. Barelli
Arpita Pal Bathija
Cooper D. Best
Margaret L. Brown
Adam P. Conry
Kevin J. Duffy
Alex W. Gephart
William L. Grant
Matthew R. Harris
Theron J. Hoedel
Matthew R. Hoffman
Luke R. Ketter
Christina J. Kretchman
Katarzyna M. Kuzniak
Charles A. Larkin
Aaron D. Martinez
Christopher J. Moore
Islin Munisteri
Emily Klawon Newes
Matthew J. Nichols
Jacob W. O'Brien
Steven A. Otto
Jaclyn J. Raskay
Patrick C. Smart
Richard E. Stilson
Claudio E. Vera
Danielle K. Williams

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Passings

To live in hearts we leave behind
is not to die.

—Thomas Campbell 1777-1844

Ted P. Stockmar '43



TED P. STOCKMAR '43, a 33-year-member of the board of trustees, died on December 28, 2009.

Ted served on the Colorado School of Mines Board of Trustees from 1948 until 1981 and was chairman of the board from 1969 to 1979. He initiated the incorporation of the Colorado School of Mines Foundation in 1951

and continued to serve the school in many capacities throughout his life.

During his time as a student, Ted was president of his fraternity, Sigma Alpha Epsilon, a colonel in the ROTC Cadet Corps, and president of both Tau Beta Pi and Theta Tau honor societies. He was a four-year letter winner in football and member of the undefeated 1939 squad, as well as a member of the Intrafraternity Council, Blue Key, and Scabbard and Blade.

After graduating as a petroleum engineer, Ted served in World War II as a 2nd lieutenant in the Army Corps of Engineers, and later as a B-24 and B-29 pilot instructor in the U.S. Army Air Corps. He earned his law degree from the University of Denver in 1948 and went on to become partner of the Denver law firm of Holme Roberts & Owen. He retired in 1991 after a 40-year career, during which he distinguished himself as an incisive expert in natural resources law and land utilization.

As a member of the board of trustees, Ted advocated for the establishment of a mineral economics program and a strengthened humanities curriculum. He was actively involved in developing the CSM Research Institute, the Colorado Energy Research Institute and the Potential Gas Agency. During his tenure, the first student housing was erected on campus, as well as the original student union and numerous academic buildings.

In addition to giving generously of his time in service to Mines and the CSM Foundation, Ted also made a substantial philanthropic commitment to the school, with gifts totaling more than \$2 million over his lifetime.

Ted was awarded Mines' Distinguished Achievement Medal in 1987, the Mines Medal in 1989, and an Honorary Doctorate in 1997. He was an honorary member of CSM Alumni Association since 1971.

Ted enjoyed golf and skiing, and has been described as a "creative" skier—having learned on barrel staves, he never quite figured out how to turn properly. He also enjoyed spending time with family and friends, and will be remembered for his intelligence, confidence and sense of humor. Preceded in death by his wife, Suzanne, Ted is survived by his children, Stephen, Brian and Anne; three grandchildren; and two great-grandchildren.

Michael S. Nyikos



MICHAEL S. NYIKOS, chairman and longtime member of the Colorado School of Mines Board of Trustees, and former Mines administrator, passed away on February 10, 2010.

Mike's service to Mines began in 1979 when he joined the administration as dean of student affairs. He later served as vice president of student affairs and external relations at the

school. At the time of his passing, Mike was chairman of the Colorado School of Mines Board of Trustees, a post he had held since 2004. He had been a member of the board for eight years and was a passionate advocate for the school and its mission, serving also as secretary of the CSM Foundation Board of Governors.

Born on September 8, 1933, in South Bend, Ind., Mike graduated cum laude with a bachelor's degree from New Mexico Highlands University and went on to earn his master's and doctoral degrees from the University of Michigan.

Before joining Mines, he taught in the South Bend school system and then worked for several years at Fort Lewis College in Durango, Colo., first as an instructor and assistant professor, then as director of public relations and information, and finally as dean of students. He volunteered at the LaPlata County Fair and Spanish Trails Fiesta, and worked with the Colorado Mounted Rangers to rescue stranded hikers and hunters. Mike was also an active member of Durango's St. Columba Catholic Church. Prior to his retirement in 1993, Mike worked for three years at Mesa State College in Grand Junction, Colo.

After retiring, Mike fed his passion for higher education and politics by serving on the President's Advisory Committee for Mesa State College and as the chairman of the Seventh Colorado Senatorial District, in addition to his involvement with Mines. According to his family, Mike considered his appointment to the Colorado School of Mines Board of Trustees the highlight of his career.

Since moving to Grand Junction in 1989, Mike and his wife, Doris, stayed active in their community. In addition to his work at Mesa State, Mike served on various Chamber of Commerce committees, the PBS Advisory Committee, and as a member of the National Junior College World Series Tournament Committee. In addition to his service work, Mike enjoyed sharing his knowledge of Hungarian food and culture.

Mike was passionate about his work life, but his family always came first. He and Doris were married for 57 years, and he will be remembered as a joyful man and an active, encouraging father to his four children. In addition to his wife, Mike is survived by daughters, Michele Mason and Maureen Keeney; sons, Chris '81 and Steve; stepbrother, Jim Groves; stepsister, Judy Laster; six grandchildren; and two great-grandchildren.

Alumni

Passings (cont.)



FRANCISCO ALVES DOS REIS '57 of Rio de Janeiro, Brazil, passed away on August 8, 2009. Born in the state of Minas Gerais, Brazil, in 1924, Francisco worked as a technician at Siderúrgica Barra Mansa, a steel company owned by Votorantim Group in Rio de Janeiro, before coming to Mines. Francisco was offered a rare Mines scholarship—perhaps the only one offered in Brazil at that time—and, while not yet proficient in English, took the opportunity

to pursue his degree in metallurgical engineering at the school, where he excelled. While in the U.S. he also took courses at the University of Colorado. During his senior year at Mines, Francisco married Suzanne, with whom he would spend the next 53 years. Shortly after his graduation, the couple moved to Brazil and Francisco rejoined Siderúrgica Barra Mansa, where he worked for 46 years as industrial director. Francisco is survived by his wife and one daughter, Sonia, who is an electrical engineer.



WILLIAM "BILL" D. BAKER '49 of Langley, British Columbia, passed away on May 2, 2009. Bill was born in Mexico City in 1915, a time when Pancho Villa was actively sacking and looting in the region, and his family was taken to the La Luz Mine for protection until it was safe to move to Vera Cruz. The family later came to the United States, and Bill graduated from the Montezuma School for Boys in Los

Gatos, Calif. He married Margaret Lewis in 1941, with whom he had three children. It was his work in the mining industry that prompted him to attend Mines and earn a degree in mining engineering. His education at Mines was interrupted during World War II when he served in the Army Corps of Engineers. Bill was a member of the Alpha Tau Omega fraternity. Following graduation, he went to work as general superintendent for ASARCO at the Parral Mine, and later joined Placer Development in Vancouver, Canada. Margaret died in 1966. Bill became a Canadian citizen three years later, and in 1972 was married to Paula Taylor. After retiring from Placer in 1980, he and Paula moved to a 9-acre farm in Langley, where they raised pigs and chickens. During his retirement, the couple particularly enjoyed traveling. Bill is survived by his wife, Paula; daughters, Betty Anne Cotton and Christine Haynes; son, William; and stepchildren, Judith Lorraine Taylor and Juanita Marie Jacob.



EVANS "EV" W. FERRIS '38 of Santa Barbara, Calif., passed away on November 10, 2008. Ev was born in Gem, Kan., in 1917 but grew up in Denver. At Mines, Ev was a member of the Sigma Phi Epsilon fraternity and played basketball. He graduated with a degree in mining engineering. During World War II, Ev

flew C-87s on cargo duty between India and China, and after the war he worked as an airline pilot for Continental Airlines. While filling out his employment paperwork for Continental, he met Myrtle Lewis, and four months later they were married in Mexico City. Ev worked for Continental for 32 years and retired with his wife to Santa Barbara. He loved golf, and played often at La Cumbre Country Club, where he served as president of the board of directors in 1981 and 1982. Ev is survived by his wife, Myrtle; son, Bob; grandchildren, Bridget and Tara; and great-grandsons, Jacob and Ryan.



LOUIS EDWARD GASPAR '45 of Lakewood, Colo., passed away on March 3, 2009. Born in 1923, Louis grew up in Lafayette, Colo. After graduating from high school, he worked with his father in mines until traveling to Golden to pursue a degree in mining engineering. Louis was one of only 25 in the graduating class of 1945. He began his career with Union Pacific

Railroad at their southwestern Wyoming mines, and in 1948 he married Ruth Nalivka in Reliance, Wyo. In the 1960s and 1970s, Louis worked for Peter Kiewit & Sons, developing, surveying and operating large coal mines throughout Wyoming and Montana, during which time he was often sought as a legislative consultant. Louis' career focused on improving mine safety and reclamation before federal laws mandated stricter controls. He returned to Colorado in 1974 to work for Coors Mineral Division and finished his career developing mines in western Colorado. Louis retired in 1985 and enjoyed gardening, helping neighbors, visiting his children and fly fishing. He was always proud of the fact that all three of his children graduated from college. In 1995, he attended his 50th reunion and was one of only two members of his class present. He is survived by his wife, Ruth; his daughters, Kathleen Reinard and Deborah Gaspar; and one grandson, Richard Reinard. His son, Robert, preceded him in death.



WAYNE C. HAZEN of Denver, Colo., passed away on July 1, 2009. Born in Berkeley, Calif., in 1917, Wayne earned a chemistry degree at the University of California in 1940 and went on to work in the National Defense Program during World War II, developing sources of manganese for the United States. Wayne also spent several years at the Los Alamos Scientific

Laboratory, where he designed and built production units for making plutonium. From 1954 to 1961 he worked at Kerr-McGee Corporation, playing a key role in developing the first major uranium production plant for the Atomic Energy Commission. Wayne and his father, H. L. Hazen, then founded Hazen Research, Inc. near Golden, a company that performs research for the mining industry. He acquired 37 patents in chemistry and metals. An excellent pianist, he made time for his hobbies, including

hiking, skiing, sailing, traveling and flying. He was awarded the Mines Medal in 1981 and an Honorary Doctorate of Engineering from the school in 1999. Wayne is survived by his wife, Norma; children, Lee, Lise, Nick, Jonathan, Chase, Zoë and Jeffrey; eight grandchildren; and two great-grandchildren.



CLARENCE “BOB” G. HEMBER '43 of Sarasota, Fla., died on May 16, 2009. He was born in Golden in 1921 and graduated from Mines with a degree in petroleum engineering. While at Mines, Bob was a member of the Kappa Sigma fraternity. After graduation he served as an Army captain during World War II. Bob was later president and owner of wire-forming

products company Harmar Products, which he sold in 1981. After his retirement, Bob designed and supervised the construction of a new building for his church, having also led the fundraising effort. During his retirement, he helped his children establish businesses: his son, Mark, acquired Myakka Wildlife Tours in Florida; and his daughter, Janet, now owns Swiss Day Pre-School in Sarasota. He is survived by his son, Mark, and his daughter, Janet Mainey. He was predeceased by his wife of 57 years, Georgia.



JEFFREY R. HUGH '85 of Golden, Colo., passed away on January 3, 2009. He was born in Uniontown, Pa., in 1962. A member of the ski team at Mines, Jeffrey graduated with a degree in mining engineering. His career began at the London Mine in Fairplay, working for J S Redpath. In 1986, he moved into construction, going to work for Tutor Perini in Boston. In

1996, Jeffrey and his wife, Lori, returned to Golden, and he joined Flatiron Construction based in Lafayette, Colo. Cheerful and outgoing, Jeffrey was admired by his colleagues, who encouraged him to attend fall and spring Career Days at Mines to “find more engineers like him.” He worked on numerous projects, including the Chesapeake Bay Bridge and the reconstruction of the collapsed Interstate 35W Mississippi River bridge in Minnesota. He and Lori particularly enjoyed spending time with their beloved horses and dogs. Jeffrey is survived by his wife, with whom he shared 25 years.

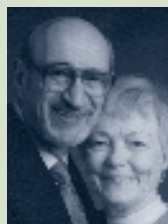


CLYDE WILLIAM KERNS, JR. '50, MS '64 of Lubbock, Texas, passed away on August 19, 2008. Clyde was born in Fort Collins, Colo., in 1925 and attended West High School in Denver, where he excelled at sports. At the beginning of World War II, Clyde was commissioned as an ensign in the U.S. Merchant Marine and Naval Reserve. He rose to the rank of lieutenant during three years serving on ships in the South Pacific. When he returned to Denver, he met Erma L. Handwerk, and the couple married in 1946. Clyde enrolled at Mines to pursue a degree in geophysical engineering

and went on to work at Phillips Petroleum for two years before joining Mobil Oil in 1964. Clyde played basketball and football for Mines all four of his undergraduate years. While working for Mobil, he returned to Mines and earned a master's in geophysics. He later became a worldwide consultant for the company, accumulating multiple patents, and travelling extensively, before he accepted a vice president's position in Colorado. He is survived by his second wife, Betty, whom he married in 1999. He is also survived by his daughter, Sandra Kerns; two sons, William and John; four grandchildren; and three great-grandchildren.

DAVID “DAVE” D. KINGMAN '58 of Cortez, Colo., died on January 2, 2009. Dave was born in Los Angeles, Calif. While at Mines, he met Ginger Ellis, whom he married just a few days after graduating with a degree in petroleum engineering. The couple spent their honeymoon driving to Casper, Wyo., where Dave would begin his career with Superior Oil. Soon thereafter, he was transferred to Cortez, where he and his wife remained for 18 years. Accompanied by their four children, Dave and Ginger enjoyed frequent trips camping and skiing. Later transfers within Superior and to other companies took Dave to Texas, Louisiana, Oklahoma, and, briefly, Israel. He and Ginger eventually returned to Colorado, where they built a log home in the mountains almost entirely by themselves. He is survived by Ginger, with whom he shared 51 years of marriage; daughters, Jennifer and Leigh Ann; and sons, Doug and Steve.

RICHARD KING MACKAY '90, MS '94 of Calgary, Alberta, passed away on May 31, 2009. After growing up in Kuwait and Canada, he attended Mines, where he earned two bachelor's degrees and a master's. The year he was awarded his bachelor's degrees—engineering, mechanical specialty and engineering physics—he was named Outstanding Graduating Senior by both departments. His master's degree was in applied mechanics. As a student, Richard enjoyed photography, skiing and working on foreign cars. He was a member of the Order of the Engineer. His love of the school brought him back to Mines, and in 2002 he was appointed to the engineering faculty as an adjunct professor. Richard is survived by his parents, Ian H. '53 and Lorraine Mackay; his sister, Tara; and brother, Ian.



DAVID B. MAZER '47 of Whittier, Calif., died on May 31, 2009. David was born and raised in Newark, N.J., and graduated from Hackensack High School in 1936. At the onset of World War II, David's college education was put on hold while he served as a first lieutenant and lead navigator in the 8th Air Force, based in England. After his tour of duty in 1944, David married

Dorothy Schopp and returned to Mines to complete his degree in metallurgical engineering. After graduating, he enjoyed a long and productive career, which included working for Curtis Wright Corporation as a production metallurgist, as well as owning and running his own company, Bennett Heat Treating Corporation in

Newark. Though David spent most of his career in Teaneck and Woodcliff Lake, N.J., he retired to Tucson, Ariz., in 1979. He and Dorothy lived there for 22 years before moving to Whittier in 2001. David is survived by his wife of 64 years, Dorothy; his brother, Leo; son, Richard; and grandson, Samuel.



DONALD E. McLAUGHLIN '73 of Loveland, Colo., passed away on October 29, 2009. Donald was born in 1951 in Durango, Colo., and graduated from Durango High School. At Mines, he was a member of Blue Key and Sigma Gamma Epsilon, competed in track and field, and served as treasurer, vice president and president of his fraternity, Kappa Sigma. He graduated with a bachelor's degree in mathematics and went on to a career in

geophysics and exploration, spending 25 years with Mobil Oil and nine years with ExxonMobil—ultimately he rose to serve as ExxonMobil's worldwide asset and priority manager. Donald spent 23 years in Dallas, Texas, where he met and married Karen Taylor in 1976. The couple subsequently moved to Houston, before Donald retired in 2006 and they returned to Colorado. He and Karen designed their dream home and oversaw its construction in Loveland. A member of the Society of Exploration Geophysicists, he enjoyed skiing, fishing, golfing and woodworking. Donald is survived by his wife, Karen; daughter, Megan; and brothers, Roy, Ron and Robert.



ROBERT "BOB" W. MEADER '51 of Centennial, Colo., died on July 27, 2009. Bob was born in 1928 and grew up in Greenland, N.H. He was a Boy Scout and achieved the rank of Eagle. Bob graduated from Portsmouth High School in 1946 and attended the University of New Hampshire before moving to Colorado to attend Mines.

He served as president of his fraternity, Beta Theta Pi, before graduating with a degree in geological engineering. Bob spent 14 months in Korea serving in the Army as a first lieutenant with the Army Corps of Engineers. After returning from the Korean War, he joined California Company in New Orleans, La., and began his graduate studies at the University of Minnesota, earning a master's in geology in 1956. That year, he married Dolores Anderson. Bob continued his studies at Louisiana State University, where he taught. In 1961 he began a 25-year career at Marathon Oil Company, rising to the position of advanced senior geologist. After retiring from Marathon, he continued consulting for Anschutz Oil and worked in the development department at the Iloff School of Theology. Bob is survived by his wife, Dolores; daughter, Susan; son, Daniel; and four grandchildren.



MARIO ERMIRIO DE MORAES '86 of Barueri, Brazil, died on August 5, 2009. Mario was the third generation in his family to attend Mines. His father, Antonio '49, and his uncle, Jose '48, were preceded by his grandfather, Jose Ermirio '21. Four additional members of his own generation at-

tended the school, including three brothers and a cousin. From a young age, Mario showed an aptitude for sports; his siblings remember him as always a step above them athletically, no matter how hard they tried. Like his father, uncle, and all but one of his brothers, Mario pursued a degree in metallurgical engineering at Mines, finding time to play soccer and football during his spare time. Son to the owner of the Votorantim Group, one of the world's largest business conglomerates, Mario's career included positions in a number of subsidiaries, including vice president of Portuguese Beneficencia Hospital, and leadership positions at Santa Cruz Energy, Morro Agudo Mining and Ermirio Cia Mineira de Metais. After leaving the mining and metals industries, Mario turned to farming. He loved being close to nature and working with animals. He owned Suaçuí Agropecuária, a farming and livestock company specializing in the selection and genetic improvement of cattle breeds. Mario is survived by his wife, Nidia; daughters, Natalia and Fabiana; son, Mario; parents, Antonio and Maria Regina; his brothers, Carlos '79, Antonio '81, Luis '82; and cousin, Jorge Mahfuz '80.



PHILIP G. MORROW '42 of Cortez, Colo., passed away on July 26, 2008. Philip was born in 1920 in Deer Trail, Colo., and grew up in Matheson, Colo. After graduating high school in 1938, Philip attended Mines and earned a degree in petroleum engineering. During World War II, he served as a pilot in the Army Air Corps for three years. In 1946, he married

Ann Winstel in Port Arthur, Texas, where he worked for a Texaco refinery. Four years later he and his wife moved to Laurel, Mont., where he worked at the Farmers Union Central Exchange Refinery. Philip was called into the Air Force in 1951 and served as a pilot in the Aleutian Islands during the Korean War. He returned to Laurel after his service and continued working at the same refinery. Philip and his wife moved to Cortez in 2003 to be closer to their daughter and family. He is survived by daughter, Jackie Brumley; son, Philip Guy II '75; five granddaughters; and five great-grandchildren.



JAMES B. PEESO '41 of Monson, Mass., passed away on May 29, 2009. James graduated from Mines with a degree in petroleum engineering and entered the U.S. Marine Corps as an artillery teacher at Quantico, before serving in the Pacific for the remainder of World War II. He achieved the rank of major. After he returned home, James joined

American Cyanamid, working with the company and affiliate, Davis and Geck, for his entire career. He is credited with developing a number of inventions for both companies. James' wife, Phyllis, predeceased him in 1989. He is survived by his son, Bruce.

Also In Memoriam

Edwin L. Beauchamp, Jr. '58.....November 1, 2007
Robert J. Blair '39.....December 18, 2005
James A. Bowler '39.....May 9, 2003
Karl O. Brueggeman '40.....July 16, 2005
William L. Chase '40.....May 3, 2004
Leo S. Cichowicz '51.....January 9, 2009
Everett Crowell '51.....November 11, 2008
Robert J. DeLand, Sr. '38.....February 3, 2002
P. Bennett Dharmawardhana '79, '81.....June 28, 2002
J. Franklin Foster '58.....January 28, 2003
Pedro Garcia '36.....January 18, 2009
Charles L. Goode, Jr. '61.....March 5, 2001
James R. Heavener '60.....June 8, 2005
John S. Hicks '48.....September 3, 2002
Forbes M. Hurley '50.....August 22, 2007
Albert T. Janssen '69.....November 29, 2008
Hugh P. King '55.....February 22, 2008
Louis D. Kovari '89.....December 16, 2003

John R. Kuykendall, Jr. '41.....October 22, 2002
Ralph E. Maxwell, Jr. '38.....November 14, 2000
Barry K. McMahon '68.....April 19, 2009
David H. McMurrin '50, '59.....April 8, 2009
Marciano G. Natividad '40.....May 18, 2000
Robert A. Ourada '57.....May 4, 2008
Raymund G. Paterson '37.....Unknown
Neal N. Riemann '86.....February 17, 2009
Angus L. Robertson '42.....May 10, 2007
Charles H. Roderick '76.....October 13, 2006
Richard G. Rosecrans '66.....September 3, 2008
Alan D. Schedlbauer '64.....August 24, 2007
Burleigh W. Shepard '51.....August 25, 2007
J. B. Vidal '37.....Unknown
Norman F. Vote '55.....December 19, 2000
Adelbert W. Warren '40.....March 19, 2009
John H. Wilson '57.....January 21, 2007
Michael James Young '98.....August 5, 2002



CLYDE O. PENNEY '36, MS '40 of Denver, Colo., died on November 6, 2009. Born in Colorado Springs in 1915, Clyde moved to Denver at an early age. After completing his degree in metallurgical engineering, he went on to earn a master's in metallurgy, before moving to Seattle, where he worked for Boeing. He returned to

Denver in 1944 and married Jean Craig. Clyde was employed as the chief metallurgist at the CS Card Iron Works, before joining D&RGW Railroad, where his work included accident investigations, material selection and specification. He retired from the railroad as vice president and assistant to the president. Clyde was a member of the American Society of Metals and several railroad organizations. He was also a member of First Plymouth Congregational Church and Park Hill Methodist Church. Clyde, who had five relatives attend Mines, is survived by his wife, Sheri; his son, David; and two granddaughters.



ERVIN C. "PHIL" PHILPY '49 of Midland, Texas, passed away on January 11, 2009. Phil was born in 1923 in Stark City, Mo., but grew up in Lamar, Colo. He was a member of the Sigma Nu fraternity at Mines and graduated with a degree in geological engineering. Before graduating, Phil married Marilyn Miller, and in 1950 the couple

moved to Midland to take part in a Shell Oil training program. In 1952 Phil left Shell to work for independent oil operators until 1974, when he formed Zinke & Philpy. He retired in 1986 but continued to work as an oil and gas consultant and investor. Phil was a member of the American Association of Petroleum Geologists and the West Texas Geological Society. He was also involved in the Boy Scouts for 17 years, and eventually served as scoutmaster of Troop 51. He was proud that his five sons all achieved the rank of Eagle Scout. Phil enjoyed playing golf and bridge, and served the Episcopal Church of the Holy Trinity in many roles, including vestryman. Phil is survived by his wife of 61 years, Marilyn; sons, Gerald, Stephen, Mark, Paul and Bruce; and 12 grandchildren.



CHARLES M. "CHUCK" STODDARD '51 of Grand Junction, Colo., died on May 22, 2008. Chuck was born in Denver in 1929, but moved to Ventura, Calif., with his uncle at a young age when his parents passed away. A member of the Sigma Nu fraternity at Mines, he graduated with a degree in mining engineering. Chuck served with the

U.S. Army Corps of Engineers in Korea from 1952 until 1953.

He went on to earn a law degree from the University of Denver in 1955. After serving as an assistant U.S. attorney, he joined a large law firm in Denver. He later moved to Glenwood Springs and established a successful practice with Chuck Steward and Willard Parkison. He served as Garfield County judge from 1968 to 1971. He and his wife, Penny, married the year he graduated from Mines. Chuck enjoyed gardening, skiing, backpacking, scuba diving and traveling. He is survived by his wife; daughters, Susan Stoddard and Sara Willis; son, Bob; and seven grandchildren.

LOUIS P. SYDEJKO '58 of Glendale, Calif., died on April 4, 2006. He was born in 1926 in Chippewa Falls, Wis., attended Notre Dame Grade School and graduated from McDonell High School in 1944. Louis served as a pilot on an aircraft carrier during the Korean War, attaining the rank of lieutenant. In 1951 he married Verlene J. Peloquin in Chippewa Falls. Following his service in the Navy, Louis began working for WH Brady & Co. in Chippewa Falls and Milwaukee. Louis and his family later moved to Golden so that he could attend Mines. He graduated with a degree in geophysics and was hired by Pure Oil. He spent three years in Crystal Lake, Ill. before Pure Oil merged with Union Oil in Calgary, Alberta. The family later moved to Glendale, where Louis continued working for Union Oil until his retirement in 1984. He is survived by his wife of 54 years, Verlene; two daughters, Connie Peterson and Robyn Seykora; three sons, Scott, Doug and Jeb; 10 grandchildren; and one great-grandchild.



JOHN G. UNDERWOOD '53 of Chestertown, Md., died on December 26, 2008. John was born in Brussels, Belgium, and grew up in Nova Scotia, Canada. He graduated from Middletown High School in Ohio, and later earned a math and physics degree from Miami University of Ohio in 1950. John graduated with a degree in metallurgical engineering from Mines and was

hired by Asea Brown Boveri, an international construction and engineering company for which he traveled the world as a senior project manager. John married Nancy Latimer in 1960. He retired in 1993 and moved to Chestertown with his wife in 2000. The Underwoods were supporters of Washington College, where they endowed the Underwood Chair in Art History. He was a member of the American Institute of Mining, Metallurgical and Petroleum Engineers and the Association of Iron and Steel Engineers. He was also a member of Capital City Pipes and Drums and numerous curling clubs. His wife predeceased him in 2005. John is survived by nieces, nephews and cousins.

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