

A man with a beard and blue shirt is smiling and holding a small, clear plastic robot with a solar panel on top. The robot has two wheels and some internal wiring. The background is a blurred indoor setting.

Fall/Winter 2009 Volume 99 Number 3

Mines

Colorado School of Mines Magazine

Unconventional Gas Goes Mainstream

Iraqi Student's Story of War and Words

What Recession? Growing Against the Grain

How He's Landed
an Invitation to
the White House



SWEATING THE SMALL STUFF IS WHAT WE DO

Sumit Agarwal
Assistant Professor of Chemical Engineering
2009 NSF CAREER Award Recipient

MTM

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Thin-film nanostructures are Dr. Agarwal's specialty, and his work with these micro materials has the potential to make a big impact on the future of computing, battery technology and solar energy.

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COLORADO SCHOOL OF MINES
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Contributors



Zach Aman '09, former editor of the Oredigger newspaper, is a graduate student. ("Honors for McBride")



Larry Borowsky is a freelance writer living in Denver, Colo. ("Anything Boys Can Do")



Kirsten Boyer is a freelance portrait photographer living in Boulder, Colo.



Anne Button consults with and writes for higher-education institutions. ("An Engineer-Poet Finds Refuge in Words")



Oliver Dewey is an undergraduate, working part time for CSMAA. Along with numerous magazine-related projects, he is the editor for Passings.



Jeff Duggan is sports information director for Mines. He writes all content for Scoreboard for the magazine.



Jeannie Jacobson works for University Advancement in corporate and foundation relations. She copy edits the magazine.



Trisha Bentz Kendall is assoc. dir. of comm. for University Advancement. She writes Inside Mines, Investing and administers the web site.



Craig Korn is a freelance graphic designer based in Denver and the art director for *Mines*.



Catherine May is a sophomore at Mines who writes for, and assists, with numerous magazine-related projects.



Doug McInnis is a freelance writer living in Wyoming. ("Awash in Natural Gas")



Todd Neff is a freelance writer based in Denver. ("Taking the Waste Out of Wastewater")



Mick Nornington is a freelance writer and reporter living in Austin, Texas. ("Beating the Odds")



Chris Peters, an undergraduate student at Mines, owns and operates Peters Photography. His work is found throughout this magazine.



Erica Siemers is director of communications for University Advancement. She contributes to Investing.



Nick Sutcliffe is editor of *Mines* magazine and director of communications for the alumni association. ("Worth his Weight in Platinum," "Beating the Odds")

Explore the opportunities

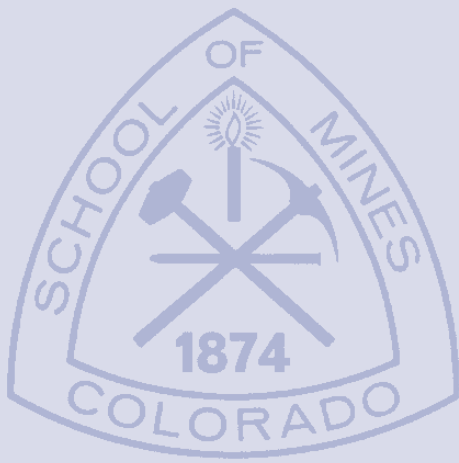


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M.W. "Bill" Scoggins
President, Colorado School of Mines

Joe Mahoney '86
President, CSM Alumni Association

Anita Pariseau
Executive Director
CSM Alumni Association

Nick Sutcliffe
Editor and Director of Communications
CSM Alumni Association

Editorial Board

Tina Gianquitto, Trisha Bentz Kendall, Joe Mahoney '86,
Anita Pariseau, John Poate, Erica Siemers,
Nick Sutcliffe, Marsha Williams

Contributing Writers

Zach Aman '09, Larry Borowsky, Anne Button, Oliver Dewey,
Jeff Duggan, Trisha Bentz Kendall, Catherine May,
Doug McInnis, Todd Neff, Mick Normington,
Erica Siemers, Nick Sutcliffe

Copy Editors

Jeannie Jacobson, Trisha Bentz Kendall

Art Director

Craig Korn, VeggieGraphics

Photography

Kirsten Boyer, Chris Peters

Printing

American Web
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Regretfully omitted from summer issue
contributing writers list: Emily Wald

Mines is a publication of 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. Visit the *Mines* magazine website at <http://magazine.mines.edu>

Dear Readers,



I hope you enjoy reading this fall/winter issue of *Mines* magazine; it's been a particularly intriguing issue to put together.

Of particular note is the cover story on Ryan O'Hayre '99, highlighting the scientific breakthroughs that earned him the nation's top early career award for scientists and engineers.

The pioneering spirit is found in another feature story, outlining the lives and businesses of three alumni-entrepreneurs. While they are at different stages in their careers, and each runs a very different enterprise, they all managed to dramatically grow their companies through the recession.

The story that follows discusses a rapidly growing sector of the energy industry—unconventional natural gas. It is abundant, it contains less carbon per BTU than oil or coal, it's accounting for an increasingly proportion of the U.S. energy supply and Mines is a key player in its development.

Finally, don't miss Anne Button's moving account of a petroleum engineering student whose poetry and prose movingly confront his sometimes harrowing childhood in Iraq and his family's escape.

Look beyond the feature stories and you'll find plenty more of interest. Highlights include a description of the addition to Brown Hall that will soon begin; accounts of three faculty members who all received the prestigious National Science Foundation Early Career Award this year; details of AQWATEC's new facility, which is purifying Mines Park wastewater on a footprint the size of two shipping containers; and the story of four intrepid sisters who all earned engineering degrees from Mines in the eighties.

Reaching quite a bit further back into the school's history, I would be remiss if I did not point out that this issue of *Mines* magazine marks the end of the 99th year of publication; the first issue of *Mines* was published October 1910. With the centennial edition approaching, your suggestions for how we should celebrate this landmark are most welcome (contact information below).

Best wishes for the holidays,

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

P.S. Congratulations to **Warren Andrews '63** who was the only respondent to correctly identify all three of the architectural details pictured in the summer issue's Mark the Spot (p. 44). Answers: A. post and lintel decoration on the top of the Hall of Justice (no longer standing) B. Decoration high on the west-facing side of Hill Hall C. Ornamentation on the north side of the west door to the Hall of Engineering.

Campus News

M Climb Sees Record Numbers and a New Twist

A record 880 freshmen made the traditional “M climb” up Mt. Zion on August 24 to mark the start of their Mines careers. The longstanding tradition saw a new twist this year, with the first-ever faculty and staff sendoff celebration. Mines faculty and staff lined Illinois Street to cheer on freshmen as they geared up for the three-mile climb to whitewash the M.

New Provost Steve Castillo made part of the hike and was inspired by the event. “The M Climb truly is a storied tradition for entering freshmen, and I really enjoyed being a part of it, even if I didn’t last long enough to get doused in paint! I heard from many students that they appreciated the faculty and staff sendoff.”

In conversations with prospective and new enrolling students, Mines’ admissions team is learning that many are enthusiastic about the university’s flexibility in courses of study and choices for pairing majors and minors, as well as the school’s recreational and social opportunities. “Our first-year students seem to want to make a difference in the world,” says Heather Boyd, director of enrollment management

Dean of Graduate Students Tom Boyd attributes a jump in graduate school applications—up 41 percent from 2008—to growing interest in the school’s well-defined mission. “While many institutions are seeing an increase in applications, I am aware of none that matches Mines,” he says. Total graduate enrollment this



Kristen Boyer



Kirsten Boyer

fall is 1,085 students, up 16 percent from fall 2008. Another possible factor boosting applications is starting salary. Payscale.com, a global compensation database, ranks Mines' median starting salary of \$60,000 for graduates with

bachelor's degrees as the highest among U.S. public universities. The school is number 11 for starting salary and number 12 for mid-career salary among all U.S. engineering schools, public and private.

The Brown Hall Addition

Construction is soon to begin on a new addition to Brown Hall, which, once completed, will make it the largest academic building on campus. The extra space will come as a relief to many; the building, which is home to the Division of Engineering and the Mining Engineering Department, has long been overcrowded.

Since Brown Hall was first built, the number of students majoring or studying with the Division of Engineering has more than quadrupled (1,500 students, or 30 percent of the student body), making it the largest academic division on campus. With course offerings in mechanical, civil, electrical and environmental fields, research and teaching space is in short supply. The project includes minor renovations to the existing facility and a \$33 million, 78,000 square-foot addition to the southwest of the existing facility.

With no room in the state's budget for such projects, the costs will primarily be covered with bonds backed by the student capital construction fee. Kirsten Volpi, vice president for finance and administration, reports that the school has already secured capital for the project and did so at very favorable rates.



President Scoggins is pleased to see the project moving ahead. "While the economic downturn and lack of funding from the state for capital construction have certainly affected some of

our plans," he says, "we are committed to finding creative but prudent ways to undertake important campus projects like the Brown addition."

Terry Parker, director of the engineering division, says that division faculty are extremely grateful to the student body. "We couldn't be moving ahead without their support," says Parker, who is pleased that along with more space for academics, the plan includes a recreational lounge for students. "They are footing most of the bill, so it's very appropriate that they get this prime space."

Learn more about the Brown Hall addition and other projects outlined in the Campus Master Plan at mines.edu/CampusMasterPlan.

New Leadership for Petroleum Engineering and LAIS

Ramona Graves, a faculty member since 1981, was appointed department head of petroleum engineering this fall, having served in that capacity for two years. "This is a very exciting time for the petroleum engineering department," remarked Graves. "Enrollment continues to be high, research volume is growing, and opportunities for faculty are as great as I have ever seen." In addition to her administrative responsibilities, Graves will continue as director of Mines' Laser/Rock Interaction Research Center, and co-director of the Center for Earth Materials, Mechanics and Characterization.



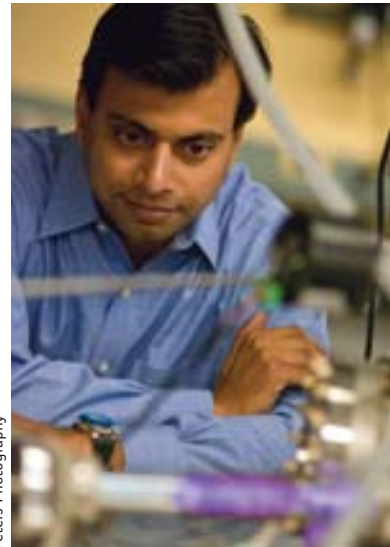
This year Mines also welcomed a new director of the Division of Liberal Arts and International Studies. Elizabeth Van Wie Davis came to Mines from the Asia Pacific Center for Security Studies in Honolulu, Hawaii. Her research focuses on Asian resources and environmental policy in Central Asia, China and Southeast Asia, and its impact on American policy. She holds master's and doctoral degrees in international relations – foreign affairs from the University of Virginia. Davis has held positions at Johns Hopkins University's Center for Chinese and American Studies in Nanjing, China, Illinois State University, the University of Virginia and Mary Baldwin College.

NSF Early Career Award Hat-Trick

Three Mines professors received 2009 National Science Foundation Faculty Early Career Development Program awards, which the NSF describes as its most prestigious honor "in support of the early career-development activities of those teacher-scholars who most effectively integrate research and education within the context of the mission of their organization." Awards are made based on peer-reviewed proposals which take into account intellectual merit and potential for broader impact. Each year, the NSF makes about 400 such awards, which include grants of approximately \$400,000. The three Mines faculty honored with these awards are profiled briefly here.

Sumit Agarwal, Assistant Professor of Chemical Engineering

Agarwal's Early Career Award will help fund a project entitled, "Molecular Perspectives of Gas-Surface Reactions during Growth of Thin-Film Nanostructures." With relevance to a variety of fields, including microelectronics, optoelectronics and photovoltaics, Agarwal explains that this project is aimed at developing methods to synthesize thin layers of insulators, metals and polymers, down to the precision of a single atom or molecule. "What distinguishes our work is that it is specifically directed at fulfilling a critical need to understand the surface chemistry occurring during these growth processes and develop them to their full potential," he says. In addition to mentoring students involved in the research, he plans to develop an elective course in thin-film processing, and foster cultural and intellectual exchange through a graduate program with Eindhoven University of Technology in the Netherlands.



Peters Photography

New VP of Student Life



Dr. Dan Fox became Mines' new vice president of student life in March, having served the school since 2005, first as director of housing and residential life, and later as director of student life.

"This is an amazing time to step into this role," says Fox. "With a president whose innovations push us forward in new ways, as well as a new provost and a recalibrated strategic plan, this is a dynamic opportunity to truly make a difference for this institution."

As vice president, Fox oversees numerous campus services, including housing, public safety, athletics, enrollment management, student development and academic services. "You face a new challenge everyday," he says. "It's engaging, challenging and fulfilling." In particular, Fox is taking time out to talk to students about what they need to feel a true sense of belonging within the Mines community. "Students are why we're all here, and I want to help figure out what will make them say, 'I am a part of Mines. I belong here. And Mines is me.'"



Cristian Ciobanu, Assistant Professor of Engineering

Ciobanu's project investigates the interplay between structure and composition in alloy nanowires. Because they can exhibit high mechanical strength and are excellent electrical conductors, nanowires are appealing as connectors in nanoscale circuits or as elements in nano-electromechanic devices. Ultimately, Ciobanu hopes his research will shed light on how nanowires composed of various alloys can perform, both mechanically and electrically, which in turn will improve the sensitivity and functionality of various nanoscale devices. Ciobanu will be leading a team of students as part of his research and plans to develop a course on advanced numerical and simulation techniques in nanomechanics and materials science.

Anthony J. Petrella, Assistant Professor of Engineering

Petrella's human lumbar spine mechanics project aims to develop a technology for the treatment of low back pain by improving preclinical testing for medical devices and surgical interventions. Low back pain is prevalent, debilitating and costly—estimates put the annual price tag to the U.S. economy at more than \$100 billion. The project involves gathering numerous CAT scans from a wide population and using them to build a computer model that simulates the complex biomechanics of the lumbar region. "The exciting thing about the technology we're developing is its power to predict how a new implant or procedure will function for an entire population of virtual patients, rather than just a single individual," says Petrella. His project also includes the development of a virtual x-ray vision simulator intended to pique interest in science and technology among K-12 students, as well as a new course that will engage Mines students in the project.



In Brief...

The 2nd annual **Leadership Summit** took place Sept. 26, opening with a keynote address by Calvin Mackie, author of *A View from the Roof: Lessons for Life and Business*. President Scoggins led a plenary session, and industry leaders and alumni led panel discussions. Learn more in Web Extras at magazine.mines.edu.

Petroleum Engineering Department faculty members **Erdal Ozkan** and **Ramona Graves** were selected as recipients of 2009 Society of Petroleum Engineers Distinguished Membership. The honor is limited to only 1 percent of SPE members, and acknowledges

those who have attained eminence in industry or academia and/or who have made significant contributions to SPE.

Mines is one of 19 recipients of a \$1.6 million share of a \$27.6 million **grant from the U.S. Department of Energy** for research into carbon dioxide storage in geologic formations. Led by Petroleum Engineering Professor Yu-Shu Wu, Mines will develop a modeling tool for carbon dioxide geosequestration in brine aquifers. Matching funds of \$400,000 will come from Computer Modeling Group, Ltd.

The new **Center for Research and Education in Wind (CREW)** was recently launched as part of the Colorado Renewable Energy Collaboratory. CREW will focus on developing energy technologies that can be rapidly transferred to the marketplace.

Mines launched a new **Energy Minor** program this fall that aims to augment students' technical knowledge of the energy industry with a broad understanding of related economic, political, environmental and social issues. For more information about the multidisciplinary program, go to energyminor.mines.edu.

Investing in Mines

An investment in knowledge always pays the best interest.

—Benjamin Franklin

Philanthropy Celebrated at the Mines Century Society Dinner

Colorado School of Mines honored some of its most generous donors October 10 at the annual Century Society Dinner, themed “East Meets West” this year to highlight the university’s rich intellectual exchange with Asia. Members of the Century Society, President’s Council and Heritage Society gathered in Lockridge Arena for music, food and entertainment, including a performance by Mines’ Indonesian student group, and the first-ever presentation of young alumni, faculty/staff and outstanding philanthropy awards. President Scoggins paid special recognition to new and rising members of the Century Society who are listed below.

Individuals whose lifetime giving to the school exceeds \$100,000 are honored as members of the Mines Century Society at Copper, Silver, Gold, Platinum and Diamond levels.

Diamond Level \$5,000,000+

Hugh E., Jr. and Michelle Harvey

Platinum Level \$3,000,000 to \$4,999,999

Ted P. Stockmar***

Gold Level \$1,000,000 to \$2,999,999

Ralph Leo and Mary Lou J. Hennebach

Thomas K. Kaplan

Harold M. and Patricia M. Korell**

Carolyn V. Mann**

Timothy M. and Bernadette Marquez**

Silver Level \$500,000 to \$999,999

Marshall C. III and Jane Crouch*

Copper Level \$100,000 to \$499,999

William P., Jr. and Jane M. Burpeau

Dorothea M. Krysuik

Michael G. and Yun C. Long

Ian H. Mackay

Paul R. Peel

*Previously a Copper MCS member

**Previously a Silver MCS member

***Previously a Gold MCS member

For more information about these donor groups, visit giving.mines.edu/givingclubs

Philanthropy Awards

Sara A. Atkins

The Young Philanthropist Award



The Young Philanthropist Award recognizes outstanding volunteer and philanthropic involvement of an alumnus within 10 years of graduation.

Sara Atkins has been an active alumni association member and a generous supporter of the

university. A 2000 engineering alumna, Sara is a quality engineer at Alcon in Houston. Since 2001, she has been supporting The Mines Fund, and she has been a member of the President’s Council since 2005. Sara has served for more than three years as an alumni coordinator for the Houston section, and has served as an ambassador for incoming Mines students in the region. The recent success and growth of the Houston section is due, in large part, to Sara’s time and dedication.

Dr. David K. Matlock

The Faculty and Staff Philanthropy Award



The Faculty and Staff Philanthropy Award recognizes outstanding volunteer and philanthropic commitment by a faculty or staff member.

David Matlock has been a vital member of Mines’ faculty since 1972. He holds

the ARMCO Foundation Fogarty Professorship in Metallurgical Engineering, serves as director of the Advanced Steel Processing and Products Research Center (ASPPRC), and is a member of the National Academy of Engineering. He and his wife, Diane, have been President’s Council members for 14 years. David helped raise funding to establish the Family of Mines Scholarship, and from 2006 to 2007 served as Campus Campaign chair.

In addition to his personal investment, David actively collaborates with the CSM Foundation to attract corporate philanthropy. He has cultivated longstanding partnerships between Mines and leading steel companies, including United States Steel, ArcelorMittal, Caterpillar, John Deere and GM. Through his leadership, ASPPRC has earned an international reputation as a leader in ferrous metallurgy education and research.



**Hugh and Michelle Harvey
The Tourmaline Award**

The Tourmaline Award honors exceptional philanthropic commitment to Colorado School of Mines.

Last spring, Hugh and Michelle Harvey contributed the largest endowment gift ever to Mines—\$10 million to establish a scholars program designed to attract

students of the highest caliber to Mines. Their transformative gift places them among the two most generous benefactors in Mines' 136-year history. As co-founder of Intrepid Potash, Hugh Harvey applied the innovative thinking he learned as an engineer to pioneer new mining techniques. He earned his bachelor's in mining engineering in 1974 and master's in petroleum engineering in 1980, both from Mines. Hugh has long been a champion of his alma mater as an active member of the alumni association and as a development volunteer. Michelle Harvey is president of the Harvey Family Foundation, and in addition to ardently supporting Mines, is a very active volunteer and supporter of the Jeffco/Gilpin Court Appointed Special Advocates Program.

Harvey Scholars receive merit scholarships covering full tuition and fees, plus enrichment grants for academic and professional activities, as well as funding for a semester of international study. The inaugural scholarship awards were made this fall.

Ted P. Stockmar '43 establishes \$1.2 million in gift annuities; ConocoPhillips contributes \$600,000 to Mines; Other recent gifts

Colorado School of Mines recently received 14 large gifts:

Anadarko Petroleum Corporation contributed \$225,000 toward their \$1 million pledge to Marquez Hall and toward the Geology and Geological Engineering Department, the Department of Petroleum Engineering, and the Society of Petroleum Engineers student chapter.

BHP Billiton Petroleum contributed \$100,000 toward their \$500,000 pledge to Marquez Hall.

BP contributed \$280,000 to support scholarships, fellowships and programs in the engineering, geoscience, and economics and business departments.

Harry D. Campbell '42 contributed \$175,000 to Marquez Hall.

Chevron contributed \$363,100 to support their University Partnership Program, scholarships, fellowships, academics, diversity programs and student groups.

ConocoPhillips contributed \$600,000 toward Marquez Hall, their SPIRIT Scholars program, the Minority Engineering Program, the Career Center, the McBride Honors Program, department and faculty support, scholarships, fellowships and student groups.

Jerry '68 and Bettina Grandey contributed \$100,000 in continuing support for Mines.

William F. Guenther, Jr. '42 continued his support of the Guenther Endowed Scholarship Fund with a \$100,000 contribution.

The Henry Luce Foundation contributed \$120,029 to support the Clare Boothe Luce Assistant Professorship.

With \$150,000 bequest from the estate of **Dorothea Krysuik**, the Eugene T. and Dorothea Krysuik Scholarship Fund was established to provide support for married students. Dorothea's husband, Eugene, was a 1952 alumnus.

Bequest distributions totaling \$400,000 were received from the estate of **Carolyn V. Mann**, widow of John F. Mann '43 and longtime supporter of geology at Mines.

With contributions totaling \$121,459, **J. Robert Maytag** established the Andes Graduate Scholarship Fund and continued his support of the Maytag Bolivia Student/Researcher Metallurgy Fund.

Questar Corporation contributed \$164,263 toward The Mines Fund, scholarships and their \$400,000 pledge to Marquez Hall.

Ted P. Stockmar '43 established two charitable gift annuities with gifts totaling \$1.2 million, which will provide valuable unrestricted support for Mines.

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

The Adolph Coors Foundation contributed \$75,000 to support Coors Foundation Scholarships.

Jerome T. '64 and Rebecca Broussard continued their support with a \$25,000 contribution to The Mines Fund.

Cameco Corporation contributed \$67,091 to support fellowships in the Department of Chemistry and Geochemistry.

Anthony F. Corbetta '48 contributed \$25,000 to establish the Corbetta Endowed Scholarship Fund.

Marshall C. III '67 and Jane Crouch gave \$42,500 in continued support for geology teaching and research, athletics and Marquez Hall.

The Daniels Fund contributed \$50,000 to support the Mobile Science Show.

With gifts totaling \$25,000 **Stan and Judy Dempsey** continued their support of Arthur Lakes Library and the Dempsey Endowed Scholarship Fund.

Devon Energy Corporation contributed \$60,000 toward scholarships.

The Edna Bailey Sussman Fund contributed \$58,380 to the Environmental Internship Program.

EnCana Oil & Gas (USA) Inc. contributed \$35,000 to support students in geology and geological engineering.

ExxonMobil contributed \$29,000 toward the Oil Shale Symposium and academic departments.

The Harry Trueblood Foundation contributed \$30,000 toward the Trueblood Foundation Scholarship.

Marathon Oil Corporation contributed \$52,000 to support scholarships and departments.

Charles S. McNeil '71 continued his support of the Student Recreation Center and began to fund a new scholarship with a \$25,000 contribution.

The Mikkelson Foundation contributed \$30,500 to the Engineering and Applied Technology Program.

Charles E. Shultz '61 continued his support for the Shultz Athletic Scholarship Endowment with gifts totaling \$44,130.

St. Mary Land & Exploration Company contributed \$25,000 toward their \$125,000 pledge to Marquez Hall.

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

Ward Petroleum made a \$25,000 payment toward their \$100,000 pledge for Marquez Hall.

The acknowledgements listed in Mines magazine recognize single gifts of \$25,000 and more. Over the course of the fiscal year ending June 30, 2009, the following individuals gave multiple gifts that totaled \$25,000 or more:

Lawrence B. '49 and Rose Curtis J. William II '70 '72 and Carolyn J. Fishback

Luanna Goetz

Victoria B. '92 and Erik R. Nielsen Bill and Karen Scoggins

Andrew P. '78 and Sherry Swiger

Taking the Waste Out of Wastewater

Jörg Drewes was talking about water quality, a favorite topic, when the Mines Park student housing sprinklers kicked on just uphill. As artificial rain fell onto July bluegrass, he observed: “They’re wasting pure drinking water.”

Drewes, an associate professor of environmental science and engineering, dedicates much of his intellectual energy to avoiding precisely such waste. It happened that he was standing next to a pilot system already capable, with the addition of a bit of plumbing, of substituting such squandered drinking water with purified wastewater from the Mines Park housing complex itself.

The system, a sequencing batch membrane bioreactor provided by Aqua-Aerobic Systems, has been up and running since February—one of several initiatives under way at Mines’ Advanced Water Technology Center, or AQWATEC, which Drewes heads up.

It works like this: Mines Park sewage is diverted into a 2,500-gallon holding tank, where it is ground up and pumped to the 1½-story bioreactor. Here sewage flows through a 2-milimeter filter screen and into one of two 7,000-gallon bioreactor tanks. While traditional sewage treatment sends wastewater through a series of tanks—some oxygen starved, some oxygen rich, some in between—triggering different eating habits among the invisible horde of microbes, AQWATEC’s sequencing batch reactor simply alters the conditions in the same tank.

The system’s membrane bioreactor filter is the final stage. Two hollow-fiber membrane cassettes do the filtering, each containing nine bundles of spaghetti-like strands. Every strand is pocked with 50-nanometer-wide pores too small for most microbes or viruses to get through.

“I wouldn’t drink this, no,” admitted Rick Huggins, a doctoral student whose work optimizing and assessing the economics of the system will one day inform his dissertation. The bottle of filtered water he was holding had a faintly yellow tinge. Still, the Mines system exceeds the performance of many conventional wastewater treatment plants, particularly at removing organic carbon, as well as nitrogen and phosphorous compounds—all without the use of the chemicals typically used in wastewater treatment.



Jörg Drewes and Rick Huggins adjusting the control panel of the bioreactor.

And producing drinking water isn’t the objective. It’s a modular technology that enables decentralized wastewater treatment through microbial action and filtration, producing water pure enough for sprinklers, crop irrigation, or release into streams and rivers.

The demonstration project aims to advance the technology to the point that it no longer requires the attention of doctoral students to maximize the system’s efficiency, making it as close to “plug-and-play” as possible. Anything less and risk-averse water managers will shy away, Drewes said.

Next steps include rerouting some of the system’s outflow to a sprinkler system and converting an adjacent Residence Life storage facility into a water-reuse field laboratory. Once the lab is completed, the AQWATEC team will experiment with systems that can filter the effluent to drinkability, while testing advanced oxidation processes.

In addition to domestic wastewater treatment, AQWATEC is developing technologies that make use of water resources such as seawater, industrial

effluent, and water extracted with oil and gas production.

Ultimately, every drop of wastewater reused on a field or in a drinking glass relieves the pressure on natural systems upon which we all depend. As said by Tzahi Cath, AQWATEC’s associate director and one of Drewes’ fellow faculty members: “In our work, there’s always a link from the bench to real life.”



AQWATEC’s bioreactor located in Mines Park.

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Tetra Technologies
Chemicals Division

Blue Level

Ambar LONE STAR Fluid
Services
Apache Corporation
CustomBag Corporation
GX Technology
Newfield Exploration
Truth Solvents, L.P.

Hole

Harry Briscoe '70 MS '72
CareerBuilder.com
Global Geophysical Services
Mark & Peggy Heeg 2010
Duane Maue '90
Leslie Penello '79
PGS Marine GOM Group
PGS Onshore Group
President Bill Scoggins
WesternGeco
Doug Woodul '78

Total raised: \$42,500.

Total donations to date: \$234,400

Scholarship funds awarded: \$27,839

2009-2010 recipients:



Ryan Williams
Linebacker
Yr: **Junior**
Mjr: PE



Jaime Thorpe
Student Body President
Yr: **Senior**
Mjr: Chem E

Grand Junction

MillerCoors Brewing
Company
Questar
Thomas Energy Services
Forest Oil
CoreLab/ProTechnics
Division
President Bill Scoggins
Peterson Energy
Management
Credit Union of Colorado

Golden

Beverage Cart

MillerCoors Brewing
Company

Breakfast

White Eagle Exploration/
Marshall C. Crouch III '67

Goodie Bag

Credit Union of Colorado

Volunteer

Questar

Putting Contest

Thomas Energy Services

Hole-In-One

Forest Oil
CoreLab/ProTechnics
Division

Coach's Challenge Sponsor

Slaton Brothers

Prize Hole

Kiewit Western Company
Lockheed Martin
President Bill Scoggins

Hole

Eduardo Aguayo and Julia
Hoagland '90
Brown Harris Stevens
Residential
Banks Insurance Agency
Bill Barrett Corporation
Harry Briscoe '70
Consolidated Edison
Solutions

Coral Production
CSM Student Life
Harry Ells '54
Tracy Gardner '96
Lake Victoria Mining
Company/Roger Newell '71
Landmark Environmental
Liberty Mutual
Dick Mandel '53/Cross D Bar
Trout Ranch
New Tech Engineering
Ken Nickerson '48
Peterson Energy
Management
Royal Gold
Sequel Energy
Strad Energy Services

Save these dates for 2010: Houston–April 16, Oklahoma City–June 4, Golden–June 14

Oredigger Quarterback Named as National Finalist for Harlon Hill Trophy

CSM quarterback David Pesek was selected as one of 24 candidates for the 2009 Harlon Hill Trophy as the NCAA Division II College Football Player of the Year. Prior to the start of the 2009 season, Pesek earned Pre-Season RMAC Offensive Player of the Year honors and was named Pre-Season First Team All-RMAC by d2football.com. So far in 2009, Pesek has been named to Allstate AFCA Good Works Team (to be recognized at the 2010 Allstate Sugar Bowl) and was featured on the monthly NCAA on Campus television show (CBS College Sports network). The president of CSM's Fellowship of Christian Athletes, Pesek earned his bachelor's degree in May 2009 and is currently pursuing a master's in mechanical engineering. Pesek earned the Academic Achievement Award and recognition on the Dean's List on multiple occasions during his career at Mines and will depart ranked first in the Orediggers' career record book in pass completions (799) and pass attempts (1,253), as well as second in school history in passing yards (9,159), touchdown passes (65) and completions (63.8%).



Oredigger News & Notes...

- CSM women's soccer program advanced into the quarterfinals (final eight) of the 2009 NCAA Division II Tournament. For the second year running, Kayla Mitchell was selected as the RMAC Women's Soccer Academic Player of the Year. Mines finished the season at 19-5-1 overall (13-3-0 RMAC).

- The CSM men's soccer squad made its second-ever appearance in the NCAA Division II Tournament in 2009. The Orediggers concluded their season with an overall record of 15-3-4 (11-2-1 RMAC).



- The Oredigger volleyball team, which qualified as the #8 seed in the NCAA Division II Central Region Tournament, established new single-season program records for overall victories (22) and conference victories (13) this fall.

- The CSM men took third place at the NCAA Division II Cross Country Championships this fall. Aaron Swift and Ben Zywicki earned All-American honors for the Orediggers. Sydney Laws, who earned All-American recognition with her 10th-place finish at the championships, competed as an individual for Mines.



Sydney Laws

- A combined total of 68 Mines student-athletes earned Academic Achievement Awards from NCAA Division II Athletic Directors Association during the 2008-09 school year.

CSM Athletics Home Schedules – Winter 2009-10

MEN'S BASKETBALL

Jan. 2	Western Oregon	7:00 p.m.
Jan. 8	CSU – Pueblo	8:00 p.m.
Jan. 9	N.M. Highlands	8:00 p.m.
Jan. 22	Chadron State	8:00 p.m.
Jan. 23	Nebraska – Kearney	8:00 p.m.
Feb. 6	UC – Colorado Springs	8:00 p.m.
Feb. 12	Regis University	8:00 p.m.
Feb. 13	Metro State	8:00 p.m.
Feb. 16	Colorado Christian	8:00 p.m.

WOMEN'S BASKETBALL

Dec. 13	Peru State	1:30 p.m.
Jan. 2	Western Oregon	2:00 p.m.
Jan. 8	CSU – Pueblo	6:00 p.m.
Jan. 9	N.M. Highlands	6:00 p.m.
Jan. 22	Chadron State	6:00 p.m.
Jan. 23	Nebraska – Kearney	6:00 p.m.
Feb. 6	UC – Colorado Springs	6:00 p.m.
Feb. 12	Regis University	6:00 p.m.
Feb. 13	Metro State	6:00 p.m.
Feb. 16	Colorado Christian	6:00 p.m.

INDOOR TRACK & FIELD

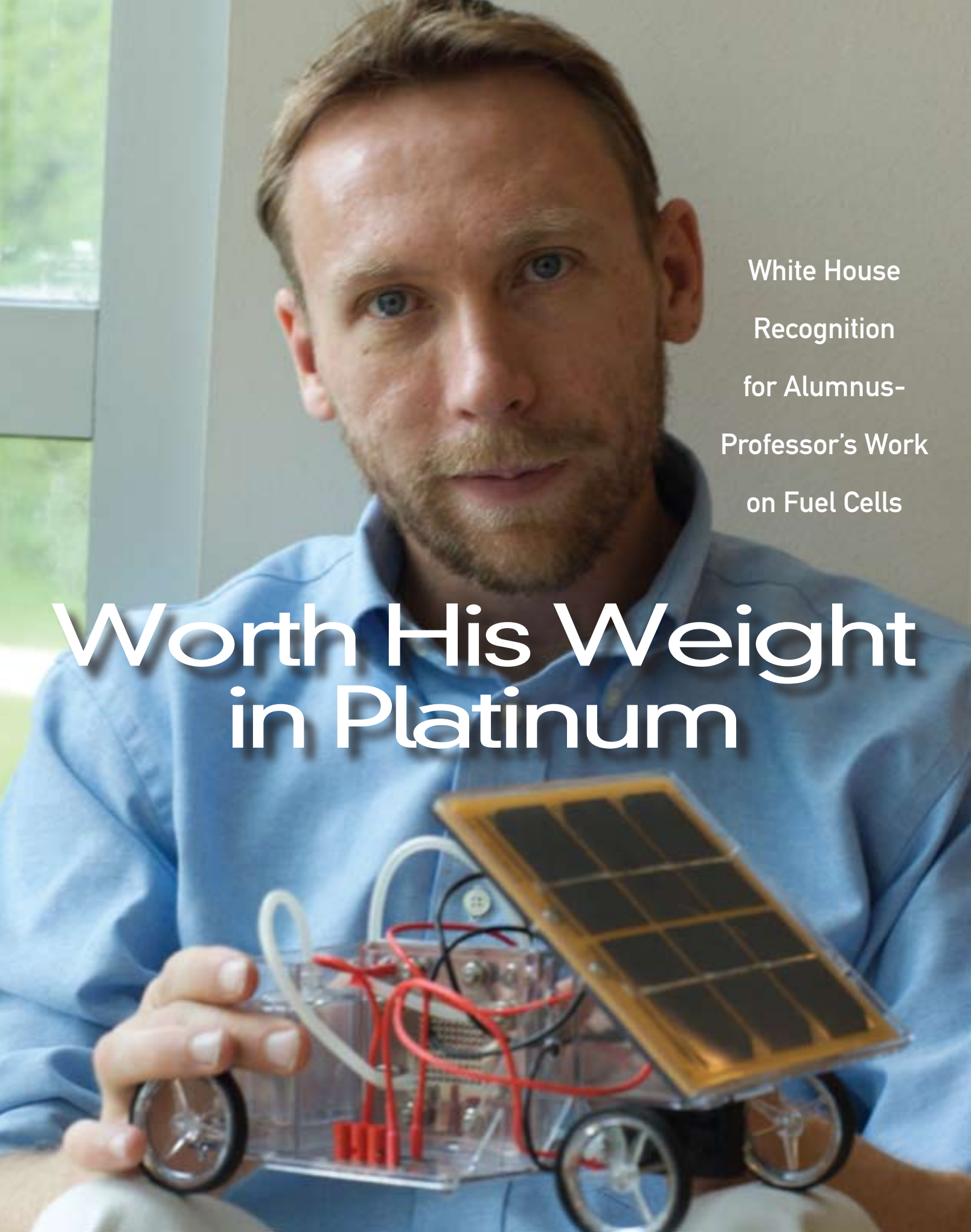
Jan. 23	Joe Davies Open	All Day
Feb. 19	CSM Twilight Open	5:00 p.m.
Feb. 26-27	RMAC Indoor Championships	All Day

WRESTLING

Jan. 7	Western State (Lockridge Arena)	7:00 p.m.
Jan. 15	Adams State (Volk Gym)	7:00 p.m.
Jan. 30	Rocky Mtn. Collegiates (Volk Gym)	9:00 a.m.
Feb. 17	Mesa State (Volk Gym)	7:00 p.m.

SWIMMING & DIVING

Feb. 11-13	RMAC Championships (Arvada)	All Day
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A man with short brown hair and a light beard, wearing a blue button-down shirt, is looking directly at the camera. He is holding a small, clear plastic robot with four wheels. On top of the robot is a small solar panel with a grid of cells. Red and black wires are connected to the robot's internal components. The background is a plain wall with a window on the left showing greenery outside.

White House
Recognition
for Alumnus-
Professor's Work
on Fuel Cells

Worth His Weight in Platinum

President Barack Obama has named Ryan O’Hayre ’99 a recipient of a Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government on young professionals in the early stages of their independent research careers. “These extraordinarily gifted young scientists and engineers represent the best in our country,” remarked Obama of the 100 scientists and engineers. O’Hayre, an assistant professor in the Metallurgical and Materials Engineering Department at Mines, will receive the award at a White House ceremony scheduled for January 13.

The award is accompanied by a grant that will go toward advancing fuel cell research, a field in which O’Hayre has quickly established an impressive record; just five years out from earning his PhD from Stanford, he’s invented a technology for measuring electrochemical phenomena at the nanoscale, helped achieve a scientific breakthrough that brings the economic feasibility of fuel cells significantly closer, and written the lion’s share of *Fuel Cell Fundamentals*, now the leading college textbook on the subject.

The PECASE also recognizes O’Hayre’s commitment to education in general and Colorado School of Mines in particular. “I always wanted to come back to Mines and inspire undergrads in the same way I was inspired here,” says O’Hayre. “I have a special place in my heart for the school.” And having been a Boettcher Scholar, he speaks of a desire to give back to the state.

O’Hayre is quick to share credit for the award. “This is a tremendous honor, but it never could have been achieved without the fantastic support I’ve received from Mines, the Metallurgical and Materials Engineering Department, the Army Research Office, and especially my colleagues at the Colorado Center for Advanced Ceramics, the Colorado Fuel Cell Center, and the National Renewable Energy Laboratory,” says O’Hayre, adding that having access to one of the best fuel cell research laboratories in the world and the nation’s top renewable energy laboratory helped him hit the ground running at Mines. He also highlights the contributions of his graduate students. “Without them, this award wouldn’t have happened. It’s their hard work that’s generating the results. They deserve a lot more of the credit than I do,” he says.

David Ginley, a research fellow and group manager at NREL, has been a mentor to O’Hayre for the past decade. They met when O’Hayre asked him to be his graduate advisor. “I offered him a position, and then told him he shouldn’t take it,” says Ginley, who instead advised O’Hayre to go study somewhere completely different. The two remained in contact, and since O’Hayre’s return, they have collaborated closely. What’s distinctive about his approach to science? “He comes at complicated problems from a fundamental basis ... he tries to understand the underlying material science,” says Ginley, who is recognized as one of NREL’s most distinguished senior scientists. “That’s not so common anymore.”

O’Hayre and his students primarily work with solid oxide and proton exchange membrane (sometimes called polymer electrolyte membrane) fuel cells. These devices, which have no moving parts, generate electricity from hydrogen or hydrocarbons by capturing the chemical energy released during oxidation. While conventional power plants convert the energy tied up in hydrocarbons into thermal

energy, then into kinetic energy, and then into electrical energy—with loss at every stage—fuel cells achieve the conversion in a single step and with much greater efficiency.

O’Hayre explains that a fuel cell’s construction resembles that of a battery, with both an anode and a cathode, and an electrolyte membrane; the differences are that they require a constant supply of fuel, and they produce water. As hydrogen gas is delivered to the anode side of a PEM fuel cell, a catalyst strips away its electrons and conducts them to the cathode via an electrical circuit, generating current. The remaining positively charged hydrogen ions, called protons, get to the cathode via an electrolyte membrane that is impervious to electrons. At the cathode, electrons and protons react with oxygen in the presence of a catalyst to form water.

Often the logjam in hydrogen-powered PEM fuel cells is this final reaction at the cathode. O’Hayre explains that this is because some very particular conditions are needed for the reaction to take place. Electrons, protons and oxygen must all be brought into close proximity in the presence of a catalyst; this requires that an electrical conductor be touching a proton-conductor (the electrolyte membrane), where there is an oxygen supply and a catalyst. Called triple-phase boundaries, the length of these interfaces on both the cathode and anode helps determine the speed of the reaction—a tricky nanoengineering problem.

O’Hayre was actually one of the first scientists to experimentally prove that the electron-proton-oxygen reaction is restricted to triple-phase boundaries in PEM fuel cells—a discovery he ranks as his most significant contribution to science to date. He did this by inventing a new imaging technique. An adaptation of atomic force microscopy, it operates on the nanoscale, mapping a material’s topography and electrical properties—including proton



O'Hayre's research team (L to R): Archana Subramaniyan, Prakash Periasamy, Rsch. Asst. Prof. Jainhua Tong, Yi Ke (Chloe), Robert Pasquarelli, Michael Sanders, Ryan O'Hayre, Cameron Brown, Ann Deml. (Absent: Dr. Svitlana Pylypenko, Aimee Queen, Lisa Bernau and Daniel Clark.)

conductivity—using an electrically conductive needle that has a tip not much wider than a single atom. With such minute resolution, he was able to pinpoint the electrical activity related to the reaction, confirming with topographic data that it was restricted to where these materials and air pockets met. Recognizing its potential, Agilent Technologies subsequently commercialized the technique based on O'Hayre's work, and it is now being used by scientists around the world in diverse fields.

If the development of PEM fuel cells is successful, the payoff is significant: laptops that operate on a single charge for 24 hours straight; cell phones that run for a week; and efficient, silent power generation in remote locations. The Department of Defense, which sponsored O'Hayre for the PECASE award, is particularly keen to see the technology evolve, as they would have myriad applications.

However, for this to happen, O'Hayre explains, PEM fuel cells will likely need to operate on a hydrocarbon—methanol being the current forerunner for portable applications. This adds another level of complexity and places greater demands on the catalyst on the anode—it's one thing to snatch electrons from a fickle hydrogen gas molecule, quite another to wrestle them away from a more stable hydrocarbon. O'Hayre says the best performing catalysts for PEM fuel cells all include platinum in some form, so adding more to speed the reduction of methanol quickly becomes prohibitively expensive for most applications, but not all—NASA made it work for the space shuttle program.

Until recently, scientists have tackled this problem by experimenting with different catalysts and various platinum alloys—and with some success: "Platinum-nickel and platinum-cobalt both show an improvement over pure platinum by a factor of two," says O'Hayre. "The problem is, we need a factor of 10 to reduce costs to the point where fuel cells become compelling."

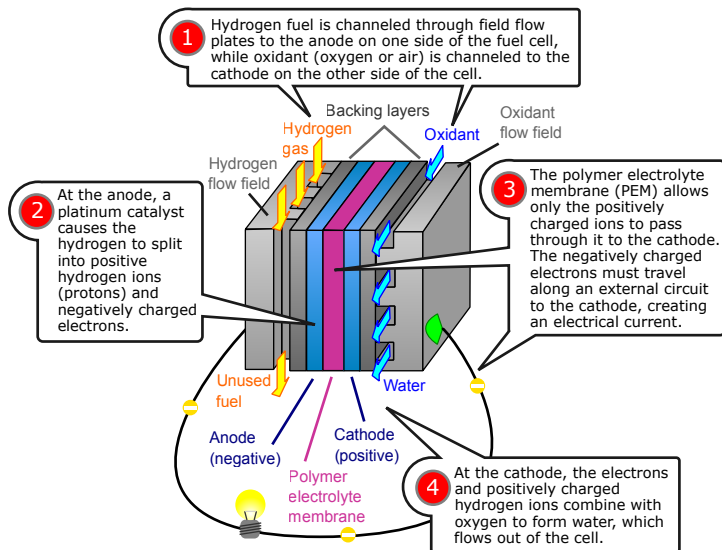
In what might be an example of O'Hayre "coming at a problem from a more fundamental basis," his team identified a mechanism to magnify the catalytic activity of pure platinum threefold. And they did so using a common element—nitrogen. Whereas in most fuel cells, nanoparticles of platinum are adhered directly to carbon (through which electrons are transmitted), O'Hayre demonstrated that when very small quantities of nitrogen are used to "dope" carbon, and then platinum is bonded to the nitrogen dopants, subtle alterations in platinum's electrical properties improve its durability and, more importantly, triple its catalytic activity—using this technique, you only need a third of the platinum to achieve the same results. From an economic perspective, it's an important finding (worth his weight in platinum many times over); and scientifically, it points the way to a whole new approach to optimizing catalysts and accelerating PEM fuel cell electrochemical reactions.

The PECASE grant specifically funds his continued research in this arena: Are there alternatives to nitrogen that might have an even more powerful effect on platinum? Does nitrogen doping triple the catalytic activity of platinum nickel also, yielding a factor of six? Can a less costly catalyst be "tuned" to achieve results comparable to platinum's? These are some of the questions that will be keeping O'Hayre and his students busy during the coming years.

If they are successful, perhaps it won't be too long before the efficiencies of electrochemical conversion can be applied to such areas as transportation, power generation and battery technology. "Recharging your laptop on a plane might one day be as simple as ordering a vodka," O'Hayre jokes. And because a PEM fuel cell takes in oxygen and gives off water, if such a day arrives, we will all need to think of our portable electronic devices a little differently. "You'll kind of have to treat it like a living, breathing thing," he says. "So if you had one of these in your cell phone, it'd be like having a mouse in your pocket."

Different thinking indeed. **M**

Proton Exchange Membrane Fuel Cell



Note: "Polymer electrolyte membrane" and "proton exchange membrane" have similar meanings and are used interchangeably.



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Although energy exploration is what we do, playing a positive role in the ongoing development of our local communities is what defines us. We believe the key to true success lies in the active participation of enhancing the quality of life for those around us.



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Beating the ODDS\$

By Mick Normington and Nick Sutcliffe

Three growing businesses in a shrinking economy

Even when the DOW tanks, credit is tight and the economy slows to a crawl, fortunes are still made. These profiles provide a window into the lives of three Mines alumni whose businesses have thrived in recent years despite the economic tsunami that is sweeping the U.S. and the world.

Each illustrates a spirit of entrepreneurship, underpinned by drive, creativity, and dedication to quality and service. They all dodged the worst of the recession by occupying a specific market niche. Oh yes, and they each listened to their father's advice.

Everything Metal, Including Kitchen Sinks

Don Kammerzell's father encouraged him to build his own company. "From the time I got out of school, my long-term goal was to run my own business," Kammerzell says. He graduated from Mines in 1971 with a degree in metallurgical engineering and went to work in the nuclear energy industry. As the industry declined, he began working for a large steel fabricator. Then, in 1986, he bought a tiny metal fabrication shop in Phoenix, Ariz., and got started with four employees—he now has 50.

His Phoenix-based industrial sheet metal firm, K-zell Metals, hasn't just ridden out

the economic turmoil of recent years; their revenues have grown 20 to 30 percent. "We are able to do things that other people just can't do," he says, crediting a highly skilled engineering staff and a shop equipped with state-of-the-art machinery.

K-zell has made everything from horse-race starting gates, to large industrial centrifugal fans, concrete forms, outdoor advertising signs, elaborately designed sculptural installations and military products. He jokes that when it comes to steel, he's made just about everything, including several kitchen sinks.

And herein lies K-zell's strength: "Our customer base is so wide that when one segment of the economy is down, another seems

to pick up, and we do the work for whoever is busy," says Kammerzell. Last year, K-zell completed projects for about 250 different customers, with contracts ranging from \$1.5 million down to \$25.

Friendly and gregarious, Kammerzell puts a high priority on (and seems to genuinely enjoy) his relationships with customers. "It's all about what you do for other people," he says. "Pay attention to your customers and you will always win."

He cites a good example. An entertainment company, Select Artists, came to Kammerzell several years ago and asked him to design and fabricate a portable stage that could be rapidly assembled for performances at major sporting events. It performed well,

“Once somebody teaches you how to truly think ... it changes your life.”



Lisa Robbins

Don Kammerzell '71

and Select Artists has been making the rounds with it ever since, including one show at the new Yankees Stadium earlier this year. Here they made such an impression that when the die was cast for the 2009 World Series, Yankees groundskeepers told Major League Baseball organizers that they would allow only one firm and one piece of equipment on the field before Game 1—Select Artists and K-zell Metals' portable stage. MLB complied and in late October, Select Artists transported the stage from Arizona to New York for Jay-Z and Alicia Keys' performance of one song, "Empire State of Mind."

By paying attention to his customers and building exactly what they need, Kammerzell has also helped save lives. A recent contract

involved fabricating brackets to enable defense contractors to retrofit Humvees with ceramic composite armor. Six weeks after the product's introduction in Iraq, the new armor saved the lives of four soldiers. "They sent us some pictures of what happened. It was pretty amazing ... and rewarding," says Kammerzell.

Working with another defense contractor, K-zell helped develop the prototypes of a new seat system that cushions some of the vertical acceleration resulting from explosions detonated beneath vehicles. Recent improvements in armor plating result in far fewer injuries from shrapnel, explains Kammerzell, but the immense vertical acceleration created by a blast under a vehicle can

often be crippling or fatal. The seat system, which uses a hydraulic piston to absorb some of the energy, has been so successful that it is now required equipment for certain military vehicles.

Looking back at his time at Mines, Kammerzell recalls the influence of two mentors in particular. "I'll always remember Jack Lubahn, a metallurgical engineering professor," says Kammerzell. "Once somebody teaches you how to truly think ... it changes your life," he says. Another mentor was his track coach: "Joe Davies taught me that there is no job that is beneath you," he says. "The first time I met him he was raking the track and picking up little pebbles."

Solving problems and being willing to do what needs to be done have helped Kammerzell build a highly successful and reasonably recession-proof business. For other aspiring entrepreneurs, he shares this wisdom. "Owning your own company is thrilling, but it isn't for everybody," he says. "However, if you think you can take a risk, fail completely, be okay with that failure, and start over, then having your own business might suit you well."

Upwardly Mobile

Doug Harrison '86 has managed to keep his company upwardly mobile throughout the recession by selling his clients, well, mobility. He's the founder and chief executive officer of The Scooter Store, which specializes in motorized chairs for the elderly. With a workforce about 2,500 strong as of October 1, Harrison expects his company will take on an additional 600 within the next 12 months. And given the country's demographics, the prospects for continued growth are good—Harrison's five-year plan includes doubling the size of the company.

Harrison agrees that the technical details of his Mines degree in petroleum engineering have little to do with his current business, but the 46-year-old says the school shaped

“The companies that succeed are those that react the best, not the ones that plan the best.”

him in many significant ways. Technical writing, attention to detail, hard work and keeping lots of balls in the air at one time are at the core of all businesses. Most importantly, the numerous convoluted engineering problems he had to tackle as an undergraduate taught him problem-solving. “There is always an answer,” he says. “Mines taught me to take outrageous problems and unravel them in order to solve them. That’s one of the things that helped me the most ... We have to unravel problems all the time.”

Many of those problems involve The Scooter Store’s main revenue source: Medicare reimbursements. With Medicare frequently updating definitions for who qualifies for a motorized wheelchair, as well as other medical equipment the company provides, staying on top of regulations is critical, particularly given his company guarantee: if The Scooter Store approves a customer and Medicare denies the claim, his scooter is free.

But Harrison and his staff do much more than interpret regulations. As they work with Medicare supervisors and coordinate communications between physicians and their patients, they become advocates for their customers, who are often negotiating some very difficult life transitions.

Harrison wears a constant smile and speaks in a soft voice. His employees exude pride in working for a company so dedicated to helping others. “Why are we here? It’s to make the world better,” Harrison states. He’s very proud of this sense of mission that permeates his company, and explains that it was this same desire to make a difference that prompted him to start The Scooter Store in the first place.

It began when his grandmother had to enter a nursing home in the late 1980s. Visiting her there, Harrison saw firsthand how devastating the loss of mobility was to his grandmother and others at the home; the loss of independence often meant a loss of dignity, and they were left with very few options. There was a limited choice of motorized wheelchairs, and they were expensive and difficult to obtain.

Seeing an opportunity to tackle the prob-

lem and build a business, Harrison and his wife, Susanna, decided to take a big risk. They pooled all of their savings, borrowed \$50,000 from Harrison’s father, and opened a tiny motorized wheelchair retail store off Interstate 35 in the rural Texas town of New Braunfels (pop. 53,000), midway between Austin and San Antonio. The subsequent 18 years weren’t without their setbacks—at one point a crooked bookkeeper fled the state with practically all their cash reserves—but clearly they survived.



Doug Harrison '86

The Scooter Store is now one of the largest sellers of scooters and motorized wheelchairs in the nation. Harrison was recently named a regional winner of the Ernst & Young Entrepreneur of the Year award, and his company made *Fortune* magazine’s list of the “100 Best Companies to Work For.” So what’s behind his success?

It’s an unconventional business in several respects. In addition to promoting a sense of purpose, Harrison believes managers

and employees should feel they are solving problems and pursuing success together, so he encourages lots of meetings. He also gives employees a stake—42 percent of The Scooter Store is employee-owned—and the company carries very little debt.

“You have to have goals,” says Harrison, “big hairy audacious goals, or BHAG as we call them around here.” One of The Scooter Store’s goals is to “create an opportunity for every elderly American to live their whole life at home.” To this end, they are expanding their offerings: they recently increased their range of in-home medical equipment and started offering customized wheelchairs to the disabled. Harrison says that future products and services could include anything and everything that would allow an elderly person to remain happy, healthy, safe and connected in their own home.

Harrison believes flexibility is key to success in business. “The companies that succeed are those that react the best, not the ones that plan the best,” says Harrison.

And though Harrison is most animated when speaking of teambuilding, problem-solving and his company’s mission and purpose, he never loses track of the bottom line—a lesson he learned from Mines petroleum economics professor, Bob Thompson.

“His big point was that no matter how good you think your project is, if you cannot show what its positive return will be, then you don’t get to do your project,” Harrison recalls. “You have to have a financial justification. I’ve always remembered that.”

Another Mines professor taught Harrison an important lesson about remembering people’s names. “People think of Mines as all math and science, but I learned valuable people skills too,” says Harrison, who tells of how a petroleum engineering professor, Bill Mitchell, once threatened to fail students for misspelling his name on tests. “His point was that people value their own name, and you should never, ever misspell your boss’s name.”

Harrison came away with more than a degree and transferrable business skills; he met his wife, Susanna, at Mines. Their relationship flourished, even after she transferred



Jordan Wiens '03

from Mines to CU Boulder, and they were married shortly after graduation. During the next five years, Doug and Susanna continued to spend a lot of time apart, with Doug working for Conoco, often stationed offshore in the Gulf of Mexico.

On his fifth anniversary with the company, he gave his notice by walking into the office holding a portable stereo blasting Johnny Paycheck's "Take This Job and Shove It." His boss, a good friend, laughed and said he had always wanted to do that.

Going into the energy industry, Doug had followed in his father's footsteps: Otto Harrison had been a lifelong engineer for Exxon. But in leaving, he'd followed his father's advice: Otto encouraged his children to seek more control over their destinies. "Go to a good college, work for 10-15 years, save your money and then start your own business, was my dad's advice," says Doug. "He always saw that as the real American dream."

2003 Grad's Company is 2 1/2 Years Old, Employs 10 and Clocks Revenue in the Millions

Jordan Wiens '03 achieved his goal of managing his own business before celebrating his 28th birthday. "My father told me, 'if you want to be a mover, own the mov-

ing company,'" says Wiens, who served as student body president during his last two years at Mines.

After graduating with an electrical engineering degree, Wiens passed up the opportunity to join the family's Colorado Springs electrical contracting company, electing instead to take a position with ExxonMobil at its oil refinery in Torrance, Calif.

Wiens subsequently enrolled in the University of Southern California's Entrepreneur Program to earn an MBA. When tasked with writing a business plan, he began outlining the concept of an engineering and field services firm that helps industry comply with emissions monitoring regulations and process safety control systems.

Hoping to get an experienced perspective on the idea, Wiens mentioned it to his colleague, Michael Andraos, an industry veteran, whom Wiens had come to know thanks to a shared passion for good coffee. Andraos was impressed with the idea, and Wiens' future business partner jumped in with both feet, becoming an active collaborator; the two strategized and refined the plan for about a year before completing the document.

Wiens' presentation of the concept, backed up with a detailed 53-page plan, was well-received, winning several competitions and a handsome \$25,000 check. Encouraged by these endorsements, they

"We each bring compatible perspectives and strengths to the table."

forged ahead and launched Xenon, Inc. before Wiens graduated from USC in 2007.


The awards helped pave the way for financing, as did their timing: "It was a perfect time to apply for a loan," says Wiens, admitting that they might have had a much harder time in the current climate.

Just two and a half years later, Xenon's business is thriving. Their 10 employees service six of the seven major oil refineries in Southern California, where they have installed customized equipment that identifies and measures pollutants in emissions and gauges other liquids and gases at various stages in the refining process.

Wiens is pitching Xenon as a one-stop-shop. "We consult with our customers to determine the best solution for every application," he says. "Then we'll engineer it, build it, install it and even maintain it with our field services division."

And it's a business model that's clearly working—annual revenues are in the millions and they recently opened a second office in Houston. "We're fortunate to be largely unaffected by the economic downturn," says Wiens.

In addition to oil refineries, Wiens says Xenon's technology has applications to many other industries, including power generation, manufacturing and wastewater treatment. "We're creating a new wireless communications division for tank gauging and other remote monitoring applications," he says.

Wiens attributes a large portion of the company's success to his partnership with Andraos. "We each bring compatible perspectives and strengths to the table," he says. "My youth, energy, motivation and ideas work extremely well with his experience, longevity and market understanding." 

By Doug McInnis

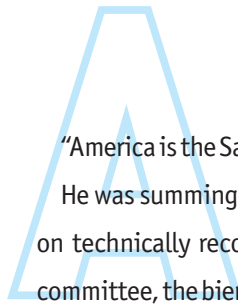
Awash in Natural



GAS

The least carbon-intensive
fossil fuel is also the
most abundant.
But recovery is no
simple matter.





“America is the Saudi Arabia of natural gas,” is how one prominent Texas oilman put it. He was summing up the contents of the Potential Gas Committee’s 2009 assessment on technically recoverable natural gas. Released on June 18 by the Mines-affiliated committee, the biennial assessment was the highest in the committee’s 45-year history.

In plain terms, the report suggests we have almost enough recoverable natural gas to see us to the end of the century. “The gas resource picture has never been brighter,” said John Curtis, professor of geology and geological engineering at Mines, and director of Colorado School of Mines’ Potential Gas Agency, which supports the committee. The assessment is considered particularly accurate because it is generated by 145 volunteers who work in the industry. “They work these basins for a living,” said Curtis.

The 40 percent jump from 1,320.9 trillion cubic feet (TCF) in 2007 to 1,836.4 in 2009 does not, for the most part, signify newly discovered resources; rather it represents improvements in recovery methods. The assessment only tallies gas that can be tapped using proven technologies. Over the last two years, operators have demonstrated they can access gas in what was previously considered a source rock, not a reservoir, which added a huge amount of gas to the assessment’s bottom line. “New and advanced exploration, well drilling, and completion technologies are allowing us increasingly better access to domestic gas resources—especially unconventional gas,” said Curtis.

Unconventional natural gas is a broad term covering coal bed methane, tight gas sands, shale gas and gas hydrates, all of which share a common characteristic: “They need some kind of stimulation or enhanced recovery to make them economical,” said Jennifer Miskimins, associate professor of petroleum engineering at Mines. “These are not reservoirs where you just drill and turn on the tap.” Unconventional gas accounts for more than half of the 20.5 TCF of domestically recovered natural gas produced in 2008. And of the additional 515.5 TCF seen in this year’s report, 85 percent is unconventional.

Colorado School of Mines has had a hand in developing many of the technologies that have brought this vast energy resource within reach of industry. Recognizing that the need for increasingly advanced technologies is only going to grow, the school recently established the Unconventional Natural Gas Institute (UNGI) to facilitate and promote research and increase awareness among lawmakers and the general public of this largely untapped resource.

UNGI combines the resources of seven academic departments,

and 11 research centers and consortia, with expertise in all four types of unconventional gas. Curtis and Miskimins, co-directors of UNGI, describe the establishment of the institute as a logical next step: With such a strong concentration of expertise in a rapidly growing, technology-intensive industry, it would be a win for the school and a win for the energy industry.

Miskimins explains that the institute will offer “a focal point for all the various unconventional gas research that is already ongoing at Mines.” In addition to connecting industry partners with the appropriate campus resources, UNGI will facilitate the exchange of information for large interdisciplinary projects involving research centers on and off campus.

She goes on to describe how UNGI will offer seed funding for research projects, including equipment and infrastructure. Along with training for undergraduates and graduate students, post-doctoral and visiting scholars who are experts in these fields will be involved. And she anticipates that as interest in unconventional natural gas grows, the institute will become a trusted source of information for journalists and policymakers.



The Boon in Shale Gas

While unconventional gas in general accounts for 85 percent of the jump in technically recoverable natural gas this year, shale gas is the real newsmaker; it went from 200 TCF in 2007, to 616 TCF in 2009, and therefore accounts for almost all of the increase.

One person who can speak firsthand about successfully extracting shale gas is Harvey Klingensmith '75, who double-majored in geophysical engineering, and geology and geological engineering, and recently founded Stone Mountain Resources. Operating in northwest British Columbia, his company is producing 27 million cubic feet of gas per day from the area's thick shale-gas formations. "It's a brute force approach," said Klingensmith. "We go down about 10,000 feet and then drill horizontally for about 5,000 feet. We hit the shale with a hydraulic hammer of water and sand. We're pumping it in at almost 10,000 pounds of pressure per square inch."

Miskimins, who is director of the Fracturing, Acidizing, Stimulation Technology (FAST) Consortium, explains: "During the creations of these fractures, a high-grade sand or artificial proppant is placed in the fractures to keep them 'propped' open, thus creating a highly permeable channel for the natural gas to flow from the reservoir to the well." Some of Miskimins' research examines the transport of these proppants out into the fracture and the monitoring of fracture growth by micro-seismic tools that listen for miniature earthquakes that the fractures create.

Environmental and Politico-Economic Benefits

The Potential Gas Committee's assessment was widely quoted in national and international media, including *The New York Times*, *The Financial Times*, the BBC, and a detailed two-part report on National Public Radio. The reason it attracted so much attention is because the economic, political and environmental implications are profound.

The U.S. spent \$390 billion importing foreign oil in 2008. Since most imported oil is used for transportation, and the technology to run cars on natural gas has been around for decades, it is conceivable that natural gas could significantly decrease U.S. spending on foreign oil. Furthermore, a greater degree of energy-independence makes the U.S. less vulnerable to interruptions in supply and it stems the flow of U.S. dollars to potentially unfriendly nations.

Natural gas also offers a way to quickly and significantly lower the

country's carbon footprint and buy time to accomplish a long-term transition to carbon-neutral energy technologies. On a per-BTU basis, natural gas emits about half as much carbon dioxide as coal, and a quarter less than gasoline. Presently, coal is used to generate the largest share of the nation's electricity, 45 percent, with natural gas a distant second, at 25 percent. (The remainder comes from nuclear, hydro and renewable sources.) Shifting this balance in favor of natural gas is widely seen as a realistic pathway to lower carbon emission. Similarly, vehicles running on natural gas could make a substantial impact.

Climbing Demand

Production of natural gas has been climbing steadily for years, with an increasing proportion coming from unconventional resources. If a swing in national energy policy were to accelerate demand, the energy industry would be working harder than ever to develop the country's plentiful endowment of these resources.

Miskimins illustrates the issue by describing the country's gas supplies as a pyramid, with the lower parts representing unconventional gas resources, and the top representing conventional reservoirs. "These are small in quantity," she said. "But it's easy to get the gas out. As you move down the pyramid, the amount of gas increases, but so does the expense and the technology required to get at them."

Thanks to improvements in fracturing, the U.S. is clearly reaching farther down the pyramid. In 2000, domestic U.S. natural gas production totaled 19.2 TCF, with less than a quarter coming from unconventional resources. In 2008, production rose to over 20 TCF, with 10.4 TCF sourced from unconventional resources.

Looking ahead, advances in technology will need to continue keeping pace with global demand, and a key area of research will remain rock fracturing. Scientists have long conducted seismic monitoring as rock is fractured, producing three-dimensional images from the data. However, better micro-seismic monitoring techniques and better imaging technologies are gradually giving researchers sharper and more detailed 3-D images of what's taking place deep underground. "We had thought a bigger hammer was necessary," said Tom Davis, professor of geophysics and director of the Reservoir Characterization Project. "But that may not be the case; better placement of fractures may be more effective."



Clockwise from top: John Curtis and Jennifer Miskimins, co-directors of UNGI. Clathrate hydrates look like snowballs, but they burn. Conventional (right) versus unconventional natural gas recovery.



Thomas Cooper, lightboximages.com

The Mother Lode of Unconventional Gas

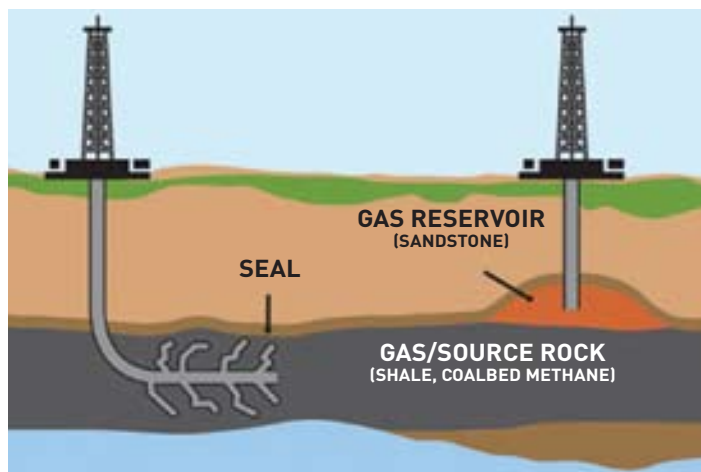
Another way technology can reach deeper into unconventional natural gas resources is to develop a means of tapping the largest category of them all: clathrate hydrates. “There’s a tremendous resource in hydrates,” said Miskimins. “We just don’t know how to economically produce it right now.”

Tremendous indeed. A conservative study by the U.S. Department of Energy estimates U.S. deposits at about 200,000 TCF. Another study by the U.S. Geological Survey suggests that global deposits of gas hydrates may contain more organic carbon than the world’s stock of coal, oil and non-hydrate gases combined.

Clathrate hydrate deposits look rather like ice and are found below the Arctic permafrost and in sediments along coastal regions around the world. On a molecular level, the hydrocarbon gas is actually trapped inside crystalline cages that remain stable so long as they are kept under high pressure and low temperature. “If you raise temperature or reduce the pressure, the gas can escape,” said Carolyn A. Koh, associate professor of chemical engineering and co-director of the Mines Center for Hydrate Research.

However plentiful, gas hydrates are the most difficult unconventional gas to recover; nevertheless, with such a potential bonanza at stake, some of the world’s biggest energy companies are looking for ways to tap into the resources. ConocoPhillips is working on a method involving pumping carbon dioxide into gas hydrate fields, which liberates the gas and simultaneously sequesters the carbon dioxide. Field testing begins in the next few months.

While extracting gas hydrates from Arctic permafrost may be simpler, the bulk of this resource is found in ocean sediments below 1,300 feet, where recovery is a much greater challenge. Even so, Japan is determined to try. “The Japanese expect to recover ocean hydrates by 2016,” said Koh. “They have huge deposits off their coastline and they are investing heavily because they have limited domestic fossil fuel resources.”



While much of the enthusiasm for natural gas stems from its environmental benefits, Koh is quick to point out that they are approaching recovery with a great deal of care; natural gas, also known as methane, is a greenhouse gas 20 times more potent than carbon dioxide.

It is ironic that such a potent greenhouse gas might end up helping to slow the mounting concentrations of carbon dioxide in the atmosphere, but it could. And when the economic benefits are also considered, the mounting interest is hardly surprising.

Many at Mines welcome the renewed enthusiasm for natural gas sparked by the Potential Gas Committee’s report. “For a long time, people have said we are running out of oil and gas,” said Miskimins, “but that’s not entirely accurate. It’s the easily accessible part that we’re running low on. There is a huge amount of unconventional gas, and Mines is going to play an important role in developing the technology to unlock it.” [M](#)

An Engineer–Poet Finds Refuge in Words

By Anne Button
Photography by Chris Peters

Displaced
from Iraq
as a boy,
Abdullah
Ahmed
writes of his
tumultuous
teens

Standing in the airport in Amman, Jordan in 2003, 15-year-old Abdullah Ahmed raised trembling fingers to wave goodbye to his family. More than two years after they had fled Saddam Hussein's Iraq, U.S. visas for everyone in the family had finally come through—all except his own. • He shared a name with one of the terrorists on the U.S. government's post-911 terrorist watch list, and his visa was held up. Nevertheless, the young Abdullah insisted his family leave while they could. "I literally had to push my mother onto the plane," he said. Alone, he was forced to remain in Jordan to navigate the labyrinthine logistics of getting himself off the U.S. list and onto a plane. • Now 21 and a junior majoring in petroleum engineering at Colorado School of Mines, Abdullah says his remarkable and often harrowing early experiences—growing up under Saddam Hussein's repressive regime, fleeing the country just two weeks before September 11 and having independence foisted upon him at a young age—inspired him to find a channel to express his complex thoughts. So while taking courses in fluid mechanics and differential equations, Abdullah also writes: essays, poems, a novel and a memoir. • "There's such a lyricism to Abdullah's writing, even his academic writing," says Toni Lefton, senior lecturer at Mines. "His voice is so authentic. When you read something he's written, you find it sticks with you weeks later."

Lefton was so impressed by Abdullah's writing that she nominated him to receive Mines' Blackwell Award for Excellence in Creative Expression, given for the "evocative representation of the human condition" through a creative work. The first freshman ever to win the award, Abdullah did so with *Execution of the Palm Tree*, a portfolio of essays that tracked the life of a tree planted by his grandfather in Iraq, as it experienced the war, the bombings and the lootings.

"They say writers are born, but I don't believe that," Abdullah says. "Writers emerge either out of heartbreak or some sort of joy. The first time I wrote, we were in Jordan. It was one of the worst times of my life. It was my mom's birthday, and I didn't have any money to buy her anything, so I wrote her a poem. So I guess I wrote out of both, really—heartbreak *and* love."

Abdullah recalls his early childhood in Iraq as happy. He re-

ceived an excellent elementary education and tested into a selective Baghdad middle school where he excelled. But as he approached his teen years in the late nineties, the political situation worsened. He was 12 when his mother, a dentist, noticed that she was being followed. He later learned that the previous owner of their family's comfortable Baghdad home had decided he wanted the house back. Since he was "one of Saddam's people," Abdullah says, "there was no arguing." Nor was there any compensation.

Even though they didn't resist, they were still in danger—as victims of such a flagrant abuse of power, they represented a threat to their perpetrator. "We feared for our lives in Iraq," says Abdullah. The family made plans to join Abdullah's uncle and grandparents in Colorado, but Abdullah's father, a mechanical engineer working for the Iraqi government, was being watched. When the authorities learned of his plans to move to the U.S., he was called



in for questioning. “If you worked for Saddam’s government, you couldn’t just leave,” says Abdullah.

Not by light of day anyway. In August 2001, Abdullah’s mother packed up her four children in the middle of the night and slipped away to Jordan—there being no U.S. Embassy in Iraq. She intended to head for the United States as quickly as their paperwork could be processed; her husband would follow as soon as he could.

However, just two weeks later the horrific events of September 11 took place, and as the world watched the twin towers come crashing to the ground, the Ahmeds looked on, shocked and appalled, aware that their lives were about to be caught up in the inevitable storm to follow.

What they had thought would be a two-week stint in Jordan turned into a tortuous two-year-long state of limbo, as immigration to the U.S. slowed to a trickle, particularly among people

from Muslim countries. From their comfortable middle-class life in Baghdad, Abdullah’s family now found themselves crammed into a one-bedroom (and very expensive) apartment in Amman. With neither parent able to work legally, the family’s savings dwindled. Thankfully, Abdullah’s father—who managed to escape Baghdad eight months after his family—eventually found work in Yemen.

It was with relief and delight that the family received the phone call, in March 2003, telling them that their American visas were ready. Abdullah’s father boarded the first plane from Yemen to Jordan, but once again, world events rocked their lives: That same day, the U.S. invaded Iraq. All Middle Eastern borders were closed, visas were shelved, and Abdullah’s father went missing. “There was no word from him,” Abdullah says. “One day during the war, we saw my aunt’s (Baghdad) house on TV, on fire. We feared that’s where he was.”

The War's Metaphor

By Abdullah Ahmed

Yesterday
as I walked down the road
of September 11 and 2003
I tripped over a rusty
metaphor.
It looked up at me and said
don't extend your legs
outside your blanket
when you know
cold air will
attack.
And I only said
keep on rusting.

Taken from a collection of poems titled,
"I Promise If You Listen You Will Hear My Skin,"
which can be read online at magazine.mines.edu)

Six weeks later, after the statue of Saddam had fallen and Baghdad was declared officially under U.S. occupation, Abdullah's father called, explaining that he'd been sent back to Iraq on the first day of the U.S. invasion. He returned to Jordan as soon as he could, and the Ahmeds left for the U.S.—heart-wrenchingly—without Abdullah. "They had to leave me behind before their visas expired," he says. For the next three months, the young teenager fended for himself in Jordan, wrangling with the U.S. embassy over his true identity.

"The daily phone calls to my family—which later I had to reduce to save money—were the only thing that kept me going," he recalls. At one point, a month into his ordeal, Abdullah received a call from the embassy to say the visa had been granted. Overjoyed, he immediately called his family in Colorado. But then, just a few hours later, he learned of another mistake with his name. "Calling my family back and telling them the news was the hardest thing that I had done in my life," says Abdullah.

Finally a visa came through. But on the day before he was scheduled to leave, somewhere on the five-bus trip between the embassy and his apartment, he lost a packet containing his visa, airplane ticket, passport and money. Desperate, the 15-year-old collected his thoughts and wrote a list of all the places he'd been that day. "There were so many places," he says. Retracing his steps exactly, he found the packet in a department store, under a pile of shirts. "I was never more relieved in my life," he admits.

When the time came at last to board the plane for the U.S., Abdullah says, "I practically dove onto it."

A new life—and language

Upon arriving in Colorado, Abdullah spoke very little English, but his talents quickly caught the attention of his teachers at Denver's South High School. Laurie Chotena, who taught English language acquisition, says, "He improved four grade levels in reading, from 7th to 11th, in just one year... He just loved language. He had such fun with words and choosing just the right one." Chotena passed Abdullah's writing on to Randal Thomas, who taught Advanced Placement English.

"What he was producing was good," says Thomas, who advised Abdullah for more than two years as he produced a 400-page fantasy novel, but the teacher was curious about where the spark for his creative writing began. "I learned about his childhood in bits and pieces over the two years," says Thomas, "and finally suggested that it's his personal story that he should be writing about."

Not just a writer, Abdullah also won awards for math. "Everyone who knew Abdullah thought he was remarkable," adds Chotena.

Having been accepted to Mines, Abdullah remained in high school an extra year to further improve his English. Then, to save money, he enrolled in community college for a year before transferring to Mines in 2007. "Abdullah seemed to grasp instinctively how important it is for engineers to be able to communicate with people," says Lefton.

In his latest poetry collection, "Hear My Skin," Abdullah uses the voice of a fictional young boy named Sami Ibrahim whose legs have been amputated after a bombing in Iraq to create a narrative thread. A three-dimensional, life-sized sculpture of Sami holding a scroll of poems accompanies the collection. "There is a sliver of hope and healing for his central character, Sami, and the voices of the fallen, across continents and cultures. The sculpted body of Sami makes the poetry collection all the more palpable," says Lefton. In a recent letter nominating Abdullah for another Blackwell Prize, Lefton writes,

Abdullah guts the human condition in complex social poems that often knock the wind out of me. He writes of loneliness and isolation in "Hushed," "...and just because I cannot hear your voice / it does not mean that you are silent, / but you are / and I am." He ends the collection by gathering up the pieces in the poem "The War Has Ended." He writes, "We listen / as humans / and therefore / against our own / stubborn / mentalities we win..." On the last page rests an "Impartial Graveyard," where people from different countries, religions, ethnicities lie together, equally, in a resonant closure to a profound first collection of poetry.

Abdullah is now editor of *High Grade*, the university's literary journal, in which he's published some of his fiction and a number of poems. He is also working on a memoir, which Lefton is helping him edit. He's the business manager of the student-run newspaper, *The Oredigger*, and he held an internship in petroleum engineering with Applied Survey Systems over the summer. "Abdullah is truly a Renaissance Man," Lefton says.

Asked about his plans for the future, Abdullah says, "I love engineering and math, but if I had to choose, I'd pick writing."

His former writing teachers, each of whom believes they'll see Abdullah's work published one day, think that's a wise choice. Abdullah "takes you places you may not want to go, through war zones, a boy's dream to ... again feel his mother's embrace, injustices and silence," Lefton says.

"But," she adds, "you are better for the journey." ■

conscientious

sometimes what you don't see
makes all the difference in the world



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The Network

Looking Ahead to Reunion 2010

Last year's reunion saw a record turnout and some successful events. We are looking forward to carrying this momentum through to Reunion 2010 by including some interesting variations on the traditional program.

Here are some highlights:

- **Date Change** While Reunion has traditionally been tied to Commencement, we wanted to provide more opportunity for alumni-student connection. A post-reunion survey indicated that commencement was not a significant factor in the decision to attend last year, so Reunion Weekend 2010 will take place Thursday, April 29, through Saturday, May 1.
- **50th Reunion Headquarters** Throughout the weekend, CSMAA will host a 50th Reunion Headquarters, providing members of the Class of 1960 a comfortable and relaxed environment to reconnect and catch up.
- **Celebration of Alumni Kick-off Event** All reunion alumni, Mines Distinguished Achievement and Mines Medalists, and graduating students will be invited to a kick-off celebration honoring new medalists and CSMAA awardees. Graduating students will see first-hand the successes and contributions of the alumni community of which they will soon be a part.
- **Reunion Breakfast** Along with providing another great opportunity for interaction, this event will also feature some current students who will share their personal stories.
- **50th Reunion Dinner** President Scoggins will be the keynote speaker at this year's dinner. The event will also provide ample time for socializing.
- **Faculty Symposium & Departmental Reunion** Last year saw the first academic department reunion—a new element of Reunion created for alumni wishing to reconnect with other graduates from their departments. Each year, reunion will include some events organized around a department or group of departments. For Reunion 2010, the mining, geology and geophysics departments will be the focus of the faculty symposium and the departmental reunion celebration on Saturday, May 1.
- **Student Expo – New this Year** Following the faculty symposium, students will display their senior design projects and graduate research for visiting alumni. You will have a chance to discuss, speculate, enthuse and question students concerning these endeavors in a casual setting.

We are excited about these changes and hope that you are too. Mark your calendar and make your travel plans. You won't want to miss it.



Peters Photography

Honors for McBride



Peters Photography

Visionary leader, renaissance engineer, creative thinker: These are some of words used to describe President Emeritus Guy T. McBride, Jr. at his 90th birthday celebration in October. Held during Homecoming, the event was attended by alumni, students and faculty, many of whom are affiliated with the McBride Honors Program that he was so instrumental in creating.

Current and former leaders of the program spoke about the impact of his vision on both the honors program and the institution as a whole. Associate Provost Barbara Olds praised McBride's support and leadership over the years, and Tom Philipose, the founder and first director of the program, hailed McBride as a true renaissance man.

E. Dendy Sloan, Weaver Distinguished Professor of Chemical Engineering, explained that as president during a time of fiscal crisis, McBride's mandate was to reestablish the integrity of undergraduate education. "McBride years were ones of laying a solid foundation for the school," said Sloan.

Many of the speeches and tributes expressed appreciation for McBride's vision and the profound impact he has had on the school. Olds explained that, during his tenure, McBride was able to expand undergraduate enrollment from 1,800 to 2,900 students and broaden graduate enrollment from 157 to 500 students. And to tackle the school's looming financial burden in the seventies, McBride initiated the first capital campaign, accruing \$63 million in 10 years.

"Like many of our greatest scientists and engineers, Dr. McBride questioned the accepted boundaries between different fields of knowledge," said President Bill Scoggins, expressing his belief that by establishing the "future graduate profile" in 1977, McBride set forth a vision of interdisciplinary excellence that remains a central point of reference for the institution today.

Many guests recognized his role in the creation of the McBride Honors Program. In a memory book compiled for McBride to commemorate the occasion, alumnus Dominic Ricotta '87 offered these reflections: "Through critical thinking, constructive discourse and a world-view perspective, the McBride program teaches its students that science and technology exist within the context of a people and their culture, the law, the environment, politics, the media and the economy. I am grateful to Guy McBride and all of the other visionaries who made the program a success..."

And Ceilia McMullen Hadden '83 encapsulated so much of McBride's legacy with her straightforward inscription: "The McBride program emphasized a well-rounded education and continuous learning—what a great foundation for pursuit of a well-rounded life."

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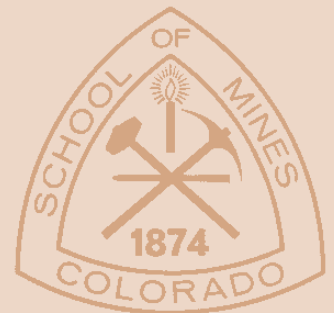
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P.O. Box 1410
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Fast Forward

Class Notes
Weddings
Alumni Profiles
Births
Passings

1952

Emanuel G. Bombolakis is a part time geology professor and currently resides in Franklin, MA.

James H. Butler III is the owner of Santana Resources Company in Houston, TX.

1960

Gerald L. Askevold is a realtor for Century 21, Whitefish Land Office in Whitefish, MT.

1963

Fred J. Hilterman is chief scientist with Geokinetics Spc and currently resides in Houston, TX.

1964

Barrett E.G. Sleeman is now with MAC Resources Group and resides in Point Roberts, WA.

1967

Kandiah Balachandran is an instructor at Kalamazoo Valley Community College in Kalamazoo, MI.

Richard C. Clark is a consultant with D&D Consulting and currently resides in Frankfort, IL.

John Hoyer retired in January 2009 from TitanAmerica LLC and now lives in Ormond Beach, FL.

1969

John D. Wright is chief engineer for Wright Consulting Company in Golden, CO.

1970

David W. Armstrong is an associate professor and department head at Montana Tech in Butte, MT.

Ronald L. Gist is a managing consultant for Purvin & Gertz in Houston, TX.

James S. Herb is sales manager at Capital Steel & Wire in Lowell, MI.

Carl W. Winters is engineering manager at Canyon Fuel Company in Helper, UT.

1971

David J. Mack is a senior technical consultant at Marathon Oil Corporation in Houston, TX.

Randolph P. Schneider is principal at Schneider Consulting in Wellington, CO.

1972

Nelson D. King is vice president of process engineering & environmental services at Pincock, Allen & Holt in Lakewood, CO.

1973

Joseph J. Krupar, Jr. is a professor at Metro State College and currently resides in Lakewood, CO.

George L. Lane is president of GL Lane Consulting in Centennial, CO.

1974

Steven D. Gilbert is the manager of reservoir engineering at Williams Companies in Denver, CO.

Stanley J. Gradisar is an attorney at law in Castle Rock, CO.

Liesa C. Houdashelt is a senior project manager with ERM and currently resides in Fairfield, CA.

Robert C. Koltz is a senior process engineer and currently resides in Longmont, CO.

Robert Z. Whipple is a contractor at Golden Engineering and currently resides in Loudon, TN.

1975

Michael G. Leidich is vice president of ROYAL USA in Golden, CO.

1976

Randal L. Bruno is a senior estimator at Sierra Mountain Construction in San Francisco, CA.

Robert A. Downey is CEO of Ciris Energy in Centennial, CO.

Dale L. Fenwick is president of Sovereign Insurance Company in Apopka, FL.

Douglas L. Jeffries is chief fire protection engineer at Chevron in Richmond, CA.

Alvin L. Langstaff is senior quality assurance engineer at Bechtel Group, in Richland, WA.

Gary J. Nilson is an asset manager with Pioneer Natural Resources in Denver, CO.

Edward L. Shuck is a geophysicist at Landmark Graphics Corporation in Littleton, CO.

1977

David B. Crawford II is an operations manager with Chevron in Houston, TX.

W. Durand Eppler is a partner with Sierra Partners in Denver, CO.

Rory D. Gilpatrick is a contractor with the Environmental Protection Agency and currently resides in Centennial, CO.

Weddings



Stacie LaRocque '08 and **Drew Tschacher** (Senior) were married on Aug. 9, 2009 at the Red Lion in Boulder, after which they enjoyed a honeymoon in Mexico on the Mayan Peninsula.



Mike Gioia '04 and **Andrea Stephens '05** were married in Colorado Springs at Holy Apostles Catholic Church on May 30, 2009.



Adrienne Nemanic '05 and David Bash were married on Feb. 6, 2009 at the Lionsgate Center in Lafayette, CO. Eighteen Mines graduates were present for the celebration.



Byron P. Poos '96 and **Kristy Kay Sjogren** were married on Aug. 8, 2009, at the Crystal Rose on Lookout Mountain outside Golden. Eleven Mines alumni were in attendance.



Angela Lemmerman '04, MS '05 and Christopher Comstock were married Aug. 14, 2009 at Schweitzer ski resort in Sandpoint, Idaho.



Clay Rosson '07 and Leah Acosta were married at the Jefferson County Courthouse in Golden, CO on May 25, 2007 by Honorable Judge Jack Devita.



Adam Smiley '09 and Natalie Puckett were married on May 30, 2009 in the Colorado LDS Temple. Many Mines alumni were in attendance.



David Rhodes '09 and Cindi Williams were married on May 23, 2009 in Paris, TX. Nine Mines alumni and three current students were in attendance.

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

Allen E. May is vice president of Denali Oil & Gas and currently resides in Spring, TX.

William A. Sargent is now with ConocoPhillips and resides in Anchorage, AK.

1978

Trevor R. Ellis is a mineral economist at Ellis International Services in Denver, CO.

Kenneth J. Litle is working for AGS in San Francisco, CA.

Bradford F. Malin is now with PC Steel and resides in Schererville, IN.

Gary L. Weihs is senior director of tomatoes with ConAgra Foods in Omaha, NE.

Joseph L. Zuech is a planner for Turner Industries and currently resides in Longview, TX.

1979

Roe C. Arn is supervisor of remuneration and systems with BHP Billiton in Farmington, NM.

Daniel P. Clark is manager of continuous improvement at Ball Corporation in Broomfield, CO.

W. Scott Graeme is a senior process engineer at Hunt Refinery in Tuscaloosa, AL.

Sharlene Piper Hower is vice president of Hower Consulting Group in San Diego, CA.

Allan R. Phillips is director of finance at Harland Clarke and currently resides in San Antonio, TX.

Claudia N. Roberts is a reserves manager at Swift Company in Houston, TX.

John L. Rovero is a resident engineer for US Army Corps of Engineers and currently lives overseas.

Michael E. Shade is vice president of StrataGen Engineering in Houston, TX.

Kim V. Thornton is advisor for reservoir completion tools at Halliburton Company in Houston, TX.

Martin D. Wittstrom, Jr. is manager of international exploration with Reliance Industries E&P.



Three Warfield alumni came together for a family wedding in Juneau, AK on July 25: **Bob Warfield '48** of Juneau; **Tom Warfield '52** of Sun City West, AZ; and **Bill Warfield '75** of Roseville, CA (listed left to right). The bride, Amanda Kohan, is Tom's granddaughter and Bill's niece.

Alumni

Fast Forward

Editor's Note: Alumni with updates from classes 1980 – 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 picture. If you do, we'll list you here in the next issue.

*** Instructions for viewing class notes online:**

If you have never logged into minesonline.net:

1. Go to minesonline.net
2. Click the red "First Time Login" link top right
3. Enter name and select your record (hint: if your name appears twice, select the record that lists your degree)
4. Enter your authenticator ID. (Printed above your name on back cover, or find it in a recent e-newsletter from CSMMA. Can't find it? Email CSMAA@mines.edu and we'll send it.)
5. Create username and password, then confirm/correct contact information.
6. Click "My Stuff" tab and select "Class Notes"

If you have previously completed first time login:

1. Go to minesonline.net
2. Click "Login" and 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

1980

David W. Baker
Brooke S. Bell
Richard M. Chamberlin
Theodore R. DePooter
Stephen C. Mountjoy
Chris A. Oglesby
James P. Wakefield
Bruce A. Williams

1981

Philip E. Brinkmann
Edwin Downer
Steven R. Enger
Melanie D. Gipe
John Y. Jo
Guy E. Saco
C. Dan Scrivner
Richard G. Williamson

1982

Bruce T. Aldridge
Julianne Bates Knutson
Daniel R. Boltz
Torkild P. Brunso
Leslie A. Covington
Dale A. Engstrom
Cully R. Farhar
Thomas J. Fleure
Ramona M. Graves

John T. Hansen
Brett C. Harrington
Mark J. Hubis
Timothy J. Inks
W. Charles Kelly III
Gregory E. Lanham
William R. Pearce
Stephen E. Randolph
Kyle B. Smith
Marcia L. Talvitie
Marcus T. Wichmann
Eric W. Wieduwilt
Sandra J. Wrobel

1983

Curtis W. Banks
Peter Critikos
Susan R. Hecker
Russell G. Keanini
Thomas D. Lookabaugh
Steven D. McPherson
Wayne W. Watson
Stewart L. Witter

1984

Mark R. Burtschi
Randy R. Cox
Simone E. Gutberlet
Mark E. Kleckner
Charles R. Mallary

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Profile

Everything Boys Can Do

Four sisters. One apartment. And one fiercely competitive, male-dominated engineering school.

It could be the premise for an MTV reality series, but to Tamara, Tawnya, Teresa and Katheleen Muhic, it was simply real life at Colorado School of Mines.

All four sisters graduated with engineering degrees in the eighties—both Tamara '82 and Tawnya '85 in chemical, Teresa '85 in petroleum, and Katheleen '88 in petroleum and mechanical. And they all went on to forge successful careers in engineering, at a time when men outnumbered women in the profession by roughly 10 to 1.

Daunting? Not to the Muhic girls. “We didn’t have brothers growing up,” says Katheleen, “so we were the sons as well as the daughters at home. We used pick axes and shovels and hammers and worked cattle and bucked hay, got dirty and greasy, and did anything a boy would have done in our family.”

Working the family ranch marked their childhood, but it was actually a sideline for their parents, who were both educators: Tom Muhic was an administrator and baseball coach at the University of Southern Colorado, and Joyce was an elementary school teacher in Pueblo.

Together they set high expectations for their daughters, who in turn rose to the challenge: They all drew straight A’s at Pueblo County High School, while starring at volleyball, basketball, gymnastics, and track and field—at one time, the Muhics held three of the four positions on a relay team. “We’d done everything boys could do up to that time,” says Tamara, “so why not study engineering? What was the big deal?”

Tamara arrived on campus in fall 1978, to be joined three years later by younger sisters Teresa and Tawnya. “Because of Tammy’s experience,” Tawnya says, “we knew what kind of opportunities a Mines graduate could get coming right out of college... We knew about the prestige associated with a Mines degree.”

“But we also knew how hard we’d have to work,” Teresa adds, “because we had watched Tammy go through it.” During weekends, Tammy often studied in her room for eight hours at a stretch.

In Golden, the sisters shared an apartment off campus, which became a family hangout, study hall, tutoring center and emotional safety net. “I remember a time when my sisters were helping me prepare for a physics test,” says Katheleen. “They’d taken physics, so they knew what I was up against. And one of them actually started



Left to Right: Teresa, Tamara, Tawnya and Kathy

dreaming about the test and losing sleep—over *my* test!”

When Katheleen arrived in 1983, Tawnya and Teresa helped their younger sister wrap her mind around drafting. “Visualizing the object in 3-D and rotating it mentally just didn’t come easily,” Katheleen remembers. “So Tawny brought home some modeling clay and molded it to replicate the objects in my assignments. That helped me learn to visualize.”

The same spirit of mutual support has continued into adulthood. All four sisters married; they have raised eight children among them, moved in and out of Colorado, and changed employers and job titles many times over. By happenstance, the sisters are currently paired in two cities: Tawnya (Chott) and Katheleen (Thurston) live in Sedalia, south of Denver, while Tamara and Teresa (Muhic) both live in Cody, Wyo.

Because they are all working as engineers, they also support each other in their professional lives. It is routine for one sister to ask another for a referral or technical advice. “They’re the first people I call,” Tamara says. “I’ve called Katheleen to ask her how she does safety-relief valve sizing. Another time I called Teresa up and asked her to tell me everything she knows about gilsonite and produced water—we had about an hour-long conversation,” she chuckled. “In my current job, I’m involved in air-quality permitting, and that’s Tawnya’s specialty—she’s one of the top experts in the country.”

The Muhic girls have long since proved that they can compete with the boys—but having each other makes the job a little easier. “This is a tough profession for women for many reasons,” she says. “You have to be tough to do it. And you have to have support.”

As individuals and as a family, the Muhic sisters are blessed with both.



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 Miles D. Brittain
 Kirk L. Ketcherside
 Daniel Larson
 Thomas M. Maul
 John M. Paneitz
 Debra H. Phillips
 Frederick H. Seymour
 George H. Wayne, Jr.

1986

Richard W. Berk
 Steve Biagiotti, Jr.
 Mark A. Chapin
 Eric D. Emerson
 David F. Fobare
 Mary C. Jensen
 Commander Eric J. Martins
 John T. Pinckney
 Peter P. Scott
 Leonard B. Smith

1987

Scott C. Darling
 Clay L. Hoes
 Nancy P. Jackson
 Jim S. Kneedler
 Paul B. Maxwell
 Jordy L. Murray
 David A. Radtke
 Marshall B. Shackelford

1988

Steven D. Bussey
 Dean J. Gipson
 Jody E. Kamrath
 Frank K. Mazdab
 Russell H. Page
 Bruce G. Sachetti, Jr.
 Brian P. Shea
 William T. Thomason

1989

Nathan S. Abelein
 Mahdi A. Abu-Ali
 Wendy L. Amann
 Linda N. Bliss
 Gregory L. Davoll
 Jay B. Knaebel
 Blase A. Leven
 James M. Osterfoss
 Wesley A. Smith
 Kathleen D. Steele
 Mark E. Zitterich

1990

Kent A. Anderson
 Eugene A. Luzietti
 Weston M. Mikulich
 Victor S. Romero
 Kathleen L. Sullivan

Timothy L. Sullivan
 Rangarajan Venkataraman
 Elwood H. Vogel

1991

Larry F. Adamson
 Peter J.N. Ashton
 Grzegorz Dewicki
 Kevin L. Hathaway
 Chad A. McKay
 James Ruble
 John E. Schaecher
 David P. Zenisek

1992

David Fazzino
 G. Gustave Greivel
 Victoria B. Jackson Nielsen
 Matthew Hakan Karazincir
 Stephen M. Keller
 Scott G. Olson
 D. Brett Redd
 Scott R. Werner
 Robert A. Williams

1993

Daniel A. Beary
 Michael J.B. Carter
 J. Russell Cirillo
 Jerome J. Cuzella
 Douglas K. Kent
 Joseph V. Kristan
 Amy E. Lamb
 Paul K. Neumeister
 Andrew D. Nicholson
 Howard A. Roepnack
 Yohan Sumaiku
 Ross A. Thompson

1994

Tiffany A. Abbink
 Robert N. Ball
 Dennis G. Downing
 Keith D. Engler
 Raymond T. Flewelling
 Pelima A. Ingka
 Daniel P. Jones
 Carl B. Krutka
 Hanchu Li
 Michael A. McDougall
 Craig J. Meis
 Mark Moseley-Williams
 Robert W. Patlovaný
 Michael W. Patton
 Christopher T. Reed
 Stephanie L. Schwenke
 Rodney D. Sgrignoli
 Anthony L. Shouse

1995

Pascual Alvarado
 Peter B. Barnhill
 David J. Barthel
 John B. Brown

Brett R. Byler
 Miss Amy N. Flammang
 Rhonda G. Gathers
 Matthew J. Hearon
 James L. Horan
 Mary E. House
 Erik P. Jacobs
 Patrick W. Mahan
 Kara L. Martin
 Chad E. Martinez
 Pedro J. Ortega
 Amy Inkell Pflaum
 Hatem Rakrouki

1996

Jami L. Alley
 Jonathan M. Bloomfield
 Richard J. Cason
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 Shawn M. Collier
 Scott A. Goodwin, Jr.
 Matthew K. Johnson
 Richard D. Johnson
 Erik Keskula
 Diana M. Light
 Roger Q. Metzler
 Kas R. Osterbuhr
 Lorraine Patton
 Norma H. Pawley
 Eric D. Readinger
 Jonathan J. Richter
 Robin L. Schott
 Robert D. Williams

1997

L. Bartholomew Adams
 Christopher J. Busley
 Tricia J. Douthit-Paulson

1997

Jeremy A. Fix
 Christoph M. Goss
 Valarie L. Salaz Hamilton
 Wm. Mark Hart
 Frederick W. Hood
 Kevin J. Mabe
 Joseph J. McBurnie
 Michael J. Miller
 Shauna M. Murphy
 Joseph W. Nielsen
 Liam M. O'Brien
 Garry S. Pape
 Christine M. Pontenberg
 Thomas Q. Roussel
 Jessie J. Shaffer
 Dickie P. Smith
 Lori L. Stucky
 Frederick S. Thompson
 Jeffrey A. Whiteman
 Bradley L. Wolf

1998

Abdullah A. Al-Rabah
 Randy R. Anway

Douglas B. Bailey
 Brian G. Bengtson
 Devin F. Boyce
 Ryan K. Christianson
 Thomas E. Fischhaber
 Arin N. Holecek
 Shane A. Holecek
 Jason P. Hupka
 Jack H. Koestline
 Ruth Morley
 Joshua N. Owen
 Toby M. Padilla
 Roman Pinon
 Narisara Thongboonchoo
 Andrew C. Van Wyk

1999

Steven D. Borenstein
 Russell A. Brain
 John J. Brinks
 Lavon J. Brooks
 Aragorn L. Earls
 Brian D. Ellis
 Stuart S. Ernst
 Jeffrey M. Ingalls
 Constance N. Knight
 Jonathan E. Lekawski
 Richard C. Morris
 Jake O'Gorman
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 Franck Sery
 Eric L. Smith
 R. David Smith II
 Elizabeth (Fischer) Stengl
 Carrie L. Strand
 Robin L. Swank
 Michael A. Weaver
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 Russell S. Wurth

2000

Michelle G. Ausmus
 Brent D. Dullack
 Christopher D. Harden
 Brandon L. Johnson
 Juan C. Madeni
 Heidi L. Morrow
 David E. Petrick
 Miranda C. Reeves
 Kimberly E. Sands
 D. Robb Sparks
 Mary Larson Troxell
 Chontel Trujillo
 Scott W. Waymack
 Todd H. Welch

2001

Matthieu T. Boucher
 Jonathan B. Cowan
 John C. Gibbs
 Stephen W. Grigel
 Nicholas R. Kimball
 Katherine E. Langer
 Justin K. Murray
 Kyle C. O'Brian
 Reco V. Prianto
 Sean A. Stewart



Class of 2029



Albert '01 and **Sonja Colianni** announce the arrival of their daughter **Emilia Linnea** on Dec. 2, 2008.



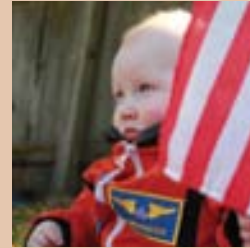
Pam (Janecka) '96 and **Erik Keskula '96** welcomed **Henrik** in Nov. 2006. **Isaak**, 6, is enjoying his new role as big brother.



Joshua '07 and **Robyn Hanes** announce the birth of their son, **Liam Thomas**, on December 23, 2008.



Linda Bliss '89 and **Chris MS '90 Sellstone** announce the birth of their twins, **Ian Corbett** and **Kai Martin**, on Aug. 15, 2009.



Jason MS '08 and **Ilsbeth Kaufman** welcomed their first child, **Adelaide Loren**, born on Feb. 25, 2009 in Flagstaff, AZ.



Kelly '00 and **Erika Taga** announce the arrival of **Brynlee Kimiko** on May 22, 2009. Pictured with **Brynlee** is big sister, **Maleea Miyoko**.



Jake '99 and **Fannie O'Gorman** welcomed **Ellie Ka-Yan** to their family on April 5th, 2009.



Christoph '97, PhD '00 and **Tatiana (Dueno) '00 Goss** announce the birth of **Catalina Mercedes** on Jan. 25, 2009.



Chontel (Cordova) and **Gordon Trujillo '00** announce the birth of **Gordon Armando**, on Feb. 25, 2009. **Gordon** joins big sister, **Kateri**.



Aaron '99 and **Bri-anna (Macfarlane) '01 Atherton** announce the birth of **Chase William**, on Jan. 20, 2009.

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1981



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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
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Andrew D. Burke
Nicolas D'Alessandro
Casey J. Dorneman
Joanna J. Eastment
Sandy J. Fecko
Jeramyn J. Feucht
Benjamin T. Griffith
Jeremy J. Hamer
Martin R. Jertson
Kazuhiro Kawahata
Joshua D. Leasure
Jack M. Pecoraro
Melissa R. Phifer
Manas Pradhan
Sean M. Ronnekleiv-
Kelly
Daniel A. Staley
George R. Teetes

2003

Christopher L. Bellona
Matthew J. Berg
Matthew R. Bird
Kimberly M. Boitano
Christopher L. Bremer
Maria G. Briceno
Michael S. Cerbo
Zachary D. Dezman
Ethan R. Erickson
Rebe J. Feraldi
Brian P. Flannery
Francisco A. Garcia
Erich A. Green
Nathaniel P. Hamm
John E. Hillert
Benjamin R.
Lichtwardt
Michael N. Lucas
Albena A. Mateeva
Patrick C. McGaugh
Anne E. Miller
Benjamin H. Miller
Michael P. Mitchell
Patrick E. Mohr
Dara Woiszwilllo O'Neil
J. Ross Serven
Chelsey L. Thompson
Craig S. Wiltshire

2004

Lily R. Barkau
Anne Marie Bogadi
Erin Cathcart
Craig A. Cavanaugh
Edwin Chau
Timothy E. Clem
Eric B. Coffman
Matthew C. Collins
Robert M. Connolly
Huong M. Dang
Alexander E. deRenzy
Chad M. Isaacs
Amoret Margaret
Lambrecht
Brandon C. Merkl
Marcelo A. Montalva
Rachel M. Morrish
Jennifer L. Nesbitt
Charles P. O'Keefe
Capt. Russell A. Powell
Alexi K. Rothschild
Megan A. Shepherd
Timothy A. Strobel
Daniel J. Trapp
Meghan P. Trujillo
Scott A. Unger
Graham P. Vlcek
Dustin L. Wilkinson

2005

Brian J. Blaskovich
Hans Ecke
James W. Farrer
Alejandro E. Franco
Brad A. Gentry
Lt. (J. G.) Geoffrey N.
Johnson
Justin R. Jones
Kelly J. Mattie
Ian C. McEachern
Christopher Moerbe
Adrienne Nemanic
Naomi E. Ott
Jeremy M. Pollock
Marissa M. Reigel
Jedidiah D. Rust
Jason W. Sahl
Andrew R. Smith
Conner J. Staley
Robert D. Tatum III
Joseph M. Torres
Michael A. Torres, Jr.
Jennie R. Vigil
Guenael Wagner
Piers T. Wendlandt
Lauren E. Wittig
Matthew M. Woodard

2006

Geoffrey P. Alkire
Robert Nichols
Benson
Matthew D. Berlin
Brandon C. DeHamer
Patrick A. Disher
Stuart T. Fehr
Matthew J. Ford
Joseph L. Fredrickson
Andrew M. Govert
Christopher A. Green
J. David Hanley, Jr.
J. Carter Hebert
Dean M. Heil
Eli F. Jennings
Erik C. Jones
Devin A.J. Karns
Scott W. Kemler
Zachary J. Kimball
Jeffery C. Kummer
Courtney L. Lancaster
Miss Amy J. Latham
David M. Le
Kyra R. Lee
Michael LeFrancois
Leah E. Loebach
Kaitlyn C. Mace
Joseph R. Maddux

Luis Z. Martinez
Dmitriy M. Mestetskiy
Prakash B. Neupane
Brian C. O'Connor
Jon M. Orth
Jeremy K. Paulus
James E. Peeke
Michael D. Pierce
Maria A. Portela
Danny L. Rutherford
Luke J. Salmans
Kaitlyn M.

Schaumberg
Barrett G. Scrivner
Brandon L. Segura
Jeremy T. Sell
Robert R. Tonnsen
Timothy R. Vidra
Kyle J. von Holdt
Patrick R. Wieck
Kyle A. Wille

2007

Fernando J. Albornoz
Anthony W. Alfini
Shamma A. Al-Reyami
Alex C. Brewster
Michael F. Briggs
Bryan M. Carruthers
Jennifer E. Cho



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 Martin P. Schmidt
 Matthew T. Shores
 Anthony R. Sweet
 Gary A. Thompson
 Kendra L. VanGorp
 Alisson D. Waltman
 Sean T. Weber
 Stephanie K. Wolf
 Shiu-Hang Yueh

2008

Aaron A. Aab
 Breanna L. Alexander
 Jonathan L. Amoroso
 Steven A. Arth
 Nicolas D. Bailey
 Richard D. Barnes
 Joseph E. Barnholt
 Nathan M. Beasley
 Nassim Bennani
 Kabchi
 Michael E.E. Breece
 Kirsten Colligan
 Zachary A. Cornett

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 Anna R. Hoessle
 Jonathan L. Ilderton
 Elizabeth Jeffries
 Christine A. Johnson
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 Clayton J. Kyle
 Kent M. Larson
 Kenton G. Larson
 Brandy L. Laudig
 Jason Leon
 Ian K. Lynn
 Kari L. Macklin
 Anthony R. Magner
 Bryan P. McElhinney
 Kelly D. Michals
 Ramya Mishra

James R. Mogge
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 Brian J. Schwartz
 Nathan A. Siedler
 Jane G. Stammer
 P. Kyle Trainor
 Stacie L. Tschacher
 Andrew J. Tupper
 Brandon M. Turman
 Karl L. Umland
 Bridget E. Ware
 Alyssa M. Wedgwood
 Benjamin A. Weeks
 Ellice Z. Whittington
 Jared W. Youngclaus
 Lisa A. Zadel
 Dmitriy A. Zinchenko

2009

Abdulrahman M. Alrugaib
 Zachary M. Aman
 Robert H. Amerman
 John A. Boxall
 Cameron D. Brown
 Jeremy A. Brown
 Samantha Y. Choi
 Joseph E. Curry
 Ryan T. Davidson
 Jacob G. Davis
 Elliott J. Dudley
 Hillary D. Easter
 Jack R. Ferrell III
 Janson P. Ferrera
 Kyle P. Gramly
 Irina D. Hardesty
 Charles B. Harkey
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 Benjamin J. Jones
 Hyun J. Kim
 Jared D. King
 Charles J. Lee
 Zhi Li
 Bin Liu
 Ross H. Melton
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Lucas A. Munisteri
 Michael W. Nolte
 Andrew I. O'Loughlin
 Jeffrey S. Parham
 Peter L. Rebstock
 Barbara A. Robinson
 Kevin B. Roth
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 Kraig E. Sheetz
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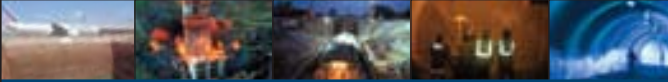


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Passings

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

—Thomas Campbell 1777-1844



E. WALTER ADAMS '32 of North Lima, Ohio, passed away May 5, 2009. Walter, who was featured in the spring 2009 issue of *Mines* magazine as the school's oldest living alumnus, was born in 1909 in Denver, where he graduated from East High School. While attending Mines, Walter was a member of the Kappa Sigma fraternity and played on the

football team. In 1932 he was instrumental in getting a permanent supply of electricity up to the M so it could be lit year round. Before graduating with his professional degree in metallurgical engineering, he met and married Catherine Primm. He and Catherine moved to South Dakota, where Walter worked at the Homestake Mine and their two daughters were born. Near the beginning of World War II, Walter began a 31-year career with Kaiser Aluminum and Chemical. In the years following, he moved around the country, building new plants in California, Louisiana and Ohio. In 1956 Walter lost Catherine to breast cancer. He subsequently moved from his home in Columbiana, Ohio, to an apartment in the nearby town of Poland. A year later, he married Eleanor Roberts. After his retirement from Kaiser in 1970, Walter and Eleanor moved to a large property in Lititz, Pa., where he cultivated fruit trees, built an extension to the house, practiced his hobby of woodworking and took up painting. Active members of the Moravian Church in Lititz, he and Eleanor led the church's committee on aging. Walter is survived by his wife of 52 years, Eleanor; his daughters, Nancy Wilson and Miriam Frenier; four grandchildren; and his brother, John.

EUGENE "GENE" F. CHANDLER '37 of Monterey, Calif., died June 21, 2008. He was born in Monte Vista, Colo., and graduated from high school at age 16. Before attending college, Gene worked on a freighter for a year and traveled throughout Asia. Gene was a member of the ROTC at Mines and earned a professional degree in metallurgical engineering. During World War II, he built bridges in France before being recalled to the U.S. to work on the Manhattan Project, during which he witnessed the first tests of the atomic and hydrogen bombs. In 1949, Gene completed medical school at the University of Colorado. After a one-year residency, he was drafted and sent to Europe to serve with a medical company. He subsequently took a residency in radiology with the Army in San Francisco. In 1968 Gene went to Vietnam to command the Army's largest hospital in Saigon; he later served as commander of the Silas B. Hays Hospital in California, and as director of nuclear

medicine and radiology. After retiring from the Army in 1973, Gene established the Department of Nuclear Medicine at Salinas Valley Memorial Hospital. During his later years, he built a water-skiing kite and a gyrocopter, and he enjoyed water and snow skiing into his 80s. He is survived by his wife of 47 years, Win; sons Eugene, Christopher and Mark; daughter, Callie Chandler; and seven grandchildren.



HERBERT "HERB" M. GOODMAN '39 of Shenandoah, Iowa, died on December 22, 2008. Born in 1913, Herbert grew up on a farm near Coin, Iowa, graduating from Coin High School in 1930. He married Helen Carmichael in May of 1934, and the couple moved to Golden the following year so that Herb could attend Mines. He graduated with a professional degree in geology and geological engineering, along with a commission from the Army Reserve as a 2nd lieutenant. During World War II, he served in engineer training centers in the United States, and later combat operations in the Pacific theater. His last station was in Nagoya, Japan. Herb achieved the rank of lieutenant colonel and was discharged in May 1946. After World War II, Herb returned to his pre-war employer, Shell Oil, and his job as a geologist. Over the next six years, his job took him to Texas, Louisiana, Colorado and New Mexico. In 1953 he resigned from Shell as division exploration manager and moved back to his hometown, where he farmed until his retirement. In 1975 he moved to Shenandoah. Herb was a member of American Legion Post #88 and served as a volunteer at the Shenandoah Public Library. He was preceded in death by his wife and his son, James. Survivors include his daughter, Ann King; three grandchildren; and seven great-grandchildren.



LEONARD B. GULBRANSEN '42 of Maryland Heights, Mo., passed away on May 27, 2009. He was born in Denver and graduated from Mines with a professional degree in metallurgical engineering. From 1944-46 Leonard served in the U.S. Navy. He then went to the University of Utah, where he earned his master's in 1947 and his doctorate in 1949. In 1954, after serving as an assistant professor of metallurgy at Mines, Leonard joined Washington University as an associate professor of metallurgy. He was later promoted to professor, and became emeritus in 1991. While at Washington University, he focused his research

on physical metallurgy and X-ray spectrography. Held in high regard by colleagues, friends and students for his teaching and research, he also served as vice chairman of the American Society for Metals 1961–62. He is survived by his five daughters, Darlene Berdeaux, Lynn Lipke, Paula Nicholson, Amber Wamhoff and Janet Gulbransen; a son, George; seven grandchildren; and one great-granddaughter.

ROBERT “BOB” C. HANSEN '51 of Wheat Ridge, Colo. passed away on August 16, 2009. Robert was born in Victor, Colo., in 1923. His family later moved to Longmont, where he graduated from high school in 1941. Though his education was temporarily interrupted by service in the Navy, Robert graduated from Mines with a professional degree in mining engineering. A member of Tau Beta Pi honor fraternity, he went on to work for the research department at Caterpillar. While in Peoria, Ill., he earned a master's in mechanical engineering from Bradley University, and went on to earn a PhD from the University of Illinois – Chicago. Robert taught engineering mechanics for 13 years at Mines, beginning in 1981. He is survived by his wife, Lois.



CHARLES “CHUCK” HASKIN '59 of Yorba Linda, Calif., passed away on May 3, 2009. Born in Golden, Colo., Chuck graduated from Golden High School in 1949 and went on to work for Boyles Bros. Drilling Co. of Salt Lake City. After completing a tour of duty in Germany with the U.S. Army, he earned a professional degree in petroleum engineering from Mines.

For more than 33 years, Chuck worked for Chevron Oil, with his time divided between California, Colorado, North Dakota and Wyoming. In 1969 he transferred to Chevron Oil Field Research, where he remained until 1992. Over the years Chuck developed a love for travel: his work took him to South America, Europe, the Middle East, Canada and throughout the U.S.; and he and Carolee, his wife, travelled extensively well into his retirement. He was a member of the La Habra Masonic Lodge and the Scottish Rite. He also taught petroleum engineering classes at the University of California and Cal Poly Pomona. He is survived by his wife of 54 years, Carolee; son, Jeff; and daughter, Diane.

PAUL J. HINDS '50 of Mount View, N.Y., passed away on September 30, 2008. Born in Malone, N.Y., in 1925, Paul attended Malone schools as a child and graduated from Franklin Academy in 1943. After high school, he entered the U.S. Army and served with the Amphibian Engineers during World War II in the European Theater. He participated in the Battle of the Bulge and was awarded the Bronze Star. After being honorably discharged, Paul attended Mines, where he joined the Alpha Tau Omega fraternity. He married Lucille Ann Ryan while still studying for his professional degree in metallurgy at Mines. After graduation he worked for Bethlehem Steel in Pennsylvania for a year, before accepting a position with Aluminum Company of America in Massena, N.Y. A communicant of the Sacred Heart Parish in Massena, he served on the parish school board, the parish council, and as a trustee. He earned a master's degree from Clarkson University in 1974. In 1983, he transferred to Brazil to work as a process control superintendent before he ended his 32-year

career with Alcoa in 1988. Paul was a life member of American Legion Post 219, the Veterans of Foreign Wars, Disabled American Veterans, the 87th Infantry Division and the Veterans of the Battle of the Bulge. He is survived by Lucille, his wife of 59 years; three daughters, Lynn McCoy, Mary Noordsy and Nancy Flanagan; nine grandchildren; and two great-grandchildren.



LAWRENCE V. HOWENSTINE '52 of Bartlesville, Okla., died November 5, 2008. Born in 1927 in Muskogee, Okla., he graduated from East High School and served in the U.S. Merchant Marine in 1945 and the U.S. Army 1946–47. In 1949 he began active duty with the U.S. Air Force. Before and after his military service, Lawrence attended the University of Utah, but he later transferred to Mines and completed a professional degree in petroleum refining engineering. In 1955 he began his career with Phillips Petroleum in Bartlesville, later working for the company in New York City, Brussels and Vienna. In 1964 he married Barbara Joan Line in Bronxville, N.Y. He is survived by his wife of 44 years, Barbara; a son, Bruce; and a daughter, Laura Howenstine.



JAMES E. MASSEY '52 of Grand Junction, Colo. died on June 24, 2009. Born in 1931 in Grand Junction, James grew up on a ranch in nearby Unaweep Canyon, graduating from Grand Junction High School in 1948 and marrying Bessie L. Miller three years later. James was a member of the Sigma Alpha Epsilon fraternity at Mines

and graduated with a professional degree in mining engineering. He was then commissioned as an officer in the Army Corps of Engineers and served two years in Japan and Korea during the Korean War as a platoon leader in the 2nd Amphibious Special Brigade. From 1954 to 1985 he worked as an engineer for Union Carbide Corporation in various locations throughout Colorado and Wyoming. In 1985, Jim earned his accreditation as a secondary science teacher from Mesa State College and worked for two years as a substitute teacher for schools in and around Grand Junction. He then taught full time for two years at Gateway School in Gateway, Colo. Jim and his wife built a home on part of the ranch on which he grew up, where they remained until his death. He is survived by Bessie, his wife of 57 years; three daughters, Cindy Wooden, Ruth Craven and Marilyn McClure; and two grandchildren.



PETER C. PETROUSTSON '49 of Mobile, Ala., passed away on July 26, 2009. Born in Jacksonville, Fla., in 1922, Pete attended Harvard University until he joined the U.S. Army during World War II. As a member of the 101st Airborne and 82nd Airborne, he served in the Battle of the Bulge. After the war, he graduated from Mines with a professional degree in petroleum engineering. Pete was

a member of Alpha Tau Omega fraternity and editor of the *Prospector* yearbook in 1949. He began his career with Stanolind Oil and Gas in Kansas. In 1957 he moved to Mobile, where he led the petroleum engineering department for the Merchants National Bank of Mobile for 23 years. He continued his banking career with

Alumni

Passings (cont.)

Continental Bank and Allied Bankshares in New Orleans, La. 1979–86. In 1986 he transferred to Guernsey Petroleum Corporation, where he served as chief operating officer until his retirement in 1990. He and his wife, Betty, then returned to Mobile, though they continued to travel extensively overseas and spent time in Perdido Key, Fla. Pete was a member of the Society of Petroleum Engineers and the Mobile Country Club, and served on the vestry at St. Paul's Episcopal Church. He is survived by his wife of 59 years; sons, Blane, Bill and John '79; and four grandchildren.



KAI A. RAVNBORG '57 of Dandridge, Tenn., passed away October 9, 2008. Kai was born in Bolivia and graduated from Mines with a professional degree in metallurgical engineering. He was a member of the soccer team at Mines. He went on to work for Cerro de Pasco Corp.

in Peru, and St. Joe Lead Co. in Herculaneum, Mo. In 1988 he patented a method of alloying aluminum and calcium into lead. He was a member of the American Institute of Mining, Metallurgical and Petroleum Engineers; the Scottish Rite; and the Lions Clubs of Fort Mill, S.C. and Herculaneum, Mo. Kai is survived by his wife, Beverly; son, Kai; three daughters, Nancy Cooney, Karen Klatt and Denise Dixon; seven grandchildren; and four great-grandchildren.



CASTLE "CAS" O. REISER '38 of Phoenix, Ariz., died on November 21, 2007. Born in Berthoud, Colo., in 1912, Cas grew up herding cattle and reading the family Bible. He attended Colorado State University and graduated with a bachelor's degree in 1934. At Mines

he received a professional degree in petroleum engineering and went on to earn his PhD in chemical and petroleum engineering from the University of Wisconsin. After working for various companies, he moved into academia and held teaching positions at Seattle University, the University of Idaho, Oklahoma State and the University of Wisconsin. He held a number of American and foreign patents. In 1958 he became the chairman of the Department of Chemical Engineering at Arizona State University. Cas served in that capacity until 1985. He is survived by his wife, Wynell; sons, John and Ted; and three grandchildren.



IRVIN "MARSH" MARSHALL RICE '39, MS '47 of Dallas, Texas, died on August 24, 2009. Irvin was born in 1917 in Manzanola, Colo., and graduated from Denver's East High School. A member of the Alpha Tau Omega fraternity, he graduated from Mines with a professional

degree in mining engineering. During World War II, he served in the European Theatre, landing on Omaha Beach on D-Day. Irvin returned to Mines after the war to earn a master's in mining engineering. He resumed military service after World War II, serving in the Korean War. A lifelong learner, Irvin graduated from the National War College, and earned a master's degree from George Washington University and a PhD from American

University. He served actively with the Army Corps of Engineers, the Los Angeles District Corps of Engineers, the U.S. Army Pacific in Honolulu, and in the Office of the Joint Chiefs of Staff, achieving the rank of colonel. He received two Legion of Merit and three Bronze Star Medals for meritorious service. After retiring from the Army, he went to work for the city of Dallas as assistant to the director of water utilities, and was later promoted to director. He retired from the city and became the executive secretary of the Trinity Improvement Association, a position he held until 2005. Irvin remained heavily involved in water planning and civil service in the Dallas area. He is survived by his wife of 62 years, Patricia; son, John; daughters, Sally Rice, Nancy Marquez and Susan Shirley; seven grandchildren; and two great-grandchildren.



ROGER A. RICHTER '51 of Littleton, Colo., died May 30, 2009. Born in 1929, Roger grew up in Denver and graduated from East High School. He was a member of the Sigma Phi Epsilon fraternity at Mines while earning his professional degree in mining engineering. After graduation Roger

served in the Army during the Korean War. During his career in the insurance industry he served in executive positions in many companies, including president and chairman of Richter/Robb & Co., and president of Sheridan Savings & Loan. Roger was actively involved in community service. A member of Kiwanis in Southwest Denver and Golden for more than 53 years, he also served many years on the Fort Logan Mental Health Citizens' Advisory Board, co-founded Big Sisters of Colorado, and co-organized Girls' Clubs of Colorado, Southwest Denver Community Center and Beaver Ranch Camp for Boys and Girls. Roger was a 32nd Degree Mason; a Shriner; and a member of the American Legion and Veterans of Foreign Wars. Roger is survived by his wife, Joan; sons Roger and Carl; daughters, Julie Tedder and Diane Herrick; 12 grandchildren; and three great-grandchildren.



KENT ALAN RUDOLPH '80 of Houston, Texas, passed away on March 30, 2007. A member of the Sigma Phi Epsilon fraternity, Kent graduated with a bachelor's in chemical and petroleum refining engineering. Shortly after graduating, he moved to Houston to pursue a career in computer programming for drilling and exploration companies. While there, he met and married his wife, Linda. He enjoyed woodturning, and won several awards from Gulf Coast Woodturners for his work. He loved golf, and gave back to his community as a volunteer at the Spring Branch Rehabilitation Center. He is survived by his wife, Linda; his mother, Alice Paxson; brother, Lee Paxson; stepbrothers, William and Robert Paxson; and other members of his extended family.



WENDELL A. SCOTT '50 of Houston, Texas passed away on May 28, 2009. Born in 1926, Wendell grew up in Denver, Colo. A member of Kappa Sigma fraternity, Wendell married Nadine Wilkins a year before graduating with a professional degree in petroleum refining

engineering. He then served in Germany with the U.S. Army for two years, before joining Hyman Chemical Company, which was later acquired by Shell Oil. He remained with Shell for 35 years, living in California, New York, Texas and Colorado. Predeceased by Nadine, he married Mary Gambill in 1983. Wendell was an avid pilot, owning both a glider and a single-engine plane, and he was an active member of the Soaring Club of Houston for many years, having once flown a glider to 30,800 ft. He also enjoyed golf, sailing, skiing and crossword puzzles. Wendell taught all of his five children to ski, and led his family on camping trips throughout the U.S. and Europe. He is survived by his wife of 25 years, Mary; daughters, Wendy Mielke, Linda Stone and Glenna Scott; son, David; and stepsons, David Gambill, Chris Kristensen and Matthew Gambill; 12 grandchildren and one great-granddaughter.



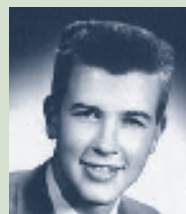
ROBERT "BOB" J. SEARLS '49 of Noosa Heads, Queensland, Australia, passed away on June 14, 2008. Born in 1922 in San Francisco, Bob married Ethel (Pixie) Green at the age of 20. At the beginning of World War II, he joined the U.S. Army Air Force. As an airman, he was awarded the Distinguished Flying Cross for saving his flight while returning from a mission in Germany. Bob studied civil engineering at Cornell University after the war, before transferring to Mines to earn a professional degree in geological engineering. He worked in Colorado, Arizona, Nevada and Canada, before being appointed chief geophysicist at a copper mine in Rhodesia (now Zimbabwe). He later joined Newmont Mining, and in 1964 moved to Melbourne to set up Newmont Holdings, a joint venture between two mining companies for which he served as chairman. Bob joined the board of Prince Henry's Hospital Medical Research Centre, and in 1987 became chairman and oversaw its incorporation. He received a Distinguished Achievement Medal in 1982, an honorary doctorate of law from Monash University in 1992, and membership in the Order of Australia in 1996. He is survived by his wife of 67 years, Pixie; their children, Jamo, Jesse and Daisy; and two sisters, Helen and Joyce.

MARVIN B. SELDIN '48 of Battle Mountain, Nev., passed away on May 17, 2009. Marvin married Ann Maughan of Golden in 1944. A member of Kappa Sigma fraternity, he graduated from Mines with a professional degree in metallurgical engineering. From 1949 to 1952, he worked for American Smelting and Refining in Santa Barbara, Mexico. He then moved to Hailey, Idaho, to work for Triumph Mining, after which he worked for Magnet Cove Barium, which was later acquired by Dresser Industries, in Malvern, Ark. He remained with Dresser until 1981, working in Battle Mountain, Nev. After taking early retirement, he purchased the Ace Hardware and Lander Building in Battle Mountain and entered into a partnership with his son, Steven. He is survived by his wife, Ann; sons, Steven and Charles; five grandchildren; and five great-grandchildren.



JOSEPH SHOAF '50, MS '51, PhD '52 of Dallas, Texas, passed away on August 27, 2008. After earning professional, master's and doctoral degrees in petroleum refining engineering from Mines, Joseph went on to a successful and varied career in the oil industry—designing and building oil refineries, drilling oil and gas wells all over the world, running

his own oil well service company, and operating a small refinery. A member of the American Petroleum Institute, Joseph served on the boards of directors of many companies. Also involved in the healthcare industry, Joseph built the world's largest nursing home in Irving, Texas. A pioneer in the field, his home was recognized as a model facility, and he became a spokesman for reform and state regulation during a time of much upheaval in the sector. He also taught classes in nursing home administration and worked with local doctors to get a hospital built in Irving. Joseph enjoyed the outdoors and held the record for the third largest caribou in the Boone & Crockett Club. He is survived by his wife, Nancy; daughter, Jo Ann Gasper; stepsons, Robin and Kevin Smith; 11 grandchildren; and two great-grandchildren.



STEVE ZORICHAK '59 of Vail, Colo., died on May 11, 2009. Born in Tulsa, Okla., in 1936, Steve later moved to Denver and graduated from Wheat Ridge High School. A member of the Alpha Tau Omega fraternity at Mines, he graduated with a professional degree in petroleum engineering. Steve went to work for Coors, where he became a master brewer

by the age of 33—the youngest with such a title in the country. During the energy crisis of the early seventies, he was chosen by Bill Coors to develop a source of natural gas for the company. He secured leases to a natural gas field 300 miles away and supervised the construction of the pipeline. After completing the project, he moved to Vail and launched Iron Creations, a blacksmith shop where he manufactured a wide variety of decorative and functional items, and trained apprentices. A well-known member of the local community, he was respected by readers of the local newspaper for his frequent and insightful letters to the editor. He is survived by his brother, JJ "Bud," and his sister, Helen Risley.

Editor's note: A reader kindly pointed out two omissions in an obituary appearing in the summer 2009 issue. Along with the many accomplishments listed, **Lieut. Gen. Howard W. Leaf** '50 was also a recipient of Mines' Distinguished Achievement Medal in 1982, and in 1978 he was awarded the U.S. Air Force's M. Zuckert Management Award, which is given annually to an outstanding senior Air Force manager. We regret the oversight.

Also In Memoriam

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Daniel Worth Butner, Jr. '50October 30, 2008
Franklin Crane '43July 23, 2007
Paul F. Cutright '72July 15, 2008
Jerry F. Davis '50February 19, 2009
John T. Donahue '59November 15, 2007
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Burton A. Ellison '61August 6, 2008
Richard L. Hough '59February 13, 2002
Warren Lee Hunter '58June 19, 2008
Maynard H. Jameson '36November 11, 2006
William Johnson '85September 13, 2005

Ray F. Keller '41August 3, 2008
Roderick W. Koontz '44August 18, 2008
Andrew C. Lamberson '58September 3, 2003
Marvin E. Lane '44July 25, 2005
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Leonard M. Sherman '49September 21, 2008
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