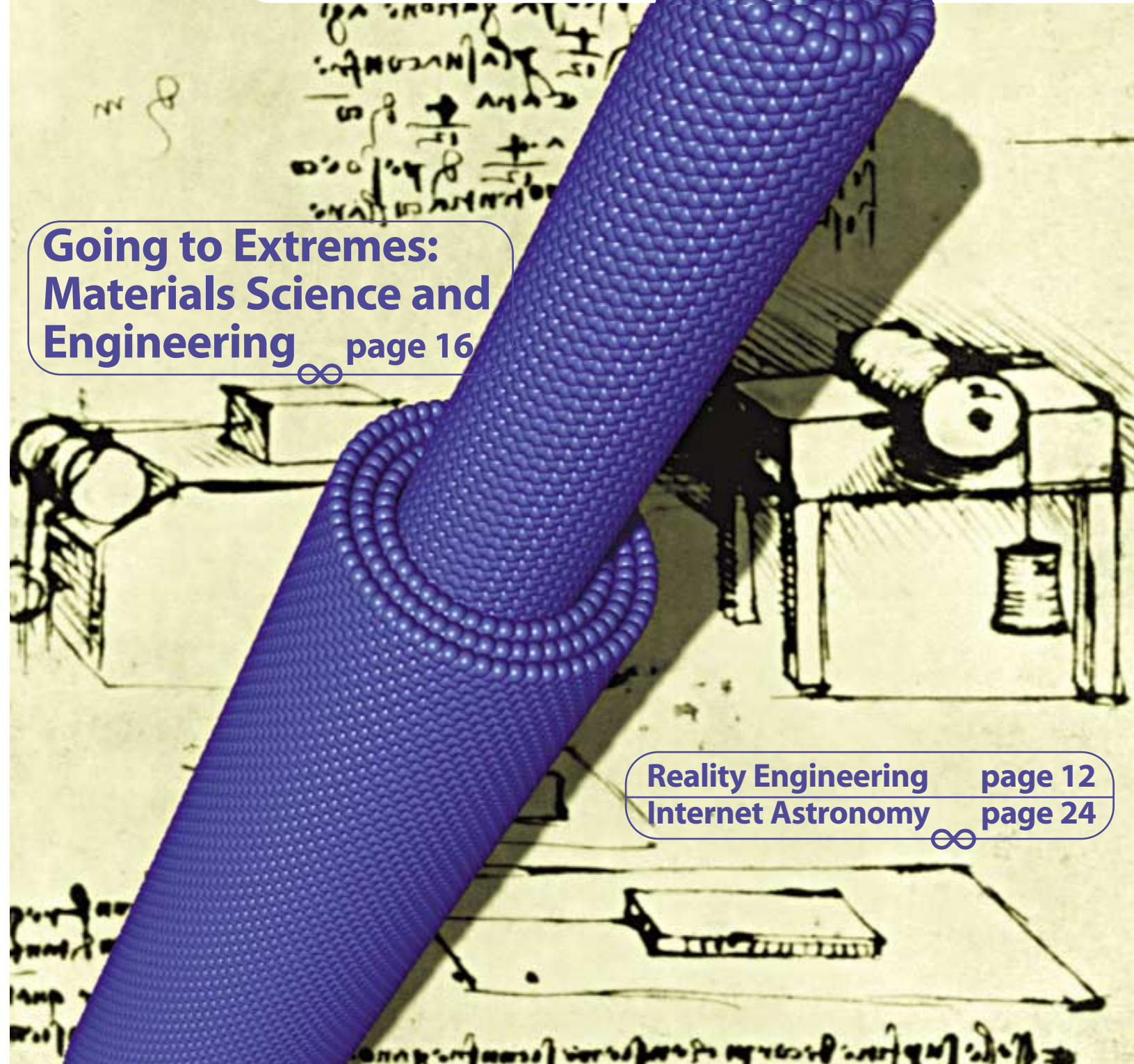


VOLUME 94 NUMBER 3
SUMMER 2004

MINES

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Materials Science and
Engineering** ∞ page 16

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Internet Astronomy ∞ page 24





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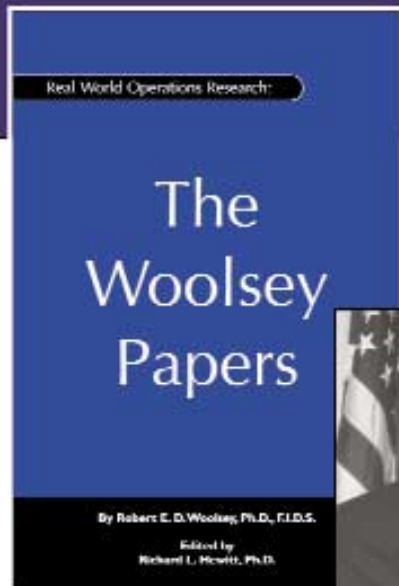


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MINES SUMMER 2004

Mines is published quarterly by the Colorado School of Mines and the CSM Alumni Association for alumni and friends of the School. The magazine is a merger of *Mines Magazine* (founded in 1910) and *Mines Today* (founded in 1986). The merger took place in 2000.

Comments and suggestions are welcome. Contact us by writing to MINES, P.O. Box 1410, Golden, CO 80402; or call 303-273-3294 or 800-466-9488, ext. 3294 between 8 a.m. and 5 p.m. M-F, MST; or email magazine@mines.edu

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Increased Alumni Support is Vital

A Special Challenge to Alumni

Dear fellow alumni,

As alumni, we take great pride in Mines' reputation as a world-class school of engineering and science. We also have a stake in Mines' ability to maintain its tradition of excellence! Active participation in our Alumni Association provides one of many opportunities for us to support these important traditions.

The School's leadership has successfully maintained the Mines tradition for excellence, as evidenced by *Kiplinger Magazine's* recent selection of Mines as one of the top 25 values for in-state public higher education in the United States. The Colorado legislature also recognized Mines' unique status by designating it the state's first "exemplary institution." **F. Steven Mooney Geol E '56,** immediate past president of the Board of Trustees, eloquently summarized the reputation we value when he said, "There is a special character to a Mines education. Students develop problem-solving abilities, leadership skills and a strong work ethic. CSM continues to be internationally recognized for graduating professionals who are ready to work."

Increased alumni involvement and support is vital to sustaining that tradition. To encourage more alumni involvement, the School and the Alumni Association have launched a new era of cooperation by entering into a joint operating agreement. This effort includes joint funding for alumni relations programs and the hiring of a new director of Alumni Relations. This agreement, discussed in the February issue of *Mines*, can be viewed online at www.csmma.mines.edu/alumni.

All CSM graduates are now automatically members of the Alumni Association and receive *Mines* magazine. Despite this effort to keep in touch with all our alumni, the percentage of dues-paying membership has declined. The number of Mines graduates has grown by approximately 6,000 over the past 10 years to about 20,000 living members, but the number who become "active" or "sustaining" by paying annual membership fees has not reflected that growth. The resultant flat revenue stream has placed significant pressure on our ability to effectively support the School and our alumni. In addition to producing the quarterly magazine, the Association maintains the database, provides job listings on line, publishes an annual directory, organizes reunions, sponsors networking section events worldwide, helps in recruiting new students, maintains a student financial assistance fund for loans and grants, and more.

Our big challenge is finding sufficient resources to adequately support the Association and its work. Like many public universities, Mines is facing budget deficits because of significantly reduced state funding and state restrictions on raising tuition, so the School is not in a position to bail us out!

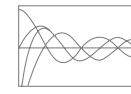
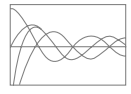
This challenge provides a special opportunity for alumni to demonstrate their pride in and support for the School. How? By increasing the number of graduates who contribute their annual membership fees to the Association. Currently, only about 20 percent—slightly more than 4,000—do so. Increasing that number of sustaining members to 6,000, or 30 percent, would greatly help alleviate the budget crisis we are facing.

THE CHALLENGE TO MINES ALUMNI: As your president and on behalf of the Alumni Association's board of directors, I challenge Mines alumni worldwide to increase active membership in your Alumni Association by at least 2,000 members. The next membership drive begins in early October, but I encourage you to go online now and renew your membership or fill out the form on page 30 and send it in today.

Let us know if you are up to meeting this challenge. I am confident that you are.

With best regards,

Art Biddle, Met E '61, CSMMA President



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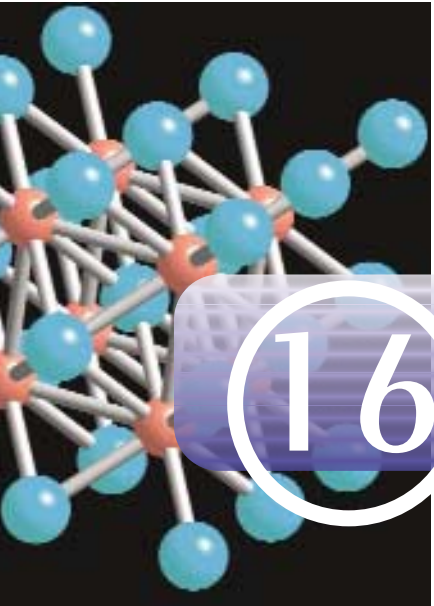
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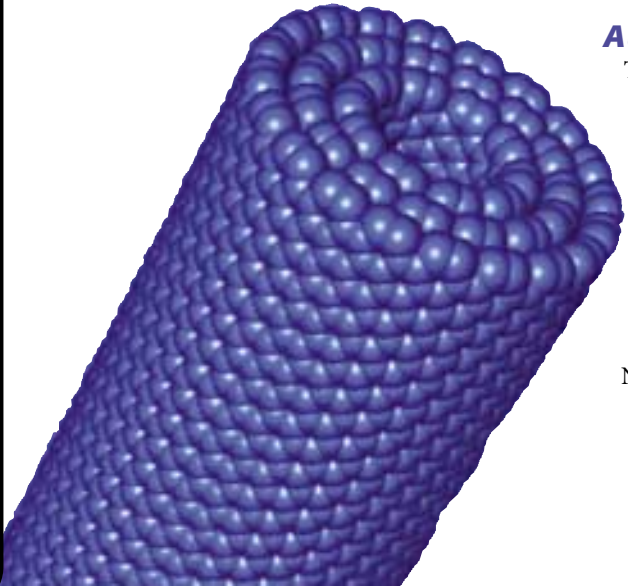
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About Our Cover:

This is a computer-rendered model of a partially telescoped nanotube with a Leonardo DaVinci manuscript as the background. In the manuscript, DaVinci considers the construction of bearings and also the frictional forces that might be encountered in bearings and sliding surfaces. He also has a drawing of a constant force spring (a mass hanging from a cord over a pulley). A nanotube bearing may be the ultimate realization of some of DaVinci's dreams. Photo courtesy of Zettl Group at Physics Department, University of California at Berkeley and Materials Sciences Division, Lawrence Berkeley National Laboratory.



1939 Graduate Passes on Legacy of Rewarding Career

By Robert Sorgenfrei

The start of fall semester 1935 at Mines was a little different from previous ones. Typical of other colleges during the depression years of the 1930s, Mines had seen an increase in each year's freshman enrollment. However, in 1935 only 160 men registered as freshmen. For the first time in years, the sophomore class outnumbered the freshmen. Total enrollment for the school year 1935-36 was 547 students, all men. Among the freshmen entering Mines that year was **Vesper "Bud" Vaseen Met E '39**. Vaseen was born and raised in the Denver area. He grew up with an innate curiosity that he satisfied by reading every book he found interesting at his local public library. He continued his intellectual curiosity at Mines, graduating as a metallurgical engineer. By the time Vaseen graduated in 1939, his class had become the largest graduating class in history: 132 men received degrees that year. *The Oredigger* remarked that the graduating class

was facing a rosier job market and that 35 percent of the class had jobs at graduation time, with 90 percent of the class to be employed by September.

Vaseen's first job after graduation was assistant sanitary engineer for the State of Colorado. Although he earlier lost an eye in a work accident, he joined the U.S. Army in World War II and served until 1946 as a sanitary engineer at two Army

bases. He left the Army with a rank of major. After the war, Vaseen worked for a private engineering firm in Denver and was responsible for drawing up the original plat for what would become the city of Thornton. He later platted a number of other town sites and subdivisions in the Denver area as it experienced population growth after the war. He also developed water and sanitation districts in the Denver metropolitan area.

In 1966, Vaseen began to work for the engineering and construction company Stearns-Roger. As a project engineer, he was able to work on and develop a number of ideas, translating them into inventions. While at Stearns-Roger, he filed a voluminous number of patent disclosures on a wide variety of subjects including patents on lasers, solar power, odor scrubbers and auto emissions control. There were a few of a non-technical nature. One of the most intriguing was a flat hot dog that would not slip out of the bun as easily as the traditional shaped one.

Vaseen retired from Stearns-Roger in 1980 to devote himself full-time to his inventions and to start his own company, AVASCO Consulting Engineers. He developed ideas and concepts that were eventually patented including: ways to minimize subsidence in coal mines, generating methane from underground coal seams, a new kind of wind-powered generator, a portable lung apparatus, and a rotating drum fermentor that he sold to

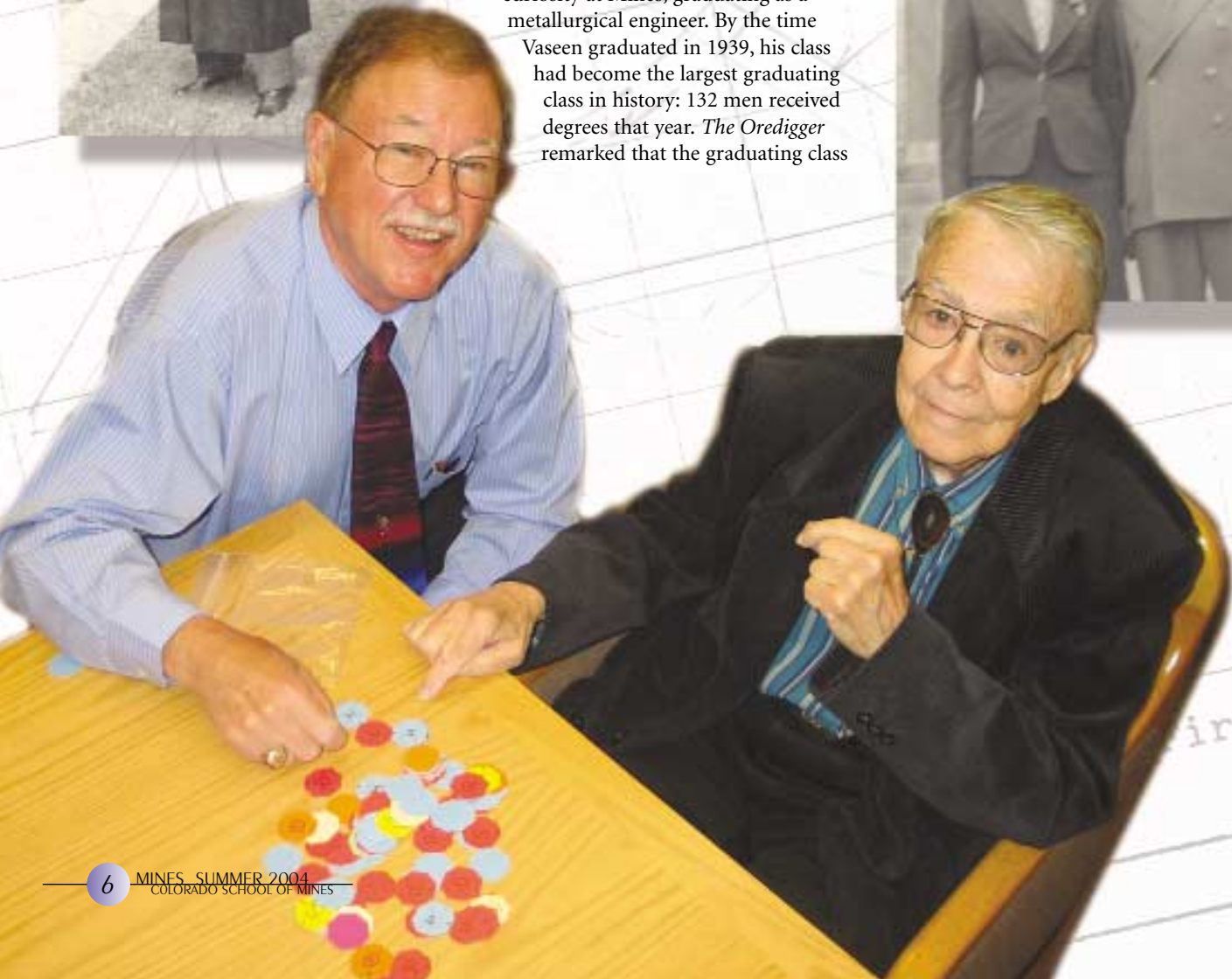


Coors. Vaseen also was interested in developing games, especially ones that would teach science concepts. One of these patented games, Polygons, was sold to Kadon Enterprises, a game company that markets the game under the name Combinatorix. This game is for sale and available at www.gamepuzzles.com. Vaseen developed a number of other games as well. All of them are aimed at engaging the mind to creatively reason and solve scientific challenges.

During Vaseen's career, he developed more than 400 concepts that were transformed into inventions, and he holds 33 patents on those inventions. He is also the author of more than 70 articles and technical papers. In 1996, he gave Mines his files and records on the inventions and patents he has done and assigned a number of his patents to the School. His collection of material is now housed in the library and documents the creative process

he undertook to develop his ideas and inventions. He hopes that students will be able to use his ideas and inventions in the course of their work at Mines.

Vaseen lives in Wheat Ridge, Colo., with his wife, June, whom he married 63 years ago. They have a daughter in the Denver area and a son in Pennsylvania. He recently observed the anniversary of his graduation from Mines 65 years ago. On an information sheet Vaseen filled out for his 50th class reunion in 1989, he credits Mines with providing him "a background for earning a good living, a satisfactory career and an enhanced curiosity which never will be satisfied." That curiosity can be explored in the collection of materials he has made available to the Mines community at the library.



Middleton Visits Yucca Mountain

Nigel Middleton, vice-president for Academic Affairs, visited the Yucca Mountain Waste Repository project site in Nevada. He met with Department of Energy executive management to present an overview of Mines education, research activities and capabilities. During his stay, he and Tibor Rozgonyi, Mining Engineering Department head, and Levent Ozdemir BSc Min '73, MSc Min '75, PhD Min '78, professor and director of CSM's Earth Mechanics Institute, hosted a reception for CSM alumni working with the project: Bruce T. Stanley EM '70, Robert Boutin EM '72, John W. Peters EM '63, Brian T. Harrington BSc Chem Eng '02, Mark B. Reineck BSc Eng '98.

E-days Ore Cart Pull

In celebration of the annual E-Days activities, students walked seven miles to the Colorado State Capitol. On the Capitol steps Gov. Bill Owens read an official proclamation declaring the 70th Annual Engineer's Day for the state of Colorado.



E-Days



Gov. Owens with E-days Chair Bonnie Harber.

New Book by Professor

Marcelo Godoy Simoes, CSM associate professor of engineering, and co-author Felix Farret, have published *Renewable Energy Systems: Design and Analysis with Induction Generators*. The book presents the first comprehensive



Roland Fischer Met E '42 noticed that from some angles, the "M" looks like it's hanging outside Foss General Store.

exposition of induction machines used for power generation. It provides the background and tools a person needs to begin developing power plants and become an expert in the applications and deployment of induction generator systems.

Mines Checks Out Petroleum Industry Collection

The Independent Petroleum Association of Mountain States (IPAMS) formally presented the Arthur Lakes Library with the Gas Technology Institute Library collection. The collection includes vintage periodicals, research, reports, conference proceedings and other resources spanning nearly 40 years.



From left, Mines President John Trefny, Library Director Joanne Lerud-Hech and IPAMS President Jim Lightner

The collection was officially accepted by President John Trefny who said,

"This donation is a great investment in our students. We appreciate being chosen to house this outstanding collection and know it will be of value to students, faculty and industry for years to come."

Black Belt Karate Expert Wins Caldwell Scholarship

Emily Milian is this year's recipient of the four-year Florence Caldwell Scholarship. She is a graduate of Cherry Creek High School in Denver and will study chemical engineering when she

enrolls at Mines this fall. In addition to being in the top 3 percent

of her class, Emily has a black belt in Shaolin Kenpo (karate), lettered in cross country in high school, and is an active volunteer. She has been a



The Continuum program, held at the end of every semester, celebrates, honors and recognizes the women who are graduating.

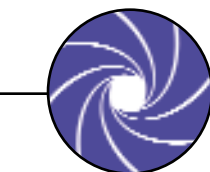
mentor for underprivileged children, took part in a Mexico City student exchange program, volunteers at a local library assisting with children's reading and crafts programs, served as president of "Hope for All," a charity that

provides toys and dresses to the underprivileged and organized Women's Rights Day activities.

Energy, Bones and Teeth

The 2004-2005 recipients of the Undergraduate Research Scholarship Awards are as follows: Senior

Jeremy Brehm will study small-scale (less than 10 kW), distributed generation, renewable energy and its application in electric power systems. Senior Timothy Casias will research emulating bone properties using calcium phosphate and hydroxyapatite. Senior Jason Higbee will pursue advancement in



the design and energy efficient applications of small motors in residential electric power systems. Junior Jessica Moehle will test the ability of the Biotic Ligand Model (BLM) to predict metal toxicity in mining-impacted aquatic systems. Senior Onica Ramey will determine microstructure, porosity and composition of human tooth sockets and study the development of materials for tooth implants.



Tim Casias presents his research.

Environmental Symposium Features Cement Industry

John Lohr, plant manager for CEMEX's Lyons, Colo.,



From left, Bob Siegrist, Environmental Science and Engineering Division director, John Lohr, Gary Graham of the Audubon Society, and CSM President John Trefny.

cement plant, discussed the challenges combining sound financial performance with a commitment to social responsibility and environmental stewardship at the Young Environmental Symposium in April. The event is made possible by a gift from Dodie and Herb Young EM '39 and was co-sponsored by the Audubon Society.

Best and Brightest Honored

Michelle Moorman and Andrew Patrick, pictured with McBride Honors Program Director Juan Lucena, were named recipients of this year's Borasio Award for outstanding juniors. Students

were judged on their personal and intellectual growth, leadership and



McBride Honors

commitment to academic excellence and achievement. Michelle was vice president of Associated Students of CSM last semester and is a charismatic, visible campus leader. Andrew has a great analytical mind, outstanding research skills and is

interested in both domestic and international politics.

The McBride's Philipose Award was given to outstanding seniors Vanessa Mitchell BSc Geop '04, BSc Econ '04 and Kale Franz BSc Phy '04. In addition to the above-mentioned criteria, the seniors (now graduates) were chosen for their potential to represent the program at the highest levels after graduation.

Vanessa will be a Churchill Scholar studying in Cambridge, England, before heading to Stanford for her Ph.D. Kale will attend Princeton on a National Science Foundation graduate fellowship.

SHORT TAKES

Chemical Engineering Awarded for Innovation

The Colorado Institute of Technology and the Colorado Commission of Higher Education partnered to award \$1.5 million in grants to innovative programs in research and education. Two of the awards went to CSM Chemical



The Wolden research team from left, Jacquelyn Leaf, Mike Seman, Wolden and Amber Johnson.

Engineering Departments' own: Colin Wolden (Accelerating Fuel Cell Development through Research and Education at CSM) and John Dorgan (Research and Education in Support of Bio-based Products at CSM).

New Board of Trustees Members Named

DeAnn Craig BSc Chem '73, BSc CPR '80, MSc Min Ec '02 and L. Roger Hutson BSc Geol '82 were appointed by Gov. Bill Owens to the CSM Board of Trustees. They replace outgoing members F. Steven Mooney Geol E '56 and Karen Ostrander-Krug BSc Pet '84.

Craig is a retired oil and gas industry executive who had an extensive career with Phillips Petroleum. Craig was awarded a Distinguished Achievement Medal by CSM in 1999. She is also a past president of the CSM Alumni Association.

Hutson owns Paladin Energy Partners, LLC, a private firm specializing in the acquisition, operation and development of producing oil and gas assets. Hutson has served on the boards of the CSM Alumni Association and the Independent Petroleum Association of Mountain States.

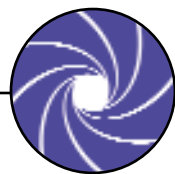


L. Roger Hutson and DeAnn Craig.



May 7, 2004

Mines 130th Annual Commencement ceremonies couldn't have taken place on a more beautiful spring day. The keynote speaker was Andrew Gould, chairman and chief executive officer of Schlumberger Limited. Of the 531 students that received degrees, 423 were undergraduates and 108 were graduate students.



SHORT STAKES

Students Win Poster Contest

Stephen Liu PhD Met '84 led the CSM Center for Welding, Joining and Coatings Research delegation to Chicago for the 2004 American Welding Society Convention. The nine students

in attendance received compliments on their quality presentations and their excellent technical and professional mannerism. At the convention, Craig Clasper BSc Met & Mat Eng '01, Fernando Martinez and Justin Chandler BSc Met & Mat Eng '02 entered

three posters in the graduate students posters contest and won first, second and third, respectively. A clean sweep!

Hurley Named AAPG Head

Neil F. Hurley, who holds the Charles Boettcher Distinguished Chair in Petroleum Geology, has been elected vice president by the 31,000-member American Association of Petroleum Geologists. His term began July 1.

Hurley holds a bachelor's in geology and a bachelor's in petroleum engineering from the University of Southern California, a

master's in geology from the University of Wisconsin-Madison and a doctorate in geology from the University of Michigan.

AAPG, founded in 1917 and with international headquarters in Tulsa, Okla., has members in 115 countries.



Neil Hurley

Three Win Teaching Awards

Honored this year by the Faculty Forum were: Barbara Moskal, associate professor of mathematical and computer sciences, who received the Alfred E. Jenni Faculty Fellowship Award; Ugur Ozbay, professor of mining engineering, who received the Alumni Teaching Award; and Robert Kee, George R. Brown Distinguished Professor of Engineering, who won the Dean's Excellence Award.

Talent and Commitment Rewarded with Scholarship

This year's Sister-to-Sister Scholarship winner is Marie Nguyen, who will be a senior this fall. She is a chemical engineering major from Littleton, Colo. Last year she was vice president of the Asian Student Association. This coming year she will be conference

chairperson for AIChE and vice president of Tau Beta Pi, the engineering honor society. Marie also is a McBride Honors Program representative. Last summer she



worked for Eastman Kodak as a chemical engineering intern and this summer she works for Shell Oil in Louisiana. She isn't sure what she will do after graduation. "There are so many choices," she says. "Everyone tells me it's invaluable to have a couple years of experience before going to graduate school." Marie is interested in

product development in industry, or becoming involved in intellectual property law and also medicine.

Gentlemen, Start Your Engines...

The state of Colorado has proposed establishment of a fuel-cell research center to be housed on the Mines campus. It is presently envisaged as a collaboration that will develop affordable hydrogen fuel-cells for use in vehicles and distributed energy supplies.

Reality Engineering

By Carly Williams

No textbook had the answer. When this year's Senior Design students ran into a problem, they had to react as the contestants on popular television reality shows do: Figure it out. Now.

The 2004 Spring Senior Design Trade Fair gave students the opportunity to present their final project - developed for real clients and customers - to the School and industry representatives. At the annual trade fair, students also discussed the challenges of problem solving, adapting to real life situations.

Exhibits showcased the students' creativity and hard work. They included projects designed to benefit technology, communities and industries. One project was a removable engine, released with a simple twist of the hand and then used to operate numerous different machines. Another was the plan and installation of permanent posts, a security system and temporary light strand wiring for the "M" on Mt. Zion. Still another group designed and installed a pump system to provide running water for the people of San Pablo, Belize.

Students discovered that the easy part was selecting a project and developing a written plan. Reality hit when the design was rolled into action and client expectations had to be met. Written plans couldn't foresee obstacles such as weather changes, equipment malfunctions, cultural differences, miscalculations and budget increases. Just as excited travelers never plan for problems with customs, baggage or transportation, the Senior Design students couldn't always stick to their plans. Most had to make last minute changes and had to use unconventional methods to get the job done.

At the trade fair it was evident the students' flexibility and ingenuity had prevailed. Their successful finished projects, and the satisfaction of their clients, said it all. Mines students are winners in reality engineering.



Lunar Robot



Diesel Motorcycle



Drag 'n Fly Aircraft



Vegetable Oil Diesel Engine "A Fat Burning Machine"



Biomedical Environmental Chamber



Removable Engine Concept

Install Your Own

HOT WATER SOLAR SYSTEM

By Elizabeth Hall BSc Eng '02

During August 2000, I installed a used Grumman Sunstream hot water solar system in my home, complete with a DD-100 active solar control module, an 80-gallon storage tank, and four 3- by 7-foot flat-plate collectors that I purchased for \$250. When my home was built during the early 1980 energy crisis, copper pipes were extended from the basement to the roof to accommodate a hot water solar system. In order to minimize space and heat loss, the control module was mounted on the south basement wall next to the storage tank and hot water heater.

A contractor vertically mounted the solar collector plates at a 30-degree angle on the south side of the roof facing directly into the sun.

The DD-100 Module system is designed to preheat water entering a domestic water heater with solar energy, thus reducing conventional energy requirements. An antifreeze solution is pumped through the closed module loop at 15 psig where it is heated in flat-plate collectors by absorbing diffused sunlight. Domestic water is pumped from the bottom of the storage tank and through the heat exchanger where it is heated by the circulating antifreeze system and then returned to the top of the storage tank, thus completing the loop. The heat exchanger is activated by a temperature differential control within the module that is connected to temperature sensors in the collector array manifold and the solar storage tank. The system is automatically activated when the differential temperature between the collector array and storage tank is 10 degrees or greater. Two separate 0.5-horsepower pumps circulate the antifreeze solution and domestic hot water at a rate of two gallons per minute when the system is in operation.

When the differential temperature is less than 10 degrees, the system automatically turns off. The system heats water up to 190 degrees during the summer. Therefore, during the summer months, the hot water heater is turned off and the domestic hot water is generated totally by the hot water solar system.

Since the energy of my flat plate collector depends on the quantity of diffused light absorbed, it is difficult to determine the exact efficiency of the system on a monthly or daily basis. Available solar energy depends on the season, latitude and other factors such as overcast, tilt of the collector plates and the angle between incoming rays. Engineering data for solar collectors located at various latitudes is available and include data on average daily sunshine on a south facing roof, mean possible sunshine for selected location and the approximate number of

collectors required per household member. I calculated that my summer collector requirement is 28.8 ft² or 1.36 collectors for two people; winter requirement is 124.8 ft² or 5.94 collectors. I used latitude of 40 degrees for the Denver metro area and 76 percent mean average sunshine. The total system plus installation cost \$1,352. I estimated that the solar hot water system paid for itself within three years.

When Delmar and Shirley Beverly designed and built their beautiful 4,400 square-foot home in Denver, they also added a passive hot water solar system. They mounted six 4- by 6-foot solar panels on the south side of the roof at a 45-degree angle and installed a custom built drain-down system. The main components of their hot water solar system are a storage tank, an expansion valve for over pressure, a temperature gauge and regulator, a 0.8 hp circulating pump and a pressure gage. The 250-gallon (2,084 lbs.) storage tank is made from reinforced plywood and the interior is leak proofed with a piece roof flashing. The water level remains below the lid at all times, but the tank is also equipped with an overflow valve as a safety precaution. The storage tank contains two 0.75-inch copper tube heat exchangers: one for year-round household hot water supply and the other for radiant heat during the winter. When the differential temperature between the collector array and the storage tank is 5° F or more, the system is automatically activated. Water is pumped from the storage tank through the collector plates where it is heated by the sun and returned to the storage tank. The drain down system does not require an antifreeze solution because when the differential temperature is less than 5° F, the system shuts down and water from the collector plates drains into the storage tank.

The hot water storage tank is maintained at a maximum temperature of 140 degrees. In winter, additional heat is removed from the storage tank to heat the house. On most winter days the water temperature of the tank reaches 125°F degrees and rarely drops below 100°F.

The system cost the owners about \$1,500 to construct. To pay a contractor to install an identical system would have cost approximately \$8,000. The Beverly house is totally electric and an estimated savings during the winter is between \$40 and \$50 per month. The Beverly's home is well-insulated and installed with heat mirror windows. The house is comfortable during winter and does not require much air conditioning during the summer. The money they saved by harvesting energy from the sun has more than paid for the installation of their solar system.

The Colorado Solar Energy Industries Association publishes a consumer guide that lists solar-related companies in Colorado. Many companies, such as Industrial Solar Technologies (www.industrialsolartech.com), sell used solar equipment at reasonable prices and provide guidance on how to install the system for the do-it-yourselfer. Local renewable energy companies and many energy-conscious citizens are members of the Colorado Renewable Energy Society (www.cres-energy.org).



Six solar panels on the Beverly roof.



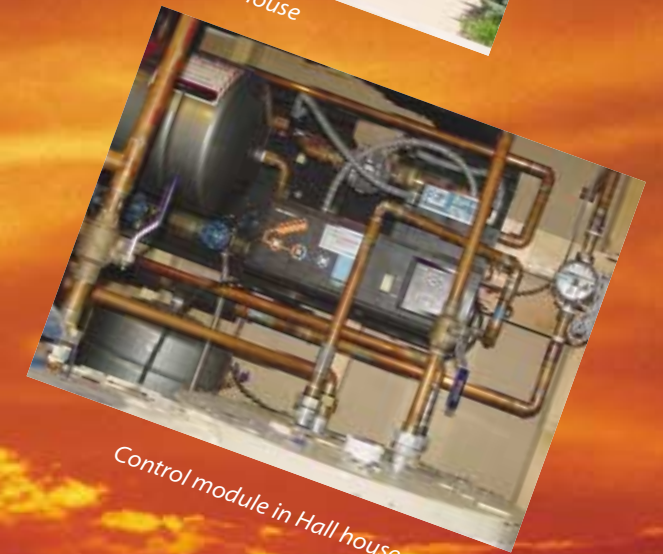
Completely assembled 250-gallon storage tank.



Beverly House



Hall House



Control module in Hall house

Going to Extremes: Materials Science and Engineering *By Mark Eberhart*

Most people call this comparatively new discipline “materials science and engineering.” However, it’s really engineering at the extreme, and those who practice it are actually extreme engineers.

For millennia, things were built from the stuff that was available – wood, stone, animal skins. Occasionally, through happenstance and luck, ancient engineers stumbled upon something new like bronze, steel or concrete and the things built from the new stuff changed the world forever. Rome not only wasn’t built in a day, it could not have been built at all without concrete. And the industrial revolution? It turned on steel.

But always, engineers were limited in what they could build by the materials on hand. Only so much power could be coaxed from a jet turbine because more power would produce operating temperatures sufficient to melt the alloys from which the engine was constructed. The glow of an LED was always green because that was the only color light emitted by the crystal used to make the diode. Some engineers and scientists, dissatisfied with these limitations, turned their attention away from making things and to the design of materials with unique combinations of properties – alloys that would withstand the higher temperatures and crystals that could be tuned to emit light of all wavelengths. Thus was born the discipline of materials science

and engineering, a discipline dedicated to developing the knowledge and capabilities to engineer the stuff from which everything else is made.

The advancement of every technology is, in part, dependent on the development of new materials. This is particularly true for technologies related to the stewardship of the Earth. Extracting minerals from their subterranean hiding places will require new alloys that are simultaneously strong, hard and corrosion-resistant. Realizing maximum efficiency from our energy resources will, among other things, call for the development of molecular sieves that allow one type of molecule to pass while another, similar-sized, molecule is blocked. These sieves may be made from polymers, ceramics or metals. The promise of solar energy awaits new semiconductors that interact with the full spectrum of solar radiation. And if we are to use our scarce resources in an environmentally benign fashion, new catalysts will be needed. It is no wonder that materials science and engineering has been designated a CSM specialty, along with the technologies related to the Earth, energy and environment. The development of new materials sits at the hub of a three-spoke wheel, enabling the technologies that will allow us to be responsible stewards of the Earth and its resources.

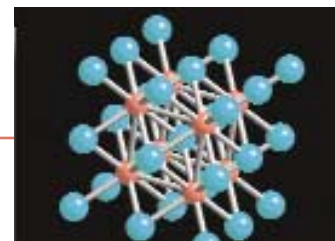
Fully one-third of CSM’s research budget is devoted to materials. Concentrated in five departments/divisions, this research spans the classes of materials from polymers to ceramics, semiconductors to metals, and a broad range of applications from high temperature structural materials to materials for solar cells.

Among the many exciting technologies that CSM researchers are working to stimulate through the development of new materials are those involved in the conversion to a “hydrogen economy,” wherein hydrogen replaces fossil fuels as our primary energy resource. There are advantages associated with such a conversion, but there are also serious materials-related problems that must first be surmounted. These include the development of new materials for the generation, storage and utilization of hydrogen.

Reuben Collins, in the Department of Physics, is working to develop materials that will allow for the transformation of solar energy into chemical energy through the production of hydrogen from water. Such renewable generation of hydrogen represents one of the most versatile ways to store and distribute the energy collected from solar cells. Unfortunately, with current technologies – photovoltaic systems coupled to electrolyzers – only a small fraction of available solar energy can be harnessed, making the hydrogen produced in this process expensive. Materials that would directly convert water to hydrogen (photoelectrolysis) may significantly reduce the

cost of solar-produced hydrogen. Working with John A. Turner’s research group at the National Renewable Energy Laboratory, Professor Collins’ study has focused on determining whether semiconductors, such as gallium-nitride, can be developed with sufficient stability and the right combination of electrochemical and optical properties to act as electrodes that, using sunlight, can directly break water into hydrogen and oxygen.

Once hydrogen is generated, it then must be stored and the usual method of storing gases in tanks is just not practical for safety reasons. Who wants to ride in a car powered by a tank of highly compressed and explosive gas? The alternative is to develop materials that take up hydrogen, much as a sponge soaks up water. Then, with a small squeeze, out comes the hydrogen, ready for use. David Olson, in the Department of Metallurgical and Materials Engineering, is working to develop such materials. His research group has been confronted with a significant problem, for while there are many metals and alloys known to soak up large quantities of hydrogen gas, they do not release it easily. Through careful experimentation and modeling, Professor Olson’s research group has created alloys of two types of metals. One soaks up and holds on to hydrogen while the other interacts only weakly, if at all, with the gas. Combined, the alloy made from these metals has just the right combination of properties for hydrogen storage.



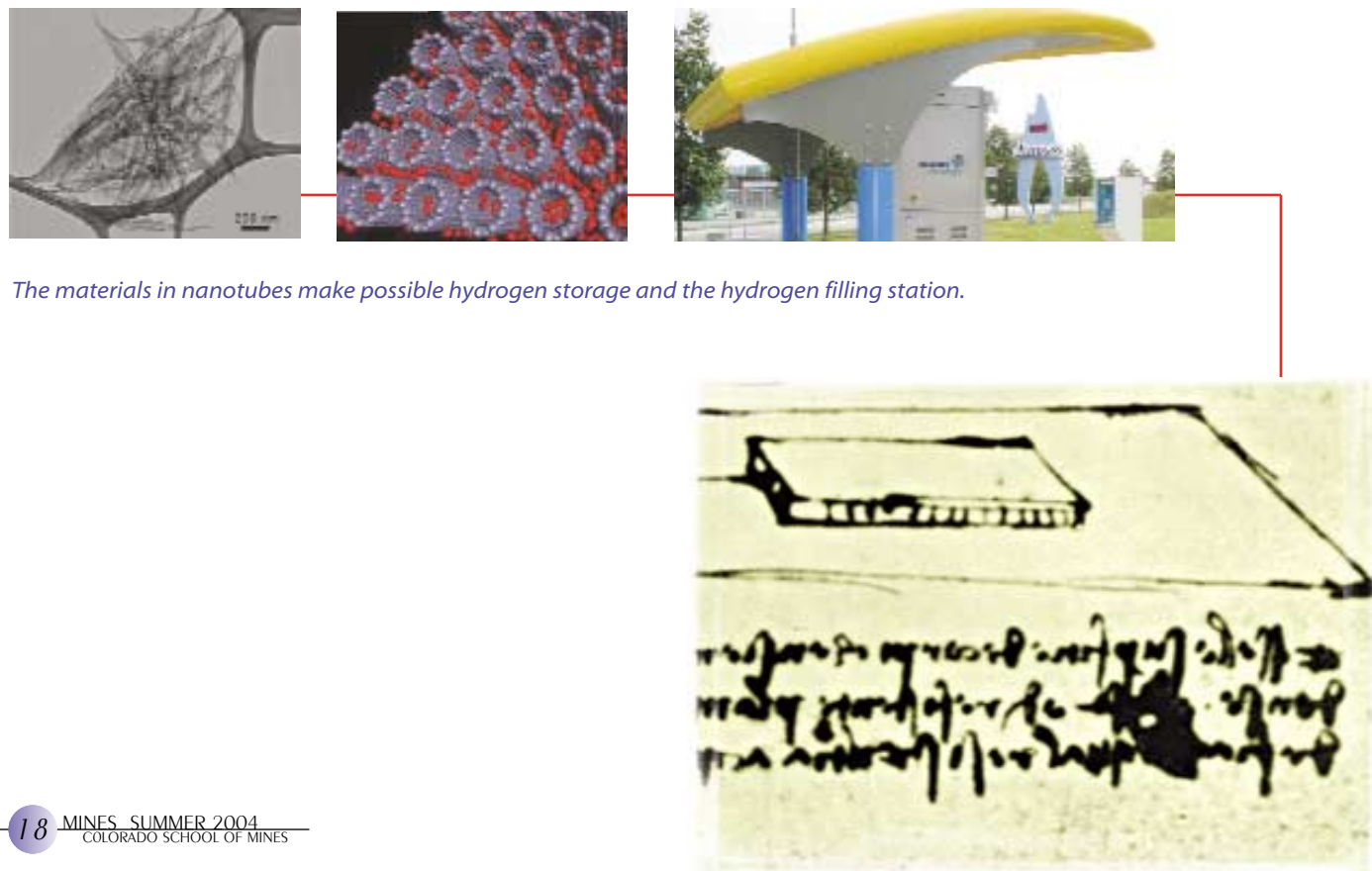
The materials in film make possible the fuel cell in the Ford Focus, which makes possible the technology in the Jeep Concept.

Materials Science and Engineering

From a materials perspective, the most complex part of the problem in the development of a hydrogen economy revolves around utilization. The preferred method to capture the chemical energy released when hydrogen reacts with oxygen to produce water is in a fuel cell. Unlike internal combustion engines where significant energy is lost to heat, fuel cells can potentially convert all available energy into useful work. But to realize this potential, the chemical reaction between hydrogen and oxygen must be controlled at the atomic level. Such control places tremendous constraints on the materials used to construct the fuel cells. Catalysts that facilitate the reaction between hydrogen and oxygen must be found. Membranes through which either hydrogen or oxygen can move easily while being impervious to the other species will also be required. Doug Way (Chemical Engineering), Scott Cowley (Chemistry and Geochemistry), Robert Kee (Engineering), and Dennis Readey (Metallurgical and Materials Engineering) are working with their research groups on various aspects of these materials-design problems. Even when these catalysts and membranes are

designed, tested and optimized, we will be far from having the ideal fuel cell, because then we will be confronted with the problem of integrating these materials into the final product. Such integration is often confronted with "incompatibilities," where materials in contact cease to function as they did in isolation. Research to circumvent such incompatibilities will be required before optimized hydrogen fuel cells are technologically feasible.

Given the complexity and diversity of materials and their properties, it may appear a Herculean task to embark on a course of study that will equip one to engineer materials in general. Fortunately, over the last 50 years or so, we have come to understand that there are commonalities uniting all materials regardless of class, i.e., metals, ceramics, semiconductors, polymers. Understanding the basic chemistry and physics giving rise to these commonalities, combined with a systematic approach to design allows the materials scientist to engineer at the extreme – manipulating atomic scale structure to produce the stuff of 21st century technologies.



The materials in nanotubes make possible hydrogen storage and the hydrogen filling station.



August	September	September	October
<p>12 Grand Junction, Colo., section luncheon: third Thursday of every month. Bookcliff Country Club, 2730 G Road, noon. For information call John Howe at 970-242-4903.</p> <p>17 Denver Young Alumni Pub Tour: My Brother's Bar, 2376 15th St., Denver.</p> <p>28 Tampa, Fla., soccer event. Call Bob Pearson for information, 800-446-9488, ext. 3959.</p> <p>Topeka, Kan., football event. Call Bob Pearson for information, 800-446-9488, ext. 3959.</p>	<p>every month. Look for the CSMAA banner. Pay own way.</p> <p>04 CSM: Tailgate party before Hall of Fame game. Brooks Field, 11 a.m.-12:30 p.m. Price TBA. CSM: Joint pizza party after game with UM-Rolla alumni. Coolbaugh House, 3:30 p.m.</p> <p>09 Golden, Colo., Lunch Bunch: second Thursday of every month. Buffalo Rose in Golden, Colo., 11:30 a.m. Pay own way.</p> <p>Downtown Denver mixer: second Thursday of every month. Marlowe's, 211 16th Street, 5-7:30 p.m. Pay own way. Look for CSMAA banner.</p> <p>15 Denver Young Alumni Pub Tour: Dark Horse, 2922 Baseline Rd., Boulder.</p>	<p>75¢ drafts, \$1.50 well drinks. Live music.</p> <p>16 Grand Junction, Colo., section luncheon (see Aug. 12 for details). Houston: Happy Hour at Two Rows, 2400 University Blvd., Houston. 6 p.m.</p> <p>18 Alva, Okla., football event at Northwestern Oklahoma University. Call Bob Pearson for information, 800-446-9488, ext. 3959.</p> <p>25 CSM: Tailgate party before Chadron State game. Brooks Field, 11 a.m.-12:30 p.m. Bring your own food.</p> <p>28 Las Vegas, Nev. MINExpo 2004. 5:30-7:30 p.m. Happy Hour in the Brew Pub at Monte Carlo Resort & Casino, 3770 South Las Vegas Blvd.</p>	<p>02 CSM: Tailgate party before Ft. Hays State game. Brooks Field, 11 a.m.-12:30 p.m. Bring your own food.</p> <p>03 Houston: Astros vs. Rockies game, 1:05 p.m. Bring your family! RSVP to Kathy Roldan or Laura Westler.</p> <p>07 Westside mixer in Golden, Colo. (see Sept. 2 for details)</p> <p>14 Golden, Colo. Lunch Bunch (see Sept. 9 for details)</p> <p>Downtown Denver Mixer (see Sept. 9 for details)</p> <p>16 Durango, Colo., football event at Ft. Lewis College. Call Bob Pearson for information, 800-446-9488, ext. 3959.</p>

September

02 Westside mixer in Golden, Colo. 5-7:30 p.m., Woody's, 1305 Washington. Get together first Thursday of

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For the most up-to-date information on what's happening in your area, check the website at www.alumni.friends.mines.edu and click on "News and Events" (top of page). Scroll down to the calendar.

Gifts of Appreciated Property ARE APPRECIATED ...

... and can provide for you and the School, for example:

- You may receive a tax deduction for the full market value of your property.
- You may avoid any taxable capital gain.
- You may be able to provide lifetime income for yourself and your family.
- You may realize estate-tax savings.
- With gifts of \$1,000 or more in value, you are recognized as a member of the CSM President's Council.

Undeveloped, revenue generating or environmentally sensitive land may be accepted by the CSMF Property Management Corp. The unique expertise and talents of the CSMF Property Management Corp. could help relieve you of the liability of property with environmental issues.

Gifts of property, stock or other capital assets can be used in making a charitable gift to your alma mater. As with any gift to the School, you will have the satisfaction of knowing that you are providing for future generations of students.

For more information, contact the Managing Director, CSM Foundation Inc. Linda M. Landrum at (303) 273-3142

Ninth Annual Hall of Fame Class Announced

By Greg Murphy, Sports Information Director

The Athletics Department has announced the Ninth Annual Hall of Fame induction class, which will be honored at a dinner and ceremony Sept. 3. The group will also be honored at halftime of the Mines football game against Missouri-Rolla Sept. 4 at Brooks Field. Kickoff for the game is scheduled for 1 p.m.

This year's class includes Roxie Bowman Sullivan BSc Chem '85, Danny Huber BSc Eng '96, MSc Eng & Tech Mgmt '03 and Duane Maue BSc Eng '90 as individuals, the 1987-88 men's basketball team, the 1969 football team's trip to Fort Lewis as a historic event, Coach Bob McCandless for outstanding coaching and Harry Campbell PE '42 as an outstanding supporter of Mines athletics.

Maue is a three-time NCAA II All-American at 142 pounds, including a runner-up finish in 1988, a third-place showing in



1989 and an eighth-place finish in 1987. His All-American distinction in 1987 made him the first Oredigger grappler in 15 years to earn All-American honors. The first CSM wrestler to win more than 100 matches in his career, Maue has seven collegiate tournament titles to his name. He finished his career with an overall record of 114-50-3 and helped Mines place in the top 20 in the nation twice during his brilliant career.

Bowman is one of the greatest volleyball players to ever wear a

Mines uniform. After sitting out her freshman year due to an injury, she came back to earn all-conference honors in 1983 and 1985 and was named to the RMAC Eastern Division All-Star Team in 1984. A team captain who twice led the Orediggers in kills, Bowman had a 29" vertical lead despite standing only 5'7".

Huber became one of the all-time soccer greats at Mines after playing two years at UC Santa Barbara and transferring to CSM. In two years at Mines, Huber led the Orediggers to a pair of conference championships as he totaled 32 goals and 16 assists and led the NCAA II West Region in scoring and finished ninth in the nation as a senior with 39 points (16 goals, 7 assists). He

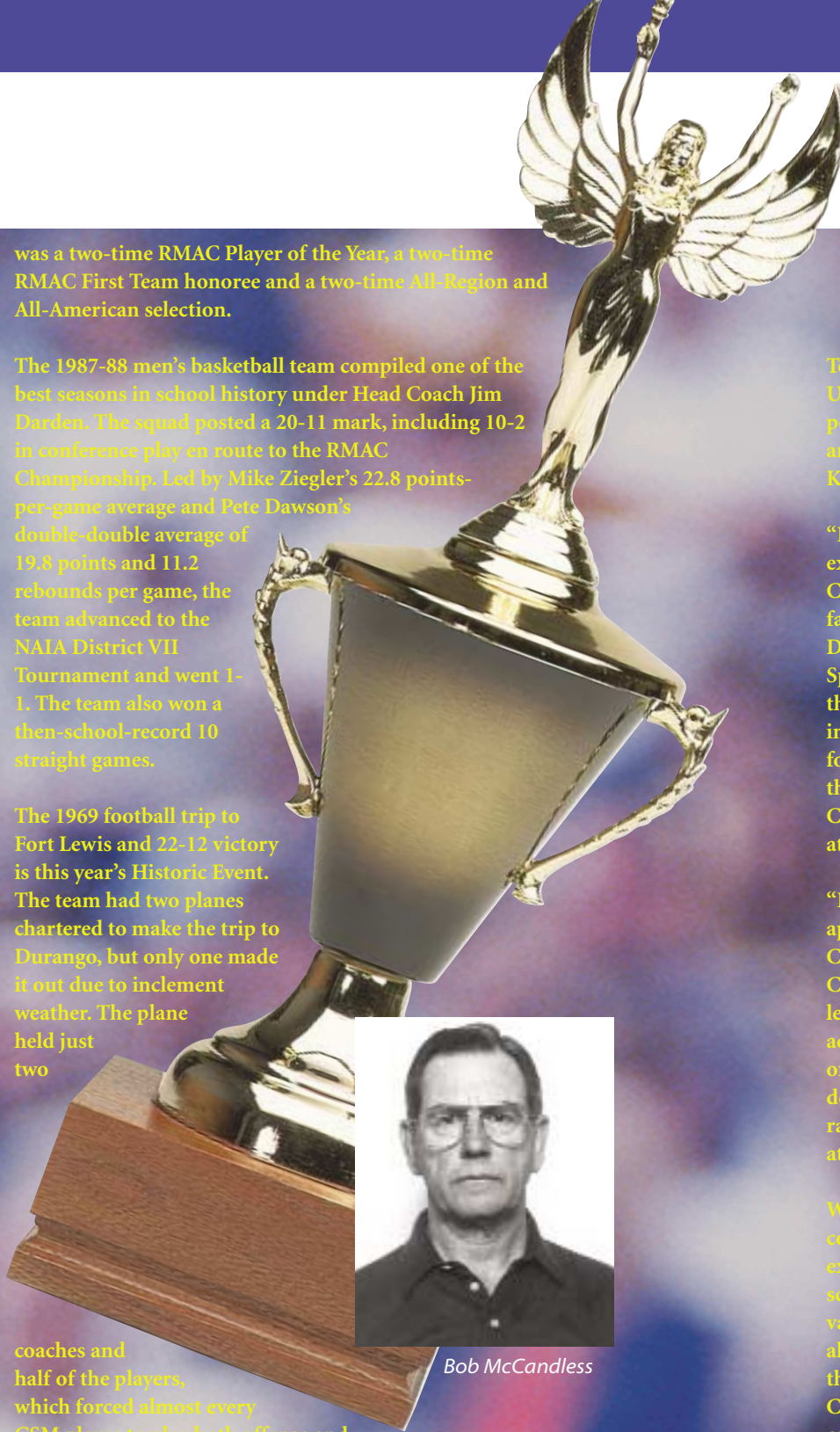
was a two-time RMAC Player of the Year, a two-time RMAC First Team honoree and a two-time All-Region and All-American selection.

The 1987-88 men's basketball team compiled one of the best seasons in school history under Head Coach Jim Darden. The squad posted a 20-11 mark, including 10-2 in conference play en route to the RMAC Championship. Led by Mike Ziegler's 22.8 points-per-game average and Pete Dawson's double-double average of 19.8 points and 11.2 rebounds per game, the team advanced to the NAIA District VII Tournament and went 1-1. The team also won a then-school-record 10 straight games.

The 1969 football trip to Fort Lewis and 22-12 victory is this year's Historic Event. The team had two planes chartered to make the trip to Durango, but only one made it out due to inclement weather. The plane held just two

coaches and half of the players, which forced almost every CSM player to play both offense and defense at the game. For many, it was the first and only time they played on the other side of the ball during their careers.

McCandless was elected as this year's Outstanding Coach after serving as the head swimming and diving coach from 1965-97 and an assistant football coach from 1968-93, while Campbell, a member of the undefeated 1939 football team, is being honored as an Outstanding Supporter of Mines Athletics after he established an endowment for the football program in 2001.



Bob McCandless

Tom Spicer Named Director of Athletics

Tom Spicer, who served as director of athletics at Fort Hays State University for the past 15 years, has been appointed to the same position at CSM as announced by Vice President of Student Life and Dean of Students Harold Chevront. Spicer replaces Marv Kay PE '59, who retired after 38 years (see profile on page 34).

"I am extremely honored and excited to be joining the Colorado School of Mines family and lead the Department of Athletics," Spicer said. "I am attracted to the academic integrity of the institution and am looking forward to further developing the outstanding success of Colorado School of Mines athletics."



"I would like express my appreciation to Marv Kay and his 38 years of service to the Colorado School of Mines as a coach and an administrator," Chevront said. "I am extremely excited about the new leadership Tom will bring to Mines. He is committed to academic excellence, has a very clear understanding of the role of intercollegiate athletics and recreational programs in a very demanding academic environment and possesses the fundraising skills that I feel can help with the advancement of Mines athletics in the coming years."

With more than 30 years of experience as an administrator and coach, Spicer will bring with him a wealth of knowledge and experience. A native of Beaver, Okla. he earned a bachelor of science degree from Fort Hays State in 1972 and played on the varsity football team for the Tigers during his collegiate days. He also received his master's degree from FHSU in 1977. Spicer was the director of athletics and director of student affairs at Butler County Community College and has experience was the director of athletics, physical education instructor, head football coach and track coach for the Durant, Okla., school district. He also coached wrestling and baseball at Bishop Miege and Fort Lewis Schlagle high schools.

Spicer is married to the former Kathy McGovern of Denver and they have four children: Matt, Amber, Kristen and Allison.

Congratulations!

The following Oredigger athletes earned All-Conference (AC), All-Region (AR) or All-America (AA) honors during the 2003-04 season.

BASEBALL

Justin Barberio (AC)
Mike Cerbo (AC)
Matt Gilbreath (AC)
Adam Marwitz (AC)

MEN'S BASKETBALL

Stephen Bahl (AC, AR)
Matt Luedtke (AC)

WOMEN'S BASKETBALL



Ashley Gronewoller (AC)

CROSS COUNTRY

Heather Beresford (AR, AA)

FOOTBALL

Nick Belden (AC)
Pat Carroll (AC)
Jonny Chan (AC, AR)
Chad Fricauf (AC)
Nick Gilbreath (AC, AR)
Scott Hahn (AC)
Jared Heath (AC, AR)
Daniel Leger (AC)
Grant Newton (AC)
Craig VanHorn (AC)

SOCCER

Brian Blaskovich (AC, AR)
Joel Flanagan (AC, AR)
Jared Peacock (AC)
Robbie Williams (AC, AR)

SOFTBALL

Heidi Bauer (AC)
Brienne Brennan (AC)
Melanie Mahoney (AC)

SWIMMING

Shane Copsey (AA)
Gretta Simpson (AA)

TENNIS

Ben Dunn (AC)
Matt Rychlik (AC)

TRACK AND FIELD

Ben MacLeay (AA)



Gina Nichols (AA)
Jared Peacock (AA)
Chris Schaumberg (AA)
Derek Thornton (AA)

VOLLEYBALL

Sonia Hesselstine (AC)
Lauren Ramsay (AC)

WRESTLING



Nathan Peterson (AC, AA)
Rick Rank (AC, AA)
Derek Thompson (AC, AA)

Transforming Resources Gift Establishes The Max W. Bowen Mineral Processing Laboratory

In honor of **Max W. Bowen EM '24**, J. Robert Maytag has generously donated \$175,000 to fund The Max W. Bowen Mineral Processing Laboratory. This new state-of-the-art facility will keep Mines and its students in the forefront of mining education and research.

The Maytag gift is a fitting tribute to Bowen's professional accomplishments and dedication to the School. Bowen devoted his life to mining. He joined the Golden Cycle Corporation in 1929 and became its executive vice president and general manager. For 12 years, Bowen served on the CSM Board of Trustees and in 1960 he was the recipient of the School's Distinguished Achievement Award, the highest honor Mines bestows on an alumnus. Bowen also was president of the Colorado Mining Association in 1959 and authored numerous articles for technical publications.

The Max W. Bowen Laboratory, to be located in Brown Hall, will enhance Mines' standing as the leading university in the training of engineers

for the mineral resource industries. The mineral processing laboratory will be used to train undergraduate students in metallic minerals, energy minerals and industrial minerals processing. The laboratory will also accommodate graduate level research, as well

as function as a testing facility for company-sponsored research projects.



Max W. Bowen

"We are honored by this generous gift that will support one of the School's core academic focus areas. Since both the donor and the individual honored are former trustees, this gift is a particularly touching expression of loyalty," said President John U. Trefny.



A crucial component of the School's ability to produce highly trained engineers is to familiarize students with the latest generation of testing equipment. While the current mineral processing laboratory facilities have served past Mines graduates well, some equipment no longer reflects contemporary professional practice. For example, relatively soft energy (coal) and industrial minerals represent a significant portion of materials mined today. At the same time, computer instrumentation and minerals processing simulation programs are now key elements of modern minerals processing techniques. By expanding the department's mineral analysis tools and instrumentation to include additional equipment relevant to contemporary mining operations worldwide, the Bowen Laboratory promises to be a valuable addition to the department's instructional resources.

Mines Acknowledges Individual, Corporate and Foundation Donations

Colorado School of Mines received gifts of \$25,000 or more from the following individuals between February 29, 2004 and June 30, 2004.

Jerome '64 and **Becky Broussard** continued their support of the Broussard Family Fellowship for Engineering and Technology Management. Their \$50,000 gift was in addition to a \$50,000 contribution made earlier in the fiscal year. During the *Transforming Resources* campaign, the Broussards have made gifts of over \$1 million to help establish the master's degree program in Engineering and Technology Management.

Harry D. Campbell '42 donated \$35,000 in support of the Campbell Endowment for Excellence in Football and the Undeclared Championship Football Team of 1939 Scholarship.

David Dickson '66 became a new member of the Guggenheim Society with a pledge payment of \$25,000 toward his *Transforming Resources* campaign commitment of \$100,000. The contribution supports both the Dickson Endowed Scholarship and the Mines Annual Fund.

A bequest of \$204,065 was received from the estate of **Edna Edey**, widow of **Alfred Edey '33**. The gift will establish an endowed scholarship fund.

The Dean Burger Memorial Award Fund received an \$85,300 gift from **Ben Fryrear '62**. The Fund is designed to help students who are at risk of leaving school because of immediate financial need—a fitting memorial for Dean Burger, who helped many such students.

Bruce Grewcock '76 established the Underground Construction Professorship in the Mining Engineering Department with a gift of \$257,000. This gift was added to his previous \$250,000 gift and serves as a challenge to the underground construction industry. The goal is to raise \$2.5 million for an endowed chair in underground construction.

Hilja Herfurth generously donated gem and minerals specimens valued at nearly \$350,000 to the CSM Geology Museum. This donated collection will help the museum maintain its status as the premiere showcase for Colorado minerals and mining history.

J. Robert Maytag made a gift of \$97,291 to support the Andes Scholarship program, which provides full tuition to Mines for four students from Bolivia and Peru. This contribution is in addition to the \$175,000 donation Maytag made in support of the *Max W. Bowen Mineral Processing Laboratory* profiled in this issue of *Mines* magazine.

Robert E. '68 and **Ann McKee** made a gift of \$35,556 to the Robert E. and Margaret A. McKee Family Endowed Scholarship Fund. Members of the Mines Century Society at the Copper level, the McKees first established this fund in 1994.

E.H. "Mick" Merelli '59 made a \$25,000 contribution to support a variety of needs in the Petroleum Engineering Department. Merelli gave an additional \$5,000 to the Mines Annual Fund.

Charles L. Pillar '35 left a bequest of \$75,000 for the Pillar Endowed Scholarship Fund.

Mines received a partial distribution of \$50,000 in unrestricted funds from the estate of **Mildred Reid**.

The Wyoming Scholarship Fund received an additional \$100,000 from **J. Don Thorson '55**. The Fund was originally established in 2001 by **Joe Dunbar '55** with a gift of \$100,000. Thorson and Dunbar intend to challenge their fellow alumni in Wyoming, with the goal of raising enough to support one new student from Wyoming to attend Mines each year.

CSM received gifts of \$25,000 or more from the following corporations and foundations between February 29, 2004 and June 30, 2004.

Baker Hughes contributed \$50,000 to support research conducted by Max Peeters, the Baker Hughes Distinguished Chair in Borehole Geophysics and Petrophysics.

BP contributed \$33,000 to support the departments of Chemical Engineering, Engineering (Mechanical Specialty), and Petroleum Engineering; the Minority Engineering Program; minority scholarships; and the Society of Women Engineers.

ConocoPhillips contributed \$250,000 toward the ConocoPhillips SPIRIT Scholars Program; the departments of Chemical Engineering, Geology and Geological Engineering, Geophysics, and Petroleum Engineering; graduate fellowships; MEP; SWE; SPE; and the Career Center.

For the 15th consecutive, **The Adolph Coors Foundation** continued its support of minority scholarships with a gift of \$75,000.

Herrenknecht AG contributed \$25,000 to support scholarships for students studying geotechnical engineering, underground construction and tunneling.

Medtronic SNT is supporting Dr. Joel Bach's Orthopaedic Biomechanics Research Program with a gift of \$31,000.

The Mikkelson Foundation contributed \$30,000 to the New Engineering and Applied Technology Program.

Rosia Montana Gold Corporation contributed \$38,348 to support research within the Department of Geology and Geological Engineering.

RWE-DEA Aktiengesellschaft contributed \$25,000 to support the Department of Geophysics.

Schlumberger contributed \$25,000 to support Professor Max Peeters' research within the Department of Geophysics.

The Edna Bailey Sussman Fund contributed \$45,040 to support its Environmental Internship Program at the School.

Texas Instruments Co-Founder Leaves \$1 Million to Colorado School of Mines



Cecil Green's gift culminates 75-year partnership with the School

The late Cecil Green, co-founder of Texas Instruments who, along with his wife Ida, were among America's leading philanthropists, named Mines as one of seven academic institutions that are among the beneficiaries of his estate. Mr. Green's generous bequest of over \$1 million will benefit the School's Geophysics Department.

"Over the past 75 years, Colorado School of Mines has been honored by Cecil and Ida Green's unwavering support of the university," said Mines President John U. Trefny. "Their intellectual and philanthropic legacy has had, and will continue to have, a profound impact on our nation and the world."

The Greens' bequest culminates a relationship with Mines that spanned close to 75 years, beginning in 1930 when Mr. Green worked with the School's personnel to develop new technologies for the petroleum industry. Mr. Green began financially supporting Mines in 1952, writing then that he wished to express his "highest regard to the Colorado School of Mines and its staff, and for the wonderful job they are doing in preparing young men, not only as engineers, but as well-rounded citizens."

Over the next half century, Cecil and Ida Green gave a total of \$4.5 million to Mines. Among their other donations, they provided substantial funding to build the Cecil H. and Ida Green Graduate and Professional Center in 1970. Then in 1975, they endowed the Charles Henry Green Professorship of Exploration Geophysics to honor Mr. Green's father.

Software Bisque Brings Astronomy to the Internet

By Maureen Keller

The problem-solving abilities taught at Mines can be applied in a million different ways. The Bisque brothers – Stephen BSc Geop '83, Daniel BSc Geop '89 and Matthew BSc Eng '90 – have used their engineering background to conquer the sky. The three Mines graduates, along with a fourth brother, Thomas, have developed astronomy software, designed a robotic telescope mount and have made it possible for astronomers around the world to access the skies via the Internet. "Astronomy and computers are a perfect match because there are so many problems to be solved," says Steve. "And many of the problems are solvable by computers."

Their business, Software Bisque, is housed in the historic district of Golden, Colo. Across Clear Creek, they've set up a manufacturing plant that produces the precision robotic telescope mounts. It's a small operation, but the mount is so sought after, there's a waiting list of over a year for the finished product.

While still attending Mines, Steve, who has an interest in astronomy, began developing *TheSky*, which today is the number one software in use by amateur astronomers. It shows the position of the planets, the Moon, comets, asteroids, satellites, up to one billion stars and over one million deep-space objects. It is so sophisticated it is considered research grade. Having developed the software, the brothers realized they needed accompanying hardware to be able to use their software to its maximum potential. Because they couldn't find what they wanted already in existence, they designed their own. The Paramount ME, which they manufacture in Golden, is a robotic telescope mount that, when used in conjunction with *TheSky*, creates an interactive, fully-automated pointing, tracking and data acquisition system.

According to *Sky & Telescope*, "There is no other product like Software Bisque's Paramount ME, nor has there ever been anything like it before," writes Dennis di Cicco in the May 2003 issue. He continues his praise describing the product as "a tour de force involving mechanical design, precision machining and software development." As the Bisesques put it, their telescope mount is the integration of electronics, mechanics and software. It is lightweight (65 pounds), portable and programmable, even from a hand-held computer.

The robotic mount costs \$12,500, the most reasonably priced high-tech astronomy accessory of its kind. With a telescope, the robotic mount and *TheSky*, a person can locate and track any one of billions of objects in the sky. Once the mount is programmed, the astronomer can leave for the night and check in the morning to see the images that have been captured. The Bisesques have cataloged discoveries made by their customers, which so far total more than 500, including supernovas, variable stars, cataclysmic variable stars, asteroids and comets.

Paramount ME units are being used to drive telescopes in 28 states and 17 foreign countries. In addition, approximately 30,000 amateur and professional astronomers are using their software, which is updated annually. A satisfied customer recently named an asteroid he discovered after the brothers (MPL 12934 Bisque). "It tumbles around in the asteroid belt between Mars and Jupiter. There is nothing special about it other than its name," says Steve, "but that was a nice gesture."

In addition to astronomer hobbyists, schools are using Bisque products. Cal Tech remotely uses the telescope system to monitor the atmosphere of Titan, one of Saturn's moons. The U.S. Air Force uses the system to track satellites every night from the Space Surveillance Center on Maui, sending data directly to Space Command (NORAD) in Colorado Springs. Even secondary schools can participate. Sites at Mt. Wilson Observatory, Calif., Las Companas Observatory, Chile, and Cloudcroft, N.M., have telescopes on Bisque mounts with Internet access. NASA currently funds students' use, and astronomers can purchase telescope time to control the observatory from any location.

The brothers' future plans include expanding the capabilities of their hardware-software solutions and making astronomy even more accessible to the general public. Steve comments, "Even though I've been developing and improving *TheSky* for over 20 years now, there are still lots of areas for innovation. We're really excited about the new software products we'll be releasing later this year, and others that are still in the works."

In 2002, the brothers received the Clyde W. Tombaugh Award for "Technical Innovation in Astronomy" from the Riverside Telescope Makers Conference.



The Paramount ME.

Spiral Galaxy NGC 5457 (M101) captured using a 20-inch telescope mounted on the Paramount ME.



From left, Dan, Matt, Steve and Tom Bisque.

Alumni notes & quotes

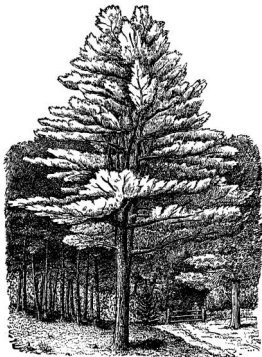
Heidersbach '63 Honored by NACE

NACE, the International Corrosion Society, honored **Robert Heidersbach Met E '63** with a Fellow Honor given in recognition of distinguished contributions in the fields of corrosion and its prevention and to develop a broadly based forum for technical and professional leaders to serve as advisers to the group. Heidersbach is president of Dr. Rust Inc., at Cape Canaveral, Fla. He was recognized for his efforts in educating students and for his research on methods of studying and controlling corrosion. A member of NACE since 1968, Heidersbach specializes in materials selection, cathodic protection, failure analysis and corrosion detection and monitoring.



80 Years and 4 Generations of Mines Graduates

John B. Cooke IV BSc Pet '03, who graduated in December, became the fourth generation of Mines graduates within the Wideman family.



Wideman tradition is granddaughter **Cynthia L. Beech BSc Met '86, MSc Met '89**, who is employed by AK Steel Corp., Rockport Works, Ind.

The Mines tradition began 80 years ago with **Frank L. Wideman EM '23** followed 35 years later by his son, **Charles Wideman Geop E '58, MSc Geop '67, PhD Geop '75**. Frank Wideman



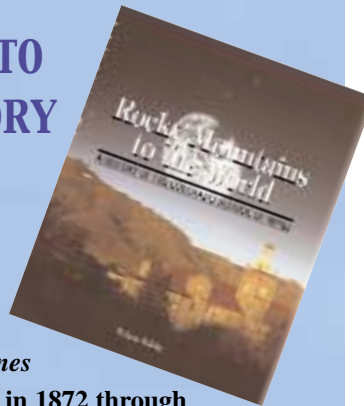
And now, a fourth generation Miner, Cooke, great-grandson of Frank Wideman, is working toward his master's degree in petroleum



retired from the U.S. Bureau of Mines in 1969, while son Charles recently retired from his professorship at Montana Tech. Continuing in the

engineering. He recently married **Ella Schmit BSc Eng '04**. There may well be a fifth generation Miner sometime in the future.

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Staying connected



Alumni Notes & quotes

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West

Bakersfield, California

Bakersfield alumni hosted Mines students who were in town for a field session.



Geology field trip in Bakersfield led by Mike Clark PhD Geol '91 and Dave Mayer BSc Pet '90.



Prof. Larry Chorn tossing a football.



Dave Mayer BSc Pet '80 and his wife, Billie.



George Vassilellis MSc Pet '93 cooking hot dogs and burgers.

Gulf Coast

Houston

Houston hosted a reception and annual golf tournament in April. The fourth annual event raised \$20,000 for student scholarship. A second reception was held in May.



From left, Dan Lewis, Bob Stitt, Kim Harden BSc Met '74, Dean Stoughton BSc Math '75, MSc Geop '78, Art Biddle Met E '61, Rod McNeill, George Puls BSc Min '75.



These Mines spouses did much of the golf committee's work. From left, Barbara Puls, Patricia Harden and Lindsay Stoughton.



Houston section coordinators Kathy Roldan BSc Geop '88 and Laura Westler BSc CPR '00.



Jill Kent BSc Eng '03, Sean Clark BSc Chem Eng '02, and Jonathan Kepler BSc Eng '01.



Class of 1939 Left to right, seated: Chuck Blomberg, Fritz Weigand. Standing: Herb Young, Ken Hutchinson, Larry Melzer, Phil Garrison, Jack Corlew.

Class of 1944
Left to right seated:
Max Mott and Joe Soper.
Standing:
Don Roe and Frank Adler.



Class of 1949 Left to right seated: Eric Hopper, Robert Black, Melbourne Miller, Hugh Evans, Philip Lawrence, Hank van Poollen, Buck Curtis. Standing: Fred Deuel, John Mason, Bob Coleman, Bob Reeder, Robert Olson, Fred Wehrle, Ev Kenworthy, Victor Smith, Lyle Jenkins.

REUNION 2004 Words of Wisdom from the Class of 1954

Expect surprises!

The Class of 1954 had its 50th reunion in May. The seasoned veterans offered the following advice to those just starting out.

Do well in your selected sector of the business, but pay attention to other disciplines. Be aware of the need also to excel in human relations, business acumen, ecology, communications and ethics, among others. Cause your profession to be a vehicle for a happy life.
Robert Abercrombie PE

Expect to be surprised. Today you can't imagine what you will be doing 10 or 15 years from now or how you will be doing it. Determine now that you will keep up with new developments as they come. Don't get too comfortable with your routines.
Harry Akers PRE

Cherish liberty, freedom and truth.
Arvid Anderson Met E

Observe "Golden" rule #1 – "Do unto others as you would have them do unto you." Do not observe "Golden" rule #2 – "He who has the gold, makes the rules."
John M. Anderson Geol E

Be frank, honest, straightforward and accurate. You may not get the immediate recognition you deserve, but character will ultimately pay off. The only certainty is the accelerating rate of change in almost everything. Don't be afraid to venture forth.
Ted Bergstrom Met E

Work hard, play hard and always keep focused on the good things in your life. Happiness is a state of mind under your control. You've had a great education. Use it wisely.
Edward C. Burgan Geol E

Keep the value of the friends you make at Mines.
Bernard Coady PRE

The quality of the knowledge and skill you have acquired during your undergraduate years at Mines is exceptional. Experience, which comes with time in your profession, is ahead of you. Experience, good and bad, leads to judgment. At the end of the day, the

quality of your judgment is what you get paid for.
Carl Cross BSc Met , MSc Met '76, PhD Met '86

Work as hard as you were taught to at Mines but *diversify* your expertise.
Philip H. Halstead Geol E

Don't neglect the people side of the technical problems you encounter. And don't neglect the arts as a way of enhancing your own life and those of your loved ones.
Richard F. Hatfield PE

Dean Burger, in his letter to the class of 1954, said it better than I ever could: "May the skills and techniques each of you have acquired from the classroom and laboratory, together with the concepts and philosophies you have gained from your associations with the faculty and your fellow students, be effectively blended to give you the personal qualities and the proper sense of values so essential for making a good life."
Edward W. Heath Geol E

Cherish the friends you made in the last four years. They're the best you'll ever have.
Robert B. Joyce Geol E

When I was still in school, my father-in-law gave me a plaque which stated (in Latin) "Don't Let the Bastards Wear You Down." Keep that thought in mind as you run into the naysayers and detractors of the world. Remember that you have been trained excellently to do your job. Do it with confidence, honesty and determination.
Andy Jurasin Geol E

Nothing is ever easy!
Robert Kendrick EM

Do not be afraid to accept challenges in areas in which you have not been trained. Life is just one long learning experience that does not end when your academic experiences are completed.
Eugene Koch Met E

Expose yourself to many different interests. You never know where the next job might come from.
Dunn Krahl Geol E

Always remember your educational roots at CSM. Maintain integrity in your personal and professional life. Work hard and keep abreast of advances in your field. Don't settle for second, but always do a first-class



Class of 1959 Left to right seated: Howard Earnest, Richard Gerhardt, Ron Koehler, Duane Graham, Gary Nollberg. Standing: George Krauss, Jim Payne, Ed Fernau, C.O. Smith, Bob Lame, Don Matchett, Ben Fryrear '62, Bob Pearson, Joe Anzman, George Dunham, Ron Schutz, Larry Faulkner, Dick Swerdfeger, Steve Milne.



Class of 1964 Left to right seated: James Dunn, Steve Chesebro, Dale Teeters, Art Petersen, Butch Sorensen, Al Geyer, Jim Rheinheimer, Jack Erfurdt, Bill Devine. First row standing: Roger Baker, Boyd Watkins, Frederick Maxeiner, Vernon "Van" Van Sant, Ronald Weiszmann, Chuck Yarbrough, Frank Buturla, George Heiser, Floyd Snyder, Dick Doran, Bud Isaacs. Back row standing: Thomas Hansen, Lloyd Nordhausen, Richard Smith, John Lohmiller, Barrett Sleeman, Tony Pegis, Bob Writz.



Class of 1969 Left to right seated: Rob Grigg, Thomas Sylvester, Mary Beth Beach, Rosalyn Temple, Bud Temple, John Wright. Standing: Ron Hibbert, John Chapman, Alan Bell, Wes Lynn, Rick Carlson, Jim Krebs.



Class of 1974 Left to right seated: Steve Gilbert, Marc Ernest, Ralph Nelms, James Hanley, Lee Hanley, Joan Stratton, Nancy Money, Rich Griebing, Tom Davis. Standing: Rich Mignogna, Patrick Taylor, Scotty Mitchel, Doug Beahm, Gary Nydegger, David Blumer, Murray Aitken, Richard Dunham, Dave Cox, Gene Fritzler, Tom Plate, Zora Dash, Ken Parrott, Hugh Harvey, Steve Malkewicz, Tom Smagala, Carl Schmuck, Dennis Gertenbach.

job for your employer. Great opportunities might come your way. Be ready to welcome them and make the necessary adjustments to your career. Find opportunities to give back to society a portion of that which you have received from it.

Thomas S. Lee Geop E

Your education is just the beginning.
Robert Lofgren Met E

Don't stay in a job you don't enjoy. Marry a good woman. Have some kids and spend time with them. Keep a sense of humor!

George Lusa Met E

Reach out! Fear not! Mines has given you a great launching so take advantage of this experience. The path ahead is as broad or narrow as you wish to make it. Above all, maintain your integrity.

Donald L. McCall PE

Professor Dr. Carpenter in his address to our graduating class admonished us, "Never confuse effort with success." My advice is: Give a good day's work for a good day's pay. If things don't work out, take your lunch pail and go somewhere else. Don't bitch about it!

Allen McGlone Geol E



The "Hard Rock Harmonizers" reunited for a performance at the All-Alumni Banquet. They are a barbershop quartet that performed at CSM while they were students. Members are, from left: Linda McCall (taking the place of Jim Russell '54 who passed away in March), Pat McCall '52, Andy Anderson '54 and Stan Wimberley '53.



Class of 1954 Front row from left: Bill Gekler, Don McCall, Eric Newman, Newell Orr, Thomas Lee, Carl Cross, Al McGlone, Roger Sullivan, Tom Fails, Andy Jurasin, Sam McClaren. Second row: Mexl Oxsen, Lawrence Tisdell, Ed Burgan, Bernie Coady, Ed Heath, George Lusa, Dick Hatfield. Third row: Bob Joyce, Bob Kendrick, Eugene Koch, Phil Halstead, Dan Richardson, Ted Bergstrom. Fourth row: Dan Nelipovich, Mark Spaeth, Stewart Towle, Chuck Russell. Fifth row: Lou Phannenstiel, Fred Kottenstette, Kent Miller, Ed Cutrell, Bob Lofgren, Andy Anderson, Bob Abercrombie, Phil Preble, Dick Veghte. Sixth row: John Anderson, Charles Chapin, Jim Hale, Garth Hayes, Jack Tindall, Jim Nienaber. Back row: Fred Campbell, Walt Weid, Harry Ells, Ed Peiker, Gene Olinger, Rev. Dick Ridley, Dunn Krahl.

Do not ever forsake your integrity for advancement or financial gain.

M. Ken Miller Geol E, MSc Met '59

Don't forget where you came from. Don't give up under adversity.

Eric Newman Geol E

Hang in there!!
Newell Orr Met E

Always tell the truth concerning your activities and knowledge so you will not have to remember your past comments if required.

Louis Phannenstiel PRE

Don't compromise your principles. You have to live with yourself.

Mark Spaeth Geop E

Do the work you like that has relevance and value to our society. Pursue it with hope, vigor and ethics, but have FUN along the way. Remember that you can make a contribution.

Roger L. Sullivan PRE

Yogi Berra said it first: "When you come to a fork in the road, take it."

Lawrence Tisdell PRE

Be flexible and accept change.

Stewart W. Towle Met E

Not only learn, but *understand*, the engineering basics – you will need them.

Richard Veghte PE

Find a good woman and treat her with respect. Remember, you don't "own" her.

Walter Weid Geol E

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Cross That Bridge When You Get To It

By Carly Williams

Build a bridge, the students were told. Build it fast. Build it light. Build it using as few people as possible. Build it to look appealing. And, oh yes, build it to hold 2,500 pounds.

Mines hosted the 13th Annual National Student Steel Bridge Competition May 28 and 29. Hundreds of civil engineering students gathered on the Mines campus for a time of fun, learning and fierce rivalry. A record 45 teams entered the competition with hopes of becoming national champions. After qualifying at regional competitions, they came from around the country, as well as from Canada and Puerto Rico. The competition was sponsored by the American Society of Civil Engineers and the American Institute of Steel Construction Inc.

Students were challenged to design, fabricate, construct and test the best-performing steel bridges. Teams were made up of six students or less. They constructed the bridge over a blue tarp, representing water. Only one team member, designated as a barge, was allowed in the "water." Construction was timed and then multiplied by team members to get a "person-minutes" time. Penalties, like dropping tools or stepping out of bounds, were added to the total time in the form of "person-minutes." **Candy Ammerman BSc BE '81**, faculty adviser to the CSM chapter of the American Society of Civil Engineers, said, "They make mistakes and learn from these mistakes. They learn how to weld, fabricate steel and machine joints. Once fabrication of the bridge has been completed, the students work as a team to find the fastest method to construct the bridge within the requirements of the rules."

After construction, each bridge was loaded with 2,500 pounds distributed over the bridge's length. If the bridge's deflection exceeded two inches, the bridge was disqualified. Finally, the bridge itself was weighed. The goal was to design the lightest bridge that could be easily and efficiently constructed and support the required load with the least deflection. The teams were judged by 46 professional engineers on speed of construction, lightness, aesthetics, stiffness, construction economy, structural efficiency and overall performance of design. "All aspects of this competition require teamwork and all aspects have engineering components. This is an excellent civil engineering competition," said Ammerman.

After 11 bridges were disqualified, the winners turned out to be North Dakota State University, first place; the University of Michigan, second; and Southern Polytech State University, third. The Mines team placed 30th.



Pieters '79 Helps Out in Iraq

Dennis Pieters BSc Geol '79, MSc Pet '92, PhD Pet E '03 was hand-picked to be the subsurface, subject matter expert to the Army Corp of Engineers for the rebuilding of oil infrastructure in Iraq last year. Stationed in Kuwait, he worked out of the Crown Plaza Hotel and Camp Doha with Gen. Robert Crear, head of the Army Corps of Engineers on project Rebuild Iraqi Oil, a joint task force between Halliburton KBR and the Army. The team, which included a cross-section of engineering disciplines, was able to estimate the cost of rebuilding the Iraqi oil facilities to pre-war levels and presented a report to President Bush. The expenditure was subsequently sent on to Congress for appropriation.



Dennis Pieters

Pieters' days started at 4 a.m. when the engineers and other technical specialists met 60 miles from the Iraqi border to form a convoy for the long drive to Basra. They passed through villages where restless children begged with outstretched hands for water and food while suspicious older males looked ready to throw rocks or missiles. The team met with engineers and managers of the Iraqi South Oil Company to inspect the surface facilities. The work was dangerous and daily temperatures routinely reached 130° to 140° F.

A developing insurgency hampered the engineers' task and a lack of security led to severe looting of all the oil field facilities. They were stripped bare. The Corps resolved the security issue by hiring opposing tribes to guard the facilities. Twelve wells were ignited by the retreating Iraqi army and six of those were seriously damaged. These wells were in the Rumaliyah field, which extends into Kuwait.

Pieters was chosen for the job for his extensive knowledge of Middle Eastern oil fields. He has worked on both Ghawar and Safaniya, the largest onshore and offshore fields in the world in Saudi Arabia, and at KOC Khafji during the early 1980s and 1990s as a reservoir simulation specialist. He built and ran computer models of the reservoir to predict reservoir behavior and to experiment with depletion production strategies. He is known as the engineer who simulated the first horizontal well in the Kingdom in the early '80s.

South Oil Company's main field is Rumaliyah, which contains 22 billion barrels of oil and supplies the bulk of the 3 million barrels a day produced by Iraq. The other field is Kirkuk in the

Northern Oil Company in Tikrit. The Rumaliyah field is plagued by corrosive high salt content in the crude that wrecks havoc with the wellbore tubulars and needs to be washed before transportation and refining. Pieters was instrumental in evaluation of the field performance with its massive water injection system installed in the late 1970s and brought on line in the early 1980s to supply energy to the reservoir because of the tarmat which restricts aquifer support.

Pieters said it was interesting working with the knowledgeable Iraqi engineers who have had to work under extremely dangerous conditions to produce oil without the proper equipment and with makeshift resources under the embargo. A field resource this size should have had a simulation model and carefully recorded information to manage it from the onset of production. Pieters found the engineers eager to get their hands on the latest technology that they had only been reading about during the long years of the embargo.

While Pieters was in Iraq, he obtained the first pre-war contract to run seismic data and prepare detailed simulation models for the Rumaliyah field. Unfortunately, seismic information was difficult to obtain because of land mines and other unexploded ordnance which needed to be cleared and problems with an unreliable supply of electricity for the sophisticated workstations and other computer equipment to be used for analysis and simulation.

Since Pieters has returned to the United States, the Iraqi situation has deteriorated. Repairs on pumps for the water injection system in Rumaliyah field have been delayed because of security problems reducing the workday and making some days too dangerous to travel. Another problem was that the necessary large, high-volume flow equipment could not be found on the shelf and had to be specially manufactured. In addition, export production through Turkey from the northern Iraq field of Kirkuk was delayed by numerous incidences of sabotaged pipelines. This consequently led to a missed deadline for achieving pre-war levels of export production by the end of 2003. In March and April, the security situation worsened still further in Baghdad and spread to the south, which had been relatively quiet compared to Baghdad. The terminals in Bakr and Khawr al-Amaya, south of Basra, were attacked and temporarily had to be closed. In May, the country was shipping only 1.8 million barrels a day, in contrast to the 2.5 to 3 million barrels exported before the war.

To date, \$1 billion has been spent rebuilding the oil industry and another \$1 billion on importing benzene (gasoline) and LPG for cooking and heating this past winter. Expectations are that another \$1 billion will be spent this year on restoration and upgrading of oil fields and refurbishing of refineries. The opening of a second offshore oil terminal in the south should also increase exports by a few hundred thousand barrels a day.



Garmat Ali water plant facilities looted bare (including the roof).



Rumaliyah facilities falling apart after war damage and looting.



Central pump station facilities for South Rumaliyah oilfield Al Zubayr, Iraq.



Inspecting South Rumaliyah destroyed pipelines.



150 million bbl water per year injection system at Garmat Ali plant.

because all work depends on security of personnel. Right now security is severely lacking.

Energy is a vastly important commodity and the engineering tools and techniques Pieters learned at Mines prepared him for the technical work as well as the challenge of dealing with a diverse group of people who had been under pressure and

repression for so long. He encourages more students to enter the field of petroleum engineering as more exciting opportunities lie in store for world travel and working and existing with other cultures.

End of an Era for Kay '63

By Steve Smith

The office of **Marv Kay EM '63** is full of pictures, awards, plaques, books and other items associated with 47 years of involvement at CSM. So it's safe to say it might take a while to clear out now that Kay has retired as athletic director.

Kay played football and wrestled for Mines in the late 1950s and early 1960s. He was CSM's football coach for 26 seasons and still holds the School record for most wins with 84. In 1995, he became the School's athletic director.

"It's time to transition into the next phase of my life," Kay said when announcing his retirement. "I'm enjoying good health. I enjoy the association with the staff and the students. You never want to go out too early and you never want to stay too long. Hopefully, I'm somewhere in between."

It is now anticipated that it would take five years at a minimum for the industry to reach a reasonable level of efficiency and 10 to 15 years to have a modern industry with a final cost of \$30 billion.

A new engineer is now on the project stationed in Baghdad on an irregular basis, since traveling in and out of the country has become extremely dangerous. Work has slowed considerably and deadlines have been shifted

Kay's father played for Mines in the late 1930s. In fact, Kay was born when his father was a junior at CSM. The younger Kay followed suit by charting the progress of the Orediggers' athletic teams as a teenager, then by choosing to attend Mines in 1956.

Kay planned to become an engineer, but the late Fritz Brennecke, Kay's football coach at Mines, changed those plans. "I got my degree, but Fritz felt I could be a coach," Kay says. "He hired me and I found out I enjoyed it and realized it was something I wanted to pursue as a career. Fritz gave me that opportunity. Next to marrying my wife and having my family, it was the best decision I made in my life."

Collegiate athletics has changed since the 1950s. Coaches no longer coach multiple sports. Early in Kay's career, some coaches were in charge of as many as three sports at one time. Another area of change is the demands placed on student-athletes at Mines. "We are asking much more in the way of time spent athletically than ever before," Kay says. A third change is what's available to students. "The School has made tremendous strides from an administrative standpoint in the opportunities provided for athletics, physical education classes and club/recreational sports. These improvements are important to the overall university experience of our students."

One thing that hasn't changed is the demands on a coach's time. "You put in a lot of long hours. You experience the ups and downs that accompany the team successes and failures," Kay says. "But for all the difficult times, there is a positive side –



the willingness and the desire of the student-athlete to do the very best they can." Kay particularly enjoyed the daily interaction with student-athletes and their families. "I couldn't have had a better opportunity in the world than to work with the young people I've had a chance to work with. I had a chance to visit with them in their homes and meet their parents and work with them through a four- or five-year college career. That was a pleasure. Most have gone on to make successful contributions to society as citizens and professionals. I've been enriched by that experience. I hope that in some small way I contributed to their success."

In addition to Brennecke, Kay worked with two other CSM coaches who helped bring him to campus – wrestling coach Jack Hancock and track coach Joe Davies. "I took a little piece of them with me as a coach," Kay said. "I learned from everybody I played



Kay with his family and the new CSM mascot "Marv the Miner."

for from Little League through college. They were all principled men. That was the most important thing. All of them were good, family people. They were men's men."

Kay's professional life wasn't spent entirely at Mines. He was Golden's mayor for eight years and served on the city council for 12 years. He chaired Golden's Buffalo Bill Days and Oktoberfest and since 1984, has been a member of the board of the Golden Civic Foundation (a non-profit group that raises funds for local organizations). "I've always felt you should contribute something to the community you live in," Kay says. "We as citizens owe it to those who follow to leave something behind through volunteering. For the time I put into the community, I receive twice as much pleasure and twice the rewards."

Kay saw his share of ups and downs while tending to city business. He was mayor when a local volunteer firefighter was paralyzed during a rescue attempt. But he also was mayor when voters approved a new community center and a new downtown streetscape.

"What I remember most is being part of a positive city team," Kay says. "We got along well and we worked hard. Collectively, everyone was interested in making Golden a little bit better today than it was yesterday. All of those groups worked toward a common goal."

Kay will be involved, on a part-time basis, in public relations and fund-raising for Mines after leaving as athletics director.

"I'm very happy," Kay concludes. "I'm healthy. I've been blessed with a wonderful wife, family and grandkids. I've had the opportunity to live in Golden and fulfill a career at Mines. It's been a perfect fit for me. What more could a Miner ask for?"

JOHN B. BOTELHO EM '42 of Sun City, Ariz., died peacefully in his sleep Nov. 23 after a battle with colon cancer. He was 84. Botelho was an avid tennis player and played daily until one month before his death. He traveled the world as a mining consultant and spent many years in the Philippines as an exploration geologist. At one point, he and his wife owned and operated a motel in California near Ft. Bragg. Botelho is survived by his widow, Harriett, a daughter, a granddaughter, a sister and many nieces and nephews.



LEO N. BRADLEY EM '49 died April 24 in Denver after a short bout with cancer. He was 78. Bradley was an influential lawyer



and maverick land baron who helped shape Jefferson County, Colo. He was a force in the county's politics and major land dealings. Bradley was involved with a number of the area's highest profile developments and for many years tried, but failed, to build a rock quarry atop South Table Mountain. He was born in Iowa and worked for his father's coal mine before serving in the Army Air Force. After his stint in the service, he attended CSM. He then earned a law degree from University of Denver and handled mostly land-use cases. Bradley married Patricia Quaintance, a descendant of Jesse Quaintance, one of Golden's first pioneers. The Quaintance family acquired nearly 10,000 acres in Jefferson County including Red Rocks, Bear Creek and Clear Creek canyons and parts of South Table Mountain. Bradley sold several thousand acres to the county for

open-space usage. Over the years, Bradley served as a trustee for the School, a board member for the Colorado National Bank and as general counsel to Coors Brewing Company. He is survived by his widow, a daughter, a son and two grandchildren.

JOHN A. BRANDON EM '49 of Campbell River, British Columbia, died Feb. 1 surrounded by his family. He was 79. Brandon was in the mining business for 35 years doing every job from mucking to manager. After graduation, he worked for Asarco in New Mexico as mill metallurgist, miner and shift boss. He then became a jackleg



demonstrator for Atlas Copco before returning to Asarco at the Page Mine as shift boss until 1957. Brandon's next job was with Hecla Mining Company where he developed the industrial engineering department and became chief industrial engineer. He left that position to become mine superintendent at the Sunshine Mine, followed by employment in the uranium industry working for Getty Oil and Western Nuclear. In 1969 he joined Cities Service to develop and expand the Miami, Ariz., copper mine and remained there until retirement in 1979. After retirement, he had one more assignment, a tunnel project at Revelstoke. In retirement, Brandon fished and started a gun repair and custom gun building business. He later settled into hobbies and bridge playing. Brandon is survived by his wife of 59 years, Virginia, three daughters and six grandchildren.

COURTNEY E. COOK PE '49 died Feb. 19. He was 81. As a boy, Cook delivered the *Denver Post* and attended Englewood, Colo., public school. In 1936, he won the first Denver Soap Box Derby. In 1943, he



joined the Field Artillery at Fort Sill, Okla., and transferred to the Air Force in 1944 where, as a second lieutenant, he flew B-25s. In 1946, Cook married Mary Virginia Bewley after having met her in Tulsa during the war where they were both in the service. It was love at first sight. After graduation from Mines, Cook worked in the oil fields until retirement in 1989. His hobbies included restoring Chevrolts, carving wood and painting gourds. His beloved wife died in 1999. He is survived by three daughters, Carol, Melody and Tracy.

WILLIAM G. "BILL" CUTLER PE '48 died of a heart attack at his Denver home March 11. He was 81. While at Mines, Cutler was a member of Kappa Sigma fraternity. From 1942-46, he served in the Army Air Corps as a first lieutenant. His career as a manager of drilling and production operations involved several positions of responsibility including employment with Chevron (Rockies), United Geophysical, J. Ray McDermott (USA), Pacific Northwest, which merged into El Paso (Farmington and Salt Lake), Moran International (London and Bermuda), Pan Ocean (Lagos and Nigeria), Parker Drilling (Nigeria), then back to Denver with Northwest Exploration, Anschutz Corporation and finally as a petroleum consultant. Cutler loved his family. He also loved to ski, sail and most of all golf. Classmate Dave Copley PE '48 remembers, "The best way I can sum up Bill is that he was a real gentleman. He was honest, helpful and kind along with being very intelligent. I cannot recall his doing or saying anything mean to anyone." Cutler is survived by a son, a daughter and four grandchildren. His wife, Mary Lou, predeceased him.

HENRY M. EVERS MET E '35 died of pneumonia Oct. 31 at age 93. He was a resident of The Baptist Homes in Pittsburgh. Evers attended CSM on a full four-year scholarship and, according to his daughter, he felt deep appreciation for his education. Among his treasures were his college math books. Evers began his career at U.S. Steel's Duquesne Works in Pittsburgh in 1935. He excelled as a problem-solver and was sent to New Jersey



FREDERICK M. "FRED" MACLEAN PE '38 of Corpus Christi, Texas, died March 13. He was 90. MacLean was an Army veteran of World War II, a petroleum/marketing engineer with Conoco for more than 30 years, a world traveler and avid raconteur. He is survived by his widow Luella, Yorkshire terrier Pluto, sister Marie and her husband Robert France PE '36, two daughters, a son, three stepdaughters, two stepsons, five grandchildren and four great-grandchildren.



character. May is survived by his wife of 47 years, Peggy, three sons, seven grandchildren and a brother and sister.

MURRY C. MCKINNON PE '52 died Jan. 24 at age 73 of lung cancer at home in La Jolla, Calif., surrounded by his family. After graduation from Mines, where he was a member of Sigma Alpha Epsilon, McKinnon entered the Naval Graduate



School and served as a meteorologist in Hawaii and in the atomic bomb tests in Anuwetok. He then began a long and successful career in oil and gas exploration, first working for Mobil

Oil. He then held several executive posts with Central Del Rio Oil, Pan-Canadian Petroleum and other companies in the United States and Canada before forming American Energy Capital Corporation, an independent oil and gas exploration and production company in Houston. McKinnon was a long-time member and past-president of the Petroleum Club of Houston. A native Californian, he had recently retired to La Jolla. He is survived and missed by his widow, Janet, three children, five grandchildren and a brother.

DIANA L. MICHELS BSC ENG '95, MSc ENGR SYS '98 died Jan. 21 at age 40. Michels was born in Arvada, Colo., and grew up in Colorado, California and Idaho. She returned to Colorado in 1982 and attended Red Rocks Community College before earning degrees from Mines. She was married to Mark Dykes and the couple lived on Lookout Mountain in Golden where she could easily access hobbies she enjoyed including hiking, backpacking and whitewater rafting. Michels was a rafting guide in 1992 and 1993. She played clarinet, flute and piano. Michels read widely in biology and history, as well as scientific and technical subjects. She also loved to bake, especially novel dishes. According to her family, Michels was experiencing severely painful physical problems before she died from

THOMAS O. MAY GEOL E '49 died at home in Federal Way, Wash., Feb. 11 at age 83. During World War II, May enlisted in the Marine Corps and served in the Pacific as a fighter pilot, taking part in the invasion of Okinawa. He also served in Korea and was awarded the



Distinguished Flying Cross and several other medals. While at Mines, May was a member of Blue Key, Tau Beta Pi and Sigma Gamma Epsilon and belonged to numerous engineering associations. For 20 years he worked for Chevron Oil in the United States and Canada. In 1962 he was transferred to Chevron Canada as chief geophysicist and successfully directed the company's Canadian geophysical activities until 1969. He then became chief geophysicist for Hamilton Brothers Oil Company of Denver. May explored for oil and gas worldwide until his retirement in 1982. He loved the outdoors, especially the mountains, and was a dedicated scientist and a wonderful family man. Throughout his life he was known to his associates as a competent explorationist and, perhaps more importantly, a man of deeds, not just words. His outstanding life accomplishments don't begin to describe his dignity, integrity and strength of

STEPHEN V. KEARNEY BSC MIN '82 died April 2 of a stroke in Johannesburg, South Africa, at age 45. After graduation from Mines, Kearney faced a choice of coal mining in the United States or gold mining in South Africa. He chose gold and joined Gencor, where he enjoyed a meteoric rise eventually becoming general manager at two mines. He then took over Impala platinum mine and turned it into one of the world's most efficient and lowest-cost producers. Before he could be successful at Impala, he had to resolve a long-running dispute with the Bafokeng people, owners of the mineral rights. "He was very personable," says Peter Joubert, Impala's current chairman, "easygoing, casual, intensely people-oriented and very emphatic about the importance of team building." Later, Kearney was recruited by the Bafokeng tribe to head Royal Bafokeng Resources, a company whose purpose is to expand the Bafokeng people's involvement in mining. Kearney is survived by his former wife Robinn BSc Geop '81 and two children.

complications related to medication she was taking. She is survived by her husband, two sisters, a brother and her parents.

EDWIN H. "ED" MONTGOMERY ME '51 of Walnut Creek, Calif., died July 25, 2003, at age 76. Montgomery was born in San Fernando, Calif. He enlisted in the Navy for two years near the end of World War II. After graduating from Mines, Montgomery started his career as a mining engineer in the small mining towns of Leadville, Colo., and Globe, Ariz. He later worked for the Bureau of Land Management, Department of Interior and worked in the Bureau's Colorado and Washington, D.C., offices. While employed by the Bureau, Montgomery was responsible for policy development and adoption promoting public ownership, multiple land use by the



public, and appropriate public management under the Federal Land Policy Management Act. His duties involved increasing public understanding and support for the proper management of public lands. He retired from federal service in 1980. However, he kept busy with numerous jobs including consulting, being a part-time bookkeeper/accountant, and most recently writing a book about his family's genealogy. Montgomery is survived by his wife of 53 years, Shirley, a son, two daughters, eight grandchildren and a sister.

CHARLES L. "CHUCK" PILLAR EM '35 died Dec. 5 at age 92. He was retired co-founder and principal of Pillar-Lowell & Associates, a consulting firm specializing in the development of underground mining systems for mining projects worldwide. After graduating from Mines, he was a shift boss for Park City Consolidated Mines in Utah. He next joined St. Joseph Minerals Corp. in 1937, where he was promoted from foreman to mine engineer to assistant mine superintendent. In 1942 Pillar joined the U.S. Army Air Corps and served in the Pacific Theater until his honorable discharge as a major in 1945. He then joined Placer Development Ltd. and eventually became vice president of

operations until his retirement in 1975. At that time he formed Pillar-Lowell & Associates and spent the next 10 years consulting on a variety of mining projects for more than 25 companies around the world. Pillar is survived by three daughters.

JAMES R. RUSSELL PE '54 of Spring, Texas, died March 1. He was retired from Amoco Production Company, where he worked for 38 years in Wyoming, Texas, New Mexico and Egypt. Russell is survived by his widow, Lois, sons Bob, Steve, Don and Bill, four grandchildren, cousins and many friends.

MELVIN ZETZ EM '51 died Jan. 11 at his home in Grand Prairie, Texas. He was 74. Zetz served in the Korean War with the U.S. Army in Japan. He was a foreman at Crucible Steel in Midland, Texas, and was a refractories supervisor at Chaparral Steel for 20 years. Zetz was a member of Holy Trinity Serbian Orthodox Cathedral, Whitehall, the Serbian National Federation, Pittsburgh and Veterans of Foreign Wars, Grand Prairie. His wife of 33 years, Janice, a daughter and a sister survive him.



Also in Memoriam

ERNEST A. LUCERO GEOL E. '52	Jan. 12, 2004
EDWIN W. SCHULUE EM '49	Feb. 28, 2002
WILLIAM F. WARD PRE '50	Aug. 23, 2003
RUTH V. WHALEN, wife of Jerry Whalen EM '49	Jan. 30, 2004

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1949

Jerry F. Whalen EM owns Whalen & Co. in Billings, Mont.

1952

Frederick H. Wurden Geol E is retired in Yuma, Ariz.

1960

James C. Dorian Jr. EM owns San Juan Saunas in Pagosa Springs, Colo.

1961

Richard De Voro DSc Geol was elected to the board of directors of the National Mining Hall of Fame and Museum.

Myron A. Goldstein Geop E is chairman of the board for American International Ventures Inc.

1963

James A. Wood Geop E is a consultant for JAW Consulting in Delta, Colo.

1964

Frank J. Buturla Jr. EM is a project engineer for RG Consulting Engineers in Denver.

1965

C. Jefferson Babcock Met E is an independent consultant in Hampshire, Ill.

Earle M. Bagley III EM is retired in Point Venture, Texas.

James B. Huddleston Met E is president of Progressive Material Technology LLC in Galveston, Texas.

Gerald V. Jergensen II Chem E owns Tecolote de la Noche, a consulting firm in Black Forest, Colo.

Thomas L. Ross Math E, MSc Math '71 is vice president and chief information officer for American Honda Motor Company in Torrance, Calif.

Jerry D. Schulz Met E, MSc Met '68 is president of Nucleomet Systems Consulting Services in Burnsville, Minn.

1966

Richard T. Reseigh EM is project manager of the \$20 million expansion of the Fort Logan National Cemetery in Denver.

1968

James L. Lessman Geol E is senior engineering geologist for the California Department of Water Resources in Sacramento.

1969

Craig E. Moore Geop E is an explorationist for Craig Moore & Associates in Houston.

1970

Leroy F. Burson Geop E is a partner for the CLK Company in New Orleans.

Richard E. Ott BSc Met is award officer for the Colorado Department of Transportation.

1971

Jerald E. Jones BSc Math, MSc Math '74, PhD Met '79 is chief scientist for N.A. Tech Inc. in Golden, Colo.

Cooper B. Land Jr. PhD Geol is an independent consultant in Hot Springs, Ark.

David J. Mack PE is advanced senior production engineer for Marathon Oil Company in Houston.

1972

Franklin E. Grange II BSc CPR, MSc Min Ec '74, PhD Min Ec '77 is chief engineer for SPARTA Inc. in Colorado Springs, Colo.

Michael R. Hughes BSc Math is a technology consultant for IBM in Scottsdale, Ariz.

1973

George F. Sanders Jr. BSc Geol, MSc Geol '75 is an engineering geologist for Materials Testing & Consulting Inc. in Bellingham, Wash.

1974

John G. Babcock BSc Min is

project engineer for the Federal Highway Administration in Wheat Ridge, Colo.

Robert N. Benko BSc CPR is retired in Pueblo, Colo.

J. Michael Boyles BSc Geol is principal geologist at the Bartlesville Research Center for ConocoPhillips Co. in Bartlesville, Okla.

Kenji C. Farinelli BSc Geop is senior systems engineer for Lockheed Martin Information Technology in Colorado Springs, Colo.

Benton T. Kelly BSc Min is manager of mine development and expansion for Drummond Company Inc. of Jasper, Ala. His work frequently takes him to Colombia.

Stewart G. Squires BSc Geop, MSc Geop '86 is vice president of North American Exploration for Aspect Energy LLC in Denver.

1975

Joseph S. Douglas BSc Phy is a senior systems engineer for Ortho-Clinical Diagnostics in Rochester, N.Y.

Gary R. Resh BSc CPR is production manager for Astaris in Festus, Mo.

1976

Stacey K. Arnston BSc Min is chief mining engineer for Pacific Coast Borax in Boron, Calif.

Dale L. Fenwick BSc Min is chief operating officer for NHRMA in Champaign, Ill.

John W. Mack BSc Min is administrative superintendent for the Cortez Gold Mines in Elko, Nev.

Francis J. Smith BSc Geop is chief technical officer for Finesse Wireless in Livermore, Calif.

1977

David E. Dombrowski BSc Met is team leader of powder metallurgy for the Los Alamos National Laboratory in New Mexico.

Douglas C. Dutton BSc BE is a reliability engineer for the Colorado Division of Amgen Inc., a biotech

company in Hygiene, Colo.

James P. Koffer BSc Min, M Eng Appl Mech '89, P.E., is manager of Koffer Mining & Refining in Golden, Colo.

1978

Eileen E. Colleary BSc CPR is a staff project engineer for the Sundyne Corporation in Arvada, Colo.

Vincent M. De Bonis BSc CPR is an account manager for Schlumberger Oilfield Services in Houston.

Craig N. Driear BSc Geop is user support geoscientist coordinator for Esso Exploration Angola of Esso Angola Ltd.

James J. Moore BSc Met is president of Metallurgical Engineering Ltd. in Gilbert, Ariz.

Philip Saletta BSc Geol is general manager of the Dolores, Colo., water conservancy district.

Gregory J. Stuart BSc CPR is an independent consulting engineer involved with business startups in San Diego.

Michael R. Will BSc CPR is district manager for BP Pipelines in Houston.

1979

John A. Edrich BSc CPR, MSc CPR '80 is a manager for Tetra Tech FW Inc. in Denver.

James K. B. Hesketh BSc Min, MSc Min Ec '87 is vice president of RMB Resources (Caymen) Limited in Lakewood, Colo.

Timothy L. Hoops BSc Geol is chief operations manager for Kestrel Energy Inc. in Golden, Colo.

Neil J. Nabbefeld BSc Geol is director and owner of Revolution Pilates Studio in Mt. Hawthorn, Western Australia.

Elizabeth E. R. Niemtschik BSc Pet is a reservoir engineer for Xcel Energy Inc. in Denver.

Barry W. Norman BSc CPR is project manager for S&B Engineers and Constructors in Houston.

David L. Ogan BSc Min is vice president and general manager of

the eastern division for American East Explosives in Alpharetta, Ga.

1980

David W. Baker PhD Min Ec is vice president of The DIRECTV Group Inc. in El Segundo, Calif.

Craig M. Camozzi BSc Pet is co-owner of the Aspen Drilling Company in Morrison, Colo.

David M. DeSonier BSc Geop is vice president of investor relations and assistant treasurer for Leggett & Platt in Carthage, Mo.

J. Michael Liittjohann BSc CPR is marketing accounting manager for Chevron Phillips Chemical Company LP in The Woodlands, Texas.

1981

William E. Cobb BSc CPR, MSc Min Ec '89 is director of environmental services for the Phelps Dodge Corporation in Phoenix.

Perry A. Eaton BSc Geop is chief geophysicist R&D for Newmont Mining Corporation in Englewood, Colo.

Stephen C. Freeman BSc Pet is vice president of production and reservoir engineering for Unocal Corporation in El Segundo, Calif.

John D. Hartner MSc Geol is western states development supervisor for the Anadarko Petroleum Corporation in The Woodlands, Texas.

Robinn Yale BSc Geop married Sam O'Leary Nov. 30, 2002 in Johannesburg, South Africa. She is director of Equate in Johannesburg.

Michael L. Ruggiero BSc CPR is manager, global supply chain, for BP in Houston.

James H. Weber BSc Pet is a petroleum engineer for Kinder Morgan Inc. in Golden, Colo.

1982

Mehmet F. Akalin BSc Geop, BSc Math is a staff seismologist for Petronas Carigali in Kuala Lumpur, Malaysia.

Daniel R. Boltz BSc Geop is a

regional database administrator for Hunt Oil Company in Dallas.

Anne M. Cornellison BSc Min is a software developer for Environmental Strategies Consulting LLC in Lakewood, Colo.

Brian R. Disney BSc Pet is a senior petroleum engineer for Tom Brown Inc. in Arvada, Colo.

Cully R. Farhar BSc CPR is consent decree program manager for the ConocoPhillips Company in Houston.

Michael J. Foley BSc Geop is technical exploration manager for Shell Petroleum Development Company of Nigeria.

Todd M. Lasnik BSc Pet is a petroleum engineer with Anschutz Exploration Corp. in Denver.

Marcia L. Talvitie BSc Geol is an aggregates manager for Old Castle SW Group Inc. in Durango, Colo.

Shawn M. Yasutake BSc Geol is a high school science teacher and swimming and volleyball coach in Fort Lupton, Colo.

1983

James E. Banaszak BSc Met is senior managing engineer for Exponent Inc. in Wood Dale, Ill.

Michael B. Curto BSc Met is project engineering group leader for Rayonier Performance Fibers LLC in Jesup, Ga.

Kent A. Friesen BSc Geol, MSc Geochem '90 is an environmental consultant for Parsons Infrastructure and Technology Inc. in Cheyenne, Wyo.

David B. Jensen BSc Pet is vice president of engineering for Layne Energy Inc. in Overland Park, Kan.

Peter W. Miller MSc Met is a financial consultant for A.G. Edwards & Sons Inc. in Bethlehem, Pa.

1984

Dennis E. Arbogast BSc Eng is program manager for the URS Corporation in Denver.

Bobby D. Brady Jr. BSc Pet is an engineer for Medicine Bow Energy Corporation in Centennial, Colo.

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e-mail: csmc@nextrgen-group.com

William H. Dears BSc Min is division manager for Patten Industries in Elmhurst, Ill.

Gerald F. Froese BSc Min is senior traffic engineer for British Columbia Ministry of Transportation in Victoria, British Columbia, Canada.

John F. Mueller Jr. BSc Geop is a development review engineer for the Public Works Department in Tulsa, Okla.

Michael L. Stewart BSc Pet is vice president and operations manager for Permian Resources Inc. in Midland, Texas.

1985

William A. Gilbert BSc Pet, MSc Pet '90 is vice president of consulting services for Statera in Lakewood, Colo.

Gregory A. Gurs BSc Pet is vice president of Gettler-Ryan Inc. in Rancho Cordova, Calif.

Roy A. Kemp BSc CPR is an engineering representative for ConocoPhillips in Houston.

Rachel W. Obbard BSc Phy is a graduate student at Thayer School of Engineering at Dartmouth College in Hanover, N.H.

1986

Todd E. Banks BSc Pet is principal of the Blackthorn Investment Group in Overland Park, Kan.

Lewis D. Dennis BSc Pet is lead facilities engineer for Unocal Alaska in Anchorage.

J. Scott Hass BSc Eng owns JSH & Associates in Parker, Colo.

Jacques D. Kern Jr. BSc Pet is vice president of operations for TRC Companies in Cypress, Texas.

John G. Kunkle BSc Min is a lieutenant colonel and brigade operations officer for the U.S. Army in Lawton, Okla.

Scott A. Malson BSc Pet is trustee for the Malson Family Trust in Westlake, Queensland, Australia.

Gregory E. McIntosh BSc Pet is manager of production engineering for the DJ Basin for the Kerr-McGee Rocky Mountain Corp. in Evans, Colo.

Matthew J. McKeon BSc Pet is

a technical adviser for Halliburton Energy Services in Carrollton, Texas.

Kevin L. Mosser BSc Geol founded Mosser Mining & Minerals LLC in Thermopolis, Wyo.

Jeffrey A. Osborn BSc Min is an engineering manager for TXU Energy in Castle Rock, Colo.

Julianna M. Stansbury BSc Math is a teacher at Bear Creek High School in Denver.

1987

Linda A. Battalora BSc Pet, MSc Pet '88, Esq., is associate general counsel for the Grynborg Petroleum Company in Greenwood Village, Colo.

Rita R. Beale MSc Min Ec is vice president of First Choice Power in Fort Worth, Texas.

Lana C. Cullon BSc CPR is a senior process engineer for Wynnewood Refining Co. in Wynnewood, Okla.

William F. Mallett III BSc Geop is geophysicist adviser for Unocal Thailand in Pakkret, Nonthaburi.

Kathryn F. Miks BSc Chem coaches volleyball at Columbine High School in Littleton, Colo.

Harold K. Snyder Jr. BSc Eng is a project engineer for the Federal Aviation Administration in Renton, Wash.

Melanie Marquardt Westergaard BSc Geop is a geology team leader for BP in Surrey, United Kingdom.

Purnomo Yusgiantoro MSc Pet, PhD Min Ec '88 is minister of energy and mineral resources for the Department of Energy and Mineral Resources for the Republic of Indonesia in Jakarta. He is also president of the conference and OPEC secretary general in Vienna, Austria.

1988

Samuel Chang BSc Pet, BSc Geop is senior production engineer for the EnCana Corporation in Calgary, Alberta, Canada.

Joseph C. Kordziel BSc Eng is president of Kordziel Engineering Inc. in Golden, Colo.

Nicolas Lacouture BSc Min received a master of business administration in finance and strategic planning from Rice University in Houston May 8.

Frank K. Mazdab BSc Geol, BSc Chem is a staff mineralogist at the U.S. Geological Survey - Stanford Ion Probe Laboratory in Stanford, Calif., where he assists outside users with sample preparation and characterization and researches trace elements and metasomatism.

1989

Keith R. Amann BSc Math is a software engineering manager for the SpectraLink Corporation in Boulder, Colo.

Linda N. Bliss BSc Chem is operations coordinator for Corning Incorporated in Danville, Va.

Robert L. Elliott BSc Geop, MSc Geop '92 is a petrophysicist for BP Trinidad & Tobago.

Betsy L. LeaRussa BSc Eng is pipelines and terminals functional excellence lead for ConocoPhillips in Fort Collins, Colo.

Diana L. Moss PhD Min Ec is vice president and senior research fellow for the American Antitrust Institute in Boulder, Colo.

Lorinda A. Schwab BSc CPR is a facilities engineer for BP America Inc. in Farmington, N.M.

Jeffrey C. Thomas BSc Geol is an engineer in the water rights permitting and availability section of the Texas Commission on Environmental Quality.

Karri E. Unruh BSc Math is a project manager for Aegis Analytical in Lafayette, Colo.

Paul R. Williams BSc Pet is a reservoir engineer for Marathon Oil Company in Houston.

Betty J. Wilt BSc Geol is a forest highway engineer for the USDA Forest Service at the Tongass National Forest in Alaska.

1990

Jennifer BSc Geol and **Joel Day BSc Eng '95** announced the birth of their second child, Nicole, born

Sept. 8, 2002. She joins brother Bradley, who is 6.



David B. Hummer BSc Min is a graduate student at CSM.

Christopher M. Sellstone MSc Geochem is a senior process engineer for Corning Incorporated in Danville, Va.

Michael L. Ziegler BSc Eng is mountain states regional manager for SimplexGrinnell in Denver.

1991

Joseph H. Katz PhD Math is senior analytical consultant for SAS Institute Inc. in Cary, N.C.

Bryan Mortimer BSc Min is assistant mine manager for Solvay Chemicals in Green River, Wyo.

Scott A. Musson BSc Math is an engineering manager for BEA Systems Inc. in Boulder, Colo.

David G. Ray BSc Eng is a major and a combat engineer in the U.S. Army.

Henri (Rick) Sandri PhD Min Ec was named to a three-person advisory board for Franklin Mining Inc. to help the company identify opportunities and acquisitions. He is a senior associate with Behre Dolbear & Company Inc.

Tanya M. ten Broeke BSc Eng is an associate veterinarian for Willamette Valley Equine Surgical and Medical Center LLC in Aurora, Ore.

1992

Andrew P. Espenscheid BSc CPR is manager of mask services for freescale semiconductors for Motorola in Austin, Texas.

Hans C. Hoppe BSc Eng is application development manager for Perot Systems Corporation in Cedar Rapids, Iowa.

Joshua F. Olmsted BSc Min is a mine superintendent in Chile.

Samuel A. Rasmussen BSc CPR has been living in northern Chile for the past three years with his wife,



Marny, and three children, Zach, Zane and Emma, the latest addition born July 7, 2003 in Santiago. Rasmussen is process plant manager for Phelps Dodge Mining Company in the El Abra mining operation near Calama, Region II.

David K. Roberts BSc Pet is international operations manager for PanOcean Energy in Winchester, Hampshire, United Kingdom.

1993

Jacob R. Hadix III BSc Pet is a trader for Calpine Energy Services in Houston.

John R. Hulme MSc Pet is manager of corporate planning for Santos Limited in Adelaide, Australia.

Carl A. Lakner BSc Pet is an operations manager for Schlumberger Oilfield Services in Tengiz, Kazakhstan.

Howard A. Roepnack BSc Eng is lead mechanical engineer for Melco Embroidery Systems in Denver.

Chad C. Soliz BSc Geop is a patent attorney with Chad C. Soliz LLC in Loveland, Colo.

Mark S. Woempner MSc Math, PhD Math '94 has retired from the U.S. Army as a lieutenant colonel after 22 years. He is a program manager for Lockheed Martin Corporation in Boulder, Colo.

1994

Daniel P. Jones BSc Geop, MSc Geop '97 is a senior geophysicist for Norcal Geophysical Consultants in Petaluma, Calif.

Eric S. Kolstad BSc Pet is senior drilling engineer for Williams

Production RMT Co. in Denver.

Kevin M. Moore BSc Eng is a mechanical engineer for Jacobs Engineering in Golden, Colo.

Linda B. Murray MSc Env Sc is program manager for Parsons Engineering Science Inc. in Norfolk, Va.

Douglas E. Schwenke BSc Eng is vice president of JDS-Hydro Consultants Inc. in Colorado Springs, Colo.

1995

James W. Barron BSc Geol, MSc Geol '98, PhD Geol '03 is a senior geologist for ExxonMobil Corporation in Spring, Texas.

Anna C. Hanley BSc CPR is director of on-campus recruiting in the CSM career center.

Brian L. Haverland BSc Min is a mine foreman for Newmont Mining Corporation in Carlin, Nev.

Haiyan Liu BSc CPR and husband, Bibo Chen, announce the birth of a son, Jonathan, born last year. Liu is a senior engineer for Alliance Engineering in Houston.

Lisa Nuttleman Gassam BSc Geop and husband, George, announce the birth of son Tyler, Sept. 5. Lisa and George were married in Hawaii in 2002.

Jane E. Elkins Rabinovitch BSc CPR is product development manager for Masterfoods USA in Redondo Beach, Calif.

Erik I. Rylander BSc Eng is OBMI & PEX product champion for Schlumberger, Ltd. in Clamart, France.

Patrick Sewell BSc Met and

Page Elisabeth Wright were married June 13, 2003 at their home in Monte Vista, Colo. They were expecting their first child in May.

Jeffrey K. Weeder BSc Met is an engineer for Galloway, Romero & Associates in Englewood, Colo.

Keith L. Woodburne BSc Geol is a project manager for TEC

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Accutite in San Francisco.

1996

Susan F. Aberle BSc CPR is a senior process engineer for Malvern Instruments in Southborough, Mass.

Leslie J. Armentrout BSc Pet is a petroleum engineer for ChevronTexaco Overseas Petroleum Inc. in Bellaire, Texas. She earned an MBA from the University of Texas at Austin in 2003.

Ramon C. Bargas BSc Eng is a member of the technical staff at Lucent Technologies Inc. in Phoenix.

Christine G. Bartlett BSc Geol, BSc Eng and **Bryan J. Burinda BSc Eng '94** were married May 3 in Evergreen, Colo. Bryan is a technical adviser for Halliburton Sperry-Sun and Christine is RTO support manager for Halliburton. They live in Houston.

Eric C. Eccleston MSc Met is a senior process engineer for the Technip USA Corporation in Claremont, Calif.

Jennifer Gadberry Hadrys BSc CPR is a process engineer for TJ Cross Engineers Inc. in Bakersfield, Calif.

William A. Hadrys III BSc CPR is an account manager for Baker Petrolite in Bakersfield, Calif.

Nicholas F. Hernandez BSc CPR is project engineer for Jones & Carter Inc. in The Woodlands, Texas.

Debra Pacas Johnson BSc CPR, MSc Met '98 is a graduate student in metallurgy at CSM and is also a technical staff member for the Los Alamos National Laboratory in New Mexico.

C. Jason Pinto BSc Pet is a senior deepwater drilling engineer for Unocal Indonesia Company in Jakarta.

Alex V. Siler BSc Eng is a senior aeronautical engineer for Lockheed Martin Aeronautics in Palmdale, Calif. He passed the Professional Engineer's exam in February.

Raul D. Varela BSc Eng is a fund manager for Elite Asset Management in Denver.

1997

Scott S. Birkmire BSc CPR is a project manager for the Department of Energy in Frisco, Colo.

Angela M. BSc Geop and **Bryan C. Danner BSc Eng** are field engineers for Kiewit in Pueblo, Colo.

Randy G. Edelen BSc Eng is a project engineer for J-W Operating Company in Wray, Colo.

Jeannine L. Ernstberger BSc Geol is a project engineer for Goodbee & Associates Inc. in Golden, Colo.

Shauna Goodnough BSc CPR married Desmond J. Murphy Oct. 26, 2002. The couple resides in Grand Junction, Colo., where Shauna is a senior field engineer with Halliburton Energy Services.

Tiffany A. Horn BSc Geop is a senior geophysical analyst for Kerr-McGee Rocky Mountain Corp. in Denver.

Megan Keefe BSc Eng married James Rase Dec. 5 in Glen Haven, Colo. The couple resides in Irvine, Calif., where Megan is a project engineer at Hunsaker & Associates.

Marc P. Oettinger MSc Env Sc is a graduate student at Babson College in Babson Park, Mass.

Yan E. Petchatnikov MSc Min Ec is an energy trader for TransAlta Energy Marketing in Calgary, Alberta, Canada.

Jennifer L. Ramsey BSc Eng married Ryan Meredith Jan. 10 in Boise, Idaho. Maid of honor was **Christie Briscoe BSc Econ '96**. Also in attendance were **Vinay Shah BSc Eng, Michelle (Sciera) Shah BSc CPR, Dave Crichton BSc Eng** and **Meredith (Stevens) Crichton BSc Eng '98**.

Eric Donald Smith BSc CPR is a senior design engineer for Lockheed Martin Corporation in Sterling, Va.

Robert J. Spang MSc Geol is an advanced geologist for the Unocal Corporation in Sugar Land, Texas.

Jodi L. Varela BSc Math, BSc Eng is an engineer for Level 3 Communications Inc. in Broomfield, Colo.

Elizabeth J. Young-Dohe BSc Met, PhD Mat Sc '01 is director of customer service for NanoProducts Corporation in Lakewood, Colo.

1998

Jennifer C. Biesterfeld MSc Env Sc, PhD Env Sc '01 is an environmental scientist for Integra Engineering in Denver.

Virginia D. Carroll BSc CPR is a process engineer for Pharmar Engineering in Boise, Idaho.

Emily A. Chastain BSc Geol is a geochemist for Barrick Gold Corporation in Vancouver, British Columbia, Canada.

Sophie T. Cramer BSc Geol is an independent consultant in Perroy, Switzerland.

Aaron B. Dixon BSc Eng is a captain in the U.S. Army in Fort Knox, Ky.

Michael P. Dolan MSc Geochem is a senior petroleum geologist for ExxonMobil Exploration Company in Houston.

Grant D. Erdmann BSc Math received a master's in mathematics from the University of Minnesota in 2003. He is a research mathematician for Air Force Research in San Antonio.

Heather J. Hernandez BSc Eng is a transportation engineer for HNTB Corp. in Houston.

Ronald R. LePlatt Jr. MSc Env Sc is a senior environmental engineer for Western Gas Resources Inc. in Denver.

Brian J. Philippus BSc Math is a programmer analyst consultant for the Nevada Power Company in Las Vegas.

Richard A. Putnam BSc CPR is an aromatics commercial specialist for Chevron Phillips Chemical Company LP in The Woodlands, Texas.

Stephen I. Suharya BSc Min is managing director for Baratrans

International Shipping in Jakarta Pusat, Indonesia.

1999

Samuel M. Brubaker BSc Eng is a consultant for Holcim Group Support Ltd. in Holderbank, Switzerland.

Bason E. Clancy BSc Phy is a research assistant for Duke University in Durham, N.C.

Mohan B. Dangi BSc CPR, MSc Env Sc '02 is consultant and co-PI for the Global Pathways Project at CSM.

David W. Frazier BSc Eng is assistant project manager for Ledcor SD Construction in San Diego.

Ruth M. Harper-Arabie MSc Env Sc, PhD Env Sc '02 is an assistant professor of environmental toxicology at Western Washington University in Bellingham.

Peter D. Harriman BSc CPR is an operations engineer for BP in Cypress, Texas.

Tiffany L. Kochis BSc Math & Comp Sci is a database and web systems team leader for the URS Corporation in Denver.

Michelle M. Lyon MSc CPR is a consultant for Accenture LLP in Denver.

Susan A. Rainey BSc Eng is a quality assurance and quality control manager for Envirocon in Casper, Wyo.

Kelly Nikel Reiber BSc Pet is a production engineer for EOG Resources Inc. in Corpus Christi, Texas.

Elizabeth (Fischer) Stengl MSc Env Sc is district environmental manager for BFI Waste Systems of North America Inc. in Commerce City, Colo.

Carrie A. Wildin BSc Eng, BSc Econ is a project engineer for ConocoPhillips in Billings, Mont.

2000

Leslie A. Baca BSc Eng received an MBA from University of Colorado in 2003. She is an engineer and scientist for the Boeing Company in Colorado Springs,

Colo.

Kim D. Blair BSc Eng is a transportation engineer for PBS&J Corporation in Greenwood Village, Colo.

Shane Gagliardi BSc Pet was married in Trinidad, Colo., in 2000. His wife is named Kat.

Cara A. Liverant BSc Eng married Justin Phillips June 2003 in Littleton, Colo.

Dax C. Routh BSc Pet is a drilling engineer for EPI Consultants in Houston.

D. Robb Sparks BSc Phy is a captain in the U.S. Army serving in Iraq.

Kelly T. Taga BSc Chem is a consultant at Accenture in Denver, Colo.

Chontel Trujillo BSc CPR is an environmental engineer and a project manager for IBM in Boulder, Colo.

Gordon A. Trujillo BSc CPR is a consultant at Accenture in Denver.

2001

Robert A. Aikman II BSc Eng is a first lieutenant in the Air Force serving in Afghanistan. He and his wife, **Michelle BSc Chem Eng '02**, live in Tampa, Fla., where she is an engineer with Cargill Inc.

Tanya K. Barb BSc Pet, MSc Eng & Tech Mgmt '02 is a teacher for Denver Public Schools.

Nathaniel C. Barnes BSc Eng is a staff engineer for Global Aerospace Corporation in Altadena, Calif.

Viki Renae Binstock BSc Chem Eng is a first lieutenant and a company executive officer in the 565 Engineer Battalion for the U.S. Army.

A.J. Colianni BSc Math & Comp Sci was married Dec. 8, 2001 in Wayzata, Minn. His wife's name is Sonja.

Jennifer L. Ehler BSc Math & Comp Sci, MSc Eng & Tech Mgmt '03 is a pay technician for the National Business Center in Denver.

Brett J. Maughan BSc Geol is an independent designer and director

in theatre in Colorado Springs.

Gregory P. Milligan BSc Pet is a consultant for Science Applications International Corporation in Houston.

William T. Parker BSc Econ, BSc Eng, MSc Eng & Tech Mgmt '03 is a systems engineer for Lockheed Martin Integrated Systems and Solutions in Colorado Springs, Colo.

Tracy Marie Perry BSc Eng is an associate for Wiss, Janney, Elstner Associates in Lakewood, Colo.

Jennifer (Kramb) Rivers BSc Min was recently promoted to the rank of captain in the U.S. Army. She currently serves with the 1st Infantry Division in Tikrit, Iraq.

Erik C. Ronald MSc Geol is a geologist for the U.S. Bureau of Indian Affairs in Lakewood, Colo.

Theodore L. Royer BSc Geop is a geophysicist for Prism Seismic Inc. in Centennial, Colo.

Richard P. Spainhour MSc Min Ec is an operations research analyst for the U.S. Army in Seaside, Calif.

2002

Travis N. Attanasio BSc Eng is staff engineer for Brockette Davis Drake Inc. in Dallas.

Michael A. Bazar BSc Eng is a sales supervisor at Best Buy in Lakewood, Colo.

Amber N. Brinson BSc Chem Eng is a project manager for Severn Trent Laboratories in Corpus Christi, Texas.

Jennifer M. Cambron BSc Chem Eng is an independent consultant in Aurora, Colo.

Robert A. Cambron II BSc Eng is an engineer for Knott Laboratories in Centennial, Colo.

Jonathan B. Casten BSc Min is a mine engineer for Kiewit Mining Group Inc. in Bremond, Texas. He was married June 2002 in Ft. Collins, Colo. His wife is named April.

Christopher C. Fischer BSc Met & Mat Eng is a graduate student at MIT.

Eva Maria Gomez MSc Min Ec

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is a technical assistant for Gaffney, Cline & Associates in Houston.

Christopher J. Good BSc Eng, MSc Eng & Tech Mgmt '03 is a mechanical and radiological engineer for Alpha Group & Associates LLC in Broomfield, Colo.

Adam D. Goodworth BSc Eng is a graduate student at CSM

Jeffrey L. Hampton BSc Eng is an assistant field inspector for Nolte Associates Inc. in Englewood, Colo.

Martin R. Jertson BSc Eng is a test engineer for Ping Inc. in Phoenix.

Sandy J. Lindholm BSc Math & Comp Sci married **Donald F. Fecko II BSc Math & Comp Sci** April 3 at



Regis Jesuit High School.

Barry E. Miller BSc Econ is president of Economatrix in Littleton, Colo.

Zachary T. Miller BSc Chem Eng is a consultant for TTS Performance Systems Inc. in Aurora, Colo.

Leslie A. Piggott BSc Chem Eng is pursuing a Ph.D. in pharmacology at University of Texas Health Science Center in Houston.

Jennifer J. Ray BSc Chem, BSc Eng is an environmental engineer for URS Corporation in Portland, Ore.

Michael B. Swartzlander BSc Eng, MSc Eng & Tech Mgmt '03 is a project engineer for Circle of Light, a non-profit organization working to bring electricity to remote parts of Africa.

David M. Weaver BSc Eng, BSc Eng is a project engineer for Zimmerman Metals Inc. in Denver.

Marissa N. Zufall BSc Eng is a water resources engineer for the URS Corporation in Westminster, Colo.

2003

Andy Aakhus-Witt BSc Phy is a manufacturing technician for Dentsply Friadent CeraMed in Lakewood, Colo.

Abigail S. Bazin BSc Chem is a graduate student at Stanford University in California.

Justin Carlson BSc Eng is a graduate student at CSM.

Youyi Cheng Pro MSc Pet Reservoir Sys is an exploration geologist for Dongsheng Petroleum Company in Shandong Province, China.

Jon M. Collis MSc Math & Comp Sci is a graduate student and teaching assistant at Rensselaer Polytechnic Institute in Troy, N.Y.

James L. Enright BSc Eng is an electrical engineer for Belfay Engineering in Denver.

Daniel Fernandez-Garcia PhD Env Sc is a post-doc at the Polytechnic University of Valencia in Spain.

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John E. Hillert BSc Chem Eng is a process engineer for ESSROC Italcementi Group in Nazareth, Pa.

Joshua M. K. Hodsdon BSc Eng is a project engineer for CLC Associates in Greenwood Village, Colo.

Chip D. Karo BSc Eng is a project engineer for Ames Construction in Aurora, Colo.

Saki Krishnamurthy PhD Met & Mat Eng is a mechanics and materials engineer for Exponent in Philadelphia.

Matthew A. Larson BSc Eng is a design engineer for JR Engineering Ltd. in Colorado Springs, Colo.

Joanna Poeck BSc Min is a mine engineer for the Hibbing Taconite Company in Hibbing, Minn.

Jonathan A. Roberts BSc Geop is a junior field engineer for Schlumberger Well Services in Victoria, Texas.

Joshua S. Rogers BSc Eng is a field engineer for Ground Engineering Consultants Inc. in Commerce City, Colo.

Brittany R BSc Chem Eng and **Nathan K. Rothe BSc Eng** are environmental specialists for the Florida Department of Health in Naples, Fla.

Adam D. Sallee BSc Eng is a field engineer for Schlumberger in Villahermosa, Mexico.

Maria T. Sanchez MSc Min Ec is a tariff analyst for Bentek Energy LLC in Lakewood, Colo.

Kyle A. Sandburg BSc Eng is an analyst for Accenture LLP in Seattle.

Casey A. Spicer BSc Eng, BSc Eng is a transportation engineer for HDR Engineering Inc. in Denver.

Jamie Stadlander BSc Eng and **Andrew Headley MSc Eng & Tech Mgmt** were married March 27 in



Las Vegas. Jamie is a civil engineer with PBS&J in Chantilly, Va.

Torlarp Suppawatcharobon M Eng Pet is a petroleum engineer for the Unocal Corporation in Bangkok, Thailand.

Andrew S. Tripp BSc Min is a mining engineer for Glamis Gold Ltd. in Durango, Colo.

Corey B. Warren BSc Eng is a second lieutenant in the U.S. Army.

Brent L. Whitcomb BSc Eng is a bridge inspector for FHWA-CFLHD in Golden, Colo.

Hector A. Wills MSc Pet is an ingenieria de perforacio for Petroleos de Venezuela PDVSA. in Maturin, Monagas, Venezuela

Ethan K. Young BSc Math & Comp Sci is a programmer for QuantumPM in Golden, Colo.

Joseph P. Zufall BSc Eng, BSc Eng is a project engineer for the M.A. Mortenson Company in Westminster, Colo.



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Income-Generating Gift Plans	Cash, stocks, bonds, mutual funds, real estate	<ul style="list-style-type: none"> Avoidance of capital gains tax Partial income tax deduction 	Variable or fixed income to donor and/or others for life or a term of years	Value of assets at termination of plan
Deferred Inheritance Trust	Assets with high potential for appreciation	<ul style="list-style-type: none"> Avoidance of estate or gift tax Increased control over distribution of estate to heirs 	Income to Mines for a specified period with principal returned to heirs	Value of income stream during specified period
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