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Steel Research Center Comes of Age,
by Ellen Glover

Mines campus an unlikely spot for research into smokestack industries

Sketches: China’s Grand Old Man of Geophysics.
Professor Gu Gongxu recalls his days as a graduate student at Mines in the 1930s.

Global Insight: Professor learns about smugglers and tourists,
by Dr. Eul-Soo Pang

New Technologies for Environmental Protection.
Mines alumnus develops a new technique to decontaminate hazardous waste.
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SUCCESS TASTES SWEET,\textit{ especially after a long battle or tough project.} George Krauss is savoring the success of wearing his five-year-old Advanced Steel Processing and Products Research Center at Mines from a $575,000 national science foundation grant to a financially independent organization sponsored by 20 American and Canadian steel producers and users. Krauss, 56, AMAX Foundation professor of physical metallurgy at Mines since 1975, is also director of the steel center. The center is recognized by industry leaders as one of the nation’s premier steel research centers because they can no longer individually support research and development spending levels of the past.

Krauss explained the steel research facility is performing a broad-based research effort with programs directed to sheet, plate, bar and special alloys. Of special interest is formability of coated sheet steels which include corrosion-resistant steels that are stamped by automotive makers into car bodies and components.

Graduate students in the Golden lab use sophisticated mechanical test equipment tied to computers to stress the coated steels to their limits, until they fracture or deform. The center’s engineers then analyze the steels under electron microscopes to determine the microstructural basis of the deformation and fracture. Other state-of-the-art projects include investigating ultralow-carbon vacuum-degassed steels with outstanding formability; direct cast strip steels which require no hot rolling; carburized steels with fatigue strengths more than double those reported for existing steels; new direct-cooled forging steels; and hot deformation processing of Alloy 718, a special forging alloy widely used by the aerospace industry. Another project, under the direction of Professor Matlock and the subject of Mike Riendeau’s M.S. thesis, has led to a patent for discoveries which improve the formability of stainless steel wires for fasteners.

Strong praise for research

Testimony to the center’s high-quality researchers comes freely from sponsors like Dr. Terry Mohr, research director at Timken, one of the original sponsors of the Mines program.

"While it is difficult to manage 19 to 25 graduate students and their projects with any success, Mines has developed a unique research center which gives sponsors answers to technical questions. One thesis builds on the next which reflects well on the professors at Mines," he said.

Another sponsor pays $35,000 a year to have a financially independent organization sponsored by five to seven years to nearly ten years, and prevent corrosion. Ronald Knapitzer, supervisor of sheet metal engineering at Chrysler, says Delts’ work is very practical, yet fundamental for the automobile manufacturer.

A cure for rust

Scott Deits, another graduate student and a 1984 Mines graduate, is working on a project which will ultimately help car manufacturers choose the best kind of coated sheet metal to extend the life of vehicles. He says the research sometimes raises more questions than it answers, “but it will be good to get back to the working world.” He says he enjoyed his three years at Timken and would like to return there to put his research into practice.

Mohr says his company is searching for a means to make its bearings smaller while retaining the properties of larger bearings. The same research could be applied to gears which would open up markets in power transmission systems like auto and truck axles, or off-road vehicles.

Timken is sponsoring Kirk Erven, a graduate student and former Timken employee, for an additional $35,000 beyond its Steel Center sponsorship to simulate bending fatigue on gears like those found in an automobile transmission. The gears are carburized, and Erven’s work demonstrates how to achieve better performance with eight different steels. Timken believes Erven’s research will enhance their share of the market for bearings and gears.

Erven is a graduate of Ohio State University and worked for Timken for three years before coming to Mines. He likes the relationship between Mines professors and graduate students, and the surprising ability on the part of the sponsors to share information.

He will finish his thesis in May if all goes well and the research can be wrapped up to a satisfactory point. He smiles when he says the research sometimes raises more questions than it answers, “but it will be good to get back to the working world.” He says he enjoyed his three years at Timken and would like to return there to put his research into practice.

continued on page 7
Wanted: graduate students with interest in steels.

The Advanced Steel Processing and Products Research Center (ASPPRC) at the Colorado School of Mines is rapidly becoming the largest university research effort in the United States devoted to steel research, and continually needs new waves of graduate students in its research programs.

At least ten openings will develop by late summer when current students finish advanced degrees. The Center hopes to attract graduate students with experience in the production and use of steels and other advanced materials. This process has already begun.

For example the Center has attached:

- Karl Gralid (B.S., New Mexico Institute of Mining and Technology) who has entered an M.S. program from the Chaparral Steel Company.
- Diane Wibulsky’s (B.S. and M.S. University of Toronto) who entered a PhD. program from DOPASCO Incorporated.
- Kirk Erven (B.S. Ohio State University) entered an M.S. program from The Timken Company.
- Bob King (B.S. Michigan Technology University) has entered a PhD. program from the Allison Gas Turbine Division of General Motors.

“We welcome SME alumnus to consider similar opportunities for graduate work. An annual stipend of about $11,000 and full tuition are provided. Unique to the operation of ASPPRC are the seminar program reviews where technical representatives from center sponsors gather to interact with SME staff and students. Projects are evaluated, new research is proposed, and dinner at the Buffalo Rose, Senior Frogs, or other outstanding downtown Golden restaurant follows,” said Prof. George Krauss.

For more information call (303) 273-5774.

Research Faculty Grows with Steel Center

It’s a little hard to believe the 52-year-old man sitting at the electron microscope is an assistant professor in the Metallurgy Department, but Steve Thompson is one of the newest members of the faculty, and is attracting attention and substantial grants.

Thompson’s research interests are concerned with the interrelationships between processing, properties and microstructures of steel products with particular emphasis on alloy development and mechanisms of microstructural change. He came to Mines in 1986 on a post-doctoral assignment with the Steel Research Center to help students with their work in microstructures.

The Pennsylvania native says he likes Colorado and the focus of the Steel Research Center. While he looked for positions elsewhere following his post-doctoral work he wanted to establish room at Mines because “in the area of physical metallurgy of steel (products) this is one of the strongest, if not the strongest, programs in the United States as I see it,” he said.

In November the Steel and Society (ISS), a nationally recognized professional society, awarded Thompson a grant worth $50,000 annually for three years. This is the third ISS grant awarded to young professors for their involvement with steel research, especially undergraduate students, "enables them to effectively sell the excitement of the new high tech steel industry." According to the ISS, the goal of the society’s Ferrous Metallurgy Grant Program is to enhance the base of trained individuals in the industry.

This grant, combined with funding from the Steel Research Center sponsors for five years, is giving the Metallurgy Department the breadth they need in their faculty, and at the same time the financial support to compete in research projects. Thompson credits Professors Matlock and Krauss with using an imaginative approach to bringing on a young faculty member with the hope that it will develop into something very positive for the school.

Dr. Steve Thompson

Dr. Chester Van Tyne

continued from page 2

Fortunately we’ve built in a lot of safety factors in the way we build cars, and with reasonable care can last longer. We are trying to design a car with a considerably longer life as we use more and more corrosion products. Cars should last now twice as long as cars built in the late 1970s without a lot of galvanized protection which is a big asset to the consumer. Cars should not be a disposable commodity—people want to keep their cars.”

Krauss said that Deits’ work mirrors Chrysler’s research on an alloy form of galvanized steel they intend to use on two new vehicles. Chrysler labs are also working on deformation of coating, relation measurements, damage to coatings, and comparing coating available in sheet products.

“Like all good research, what Scott is discovering will lead to new projects and new opportunities for either himself or new students because we are just scratching the surface in understanding these new coatings,” he added.

Close relationships

Krauss says one of the best benefits of the steel center is the close relationships between the students and the supporting institutions, including Chrysler. “In the last year we have had a number of students working with a Chrysler related project both in Golden and at Chrysler’s home office. We’ve seen the students’ tops-notch reputation and we heard that to recruit or identify talent for our engineering groups. It’s one of the best ways to find future Chrysler engineers,” he smiled.

Comments like that are exactly what Krauss and Matlock like to hear. Continued interest by major corporations will fuel the Advanced Steel Processing and Products Research Center for the next decade, while alumni like Erven and Deits will provide the necessary tie to Mines for graduate students and future research projects.
China's Old Man of Geophysics

An interview with Professor Gu Gougu
Past Chairman of the Chinese Geophysical Society

by Ken Larner
President, Society of Exploration Geophysicists

Editor's Note: As President of the Society of Exploration Geophysicists (SEG), Dr. Ken Larner, Charles Henry Green Professor of Exploration Geophysics at Colorado School of Mines, conducted this interview of Professor Gu Gougu. Gu was past chairman of the Chinese Geophysical Society and is currently professor emeritus of the Chinese Academy of Sciences. The interview was conducted on August 25 in Beijing, at the Hotel in Beijing. Virtually every interviewee was such a joy and so easy to talk with as Professor Gu, a noted and respected geophysicist, on assignment for Mines Magazine to interview China's most highly rated and respected geophysicist, Professor Gu Gougu. Professor Gu, who is past chairman of the Chinese Geophysical Society and who was recognized as honorary member of SEG at its annual international meeting in November 1988, is a Mines alumnus, having received an M.S. degree in exploration geophysics in 1936.

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When you were talking about how you came to be so interested and respected in this field after such humble beginnings, you said that you had been a chance in part, but I think very much so from the love and dedication you have for this field. When did you then go back to the university? Did you ever go back to the university to join a faculty, or just to teach when the opportunity arose?

Just teach. I was supposed to be a research professor in the Institute of Geophysics of the Science Academy. In 1950 or 1952 when the Institute of Geophysics of the Academy of Science was organized, I was supposed to be its vice-director. Then in 1952 I was asked to be the director of the geophysics branch of the Ministry of Geology. Normally I was supposed to be working in the Academy of Science, but actually most of my business was in the Ministry of Geology.

What would you most like to see happen for geophysics in China?

We have to do research in the technology first. I think the Ministry of Geology has about 100 crews, and 300 in geology in China and sometimes I would go back to teach a course. There were lots of students. Always I would find some time to teach. I was working for the Ministry of Geology, the Bureau of Geological Prospecting.

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Did you ever go back to the university to join a faculty, or just to teach when the opportunity arose?

Yes. In this country most of the geophysicists are engineers. They are short of ideas. They graduated from high school and went to one of the geology colleges, and their background in physics is not sufficient. Sometimes it is very difficult to support because the results may not pay off for ten years or more. I've always seen this kind of problem in earthquake prediction. They look for easy solutions. Anything anomalous will mean that it is some kind of precursor to an earthquake. We must look to deep science from deep inside the earth.

When you were talking about how you came to be so interested and respected in this field after such humble beginnings, you said that you had been a chance in part, but I think very much so from the love and dedication you have for this field. When did you then go back to the university? Did you ever go back to the university to join a faculty, or just to teach when the opportunity arose?

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Do you have any thoughts as to what the Colorado School of Mines can do to help geophysics in China?

I think that every year we send lots of eolieges of geophysics to their graduate schools. I think so, in China I think that people cannot get to think as much as students in the United States in geophysical exploration. We have four institutes or universities of geology that have geophysical departments, but they are unable to continue the fundamental research and not just do operation. Sometimes the instrument man just knows the instruments.

Do you still think there will be a demand for geophysicists to study abroad?

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Are there any subjects that you encourage young scientists to pursue?

Yes, they should try to find out how to detect oil directly by seismic means. I have studied some papers in the English literature. There are theories of wave propagation in porous media. I read a paper by Meissner in West Germany who was discussing the so-called "field" exploration or seismic methods. Also I read a paper by Amsley, who tried to use the S-waves. I think it is very difficult to support because the results may not pay off for ten years or more. I've always seen this kind of problem in earthquake prediction. They look for easy solutions. Anything anomalous will mean that it is some kind of precursor to an earthquake. We must look to deep science from deep inside the earth.

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Do you think that this situation is changing?

No, not really. I don't think that a leading researcher would have been satisfied working in this country.

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Considering your accomplishments, what you've done and the way you've approached things, do you think there was any direct benefit from having gone to Colorado School of Mines? Did your education at Mines in some particular way have an effect on how you approach your work?

I got my geophysical exploration education entirely at Colorado School of Mines. I think that the training that I got there was a solid foundation. When I came back to China I still knew something about physics and how to use it for exploration.

Would you favor training people in one country rather than geophysicists in their undergraduate work and learning geophysics primarily in graduate school? What is your feeling about that?

In this country most of the geophysicists are engineers. They are short of ideas. They graduated from high school and went to one of the geology colleges, and their background in physics is not sufficient. Sometimes it is very difficult to support because the results may not pay off for ten years or more. I've always seen this kind of problem in earthquake prediction. They look for easy solutions. Anything anomalous will mean that it is some kind of precursor to an earthquake. We must look to deep science from deep inside the earth.

You've accomplished so much in your life and had this particular career path. If you had the opportunity, would you do anything differently? I would stick to exploration geophysics, but I would like to do more to advance the science of geophysical exploration. Now in China, geophysics is always in the state of correction, no scientific research. People are always after the quick effect, and even in the field in production, they don't know why they are doing any particular profile. Their purpose is just to finish the profile. That's the trouble.

I think that before the end of my life, I have to do some work to promote some of the research in earthquake prediction and exploration geophysics. In this country, I just want to do as much as I can for the few years left of my life.

Sketches is a feature of Mines Magazine. If you know of an alumns ourselves included with an interesting background or unusual accomplish­ments, please send some biographical information along with your name, address and phone number to "Sketches," Mines Magazine, P.O. Box 1415, Golden, CO 80402.

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Can the extensive contamination at the Rocky Mountain Arsenal be cleaned up soon? Can discharges from overflowing lagoons at Rocky Flats be prevented? New technology is being developed for both, but it can be used only if there are some structural changes to the current hazardous waste regulations that control how companies dispose of their wastes and remediate contaminated sites.

Much of the new technology being developed to protect the environment is coming from small companies. A Mines graduate has been involved in developing one such technology, freeze crystallization. Here are some insights into the process and the unusual barriers facing technological developments in the environmental field.

There is a lesson in the environmental legislation of the last 10 years - the methods used to control wastes and manage the chemical output of industrialized society of the past has not been and will not be adequate for the future. A corollary is that the methods of the future will also be more expensive than those of the past. The changes haven't been easy for anyone to accept or adapt to, whether it be the generator, the regulator or the public. Progress seems painfully slow to the public yet breakneck to the regulator and the generator who are charged with implementation. The companies that are developing the new technologies which will be at the core of the environmental controls of the future also find the pace excruciatingly slow.

A triad of hazardous waste legislation was passed in the late '70s: the Toxic Substances Control Act (TSCA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA). These created a whole new growth industry, providing services to the companies that generate hazardous wastes. It also established that there is a cost associated with land disposal of wastes, which has become the major incentive for recycling wastes. A number of companies with treatment technologies viewed the legislation as creating new markets for their services and products.

The role of new technologies
In implementing CERCLA, commonly known as Superfund, the Environmental Protection Agency (EPA) has been criticized for not using treatment technologies to the degree stipulated in the legislation. In the reauthorization of the program, called SARA - Superfund Amendments and Reauthorization Act, a program was set up to identify, test and evaluate new technologies. The program was implemented by the EPA and is called the Superfund Innovative Technologies Evaluation program, or SITE. In the three years since the program was started, 40 technologies have been accepted for demonstration, judged by the EPA to be sufficiently developed to justify demonstration in the field on actual Superfund site hazardous wastes. Of the companies selected for this program, only five are Fortune 500 companies, generally large companies with less than 50 employees. The size of the technical innovators in this marketplace has a major influence on the barriers to implementation.

Freeze Technologies Corporation
One of the technologies chosen for demonstration in the SITE program is freeze crystallization, developed by Freeze Technologies Corporation of Raleigh, North Carolina. Jim Heist (CPR '69) is president of the company and one of its founders. Freeze crystallization is a broadly based purification technique that can be used with literally all hazardous wastes: aqueous wastewaters, organic solvents, and even solids and solids by first washing the contaminants into water or a solvent. Since radioactivity comes from isotopes dissolved in water or from the heavy isotopes of water which freeze at different temperatures than water, freeze crystallization is the only process that can decontaminate mixed wastes (radioactive and hazardous) in one step.

Freeze Technologies Corporation, founded in the early 1980s, has developed one suchinnovative process in smaller companies. Heist Engineering was formed to develop and promote freeze crystallization for use in the environmental marketplace. Jim Heist had become aware of the freeze crystallization process when he worked with Monsanto, the Signal Companies (now part of Allied-Signal), and Bechtel. As environmental laws were passed in the early 1970s, both Monsanto and Signal were developing membrane processes to address some of the more difficult liquid waste treatment needs of industry. Heist Engineering became a developer of new technology by a slightly different route. "We had clients with specific needs that couldn't be met by conventional technology - those which needed the type of process that could only be met by freeze crystallization," Heist explained. 'The few freeze processes available in the marketplace were designed for specialized chemical separations and too expensive for waste treatment applications. Since there wasn't equipment available to do the job that was needed, we began developing suitable freeze crystallization process technology.' After the requisite laboratory demonstrations, two pilot plants were built to demonstrate and develop the technical innovations proposed by Heist engineers. These pilot units provided the vehicle for testing, defining problem areas, and devising solutions until a complete, working process resulted.

In late 1987 Heist Engineering joined with Environmental Systems Company of Little Rock, Arkansas to form a new company—Freeze Technologies Corporation (FTC)—to...
This plant has been built by Freeze Technologies for on-site remediation of contaminated facilities. It works on contaminated liquids that are either recovered on-site or generated by a soils washing process to decontaminate the soils and debris on a site. The mobile plant consists of two modules that sit atop the other, separating for shipment on low-boy trailers. This unit processes up to 25,000 gallons per day of contaminated liquid waste.

**Barriers**

The barriers to implementing a technical innovation don't differ in concept between different technologies and markets. The degree, however, is influenced very markedly by the user (e.g., chemical company engineer and government environmental manager) and the use (is it a profit-making application or a 'cost containment' issue). Barriers to implementing a new technology can be categorized into three major headings: technical, institutional, and financial. Technical barriers are exacerbated in the case of hazardous waste treatment by the difficulty of getting 'real wastes' to work with, which is an imposition of the institutional barriers. Technical risk is also much more heavily weighted in the public sector than the private.

Institutional barriers in the hazardous waste business range from the reluctance of program managers to implement anything 'risky' (is it a 'gamble' with anything that isn't fully proven, to the paperwork involved in government contracting. Under the current hazardous waste framework, once a waste is produced, it must be manifested and tracked, or if treated, it must meet stringent discharge requirements. Facilities that treat wastes must obtain permits that define the kind of wastes that are generated or accepted for treatment, and the manner in which they will be treated. Changes to the treatment systems must be submitted for approval before they are implemented.

Treatment of wastes at Superfund sites does not only after the site has been thoroughly evaluated for demonstrated technical proficiency and then for cost-effectiveness. New technologies have a hard time meeting the 'demonstrated technical ability' of either situation. This is the barrier that the S.U.T.E. program is attempting to remedy.

In addition to the technical community reviews which must be passed before a new technology can be used, there is a public stigma that has been attached to many technical alternatives. Many of the 'engineered solutions' - i.e., containing hazardous wastes in confined lagoons and landfills - have failed to provide the protection specified. Other new technologies have failed to perform as promised when they have been tried, so that the public is very skeptical of un-demonstrated alternatives. And yet, the public is generally dissatisfied with leave-in-place alternatives, requiring some sort of treatment. You can't have new technical alternatives without some sort of development and demonstration period.

An additional institutional problem is the general lack of technical sophistication by the public. This has been addressed in SARA as well, grants on any Superfund site allow local citizens to hire a technical consultant to provide unbiased advice on all aspects of the cleanup. None of the institutional remedies do anything to speed up the process of accepting new technologies. Generally it takes a developer two years or longer, to have a method accepted. Many companies have been working for close to five years, without getting any revenues from Superfund work.

Financial barriers are a problem, especially for the small company. Heit Engineering funded the development of its freeze crystallization technology through internal investment and outside contract research. The resources necessary to demonstrate the technology required capital restructuring of the company. Debt financing of pre-commercial process technology isn't generally available. We concurrently approached the venture capital, investment banking and joint venture markets for capitalization and ended up forming Freeze Technologies as a new corporation owned by the Heit shareholders and Environmental Systems Company. Without the substantial capitalization provided by one of these means many promising technologies will find it impossible to become commercially viable, Heat commened.

Freeze Technologies was accepted in the EPA's S.U.T.E. program in the summer of 1988 and is currently performing demonstration tests at the Stringfield's National Priorities List (NPL) site near Riverside, California. A transportable pilot plant is also used to demonstrate treatment capabilities at generator sites.

The year is 1999. You have a business meeting in the Golden area and decide to stop by the Mines campus for a brief visit. You note that the buildings look essentially the same, and the young freshmen are not too much different from your days at Mines. You pause to ask yourself, "I wonder why these students chose to attend Mines?" You think back to your decision and recall what factors influenced you. Possibly it was your family or a personal friend, but very likely it was an influential teacher or counselor. You probe a little deeper and ask "How do these influential teachers learn about Mines and what affiliation do they have with the school?" Interestingly, your thought processes have followed those of many administration and faculty members at CSM.

To be sure, many educators know about Mines because it is their job to know such things, and the school makes available to these individuals any number of publications and information packets. Through the admissions office, the school reaches prospective students through college nights (often enlisting the assistance of loyal alumni), personal contacts, and valuable activities, it is also important to have these key educators feel a kinship with the school and become personally familiar with the breadth and quality of the education provided at Mines. Involving these teachers in CSM-sponsored courses is one practical way to achieve this goal.

For more than 20 years, Mines professors and staff have provided courses both on and off the campus for Colorado's science teachers. This 'teacher enhancement' program has continued to grow over the years, providing the opportunity for the Mines community to pass on its knowledge to the youth of the state and nation. This educational process will not only yield more prospective students for Mines, but will produce better-educated high school graduates, regardless of where they go to college, and in general, will produce a more knowledgeable and better informed society.

When President Bash met with the nation's governors in Virginia to discuss educational reform, one message was clear: students in grades K-12 need help—full and that includes training teachers who currently lack skills in math and science and providing them with quality materials that make learning relevant. These have been, and continue to be, the goals of the CSM teacher enhancement program.

The Role of Mines

Dr. John Trefny, a professor in the CSM Physics Department and associate dean of research, has been involved in teacher enhancement programs for over 25 years. He serves as the chairman of the teacher enhancement committee at Mines, which helps coordinate various campus activities in this area. According to Dr. Trefny, Mines' reputation as a leader in earth science education is well-known among Colorado school districts. Over the past three years alone, approximately 2500 teachers have taken courses through CSM. Some of these courses were organized and conducted by CSM personnel on either a cash-funded basis or through grants from the National Science Foundation and other sponsoring agencies. Other courses were conducted by local school districts under the direction of CSM, which ensures that the courses meet the high educational standards of the school. In most cases, the teachers completing the courses
received credit from CSM applicable toward re-certification requirements with Colorado Education Projects from throughout the nation readily take CSM courses, but the majority of the participants are from Colorado, and CSM has an extremely good working relationship with area school districts and their respective science coordinators.

For many years these courses were conducted or coordinated by individual faculty members, each responsible for developing, marketing, and delivering his or her own project or course. In 1987, the Office of

teacher enhancement activities, which may include new course development, curriculum building, proposal preparation, and cooperative efforts with area school districts. Tuition income also covers direct operating expenses, including faculty salaries, educational materials, space rental, and clerical support. Through the teacher enhancement program, Mines offers a wide range of courses, some taught by CSM faculty, others by specialized off-campus instructors.

Teachers say they like the practical, yet creative, approach given by the courses; offerings such as "Energy resources - Today and Tomorrow," "The Total Concept of the Mining Industry," and "Front Range Field Studies in Geology" follow Mines' traditional hands-on approach to teaching practical earth science. Courses like the popular "The Zoo as a Classroom" and "The Museum and Botanics and Ethnographic History Come Alive" increase the participants' knowledge of the life sciences and help parents and teachers see the zoo, botanical gardens, and Natural History Museum as meaningful adjuncts to the classroom. Other recent courses have dealt with Grand Canyon ecology and development, curriculum writing, teaching practical earth science, and instructional services.

Mines also offers ChemCon: Chemistry on the Community Workshops. This course was developed by the American Chemical Society and has been taught by Mines personnel and has been tested in classrooms for the past three years. It represents a radical departure from traditional teaching because it puts facts into realistic settings rather than merely presenting chemistry as a collection of facts to be memorized or plugged into calculations.

The principal ChemCon instructors and coordinators for these courses are Dr. Thomas Wildeman and Dr. Matt Cole, both professors in the Department of Chemistry and Geochemistry. According to Dr. Cole, ChemCon courses have probably reached 40 percent of the high schools in Colorado; and in several schools during the course, 10 percent of the classes have been required to include ChemCon in the curriculum. Additional chemistry sections have been required to meet student demand.

Alliances Established

CSM realizes that just as coordination of campus activities is desirable, cooperation with other institutions and organizations with similar missions is also advantageous. Thus, CSM is a member of the Colorado Alliance for Science. The Alliance is a statewide organization of education, school districts, universities, government agencies, and businesses working together to create partnerships with the power to change and enhance science education in the schools. One of the major thrusts of the alliance education is the training of industry, government, and public schools; but the program can provide a model for each science curriculum development elsewhere in the United States.

The oil and gas exploration module is aimed at students in grades 9 through 12 and will offer hands-on laboratory experiments as well as well-founded classroom instruction. The module was developed during the Summer of 1987 and will be taught on a pilot basis during the Spring of 1990. Professionals in the Denver's earth science community will also be asked to help teach some of the new materials. This variation on the team-teaching approach will add a "real world" touch to the classroom," says Matis. The module has been developed as a partnership between CSM, Amoco Production Company, Jefferson County District R-1, and Adams County District #12. In addition to these four participants, financial support was provided by the Union Pacific Foundation.

One of the more successful programs as valuable outreach programs is the "real world" touch in the classroom," says Matis. "Not only does it mean a substantial collaborative effort between industry, government, and the other in groundwater contamination—already under development. "The significance of this program is tremendous," says Matis. "Not only does it mean a substantial collaborative effort between industry, government, and public schools; but the program can provide a model for each science curriculum development elsewhere in the United States.

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Alumus continues to serve industry

ART MEYER

For 21 years the Colorado Mining Association Education Foundation, through CSM, has been offering a continuing education program to inform Colorado teachers of the importance of the mining and metallurgical industries to the state. Through a combination of lectures and field trips, teachers take the six-week summer course to acquire a working knowledge of earth resources.

Art Meyer, Geol. E. ’50, has served as an adjunct professor with the program for the last five years. Tall and fit, Meyer blends the group finds ‘color’—flakes of various operations to supplement the faculty of approximately 65 associations, which has also raised more than $10,000 for his 40th class reunion. Art’s latest project is serving at a FIFTY FIFTY Committee chairman for his 40th class reunion.

Meyer described the program as dynamic: every effort is made to keep the subjects up-to-date and present new innovations when the material becomes available. The program gives teachers techniques to help them better present material in their basic science classes, such as chemistry and physics. The program has been presented to 250 teachers from 28 states and Canada. Teachers receive six semester hours of credit that may be applied toward recertification requirements.

Meyer is very low-key about his role as an adjunct professor. He views it as one more step in a successful career as a geologist. After graduating from Mines in 1950, he worked for three mining companies. He is retired from Union Pacific Resources as chief geologist of technical resources. He continues to be a consulting geological engineer working from his home in Lakewood, Colorado.

Once a Coal Miner...

"Of course you’re a coal miner, you can never give it up..." For the first time, the story of Colorado’s northern coal field and the role it played in the state’s labor movement has been chronicled.

Once a Coal Miner... is a picture-filled story of men and boys who seldom saw the daylight, and of the tension of the camps where women felt the earth rumble before they heard the whistle that signaled an accident underground. It is also about the strikes, the ‘scabs,’ the bullets, and the black lung disease that shaped the miner’s lives.

Despite its small size, the coal industry played a vital role in Colorado’s development. The northern field was the first to attract labor conditions forever. It ignited attitudes that shaped our view of labor conditions forever. It ignited the movement has been chronicled.

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Colorado School of Mines Alumni Association invites you to join a special sailing September 24 through October 1, 1990, personally hosted by Norm and Jan Zehr.

**ITINERARY**

- **September 24, 1991**
  - 8:00: New York, ship departs 9:00 a.m., lunch served 12:00 p.m.
  - 9:00: Arrive at New York • Cruise to GreatAXBay
  - 5:00: Mouth of the Hudson, dinner served 6:00 p.m.
  - 9:00: Quebec • Montreal • Seven day cruise to:
  - New York, disembark morning 6:00 a.m., disembark afternoon 4:00 p.m.
  - September 24, 1990
  - October 1, 1990

Special discount air fares are available.

Seven day cruise to:
- Bar Harbor • Halifax • Quebec • Montreal
- aboard the elegant new Royal Cruise Line Crown Odyssey

Space is limited! Book Now!
Special bonus amenities when you book early!

For reservations and information please call Jan Zehr at 1-800-950-2102 or 303-232-2103. Ask about extending your cruise to 14 days, returning to New York October 8, 1990.

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- Our "Brass Rail Lounge" with "Happy Hour" reduced drink prices, free snacks and live entertainment!
  - A very special rate of $39 single / double (+ tax)

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**DIRECTOR'S DESK**

by Norman Zehr, '52
Executive Director

Generally I have avoided any type of political comment in this column, trying to confine my writing to matters of Colorado School of Mines and its alumni. However, I am sure many people are aware that I hold some very definite political opinions. I think that is an integral part of being an American. At the risk of stirring up some of you I shall make some political comments.

As an amateur historian I believe we are now living in truly historic times. Most of us have lived through what later were labelled as "historic times". Technically all times are historic, but some periods leave a greater impact on world events than others. Seddon do we realize this while it is happening - a bit like the bumper sticker which asks "Are we having a good time?" That is human nature, following the woods and the trees philosophy.

Obviously the World War II period brought great change to the world. It saw the beginning of the end of much of the world's colonialism, at least by the traditional colonial powers. Some new faces appeared on that scene and are still around. The communist powers certainly were the greatest, if not the only, offenders in this regard following World War II. Now it seems that a reversal of much of communism's reach is in process. I hope we will not be disappointed by reality.

Communism has been an essentially 20th century phenomenon. It began in 1917 during the First World War, in Russia. After 1945 it spread through eastern Europe and Asia, and later into the Western Hemisphere. In many cases it replaced other, dicentnsiphs of equally undesirable nature (e.g. Cuba and Nicaragua).

During many of our years in industry I was privileged to travel to places such as the Soviet Union, East Germany, Czechoslovakia, Poland, Hungary, Cuba (just after Castro took office), Chile (under Salvador Allende), and Nicaragua (before and after the Sandanistas took over).

These visits convinced me, if I were not already convinced, that our American way of living, while not perfect, is far superior to living in the communist countries.

Certainly my tour in Korea had a greater impact on world events than others. I feel sure I will hear about it.

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The Mines Magazine • February 1990
DENVER
Thirty-six alumni and guests met in the bathroom at the Denver Athletic Club, Tuesday, December 5, for the annual CSMAA Holiday Party. The 11:30 social hour, which gave everyone an opportunity to visit with old friends and meet some new ones, was followed by an excellent lunch and meeting, and meet some new ones, was followed by an excellent lunch and meeting.

JUST A NOTE: If you make a reservation for a section event and find you are unable to attend, PLEASE GIVE THE SECTION COORDINATOR THE COURTESY OF A CANCELLATION CALL. We know circumstances sometimes demand a last minute cancellation, but often a section is billed by the hotel (restaurant, etc.) for "no shows". If this is the case, the "absent" guest can also be expected to be billed to help cover the expense. If you have news to share about your section or would like to help us organize an alumni section in your area, please write or call Norm Zehr or me; inside Colorado 1-800/245-1060 or 3296; outside Colorado 1-303/3290; 3296.

DENVER Association heid a pre-Christmas lunch you to Jim Muhyan '54, Chris Oglesby '54, followed by an excellent lunch and meet some new ones, was annual CSMAA Holiday Party. The TUCSON Board member representing the Rocky Mountain Region, 25 members enjoyed the discussion on the conflict between the administration and faculty and also on the direction the school should be taking. The group directed Hannon to express their opinions at the next alumni directors meeting.

For alumni in the Calgary area, Nor says: "We had a most successful alumni lunch at the Petroleum Club at noon on Monday, December 4. According to Nor Hannon '47, CSMAA board member representing the Rocky Mountain Region, 25 members enjoyed an informal discussion on the conflict between the administration and faculty and also on the direction the school should be taking. The group directed Hannon to express their opinions at the next alumni directors meeting."

CALGARY
The Calgary section of CSM Alumni Association held a pre-Christmas lunch at the Petroleum Club at noon on Monday, December 4.

BAKERSFIELD
Kevin Smith, 92, coordinator for the Bakersfield section, called to tell us that eight alumni attended the November 2 section meeting held at noon at the Bakersfield Petroleum Club.

Class of 1939 50th Reunion

Dear Norm and Ellen:
Thank you for your respective letters regarding my dismay of no '39 Class Reunion class picture in the Reunion Issue of Mines Magazine. While I appreciate very much the picture with the names captioned below, even if in a much later issue? My theory being better late than never — say by popular demand, or what ever, should excuses be needed. For the life of me, I cannot imagine why, and believe me I have a pretty good imagination, and I have tried very hard to imagine why not. To me it seems simple and basic.

By way of informal research, I polled some local alumni. Some were not very interested. One said he NEVER read the magazine. But none disagreed with my point — regardless of age or class.

Pleas pardon this joint letter. If either of you can answer my question, one answer is enough, if neither of you can, please let me know and I will follow up accordingly.

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Please pardon this joint letter. If either of you can answer my question, one answer is enough, if neither of you can, please let me know and I will follow up accordingly.

Sorry to belabor this issue, but the name Heinrichs was inherited. Thank in advance for your indulgences.

Regards,
Sincerely
Walter E. Heinrichs, Jr., '40

Dear Ellen:
We are determined to find every member of the Class of 1939. As you know, our 40th Reunion is coming up May 9-12, 1990. In light of this effort, I enclose this last known picture of Charlie Fowlkes taken on Senror Day, 1950 and ask that you publish it. Hopefully, someone will recognize Charlie from this outstanding likeness and tell him we are looking for him. Charlie, 'Come Home!' I also sent along a picture of Norm Korn taken on the same day. Norm has recently been found, but a picture like this ought to be published anyway.

Thanks for including the "NIFTY FIFTY MINERS PLAN 40TH REUNION" article about our reunion in the November issue.

Best regards,
Art Dickinson

Continued on page 29
UNDER THE "M"

Miner 49er - SAE 40th Reunion
by Robert D. Sloan, '49

Y ou had to be at homecoming last fall to experience the magic that was taking place in Golden and on the Mines campus. The Miner 49er - SAE alumni group held its 40th reunion. To know who this group is and to understand the meaninglessness of this reunion, you need to relate to Mines at the end of the Second World War.

In 1945, as World War II was winding down, the total enrollment at Mines was 170 students. Within a year that figure tripled, and by 1949, enrollment increased to 1,285, Mature Miners had fought for their lives to protect our freedom, shared locker rooms, laboratory benches and all aspects of campus life with 17-year-old freshmen who were straight out of high school and most likely were away from home for the first time.

As we came to Mines and inquired as to where to live, Dean Morgan told us of a building that was to be the new Fraternity house. Others were met at the train station by a black Model A driven by Bill Erickson or Jim Quinn, and some of us were picked up by a hotel and invited over to the SAE fraternity house for a meal. Eventually many of us joined the SAE fraternity. While Mines was providing us with a professional education, lessons in human relationships were being learned daily in the close-knit family which had been developed in the fraternity.

As each year went by, seniors were invited over to the SAE house for a meal. Eventually many of us joined the SAE fraternity as well. The Fraternity house was the scene of dining, singing and reminiscing during which time we reviewed old yearbooks and photographs to remind us of what we were like back then.

The Census can do more for your bottom line than you think.

Information the Census receives may be important to the future plans of your company. For instance, shifts in population may show a need for new or increased services in growing areas. That may lead to additional opportunities for your company.

Answer the Census.

The Census counts for more than you think.

Census 2000

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The Census can do more for your bottom line than you think.

Information the Census receives may be important to the future plans of your company. For instance, shifts in population may show a need for new or increased services in growing areas. That may lead to additional opportunities for your company.

Answer the Census.

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JOHN MOORE TAKES OVER AT METALLURGY

Dr. John Moore, Mines' new head of the Department of Metallurgical and Materials Engineering, sees the Steel Research Center as a true asset to the iron and steel industry because of his shift in curriculum in metallurgy departments nationally away from classical metallurgy to materials and polymers. Mines has one of the few departments which teaches state-of-the-art metallurgical developments superimposed on classical metallurgy which makes the transfer of technology more easily achieved. The loss of corporate research and development divisions makes a good role for the Mines Steel Center to fulfill," he said.

Moore said the combination of classical metallurgy with advanced ceramics (funded by the Coors Ceramics Center) gives Mines a balanced curriculum to keep up with developments.

According to John J. Moore, Department Head, this reunion will be held on campus during June 14-16, 1990. A one-day conference on "The Materials Industries in the Twenty-First Century" will be presented on Friday, June 15. Former and current faculty and friends of alumni are encouraged to participate.

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ALUMNI NIGHT WITH THE DENVER NUGGETS

Thirty-two alumni and friends met at McNichols Arena Tuesday, December 12, to watch the Denver Nuggets lose 121-108 to the World Champions Detroit Pistons. The Denver loss was its first at home for the season, but as Coach Doug Moe concluded to a Denver Basketball reporter, "Hell, you can't win all your home games."

Among those cheering the Nuggets were Helen and Max Coats '55; Chuck Blomberg '59 and his brother Clerm, Steve Sonnenberg '81; Chris Oglesby '80 and Margaret Lessenger '81 and guest, Kay and Bill Mueller '40; Kathy and Stu Bennett '66 (who wondered why some of his other classmates weren't there—maybe next year); Frank Horino '44 and guests; Fritz Weigand '39 with his party of eight; and Mary Jo Giddings from the Alumni Office. CSM staff members Marqie Arnold, Betty Ames, and Sharon Kirts were there with some of his other classmates.

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GLOBAL INSIGHT

A COUNTRY WITH TWO SETS OF RULES: SMUGGLERS AND TOURISTS

by Dr. Eul-Soo Pang
Head of the Department of Global Systems & Cultures

That might have helped, said one sympathetic diplomat stationed in Georgetown. But the trouble was that both national airlines of Suriname and Guyana have one plane each and neither flew to Port of Spain. The Trinidadian airline does not fly into Paramaribo. Due to my lecture schedule, I flew the Trinidadian airline to get to Guyana and then flew on to Paramaribo on the Suriname Air. I never learned who was responsible for flying my luggage.

Miraculously, thanks to the skilled diplomatic intervention by sympathetic U.S. embassy officers, the luggage caught up with me. I received it again next season. Join us! I

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CENTENNIAL REUNION

Mines Alumni who graduated in Metallurgical Engineering are being invited to a reunion to be held by the Department of Metallurgical and Materials Engineering to commemorate the 100th anniversary of the granting of degrees in metallurgical engineering at Mines. According to John J. Moore, Department Head, this
March 31

Rotc military ball

April 5-7

E-Days at CSM

May 10-12


May 31

Csma Sixth Annual Golf Tournament - Applewood Golf Course, Golden. Reserve the date! Dr. E. W. Rogers, CSM Geophysics department head.

Sept. 23-26

Society of Petroleum Engineers Annual Meeting - New Orleans, Louisiana. CSM Alumni Breakfast; details to be announced. Speaker: Dr. Craig Van Romig, CSM Geophysics department head.

Sept. 24

CSMA Alumni Cruise in Conjunction With Royal Cruise Line. Seven day cruise to the Caribbean. Details to be announced.

Sept. 25-26

AMC mining convention - New Orleans, details to be announced.

Society of Exploration Geologists Annual Exposition - San Francisco, California. Details of alumni function to be announced. Speaker: Dr. Phil Romig, CSM Geophysics department head.

Dec. 4

Csma Banquet for Graduating Seniors - Green Center. Social Hour, 6 p.m.; Dinner 7 p.m.

For reservations and additional Information, call 303/273-3290 or 303/273-3295, or, OutsidE Colorado, Call 1/800-446-9489, ext. 3290 or 3295.

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Cecil Robert Walbridge


He was born March 8, 1905, in Weld County, Colorado. He was associated with Ingensoll Rand for many years. Walbridge was an active shooter and contributed to the school.

He is survived by his wife, Ella May Seabury Westover; and a sister, Lillie W. Cunningham, of Greeley, Colorado.

Contributions may be made to the American Heart Association, 1280 S. W. Cunningham, of Greeley, Weld County, Colorado. He was contributed to the President's Council at the University of Cincinnati. He passed away after suffering a stroke. He was 78 years old.

In addition to his wife, Harrison is survived by two sons, Louis Harrison of Puerto Rico and Clark Harrison of Nucla, Colorado; a stepson, Joe Watt of Arvada, Colorado; a stepdaughter, Alice Daughtee of Mesa, Arizona; and numerous grandchildren and great-grandchildren.

Herbert D. Thornton

Herbert D. "Herb" Thornton, 71, died September 12, 1989, after a short illness. He was born May 26, 1918 in Silver Bell, Arizona. He graduated from Mines in 1940 with a degree in petroleum engineering.

He was an All Conference Center on the Mines football team during his only undefeated season. He was a co-founder of Mines' Clare Club and was a distinguished achievement medalist in 1977. He served in the Navy during World War II.

He then worked for a number of oil companies before joining Teal Petroleum Company for W.H. Grace Co. in 1973. He became an independent oil man in 1978. He was a member of the Petroleum Club, S.P.E.E., and many other organizations serving in various capacities.

He is survived by his wife, Gerre Thornton, sons, Steven D. Lemond and wife Angela; Charles and his wife Karen; Harry and his wife Karen; and son-in-law, John. He also had a daughter, Alice, and a son, Joe Watt. He is survived by a sister, Lillie W. Cunningham, of Greeley, Colorado.

Memorial contributions may be made to the Colorado School of Mines, 1500 Illinois, Golden, Colorado 80401, or a favorite charity.

Daniel B. Gregg

Daniel B. Gregg, 100 years old, died October 9, 1989. He was born November 26, 1888, the oldest of seven children of Judge Edgar and Anna Elizabeth Hecht Gregg of Cincinnati, Ohio, and at the University of Cincinnati. He passed away after suffering a stroke. He was 78 years old.

In addition to his wife, Harrison is survived by two sons, Louis Harrison of Puerto Rico and Clark Harrison of Nucla, Colorado; a stepson, Joe Watt of Arvada, Colorado; a stepdaughter, Alice Daughtee of Mesa, Arizona; and numerous grandchildren and great-grandchildren.

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Robert W. Tesch, Jr.

Robert W. Tesch, Jr., P.E. 1933, died September 2, 1989, in a Fort Worth, Texas hospital after undergoing surgery. He was 78 years old.

In addition to his wife, Harrison is survived by two sons, Louis Harrison of Puerto Rico and Clark Harrison of Nucla, Colorado; a stepson, Joe Watt of Arvada, Colorado; a stepdaughter, Alice Daughtee of Mesa, Arizona; and numerous grandchildren and great-grandchildren.

Robert W. Tesch, Jr.

Robert W. Tesch, Jr., P.E. 1933, died September 2, 1989, in Fort Worth, Texas hospital after undergoing surgery. He was 78 years old.

Bob, as he was known to friends and colleagues, was born in Denver and raised in Loveland and Loveland and Denver. He was an accomplished musician who played the clarinet in silent theaters at the age of 12 while still wearing knickers. At 16 he played in orchestras of the Dollar Steamboat Line on cruises to the Orient and also around the world. Later, while at Mines, he financed his education by playing in the Denver Symphony as well as other orchestras and jazz groups.

At that time he was a member of the Denver Musician's Union along with an unknown trombonist named Glenn Miller. While at Mines he was a Sigma Nu and Mason. Later he became a Shriner.

After graduation he began work with Stanolind Oil and Gas in west Texas. In 1953 he and Anne Louise Hix of Midland were married. Bob and Anne moved to Fort Worth about 1930 where he attended night school at North Texas School of Law; he became a member of the Texas Bar in 1941. He entered the U.S. Army in Vietnam War and earned the Bronze Star and Legion of Merit. He was a member of the Retired Officers Association, the Colorado School of Mines Alumni Association and the Scottish Society of the Pilots Peak Region.

In addition to his wife, Harrison is survived by a brother, Ross M. Lyon, who was born January 13, 1912, in Galien, Michigan. He had been a resident of the area for many years. He graduated from Mines in 1939. He served in the U.S. Army during World War II, the Korean War and the Vietnam War and earned the Bronze Star and Legion of Merit.

He was a member of the Retired Officers Association, the Colorado School of Mines Alumni Association and the Scottish Society of the Pilots Peak Region.

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He was a member of the Retired Officers Association, the Colorado School of Mines Alumni Association and the Scottish Society of the Pilots Peak Region.
James Richard
U.S. 50, died in Tucson on April 1, 1989. He is survived by his wife, Joyce, and his six children. He worked for ASARCO his whole career, and worked for 35 years. He was a lifetime member of AIME and Tau Beta Pi.

The years Jim spent as the general manager at Neptune Gold Mining Company in Nicaragua were the height of his professional career. Running a gold mine in the middle of the Central American jungle posed a number of challenges which he took on and mastered. The isolated mining camp had many logistical problems as well as political ones. He was at home with Nicaragua's presidents and their minions. He never lost sight of the mine's success in terms of profitability either.

Jim was rightfully proud of his accomplishments in Nicaragua. He molded a diverse group of foreign nationalities and Nicaraguans into a working team. He actively worked to improve the educational facilities in the mining town and set up scholarships for those who needed schooling beyond high school.

Associated with ASARCO, using his math and science background, he got a Masters in Education at the University of Arizona. He taught at Cholla High School in Tucson for a year and a half before health problems forced him to quit in December 1988. This January, with boundless will, even with bad health, he enrolled in a Masters program at the University of Arizona in English as a second language, allowing him to tutor adults in basic English.

Donald W. Roberts

Surviving are his wife, Mary; two daughters, Jean Roberts Kobe, of Indianapolis, Indiana, and Kathleen Roberts of Boston, Massachusetts. A daughter, Susan, died in 1986, and a son, David, died in 1975.

Don is buried in Massachusetts National Cemetery in Bourne, Massachusetts.

William C. Kellogg

William Kellewell, a civic leader with varied interests and responsibilities in Southern California, died of cancer on October 9, 1989. He was 68.

Born August 31, 1921, in Altadena, Kellogg moved his boyhood to the Los Angeles suburb and made his home there even while working at the Beach and Tennis Club.

He attended the Flintridge Preparatory School and went on to complete a degree in geology and geophysics at the Colorado School of Mines in 1945. During World War II, Kellogg studied electronics and meteorology at Harvard, the Massachusetts Institute of Technology, and New York University. He served in the Army Air Force as a lieutenant.

He later attended business school at Stanford.

Kellogg was a member of both the Kellogg and Scipio newspaper families, was publisher of the Santa Barbara News Press, and was a member of the Sigma Nu fraternity while a student there.

Kellogg served as a lieutenant in the U.S. Navy in the South Pacific during World War II, and during his 40-year professional career he worked and consulted for a variety of metallurgical operations throughout the world.

Kellogg was a member of the La Jolla Shores Planned District Ordinance Advisory Board and the La Jolla Shores Association. He was a trustee of the La Jolla Town Council, where he headed the Parks and Beaches Committee.

From 1981 to 1983 he was president of the La Jolla Beach and Tennis Club.

Kellogg was survived by his wife, Mary; two daughters, Jean Roberts Kobe, of Indianapolis, Indiana, and Kathleen Roberts of Boston, Massachusetts. A daughter, Susan, died in 1986, and a son, David, died in 1975.

Donald W. Roberts, 71, of Ridgewood, New Jersey, died October 25, 1990, while on his way to Homecoming '90 at Golden.

Don graduated from Mines in 1941, with a degree in geology. He later earned a master's degree in meteorology from the California Institute of Technology, and a masters in petroleum engineering from the University of Tulsa. He also graduated from the Industrial College of the Armed Forces, in Washington, D.C.

Don spent 25 years in the Air Force, mostly in research and development. He retired in 1965, with the rank of colonel.

Roberts spent 12 years with ITT Federal Electric Corporation, in systems management work. For three and one-half years he ran the DEW Line and BMEWS. He retired from the mine's success in terms of profitability either.

Robert S. Brummett

David Crawford

David Moore Crawford, 64, P.E., died on May 21, 1989, from complications resulting from emphysema and heart problems. Crawford, executive director of the Colorado School of Mines Alumni Association from 1981 to 1984, had been ill for a lengthy period. He was born in Parkburg, West Virginia on September 25, 1924.

David Crawford graduated from the Asheville School in North Carolina. He then entered the armed forces, and served for three years, assigned to the European Theater of Operations. Prior to attending CSM, Crawford was a student at Princeton for one year.

At graduation, Crawford was hired as a petroleum engineer with the Plymouth Oil Company, and worked in their office in Sinton, Texas.

After three years in the oil patch, Crawford returned to Parkburg where he worked for the Parkburg Rig and Reel Company. Following this, he became president of the Avco Brick Corporation. He later became president of the Citizens Building Supplies Company.

His next post was with Construction Specialties Company, where he was first manager of the materials sales division, later president. Immediately prior to assuming the post of executive director for OSMA, he was president of RSL Inc., a construction supply firm.

He was very active in the Masonic order and in the Presbyterian Church.

When Crawford left the Association, he accepted employment with Henderson Petroleum (Don Henderson, G.E. B81). Crawford is survived by his three children, Christie Jones, of Parkburg, David B. Crawford II, P.E., and Shirley Crawford, both of whom reside in Houston, and both of whom are employed by Chevron. He is also survived by his second wife, Judith McNamar Crawford.

William F. Spain

William F. "Bill" Spain died September 26 in Houston, Texas, after a long illness.

He married Merlyn Viles, a former Golden resident, in January 1945. Spain was 68.

Still, Kellogg missed his old line of work. He had hoped to go back into geological exploration again, according to his son.

Marc Van Buskirk, a member of the Beach and Tennis Club, said he would see Kellogg keeping up with his field by reading technical journals at lunch.

Kellogg also immersed himself in civic affairs. Though he spread his residence between La Jolla and Ahadena, he made his voice heard locally.

Kellogg was a member of the La Jolla Shores Planned District Ordinance Advisory Board and the La Jolla Shores Association. He was a trustee of the La Jolla Town Council, where he headed the Parks and Beaches Committee.

From 1981 to 1983 he was president of the La Jolla Shores Association.

Kellogg served as a lieutenant in the U.S. Navy in the South Pacific during World War II, and during his 40-year professional career he worked and consulted for a variety of metallurgical operations throughout the world.

Spain is survived by his wife, Merlyn, Houston; sons, William F. Spain, jr., Nimbin, Australia; Paul B. Spain, Houston, and Stephen C. Spain of Kemp, Texas; daughters, Carol A. Ming, Hawthorne, California, and Linda J. Spain, San Francisco, California, a sister, Patricia Lorich, Winston-Salem, North Carolina, and ten grandchildren.

A memorial service was held in Houston on September 28.

Robert S. Brummett

David Crawford

David Moore Crawford, 64, P.E., died on May 21, 1989, from complications resulting from emphysema and heart problems. Crawford, executive director of the Colorado School of Mines Alumni Association from 1981 to 1984, had been ill for a lengthy period. He was born in Parkburg, West Virginia on September 25, 1924.

Robert S. Brummett, M.E., 1926, of San Gabriel, California died October 7, 1989. He was born December 3, 1905 in Missouri.
He was a member of the board of directors of the San Gabriel Valley County Water District for 43 years. He owned and operated Beaumont & Dembton Contractors. He was a charter member of San Marino Masonic Lodge #695, F. & A.M.

He is survived by his wife, Phyllis; daughters, Patricia L. Ray and Roberta Dembion Contractors. He was a Kentucky resident, was an aerospace consultant, retiring in 1982. He graduated from the Colorado School of Mines in 1955 with a degree in geological engineering.

He was a Korean War veteran. He owned and operated Brummett & Son for 43 years. He died in a home in the Washington, D.C. area. He was born April 17, 1929 in Ohio.

Survivors include his wife, Babette "Babs" Peavy; his brother, Pauline E. Swann, of Sarasota, Florida; two daughters, Kathy Martin, Patty Robinson, Jeff Ray and Delvick Ray; and six grandchildren.

William R. Peavy

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William Reader Peavy, 60, of St. Petersburg, Florida, died November 9 in his home. He was born April 17, 1929 in Ohio.

Peavy, a longtime Englewood, Colorado resident, was an aerospace engineer, retiring in 1982. He graduated from the Colorado School of Mines in 1955 with a degree in geological engineering.

He was a Korean War veteran. He was a member of Golden City Lodge No. 3 AF & AM, F. & A.M., of Los Angeles, California; one brother, David Peavy, of Dallas, Texas; two sisters, Judy Fan, of Hapelte, Ohio and Polly Cox, of Florence, Oregon; and three grandchildren.

Contributions may be made to the American Heart Association (Colorado) Inc., 1280 So. Parker Rd., Denver, CO 80231.

ALUMNI UPDATES

'42 Frank M. Stephens, Jr., Met. E. is president of Iron Caribou Holdings, Ltd.

'43 George J. Featherstone, E.M. has retired - faculty emeritus from Bleidfield State College in Bleidfield, West Virginia.

'49 Russell L. Wood, E.M. and Hon. Mem. has been appointed senior associate of Behre Dolbear & Company, Inc. in Denver.

'50 John D. McFerr, Met. E. is president of Las Byran Enterprises, Inc. in Oregon, Arizona. B.C. (Dick) Siegfried, Geop. E. is with Siegfried & Siegfried Ltd., a resource consulting firm in Calgary, Alberta, Canada. Robert L. Marsh, Geol. E. is a geologist with Groundwater Technology, Inc. in Mipitas, California. Donald J. Johnson, Met. E. and MSc, Met. '56 is professor emeritus with the University of Nebraska/Department of Mechanical Engineering. He will be a visiting professor at the Tatung Institute of Technology in Taipei, Taiwan, January-August 1990.

'52 Charles N. McCollough, Geol. E. retired December 31, 1989 as vice president of exploration from Occidental Exploration & Production. John C. Dingman, P.R.E. is president of Dingman Enterprises, Inc. in Houston, Texas.

'53 Edgar T. Hunter, E.M. is senior project engineer with Pikes Peak Mining Co. in Victor, Colorado. Thomas W. Rollins, Geol. E. is with Rollins Resources of Houston, Texas.

'55 Donald E. Graves, P.R.E. is staff technologist with Star Enterpises in Houston, Texas. Charles J. Marquardt, Geop. E. is staff geologist for Chevron Enery Co. in Dallas, Texas. Joe S. Irwin, Geol. E. is president of Jubilee Resources, Inc. in Calgary, Alberta, Canada.

'59 Anthony C. Dempster, E.M. is executive director/strategic planning at Texas A & M University in Houston, Texas.

'60 Walter J. Knudson, Jr., Geol. E. is principal water resource engineer with the Division of Water Resources of the State of Colorado in Denver. Euclid P. Woolen, E.M. is with Zeni Drilling Co. in Mooguement, West Virginia. S. Bruce Heister, Met. E. is president of Alcan Pacific, Ltd. in Tokyo, Japan.

'61 Floyd F. McFerr, E.M. is president and chief executive officer of California Resources, Ltd. in Calgary, Alberta, Canada.

Consolidation Coal Co. in Pittsburgh, Pennsylvania.

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Dan Kappes, '66
W. Robert Rowe, '81
Charles E. Haunr, '74
Richard Ellwanger, '70

'59 Frank J. Ucciardi


'58 Anthony G. Dempster
Cornelius F. Utilities, B.S. CPR is a staff plant engineer with Western Union in Arkansas, Little Rock.

80 Roger Casteel, B.S. CPR is an energy analyst for John S. Herald Energy Services, Inc. in Mountain View, California.

81 Floyd T. Elliott, B.S. CPR is senior project manager for Enron Oil & Gas Co. in Fullerton, California.

82 David H. Jerome, B.S. CPR is an engineer with Simulation Sciences, Inc. in Fullerton, California.

83 Larry (Baker) Kramer, B.S. CPR is a project manager for Experian, Inc. in Richmond, Virginia.

84 Susan G. Magnusson, B.S. Geop. is a research geophysicist for Ormat Technologies, Inc. in West Germany.

John R. Gaffney

John R. Gaffney, BSc. Pet., is an engineer with Boy Gaffney Oil Co. in Dallas, Texas. Joseph M. Calkins, BSc. Min., is a sales engineer with R.B. Scott Co. in Bakersfield, California. Howard L. Hoiden, BSc. Met., is a research geologist with Berrong Enterprises in Golden, Colorado. Kathy J. Ayers, BSc. Met., is with the Colosseum, Inc. in Las Vegas, Nevada. The Mines Magazine • February 1990
J. Foley, BSc. Pet. is a drilling engineer with Caterpillar, Inc. in Peoria, Illinois.

Dino A. Domenico, BSc. CPR is a production engineer with Unocal. Inc., in Southern California.

Jonathan J. Jambor, BSc. Eng. is a manager/engineering with L&M (formerly of Chevron, Inc.) in Bakersfield, California.

North Carolina, Bradley R. Blair, BSc. Met. is a quality control manager for the Los Alamos National Laboratory.

BSc. Geol. is a graduate student in mineralogy at CSU. Douglas G. Kearney, BSc. Met. is a quality control manager with Hinderliter Heat Treating. Richard C. Hugo, BSc. Met. is a graduate research assistant for the Los Alamos National Laboratory.

The National Society of Professional Engineers (NSPE) is inviting fellow Engineers, spouses, friends, and students to join in the fun and enthusiasm of the MATHCOUNTS program. They challenge seventh and eighth grade students with school, local, state, and national competitions. The program trains students to work as a team. They compete for the best and most accurate answer, with the emphasis on speed.

For the Los Alamos National Laboratory.

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