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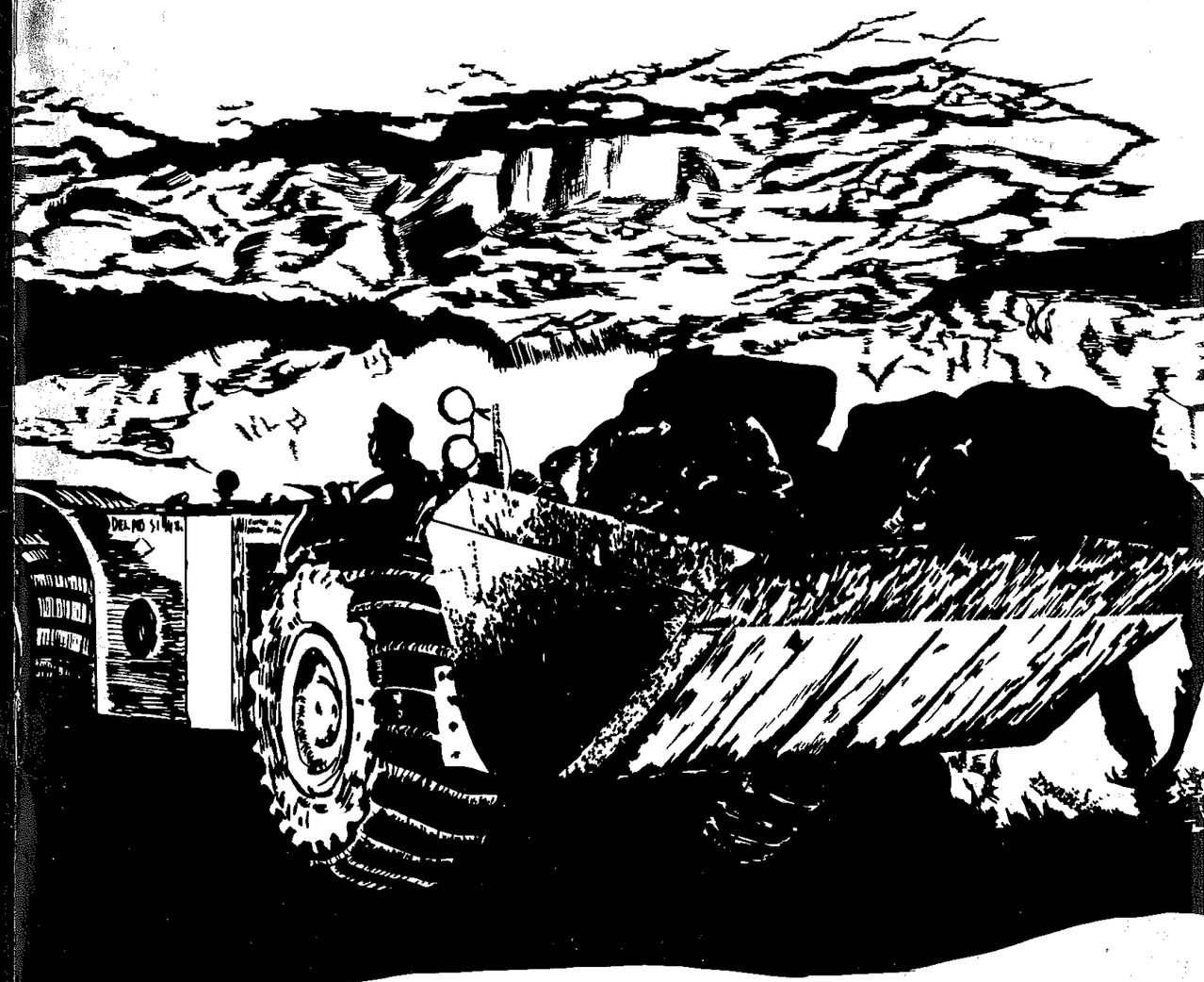

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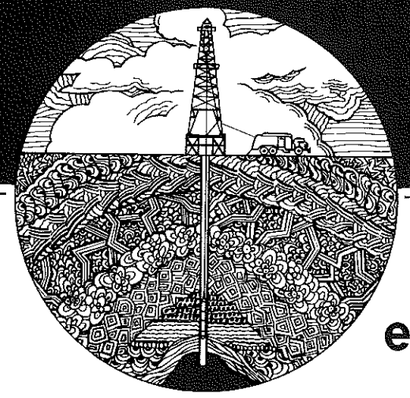

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alumni events calendar

Dec. 5—NWMA Meeting, Spokane, WA. Breakfast, Davenport, 7:30 a.m.

Dec. 8-9—AIME-Arizona Meeting, Tucson, AZ. Luncheon to be announced.

Dec. 9-11—Cont. Ed. "Maintenance Management for the Mining Industry," Denver, CO. For further information contact K.M. Barbour, CSMAA.

Dec. 18-19—DECEMBER CONVOCATION; Banquet, Dec. 18, Green Center, 6 p.m.; Commencement Exercises Dec. 19.

Feb. 11-13, 1981—84th National Western Mining Conference & Exhibition, Denver Fairmnt Hotel, Denver, CO, sponsored by The Colorado Mining Assn., 1515 Cleveland Pl., #330, Denver, CO 80202, (303) 534-1181.

Feb. 13—CMA Convention, Denver, CO. Luncheon, Denver Athletic Club, 11:30 a.m.

Feb. 14—FOUNDER'S DAY BANQUET. Dinner CSM, Friedhoff Hall, 6:30 p.m.

Feb. 22-26—AIME National, Chicago, IL. Breakfast to be announced.

May 7-9—1981 COMMENCEMENT, Reunion classes are 1926, 1931, 1936, 1941, 1946, 1951 & 1956. Banquet— May 8, Green Center, 6:00 p.m.; Commencement Exercises —May 9

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features

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departments

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comments . . .

ASAP . . . .

by Dr. Guy T. McBride, Jr.

America urgently needs top-flight mineral and energy engineers. Because Mines needs to keep offering first-class engineering education to meet the nation's demands, Trustees of the School adopted a new financial policy this year, as you have heard.

We now need your help.

The policy increases student tuition and at the same time raises the challenge to increase levels of student financial assistance. While we are at work to make a Mines education the best possible, we need to keep the doors open here for those who are deserving and best able to succeed as students and future engineers.

Those who have benefited from a Mines education do have a particular interest in seeing the School succeed. We now have a well-defined program that needs your support—the Annual Student Assistance Program (ASAP).

We have 528 first-level reasons for supporting ASAP this year. That is the number of students the School has determined will need additional financial resources to continue at Mines next semester.

Colorado resident tuition for 1980-81 is nearly doubled—$693 per year to $1,282. Tuition for nonresidents rose from $3,6762 to $4,563. The increase in operating budget which the tuition income makes possible is going mainly for three purposes, all essential for improving the quality of education Mines offers: an increase in faculty salaries that keeps up with inflation; hiring of faculty support personnel such as secretaries, technicians, and lab assistants to help the faculty be more effective in teaching; and the addition of a few persons to help with admissions, counseling, and advising students.

The School's Board of Trustees has become increasingly concerned since 1975 about the steady erosion of state support of higher education at Colorado School of Mines. By the 1979-80 academic year Mines had only $4 to spend in operating costs on each student's education for every $5 it had in 1970, in constant value terms. Rather than watch the quality of the Mines education proceed downhill, the Trustees embarked on what the *Denver Post* called a "bold and risky path." Trustees sought and obtained permission from the Colorado Legislature to institute the innovative policy on a trial basis.

The decision was reached after thoroughly exploring all available options and consequences. A major factor in the Trustees' final decisions was faith that Mines alumni will step forward and help support the new policy with their own money when they understand what it is and why it was adopted.

Essential to the success of the plan is the ability of the School to provide a financial aid package so that all qualified applicants accepted at Mines who need financial assistance can obtain it. In addition, the School must have the resources to compete for superior high school students who might be attracted to schools in other professions. The population estimates of the college-age group for the next few years indicate this competition will be intense.

In this academic year, we estimate that the total amount available for undergraduates at the School will be about $3.65 million in loans, grants, work study, and scholarships. Approximately 60 percent of all undergraduates currently receive some form of aid, with an average award of $2,728 per student.

The Financial Aid Office nonetheless has estimated that an additional $373,000 will be needed this year to offset the higher tuition rates and sustain our ability to offer a sufficient financial aid package to qualified students.

As you are aware, the CSM Alumni Association Board of Directors agreed to devote alumni fund-raising efforts to meeting student financial aid requirements through ASAP. Our friends in industry, who also have much to gain by insuring that the School maintains its quality, are being asked to increase their support of students through academic achievement scholarships.

Alumni of the School are fortunate in having had the opportunity to receive a high quality engineering education. With the need so great for mineral engineers, students must have a similar opportunity to come to Mines with the knowledge that potential financial barriers will not be a problem.

You are encouraged to join forces with CSM and with industry to make it possible for talented students to attend Mines who might be attracted elsewhere or who may not otherwise be able to afford a Mines education. Through the ASAP, you have the opportunity to assist young people seeking the kind of education only Mines can offer.

The nation needs more talented individuals to take up the challenges involved in meeting the nation's mineral and energy demands. The Colorado School of Mines is determined to do its part in supplying this talent.

I congratulate the Alumni Association for coming forward with a program to help sustain the School in its mission, to attract its share of the nation's best high school students, and to guarantee that America's needs for mineral engineers will continue to be met.

—mm—

Dr. Guy T. McBride, Jr.

Minerals & National Defense

by General Alton D. Slay

I would like to give you my assessment of the current U.S. defense posture and what some of the trends are. The commentary that I will make on the relationship of your industry to my industry, defense, will then be compellingly obvious to you.

The theme that I will dwell on is an unpleasant one for me, and I think unpleasant to every thinking American. Our position in the international pecking order, of military power, industrial power, technical power, and economic power as it relates to the defense business is slipping badly. We are no longer the "arsenal of democracy" that President Roosevelt correctly tagged us about 40 years ago. In fact, unless we see some definite change for the better over the next five or ten years, we will reach the point where we cannot even accurately characterize ourselves as the arsenal for the United States.

Twenty years ago we were the strongest nation in the world, perhaps in the military sense, stronger than all the rest of the world combined. But I believe that future historians will mark that time, the early 1960's, as the time when our power relative to the rest of the world in every category started to decline.

Militarily that decline has brought us to the point today where our position vis-a-vis the Soviet Union is characterized by some as an equivalence of power. Regardless of how you characterize it, the fact of that decline is absolutely immutable. In those early 1960's we had a very, very overpowering nuclear strategic capability edge over the Soviets. That strategic power edge has completely vanished. The Air Force had 350 major force squadrons with 850,000 military people operating 16,000 first-line aircraft from 250 major installations all over the world.

Today we have just 250 major force squadrons, not 350. We have 550,000 military people, not 850,000 people. We now operate 7,000 aircraft, not 16,000. We operate those aircraft from 134 major installations, not 250.

About the same degree of decline can be measured in our other services. In 1970, for example, our total armed forces strength—Army, Navy, Air Force, and Marines—stood at three and a third million people. That figure today is two million, a decline of 40 percent in the decade.

As a comparative statistic, while our armed forces were declining 40 percent in the last decade, Soviet armed forces strength has grown about 25 percent. Since we were both about equal in 1970 in military strength, that represents a net disparity in growth of 65 percent. Those are facts.

During those same ten years, Soviet defense spending has grown at an average of five percent in real terms—year in, year out—every year.

Another fact is that during those ten years, each year—year in and year out—our defense spending has either declined or remained static. During the 1970's, Soviet spending on things related to my business—that's military research and development, military weapon systems acquisition, military facilities—exceeded that which the United States spent by $240 billion. Last year the Soviets spent over $50 billion more on those things than we did. That is more than the entire Air Force budget, including pay of troops.

The total number of Soviet scientists and engineers engaged in all types of research and development is approaching the one million mark. That is by far the largest R & D manpower pool the world has ever seen.

Last year the Soviets graduated just under 300,000 engineers. We graduated 50,000, and that was a banner year for us. We have never graduated more than 52,000 engineers in any one year.

Today, and for the last ten years, the Soviets have had three engineers engaged on military projects for every one that we have.

The old adage about poorly built Soviet equipment, ineffective Soviet equipment can be forgotten. If that was ever true, it certainly is not true today, and it was not true when the equipment that the Soviets have in the field today was bought. They have highly sophisticated, reliable and effective equipment.

I want to put away the myth, also, that the Soviets are bumblers when it comes to production. They are not. They are efficient producers, and their factories are modern and well equipped—better than ours.

Sixty percent of the equipment used in the aerospace industry is over 20 years old. The Soviets are outproducing us in every aspect of military production. For every armored vehicle we produce, they produce ten. For every artillery tube, they produce ten. For every fighter, they produce two and a half. For every helicopter, they produce three. They field 18 surface-to-air missiles for every one we produce. They build twice as many submarines and twice as many naval surface combatants as we do.

They are now and have been for 20 years on an R & D and acquisition offensive. They have a constant forward thrust which we lack, a constant forward acceleration; we lack that.

I have been discussing the "baddies," the Soviets. Let's look at our friends, see what they are doing. We are being directly challenged in the technical, economic and production sectors by many of our friends and allies in the West, and we have inexorably lost ground every year. Like our relative military, technical and production strength vis-a-vis the Soviets, our industrial economic and technical power relative to the rest of the free world is also declining. That relative industrial decline has brought us to a position today where much of our industry is less efficient than Japanese, German, French or Italian industry.

I had a 20-man team that spent six months touring Japanese, German and other foreign industries so I could see directly and for myself whether what I was reading was true. **It is.** That relative industrial decline has brought us to the point where most of our consumer electronics, like TV's, radios, stereo equipment, electronic watches, games, are imported from foreign sources to the point where Japan and Italy today can produce an equivalent automobile in half the man-days that we can in the United States. Last year the Japanese produced more cars and more trucks than did we; Japan has ten times—ten times the number of robots in their industry than do we in this large great country of ours. We are totally dependent on foreign sources for a large portion of our strategic minerals, as you well know; and we are required to pay whatever price is demanded by foreign powers for a large part of our energy resource.

That relative economic decline has brought the dollar to its lowest ebb ever, from 4.2 German marks to the dollar when I was stationed last in Germany, to 1.7 now; from 360 Japanese yen to the dollar when I was last stationed in that part of the world, to 220 now.

That relative technical decline has brought us to the point where we are soon going to be passed by several Western nations in technology. In many technical fields, particularly in micro circuitry and other areas of electronics, robotics, and machine tools, several countries are already ahead of us and the gap is widening.

According to the Bureau of Labor Statistics, our productivity growth rate for the total economy is the lowest of all major free world nations and continues to decline. While Japan's rate has been increasing annually for the last 20 years at 7.1 percent and West German's at four percent, the United States has been limping along at 1.5 percent.

Last year our productivity growth rate was a negative .8 percent. We didn't grow at all. This year, according to the figures for June, it looks like we will have a negative growth rate of about minus three percent.

Two years ago the United States Council of Economic Advisers projected a one and a half percent economic growth rate for the United States over the next ten years or so. That council must also devoutly believe in the tooth fairy, but suffice it to say that right now that forecast looks highly, highly optimistic. But even if you buy that forecast, if we do average over the next ten years a one and a half percent growth rate, that organization projected that France would overtake us in total worker productivity in 1986, Germany in 1987, and Japan in 1988.

I use a lot of mineral products in my business. Therefore, I watch very closely what is happening in this sector. The problems related to petroleum, for instance, are universal. Uncertain supply and very high cost of petroleum products are affecting us very, very adversely in readiness and training.

We also use a lot of non-fuel minerals. We have to have a reliable source of supply for those minerals to assure that we can reliably produce the hardware that we have to have to keep our armed forces going.

The United States had to import last year over $25 billion worth of the kinds of materials that I have to have in my business. This worries me. The fact that today we are dependent on foreign sources for over 50 percent of the total amount of essential strategic materials that I use in my business makes me very uncomfortable. The fact that many of these essential materials come exclusively from foreign sources and some of the most critical of them come from highly unstable areas of the world causes me great pain. The fact that the Soviet Union is virtually independent of imported supplies in all of these minerals and is in fact a net exporter of some of them causes me even greater pain.

The strategic implications of a situation like that are not very good. The strategic implications are even more painful to contemplate if you add another fact, that the nations and supranational groups with which we are allied are even more dependent on imports than are we. Let's take just one, West Germany, for example. They are totally dependent on imports for aluminum, tungsten, nickel, titanium, molybdenum, vanadium, antimony, mercury, platinum, magnanese, chromite, zirconium, asbestos, magnesite, and phosphate. They are 99.8 percent import dependent on copper; 93 percent in iron; 87 percent in lead; and 68 percent in zinc. Every one of those materials is essential to defense production. We rely greatly on German production of our NATO force.

Even where we have adequate supplies of the basic materials, we often don't have enough processing capability. Titanium sponge is a good example of that. We ony have three plants which produce titanium sponge.

There are only three remaining U.S. suppliers of large forgings, the kind that we need for aircraft landing gear and engine components. We are now being impacted by the closure of literally hundreds of founderies which occurred in the mid-70's as a result of a very ambitious OSHA-EPA rule making. Those which were able to stay alive had to make substantial investments in antipollution equipment which generally did nothing to improve productivity.

The shrinking industrial base, coupled with increasing demand not only nationally but worldwide for scarce materials

and products has resulted in greatly lengthened lead times and highly escalated costs. That means you as taxpayers in the United States are hit again.

Lead times for titanium forgings for aircraft and jet engines have gone up by 87 **weeks** since 1978. Large aluminum forgings were recently reported to me at 115 weeks, which was an increase of 43 weeks from last year. Steel forgings for landing gears have gone from 36 weeks in 1978 to 96 weeks in 1980.

As an example of what these problems in lead times cause, A-10 aircraft deliveries have been extended from 29 months to 49 months in the past two years due to the increased lead time for large forgings. It is a consistent story everywhere.

We hear a lot of talk today about the need to accelerate our defense spending and the need to surge our acquisitions system. Today there appears to be a considerable segment in our Congress determined to do something quickly to get defense hardware to the troops in the field. But I am afraid that our near term capability to surge, to do something quickly, is minuscule, and the long-term prospects aren't as grand as some people think.

In my opinion we are well on our way toward becoming a second-rate industrial power. That concerns me as an American citizen and concerns me very deeply as a professional military man. I think it is a gross contradiction to think that we can maintain our position as a first-rate military power with a second-rate industrial and mineral base. It has never been done in the history of the world. The factors that underlie this sorry situation aren't new. They have been germinating and maturing for a long time. One of these factors is the state of our national mineral policy. The most pernicious other factor relates to the incentives to invest in modern plant and equipment. Too few are positive, too many negative. On again, off again defense budgets in my business adversely affects us. Government overregulation adversely affects defense. The lack of competitive pressure in some areas and too much in others affect us, as do repressive profit policies. Repressive inflation, interest rates, repressive amortization and tax policies, are all dangerous for us.

Obviously, most of these factors are not within the province of the military, and I can do little directly to change them. There are a few things that everyone can do.

One thing that we can do is to stir the pot and to view the situation with alarm in public, try to increase the awareness of the problem.

A sick **industry** equates, in my mind, to a sick **defense** posture.

I have sent proposals to the Pentagon for both regulatory changes and law changes addressing some of these problems.

I have sponsored a legislative and regulatory change package that will make the use of multi-year procurement, for instance, in government much easier. Currently we have to contract in the worst possible way, a year at a time. That is a total disincentive to long-term capital investment in new plant and equipment. This proposal would redefine and broaden my long lead authority and the long lead authority of other government officials. It would allow advanced material buys for out-year deliveries, which we can't do now. It would also raise cancellation ceilings on all government contracts.

In the area of contract financing, I have proposed some regulatory changes which would allow us to increase such things as progress payments rates. It would allow us to lower the level for approval of milestone billings, would revise the criteria for approval of unusual progress payments and other things, all designed to improve the opportunity for productivity enhancement ventures.

I am also attempting to get a regulatory change which would allow us to include specific critical materials, raw materials such as bar stock and sheet stock, with other long lead purchases, and to stockpile that within our factories. We cannot do that now.

We have also worked with OSD, the Office of Secretary of Defense, and with FEMA on getting more rational stockpile policy. The stockpile policy through Title 3 of the Defense Production Act, *must* be revitalized.

Consideration must be given to enlarging of the national stockpile of expanding our basic mineral industry.

I have asked for a substantial increase in funding in our manufacturing technology from 57 million this coming year to 180 million in FY '86 as a constant spur toward productivity enhancement in the aerospace industry.

A group of mining industry executives visited with me a few months ago. I found that we all viewed the situation with alarm, trepidation and frustration. I have also held similar meetings with leaders of aerospace industry, and I am scheduling a meeting with national labor leaders whose organizations encompass the industry with which I do business.

Every one of these actions, even though every one of them is totally, completely successful, is just nibbling around the edges of the problem. Even if they all turn out well, the basic systemic problems that we all know exist will remain almost unscathed. What I have talked about this morning are problems of national scope which, if they are to be solved, have to be approached and dealt with on a national scale.

I have talked at some length about what our competitors are doing to make things tough for us—military, political and technical. But our problems are generally of our own making. Our destiny, I believe, is squarely in our own hands. It is not in the hands of the Soviets, it is not in the hands of our Western world competitors. We have it totally within our own capability and within our own grasp to reverse all of those adverse trends that we have talked about—if we set our minds to it. But will we step up to it? Well, that's the $64 question.

Our nation has been characterized throughout its history as having an abiding faith in the tooth fairy. We want to believe that things are great. We want to convince ourselves that things are going to turn out all right in the end and that the tooth fairy is going to visit us and leave that productivity dime under our pillow. It will not happen short of a national commitment to make it happen. The key to our success or failure in making things turn out all right is leadership at all levels—in government, in industry, in the military, in education.

And lest you get the wrong idea, I class myself as a dedicated optimist. . .a little cynical, perhaps, but a dedicated optimist. But the cynical side of my nature demands that I share with you another conviction: that pessimists are generally more accurate in their forecasts than optimists. But optimism about the future is reasonable because good things as well as bad things happen. And, God knows, we have had enough bad things happen to us in the past several years. It is time for some good things.

There is a difficult and very rocky road ahead if we are going to make these things come true. We've got to have the national sense of high purpose and national will that has carried us through many crisis in the past. Sen. James McClure characterizes the current situation in your industry as being of crisis proportions. I agree with that.

We will have to dust off our old tradition, I think, of hating to be second best. We will have to take our old national trait of unabashed, unapologetic patriotism out of the storage closet in the attic, and we have to quit apologizing for being the greatest country on earth. We have to quit worrying about the things that we have to do to maintain our position as the focus of political, economic and military power and leadership in the Western world and get on with the job. In short, we will have to start acting once again like the great world power that we still are and face up to the fact that we have to continue to fulfill our responsibilities of the Western world's power. We cannot shrink away from those responsibilities. If we do, I think our way of life and the freedoms that we love will shrink away from us and we will deserve whatever sorry fate befalls us.

I would like to close with a quote from the close of a speech made by Theodore Roosevelt three-quarters of a century ago. He said, "The things that will destroy America are prosperity at any price, safety first instead of duty first, the love of soft living and the get-rich-quick theory of life."

He went on to say, "If we seek merely swollen, slothful ease, and accept ignoble peace, bolder and stronger people will pass us by and will win for themselves the domination of the world."

Editors note: This is the second in a three part series of articles consisting of the keynote session addresses at the 1980 American Mining Congress, San Francisco.

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CSM Mining Department

Patricia Curtis Petty

The Mining Department tops the list of departments at Colorado School of Mines which have received funding for contract research this year. That's an enviable position from the point of view of the graduate students and the professors supervising this research. It is a vote of confidence by industry in the ability of this department to solve problems and provide answers. It is also a matter of some concern to the head of the department, Dr. Thys Johnson.

While Johnson is pleased with the variety of programs possible in the department because of this funding, he is also balancing this against other forms of research, particularly on an undergraduate level, and constantly weighing methods of integrating the funded research programs into the total curriculum of the department.

Together with the professors with whom he works, the other faculty on campus, and information garnered from mining department alumni, Johnson is evaluating almost every area of the current instructional mode, the type of student, the number of short courses given for continuing education programs and the future of the department. This is quite an undertaking, and, coupled with the daily teaching load, administrative duties and other responsibilities, has kept the staff of the department locked into extra hours of study and consideration.

New Move

After decades of being quartered in Chauvenet Hall, the teachers, support personnel and students of the mining department are excited about moving into the magnificient new George R. Brown Mining and Basic Engineering Building. The range of opportunities for expansion in the new building is challenging for everyone, particularly in the areas of research. New equipment, provided for by commitments from Newmont Mining and Ingersoll Rand, will enable the department to move into hitherto impractical areas of research and study.

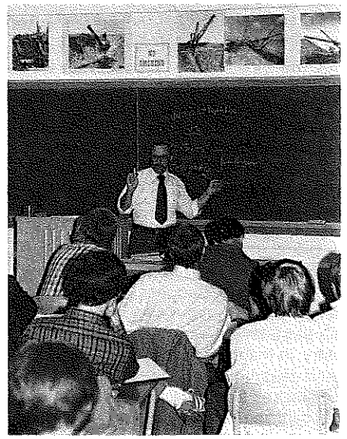
To better meet the challenges of the new surroundings and new facilities, the faculty is planning a few immediate changes, and planning for other, more significant changes in its program for later implementation.

One of Johnson's concerns with the present curriculum is *design* courses. He is evaluating what is currently missing in the course of study, hoping to add this material, and also to ascertain if there are overlapping courses. Recent additions to the curriculum addressing this problem are: underground mine design and evaluation; advanced surface design; advanced bulk handling mining techniques and more emphasis on rock mechanics.

Other philosophical and practical questions with which the faculty hopes to find some help were presented in the November, 1980, MINES Magazine. Dr. Donald Gentry, head of the curriculum committee in the department, is anxious that the alumni of the department return the questionnaires provided for their response.

Engineer or Technician

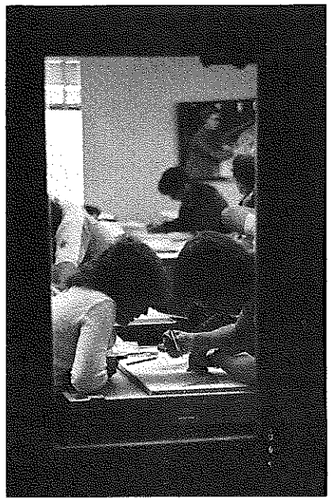
The question constantly arises in evaluating the mining engineer who graduates from CSM—what sort of engineer should we be educating? Should Mines concentrate on the research or analytical thinker? Historically, there has been a great deal of emphasis placed upon the fact that the Mines graduate "hits the ground running." Now, according to Johnson, the School needs to determine how many graduates *do* end up in the actual production stream. How many people are going to spend their mining engineering career actually in mine design simulation or other computer-oriented activities? What are the trends in industry and mining development, and how can the School and the Mining department best satisfy the demands of these trends?



The blackboard still is an important class tool, computers notwithstanding, as Prof. Gentry demonstrates here. (BRODIE FARQUHAR PHOTO)

More Coal Mines

Historically, also, CSM has produced engineers in the hard-rock mining area. Today, more and more graduates are going into coal production, and as technology develops, will be involved in the mining of oil shale. The necessary strengthening of the faculty to deal with these new demands has been taking place over a long period of time, and Johnson feels that the mining department faculty now in place is one of the best qualified in the United States. He cites the expertise available in rock mechanics; coal longwall; equipment evaluation, in addition to the skills which have always characterized the department, and feels that this breadth will continue to expand the education in the department. An extra benefit, not always found in other mining schools, is the fact that every professor in the department has spent usually a minimum of three years, and some much more, in the mining industry. Johnson stresses the importance of this training with its concomitant advantage of understanding the requirements of industry, rather than the more rarified classroom training only.



Two heads are better than one, when struggling with a tough problem.
(BRODIE FARQUHAR PHOTO)

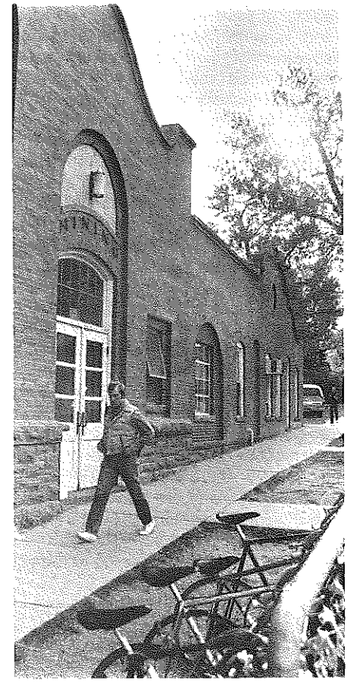
While industry requirements have always formed the basis upon which the mining graduates have found employment, there has been an element of choice present in the last few years not previously found. More fields, such as the greatly expanded computer application to mining, the expansion of engineering consulting firms and the necessity of much more concentrated research to find ways of utilizing resources, have been made available to the typical CSM mining graduate. In addition, there have always been a number of the entrepreneurial types, with each class of graduates having its quota of these miners. Quite often, they gravitate to the precious metals mining industry.

Facility Enlargement

Facilities in the new mining building will also broaden the base from which the faculty and engineering students will benefit. With almost twice as much space available as before, a wide range of experiments in coal laboratory; coal preparation areas; ventilation laboratory and rock mechanics will now be possible. Nearly 60 percent of the first floor of the building will be dedicated to rock mechanics study, with 4 testing machines available instead of the 1 now in use. Provided by Newmont Mining, the equipment is of the newest design, and includes a 1 million pound test set-up. Drilling facilities designed especially for the new building by Ingersoll Rand will open up exciting new possibilities in the teaching of that emphasis.

Dr. Donald Gentry feels that the curriculum adjustment, made upon the basis of the questionnaire and all other factors currently being weighed in the department, will have to be interlocked with the ongoing School-wide studies of curriculum. He is concerned with the competence of the graduate in other areas besides mining, and particularly concerned with the motivational factors of students attending Mines. A special sort of person, Dr. Gentry feels, is attracted toward the profession of mining engineer. The nature of the work requires patience, dedication and a high degree of skill—which takes many hours of study and hard work to obtain. Background, knowledge, even personality enter into the making of a good mining engineer he says.

Some similar thoughts are voiced by Dr. William Hustrulid, who says that the industry itself is partially responsible for the lack of incentive for young people coming into the field. Mining engineers, he feels, traditionally poor at communi-



Chauvenet will be left behind soon, as the Mining Department moves to the new George R. Brown Hall.
(BRODIE FARQUHAR PHOTO)

cating, and, even among themselves, do not always transmit information essential to development and growth of the industry.

Technical literature, in both quality and quantity, is improving, Hustrulid says. He sees a real improvement in the availability of hard information on research and new techniques, and the whole spectrum of mining development is being covered much more thoroughly. CSM professors are contributing to this vastly larger pool of information with articles for textbooks and journals, with Dr. Robert Trent, of the mining department, being the latest. He is the author of a chapter in the new Society of Mining Engineers Handbook on Mine Plant Design.

Hustrulid agrees with Gentry that the mining engineer is often a very special person, coming from a special background. This has led, he feels, to a philosophy in the teaching of mining engineers which stressed descriptive, technical *feelings* on some aspects of the industry. Today's trends are toward problem solving with hard calculation techniques. Students now have tremendously increased capability with modern calculators to arrive at answers more quickly, to seek many different approaches to problems. The "art" of mining might not be appealing to today's students, brought up on calculators and computer technology . . . hard information is their real desire.

Questions posed by Hustrulid are provocative—is it the responsibility of the School to teach *only* the essential fundamentals, then up to the company employing the graduate to complete specific training for specific object? Or, is the reverse best? That is, does the School put too much emphasis on broad training now, and should it be more narrowly focused? He also stresses that mining engineers and engineering technologists are *not to be confused*. There are schools of mining technology in the U.S., and there are engineering schools, such as CSM. He suggests that in some cases, the company employing engineers imperfectly understands the differences between the two, and can therefore be disappointed in its hiring results.

Drainage Study

Like many of the professors in the mining department, Hustrulid currently has a number of funded research projects in place—all with government funding, channeled through industry sources. Nuclear waste disposal, oil shale, raise-boring and rock mechanics programs are being investigated by graduate students under his supervision. A particularly interesting project underway is methane drainage, under the search for unconventional energy sources.

This problem investigates the possibility of obtaining methane gas as an energy source before the coal in which it occurs is mined. A source of explosions and deadly emissions now, methane could become a marketable resource under the proper conditions. The project is studying a system of hydraulic fracturing, wherein drilling and injection of a variety of fluids could be utilized to concentrate the methane in a central recovery area. It could then be diverted into a collection system, pumped to the surface and used.

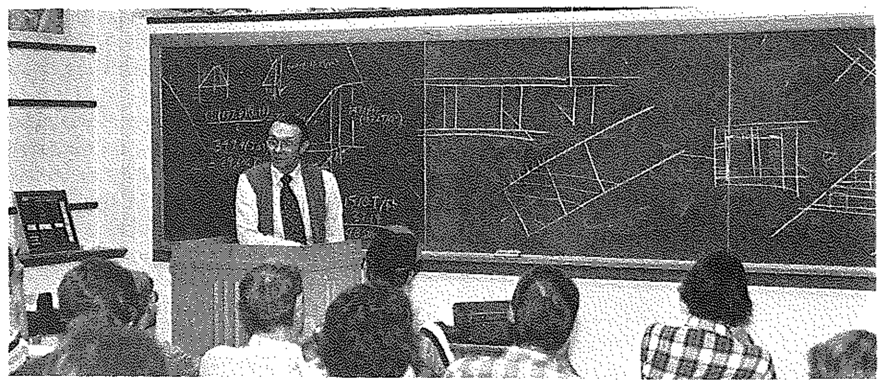
In order to test the various aspects of this, a special materials "sandwich" has been put into place in testing frames at the Edgar mine. The "sandwich" consists of coal, limestone and sandstone, and is subjected to both vertical and horizontal pressures outside and to internal pressures, applied to holes drilled in the blocks. The study covers fracture initiation and the subsequent propagation of the cracks in the block. A major question is the migration of cracks through a given formation, and if this migration can be controlled. The current study deals more specifically with the formation of the cracks and fluid recovery, and the maintenance of fractures in each bed of the sandwich. If pressure changes are excessive after the fluid and methane are collected, would this destroy the minability of coal beds so treated is also a major investigation.

Hustrulid points out that research projects are actually business ventures, with usable economic and technical data. If a specific need for research is not seen by a company, there is often reluctance to fund research of a "pure" nature, with the result that important information is often lost or delayed. Fewer and fewer U.S. citizens are going into the graduate program, preferring to enter industry immediately, with the result that much technical expertise is being lost. He feels that companies should consider more employee-graduate student relationships, although the public information requirement on new processes might intervene. The resultant new emphasis on research from such a program would be extremely beneficial to the industry and would encourage students to do graduate research.

Longwall Research

Longwall coal mining in a new technique is a graduate research project being conducted by Dr. Donald Gentry. Based on a German breakthrough in longwall mining, the research, being carried out at the Mid-Continent Resource Company's Carbondale property, is called a multiple-lift system of mining. Two sequence mining, involving two cuts at the coal, rather than the one used in conventional longwall systems, is being used. For the thick coal seams found in the Western U.S., this system would result in greatly increased recovery of the very valuable resource. Factors in the study include the measurement of stability, stress, pressure build ups, and especially stress ahead of the face. If the technique can be proven, it will result in better mine design and effective mining.

Advance longwall mining, rather than the retreat system, has been used at this mine previously, and the effectiveness of this is also part of the study. The team working on this project is composed of graduate students working on



Rock mechanics expert John Abel explains some simple diagrams to class.
(BRODIE FARQUHAR PHOTO)

both master's and doctor's degrees, plus occasional labor of undergraduate students and other laborers.

Another one of Gentry's projects consists of an important study in rock mechanics and the response of rock to longwall mining. A 35% pitching coal seam is being examined for its response to various kinds of equipment, the type of engineering required to maximize production and the correlation of surface effects of subsidence due to the underground operation.

Gentry's team is working under direct grants from the Department of Energy, and he points out that this is one of the few government expenditures directly related to increasing the coal commodity base.

Equipment Evaluation

Moving from underground coal production to surface mining, another research project is being overseen by Mathew Hrebar, who has extensive industrial experience. Hrebar, who worked as an engineer for Bucyrus Erie, primarily on Western mine sites, is working with a graduate student on an equipment comparison project involving scraper mining systems and drag-line. A generalized case study, the project deals with overburden depths, production rates and the comparative economics. With the current cost of diesel fuel, this study has become extremely important. Existing data bases have been used for this project, setting up an in-house case study system. Later field experience has been garnered at several surface coal mine locations. Three basic systems were used for the comparison, and the project then put on computer simulation. Other areas, completed within the last year, of graduate study under Hrebar's direction have been dragline simulation models and advanced surface coal mining planning.

Although a great deal of computer oriented work is not used at the undergraduate level in this particular area, Hrebar emphasized the value of a software contour mapping package made available to the mining department by Radion Corp, Austin, TX. The package, CPS-1, is valued at $50,000, and would not have been accessible to the department without this cooperation. Hrebar sees software packages for the simulations necessary in much of the equipment evaluation tests as being of primary necessity for the future.

Health & Safety Program

During the past year two significant events have occurred that have strengthened the emphasis on health and safety within the Mining Engineering Department.

First, two new courses, Mine Safety Management and System Safety Engineering have been approved by the curriculum committee. These courses, in conjunction with existing courses in Mine Industrial Hygiene, Mine Regulations and Selected Topics—Health and Safety, provide nine hours of course work in the area of mine safety. With these nine hours a mining engineering student can obtain a mining safety minor, an important emphasis considering the new regulatory requirements.

Second, the Mining Department has received a grant from the National Institute of Occupational Health and Safety (NIOSH), in cooperation with Colorado State University, to plan for the establishment of a graduate program in Mine Industrial Hygiene. This plan includes developing a curriculum for the program, obtaining a qualified Mine Industry Hygienist as program developer and acquiring the necessary equipment for instructional purposes.

The grant is for $100,000 which includes two $8,000 scholarships and $25,000 for new equipment as well as funding for a new faculty person. This program also represents a cooperative effort with the established industrial hygiene program at Colorado State University—one of the first cooperative programs between institutions of higher learning in Colorado.

For the past six years a conference called the Institute of Mine Health and Safety has been conducted. The Institute originally dealt only with coal mine health and safety but last year was expanded to encompass the entire mining industry.

The 1980 conference theme was "Safety and Health—Cost Effective?" Approximately 300 people attended the conference which is now considered an annual event.

One research paper, "Cost of Safety and Health Regulations at Selected Western Coal Mines," has been sponsored and published by the Institute.

Rock Mechanics Facility

John Abel, widely recognized for his work in rock mechanics, has planned and is in the process of implementing a large block-caving frame facility, to be installed in the research area of the new Brown building. The facility would be capable of handling much larger masses of rock than the unit which has been in use for some time in Chauvenet Hall.

Consisting of two frames, the materials under study would greatly enhance the capability to measure stresses, fractures and reactions of rocks under certain conditions, and would also allow more student participation in the projects.

Abel says that rock fragments up to 6-inch size can be examined, draw column heights of up to 45 times the width of the draw can be investigated, significant variations in rock fragments size and shape can be studied and some 3-dimensional testing of drawpoint spacing can be examined.

The new Materials laboratory at the Brown Building is 28 feet high, 17 feet wide and 37 feet long, giving more than sufficient space for the frames. Bin storage is also available, making the new facility an ideal place for this testing.

To date, three companies have agreed to help fund this project, which would make public all information and results derived for the project, to the total benefit of the mining industry.

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Mining Department Faculty

John F. Abel, Jr. received his bachelor's, master's, and doctorate degrees from the Colorado School of Mines. He has been in the industry for 24 years, having worked in several companies and taught in two other universities before coming to Mines. He has had articles published on several subjects including permafrost tunnels.

George B. Clark, with over 45 years experience in the industry, taught at the University of Illinois and the University of Missouri—Rolla before coming to Mines. He graduated from the University of Utah with a bachelor's and master's in mining engineering and received his Ph.D. from the University of Illinois.

Charles O. Frush has been employed since 1946 as an instructor at Iowa State University, University of Liberia and the Colorado School of Mines. He received his education at Iowa State University. Articles of his have been published in the SME Mining Engineering Handbook and the CSM Quarterly.

Donald W. Gentry received his bachelor's degree from the University of Illinois, his master's from the University of Nevada, and his Ph.D. from the University of Arizona. At Mines since 1972, he has been in the industry since 1966 having worked for several major companies. Many of his articles have been published.

Matthew J. Hrebar began his career in the industry in 1964 working for Bethlehem Mines Corporation, after graduating from Pennsylvania State University. He received his master's from the University of Arizona. Since coming to Mines in 1975, he has had several articles published.

William A. Hustrulid received his bachelor's, master's and doctorate degrees from the University of Minnesota. In the industry since 1965, he has worked in Sweden and Africa. Before coming to Mines he taught at the University of Utah and worked for Terra Tek, Inc. in Salt Lake City.

Thys B. Johnson, in the industry since 1956, received his bachelor's and master's from the University of Minnesota and his doctorate from the University of California. He worked for U.S. Steel between 1959 and 1964, for the U.S. Bureau of Mines in Denver until 1972 and has been at Mines since 1971.

Robert T. Reeder graduated from the Colorado School of Mines in 1949 and worked as an engineer for various mining operations, including a tour of duty with the Mining Branch, Conservation Division of the U.S.G.S. Prior to coming to Mines he served as chief engineer and project manager for Gates Engineering Co.

James M. Riddle received his bachelor's and master's degrees from Mines and then went on to Virginia Polytechnic Institute and State University for his Ph.D. In the industry since 1969, he worked in several mines in Colorado before entering the teaching field at Pennsylvania State University.

Robert H. Trent graduated from the University of Utah in mining and engineering and later received his master's degree from the same school. He has worked for mining companies across the United States and before coming to Mines taught at the University of Pittsburgh and Sheridan College in Wyoming.

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2 Percent Ore, 98 Percent Hard Work

In the Oquirrh Mountains' Pine Canyon of southwestern Utah, hard rock miners with pack mules, picks, and blasting primer cord crawled over craggy slopes to stake mining claims in the late 1800s. Abandoned tramway cable riggings and wooden ore bucket pulley towers are silent testimony to the incredibly hard work, slow production success and limited ore recovery they endured.

Today, the Anaconda Co. is mining the same mineral lands with modern equipment, a technique called vertical crater retreat, laser beam technology, a gravity-based concentrator flow, metric measurements and computer/cathode ray video terminals.

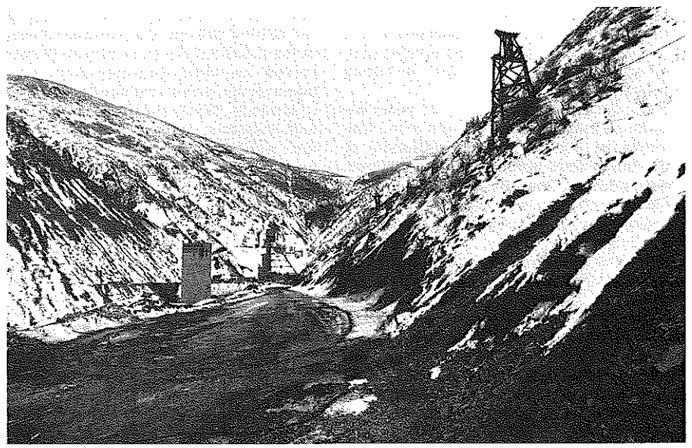
After a five-year, $216 million investment, Anaconda's Carr Fork Mine southwest of Salt Lake City at Tooele is producing about 4,000 metric tons per day of copper ore grading out about two percent net. Production began in September 1979 and by June 1981 approximately 10,000 metric tons per day will be mined routinely.

Nevertheless, the equation for success at Carr Forks today remains much the same as it did for the pick and pack mule brigades—2 percent copper, 98 percent hard work.

Anaconda's undertaking is making use of some rare or first time mining circumstances. Art Ditto, project manager, says, Carr Fork, projected to have a 25-year lifespan, is one of the very few large underground base metal mines developed in the last 10 years in the United States. The mine is the first of its kind in the nation to be designed in metric measurements.

Carr Fork is one of a limited number of deep mines which makes use of a mining method called Vertical Crater Retreat (VCR). Large diameter holes are drilled from the top sill through the ore to an undercut draw opening. Explosives blast chunks of ore downward to the undercut. The method retreats upward until the top sill is reached.

Other unique aspects include a gravity-based concentrator flow requiring only five process pumps. This system takes advantage of the steep slope terrain. One of the most modern engineering methods is a laser beam system. It is used at distances of between 3,000 and 4,000 feet. The laser pinpoints the drift center, allows measurement of the drift and is used to align rail haulage track to a one-half percent slope grade.



A contrast of the old and the new in the Bingham District's Pine Canyon at Tooele, Utah is evident here. At right is the 60 to 100-year-old steel cable tower tramway used for mining before the turn of the century. At left is Anaconda's modern production shaft headframe and nearby service shaft headframe. (L.B. Foster photograph)

Track Key to Productivity

The track haulage system is considered a key element in the production process by Ditto and mine management personnel. More than 300 tons of 115-lb. rail and nearly 5,000 hardwood crossties, pressure-treated for longer life in wet underground conditions, were supplied by L. B. Foster Co. Foster specializes in rail, pipe, piling, construction equipment and fabricated products.

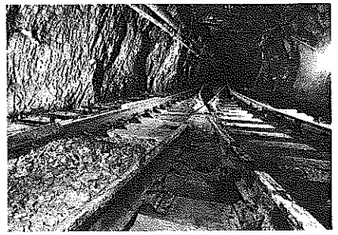
Involved in the haulage system is 8,000 linear feet or 4,000 track feet of rail from Foster, and a minimal amount of 80-lb. and 85-lb. relay rail.

Installation of the rail, supplied through Foster's Los Angeles Division, involved utilizing the two-deck, men/materials cage in the surface shaft headframe. Six 39-ft.-long rails at a time were hooked to the underside of the cage floor and lowered to both main levels at elevations of 970 and 1,200 meters above sea level.

Rail strings are spiked to hardwood ties with steel plate overlays. Huck bolts were used on all joint bars. Concrete slabs, steel ties and pandrol plates on concrete ties were considered but rejected for the haulage system for various reasons. The overriding goal is for a safe, secure track haulage system that minimizes production downtime.

Heavy Duty Trains Used

Two trains of Asea 12-cubic-meter cars are being used in the haul runs. Each train is composed of 20 cars and is moved by two General Electric 30-ton locomotives. The trains can be controlled from either the front pulling locomotive or the rear pushing vehicle. The second unit responds automatically to the operator's commands. The trains also can be controlled by radio commands transmitted by an operator at the loading chute.



L.B. Foster Co.'s frogs and switches for the 11 custom fabricated turnouts in the new mine. (L.B. Foster photograph)

Carr Fork utilizes a blend of manpower and computers. Project development and actual mining necessitates a workforce of 700 to 800 persons, the majority of which are miners. Anaconda operates its own miners training classes in which trainees are screened, selected monthly, paid for class work and classified. The goal is to fill the necessary 550 miners jobs to operate three and four man crews, three shifts a day, seven days a week.

Computers Quantify Progress

Approximately 25 video display terminals are in use throughout the various departments to provide quick access to a variety of facts, figures, charts, projections and design ramifications. It allows personnel of several departments access to relevant data. Several computer systems have been used already, and more are scheduled to keep pace with mine growth.

The bottom line at Carr Fork is seen as a low-cost copper mine that will return a profit on investment over the long term. Fluctuations in the copper market and mineral speculation will have an effect on Carr Fork's success level. However, mine management has faith in the future and in the timing for the facility to hit its production peak. Anaconda's 60-plus-years of patience in its Tooele area investment has every indication of panning out.

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alumni update

'39 William F. Distler, E.M. and Medalist '77, with Climax Molybdenum Company, was a member of the program committee for the AMC Mining Convention held in San Francisco in September.

Courtney E. Cook

'49 Robert J. Black, Geol.E., formerly chief geophysicist for Zapata Exploration Co., is now manager of geophysics for Weaver Exploration Co. in Houston. **Herbert J. Ashe, E.M.,** of Bethlehem Steel Corporation, and **Franck M. Monninger, Met.E.,** of Occidental Minerals Corp., were members of the program committee for the AMC Mining Convention held in San Francisco in September. **Courtney E. Cook, P.E.,** is now vice president-operations for Western Associated Development Corp. in Denver. He was previously vice president-operations for Kissinger Petroleum Corp.

'50 Ronald F. Lestina, Geol.E., is now self employed as a geological consultant in oil and mining leasing and deals with environmental issues. He was previously with Farran Development Corp. as manager of operations.

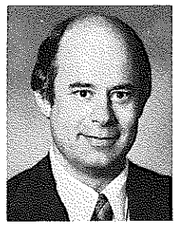
'52 Ira E. McKeever, Jr., Geol.E. and Van Diest Gold Medalist '65, was a member of the AMC Mining Convention program committee. He is with Colowyo Coal Company. **Claude B. Jenkins, Geol.E.,** has been promoted from division manager to manager-joint interests for Aminoil USA.

'53 Stanley C. Holmes, E.M., of Phelps Dodge Corp., was a member of the AMC Mining Convention program committee in San Francisco last September. **Edgar D. Turner, P.E.,** has moved from vice president and general manager to vice president-operations for Fluor Drilling Service in Irvine, California.

'54 James D. Mulryan, E.M., formerly manager of safety and land development for Cyprus Industrial Minerals Co. in Montana, has been transferred to Littleton, Colorado as assistant manager-development and exploration with that same company. **James B. Russell, P.R.E.,** has been promoted from field engineer to division facilities superintendent for Amoco Petroleum Corporation.

'55 Harold E. Kellogg, Geol.E., previously a self-employed exploration consultant, has been named exploration manager in the Denver office of the newly-formed U.S. subsidiary of Joffre Oils Inc. of Calgary.

'61 Ronald B. Kahler, Met.E., formerly project manager for Morrison Knudson Co., Inc., has joined Hecla Mining Co. as assistant chief engineer in Pinehurst, ID.



Thomas R. LaFehr

'62 Dr. Thomas R. LaFehr, MSc.Geol., chairman of Exploration Data Consultants, Inc. of Denver, has been appointed to the Advisory Subcommittee on Geodynamics and Geology of the National Aeronautics and Space Administration Advisory Council. He has published numerous scientific papers on geophysics and geology. **Thomas J. Augustine, E.M.,** is now general superintendent of Allen and Maxwell mines for CF & I Steel in Western, Colorado. He had been superintendent of that company's Sunrise iron ore mine in Wyoming. **W.R. Pitman, P.E. and**

Thomas Augustine

MSc.Pet. '66, is no longer completely involved in the oil business as in the past 17 years. He is now trying his hand at ranching. He and his family welcome Miners to stop by on their way to catch the big Kamloop trout in Pend Orielle Lake and other lake points north in Canada. They are located near Athol, Idaho, 18 miles north of Coeur d'Alene.

'63 Gordon R. Lacy, Jr., E.M., is now manager-business development for Morrison-Knudsen. He had been with Holmes & Narver Inc. as manager-marketing services.

'65 Barry D. Quackenbush, P.E., formerly manager for Tenneco Oil E & P, is now production manager for Tenneco-Central Gulf Division.

'68 Stanley Smookler, MSc.Geop., is now a geophysicist for Water Power Resources Service, in the Department of the Interior.

'69 Bruce A. McKinstry, E.M., formerly project engineer for Harrison Western Corporation, has joined J.S. Redpath Corp. in Arizona as general superintendent. **Ronald J. Cooper, P.E. and MSc.Pet. '70,** is employed by Conoco Inc. as division engineer. He had been with Continental Oil as director-regulatory affairs and services.

'70 Roger E. Knight, P.E., has joined Petroleums Inc. of Denver Voyager as operations manager. **Robert P. Bills, E.M.,** formerly business development representative for Dravo Corp., is now project manager-coal and minerals division for Tosco Corporation.

'71 Roberto G. Aguilera, M.Eng.Pet. and PhD. '77, is president of Roberto Aguilera and Associates, Inc. in Canada. **Harry J. Briscoe, BSc.Geol. and MSc.Geol. '73,** formerly division geologist, has been promoted to division exploration manager, southwestern division, Tenneco Oil Company in San Antonio, Texas. **Larry R. Fischer, BSc.Min.,** is project engineer for Rio Blanco Oil Shale Co. He was previously senior mine engineer for Gulf Mineral Resources Co.

'72 Robert D. Wunder, BSc.Geol., has been transferred from Kennecott Copper Corp. where he was a truck foreman, to Kennecott's Bingham Mine, KMC, where he is operations superintendent. **James Bruce Bills, BSc.Min.,** formerly staff mining engineer for 3R Engineering, is now engineer for United Bank of Denver. **Christopher Bobbitt, Math,** has been promoted from systems analyst at Gates Rubber company to systems engineer for that same company.

'73 Thomas W. Haycraft, BSc.CPR, has joined Purvin and Gertz Consulting Engineers as a consultant in Dallas, Texas. He was formerly with Drake Engineering and Construction in Winter Park, Colorado. **C. "Mike" Crutchfield, BSc.Met.,** is project engineer for Bateman Uranium Corporation in Lakewood, Colorado.

'74 Robert A. Windels, BSc.Geop., is presently vice president of Evergreen Geophysical Associates Inc. **Michael J. Flanigan, BSc.Pet.,** has received his MBA degree from West Coast University, Orange, California. He is employed by Grace Petroleum Corporation as the southern district operations engineer in Denver. **Bruce E. Peers, BSc.Min.,** has moved from Ingersoll-Rand to Loveland Compressor Inc. as sales manager. Loveland Compressor specializes in remanufacturing/replacement of air conditioning, refrigeration and air compressors.

'75 Melinda S. Smith, B.E., senior production engineer for Exxon Co. in Houston, will be married in January '81 to Eli Guajardo. **Richard A. Bohling, BSc.Met.,** is back in Colorado working for Homestake Mining Co. after working five years for the Cleveland Cliffs Iron Co. in Michigan's upper peninsula. **James C. Hasbrouck, BSc.Geop.,** formerly marketing geophysicist for Geometrics Inc., has joined Gulf Mineral Resources Co. of Denver as a geophysicist. **Raymond J. Zeidler, BSc.Min.,** is employed by T.O.E. Investments in Denver as mining engineer.

'76 James H. Hannan, E.M., is now shaft engineer for Harrison Western Corporation. **Chuck McLendon, BSc.Min.,** has been promoted to chief engineer for Allied Chemical's 4.5 million tpy quarry in Jamesville, New York. He was formerly senior mining engineer at Allied's trona mine in Green River, Wyoming. **Robert O. Walston, BSc.Geol.,** previously coal exploration geologist for Martin Trost Associates, is now exploration geologist, involved with geothermal developments in the West for Technology International of Denver. **Art Palm, BSc.Min.,** has been promoted from mine production supervisor to general mine superintendent for Allied Chemical in Green River, Wyoming.

'77 Paul M. Taufen, MSc.Geoch., is senior geochemist for Texas Gulf. **Lawrence D. Kulp, BSc.Met.,** formerly an engineer for Anaconda, is now metallurgist for Dalton Precision in Cushing, Oklahoma. **Ben B. Massie, BSc.Min.,** has joined Standard Metals Co. in Silverton, Colorado as miner. He had been with Stearns-Roger in Wyoming. **Robert S. Bolmer, BSc.Pet.,** previously petroleum engineer for Gulf Energy Minerals Co., is employed by NICOR Exploration as a petroleum engineer. **Gerald A. Madore, BSc.CPR,** has moved from Gulf Oil Co. where he was a chemical engineer to Gulf Mineral Resources Co. where he is a process engineer.

'78 Harold H. Miller, BSc.Met., has moved to Florida to work for Agrico Chemical Company's mining division as senior metallurgist. **Dan Driscoll, BSc.Met.,** formerly safety officer for Western Nuclear, has joined Colorado School of Mines Research Institute as research metallurgist. **Jill C. Ivey, BSc.Min.,** is employed by Anaconda Copper Co. as production engineer. She had been shift boss for Kerr-McGee Nuclear Corp. **Donn W. Murphy, BSc.Pet.,** who had been with Tenneco as petroleum engineer, is now an associate with Petroleum Engineers, Inc. of Denver.

'79 Ramona M. Nicks, BSc.Math, is now receptionist/counselor for Chapman College. She was formerly ensign for National Oceanic and Atmospheric Administration. **Michael A. Smith, BSc.Met.,** previously metallurgical engineer for Inspiration Consolidated Copper, is now with UOP, Inc., Mineral Science Division as project engineer. **Russell W. Truby, BSc.Pet.,** is employed by Marathon Oil Co. as drilling foreman. **John McDonnell, BSc.Min.,** has joined Multi-Mineral Corporation in Meeker, Colorado, as a mining engineer. **Sharlene M. Piper, BSc.Pet.,** is now offshore operations engineer for Arco Oil & Gas Co. in Houston, Texas.

CSMAA Honorary Membership

The CSM Alumni Association annually confers honorary memberships in the Association on individuals who have been of significant service to the Colorado School of Mines and its Alumni. Individuals can be recommended by members of the Association for this honor. An Honorary Membership Committee recommends candidates to the Association Board of Directors for final selection.

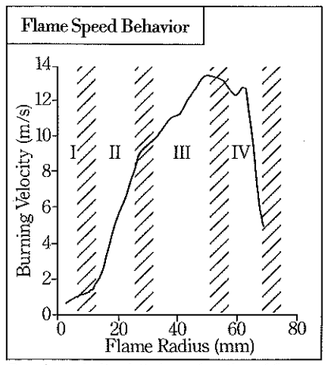
Several criteria are used in selecting individuals for this honor. These are:

- The recipient of the Honorary Membership in the CSM Alumni Association must be of good moral character and in good standing professionally.
- The recipient must have rendered distinguished service to the Association and/or the Colorado School of Mines.
- The recipient need not be a graduate of the School of Mines.
- The recipient should be able to be present in person to receive this honor at the May 1981 Commencement banquet.

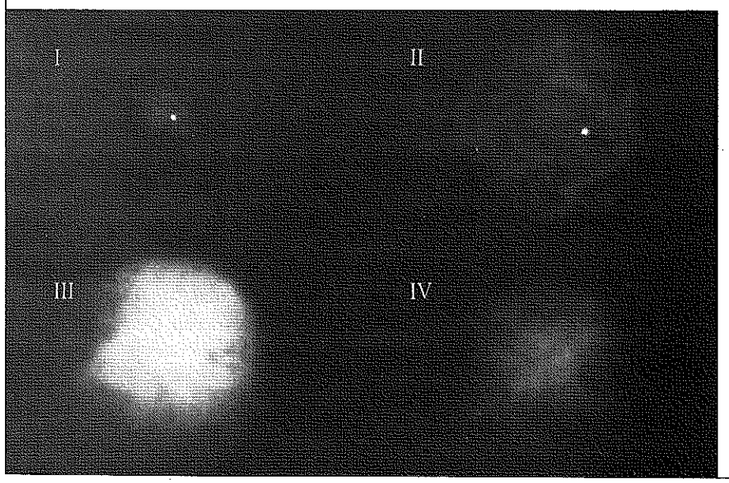
Please submit your recommendations for this honor to the Honorary Membership Committee, Alumni Association, Guggenheim Hall, Golden, CO 80401, prior to January 15, 1981. Please include a brief synopsis on the background and service of each individual with your recommendation.

The Turbulence Parameter

Energy-efficient operation of the internal combustion engine requires the highly turbulent movement of fuel and air in the chamber. Recent advances at the General Motors Research Laboratories provide a new basis for determining what degree of turbulence will get the most work from each drop of fuel.



Burning velocity plotted as a function of flame radius. Combustion stages are indicated by roman numerals.



High-speed photographs showing flame evolution (lasting six milliseconds) through four stages: initiation (I); flame growth (II); full development (III); termination (IV).

WITHOUT TURBULENCE, the highly agitated motion of cylinder gases, combustion would take place too slowly for the gasoline engine to function. Predicting combustion behavior in order to design engines with greater fuel efficiency depends upon understanding the relationship between vital, turbulent gas motions and burning rate. The challenge is to quantify this relationship—a complex task made more difficult by the requirements of measuring a transient event occurring in a few milliseconds within a small, confined space.

New knowledge of how turbulence affects flame speed has been revealed in fundamental studies conducted at the General Motors Research Laboratories by Drs. Frederic Matekunas and Edward Groff. Their investigative results have been incorporated into a model that successfully predicts the effect of engine design and operating conditions on power and fuel economy.

The researchers separated their experiments into two phases. In the first phase, they measured turbulence in the engine cylinder; in the second phase, they determined flame speeds over a broad range of operating conditions. Testing took place in a specially designed, single-cylinder engine equipped with a transparent piston to permit high-speed filming of the combustion event.

Hot-wire anemometry was applied to measure the turbulent flows while the engine was operated without combustion. Instantaneous velocities were calculated from the anemometer signals and simultaneous measurements of gas temperature and pressure. More than 400,000 pieces of data were processed for each ten-second measurement period.

The significant measure of turbulence is its "intensity," defined as the fluctuating component of velocity. Because conditions in the cylinder are both transient within cycles and variant between cycles, separating the fluctuating and mean components of velocity is inherently difficult. The researchers overcame this problem by using a probe with two orthogonal wires properly aligned with the direction of the mean flow.

In the combustion phase, tests were performed at over one hundred operating conditions of varied spark timing, spark plug location, engine speed and intake valve geometry. Detailed thermodynamic analyses were applied to the recorded cylinder pressures to calculate flame speeds throughout combustion. High-speed films were analyzed frame by frame to validate flame speeds and to characterize how gas motions influence the initial flame.

The researchers used these measured flame speeds, turbulence intensities, and the conditions under which they occurred to formulate a burning law for engine flames. They divided the combustion event into four stages. The initiation stage begins with ignition and ends as the flame grows to consume one percent of the fuel mass. In the second stage, the flame accelerates and thickens in response to the turbulent field. The third stage exhibits peak flame speed. In the final stage, the thick flame interacts increasingly with the chamber walls and decelerates.

OVER THE RANGE of turbulent intensities encountered in engines, the researchers were able to describe the turbulent burning velocity, S_T, during the critical third stage of combustion with the expression:

$$S_T = 2.0\, S_L + 1.2\, u'\, P_R^{0.82}\, \beta$$

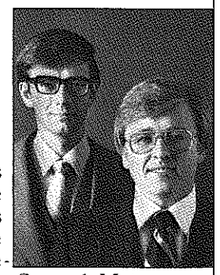
S_L, the laminar flame speed—a known function of pressure, temperature and mixture composition—is the flame speed that would exist without turbulence. The variable u′ is the turbulence intensity. P_R represents a pressure ratio accounting for combustion-induced compression of the unburned mixture. The dimensionless factor β accounts for the effect of spark timing on geometric distortion of the flame which occurs during the first combustion stage and persists into the later stages.

The researchers also observed that the burning velocity in the second stage increases in proportion to flame radius, and that in predicting the energy release rate from the burning velocity equation, it is necessary to account for the finite flame-front thickness.

"The form of our burning equation," says Dr. Matekunas, "shows a satisfying resemblance to expressions for non-engine flames. This helps link complex engine combustion phenomena to the existing body of knowledge on turbulent flames."

"We see this extension," adds Dr. Groff, "as a significant step toward optimizing fuel economy in automotive engines."

THE MEN BEHIND THE WORK



Drs. Matekunas and Groff are senior engineers in the Engine Research Department at the General Motors Research Laboratories.

Both researchers hold undergraduate and graduate degrees in the field of mechanical engineering.

Dr. Matekunas (right) received his M.S. and Ph. D. from Purdue University, where he completed graduate work in advanced optics applications.

Dr. Groff (left) received an M.S. from California Institute of Technology and a Ph. D. from The Pennsylvania State University. His doctoral thesis explored the combustion of liquid metals.

General Motors welcomed Dr. Matekunas to its staff in 1973, and Dr. Groff in 1977.

in memoriam

Wallace W. Agey

Wallace W. Agey

Wallace W. Agey, Met. E. 1939, died September 4, 1980, in a Salt Lake City hospital. He was 73 at the time of his death.

Born in Chicago, Illinois, his family moved to Kansas City where he attended high school and the Kansas City Junior College before entering Mines. After his graduation in 1939 he joined Rip Van Winkle Mining Co. in Elko, Nevada. Later that year he moved to Phelps Dodge Copper Corp. in Arizona.

In 1940 Agey became a junior metallurgical engineer with the U.S. Bureau of Mines in Salt Lake City, Utah. He remained with the Bureau of Mines until his retirement in 1972 from his position as research metallurgist. Between 1949 and 1951 he was stationed at Mexico City as liaison to the Mexican Bureau of Mines.

He is survived by his wife, Catherine.

Arthur C. Smith

Arthur C. Smith, P.E. 1937, died September 19, 1975, in St. Petersburg, Florida. He had been retired there since 1959.

While at Mines Smith was a member of Blue Key, Beta Theta Pi, Scabbard and Blade and Theta Tau. After graduation he was employed as petroleum engineer for Lago Petroleum, a subsidiary for Standard of New Jersey, in Maracaibo, Venezuela.

He later moved to Creole Petroleum Corporation. He retired as drilling superintendent for Eastern Division in Quiriquire, Venezuela.

He is survived by his wife, Imogene, and one son.

John Kushner

John Kushner, Met.E. 1942, died December 19, 1979, in Binghamton, New York, at the age of 64.

After his graduation from Mines he joined Bliss & Laughlin Steel Corp. in Buffalo, New York. He later worked for Chevrolet Motor Corp., Spaulding Fibre Co., Carrier Corp., and the State University of New York. In 1959 he joined the Broome Technical Community College in Binghamton as head of the department of chemical technology.

He is survived by his wife.

Robert S. Spalding

Robert S. Spalding, E.M. 1933, died September 24, 1980, at St. Anthonys Hospital Central in Denver.

Born February 11, 1909, in Denver, he attended Princeton University and the Colorado School of Mines, graduating in 1933. He was employed as metallurgist and engineer for firms in Colorado, Arizona, New Mexico, Alaska, and Nebraska throughout his career. Several of his munitions inventions were patented during the time he worked for the Remington Arms plant. He also invented a fuel injection system.

Spalding was instrumental in bringing a planetarium to Denver and was a member and past president of the Denver Astronomical Society. He also was a sponsor and board member of the Spalding Rehabilitation Center.

In 1969 he ran for mayor of Lakewood when the city first was incorporated. He also taught at Colorado College.

Spalding was a member of the American Society for Metals, A.D.P.A., Colorado Society for Engineers, and AIME.

He is survived by his wife, one son, two stepdaughters, two grandsons, and four stepgrandchildren.

sections

New York

The New York Alumni Chapter hosted Dr. Guy McBride, CSM President, and C. W. "Bud" Leeds, CSM Foundation, at the Pinnacle Club on October 2, 1980. Ralph Hennebach, '41, made the arrangements. Dr. McBride outlined "CSM 1980-81" and responded to a number of Alumni questions.

Those attending included Charles Irish, '50, president; Newell Orr, '54, corresponding secretary; Jack Bell, '49; Peter Bergen, '58; Bill Breeding, '39; John Chandler, '59; Peter Donavan, '63; Van Donohoo, '39; Jim Endacott, '54; Herb Goodman, '48; Ralph Hennebach, '41; Bob Howe, '33; Kurt Linn, '52; Ted Nelson, '34; Hobert Orton, '53; Don Roberts, '41; Allen Schedlbauer, '63; Jay Spikelmier, '69; Ned Wood, '48; George Wunder, '36; Bill Yopp, '56; Joan Irish; Michael Joyce, Olin Foundation; and Bill Dinsmore, Texasgulf.

letters

Dear Ms. Petty:

I always enjoy the MINES Magazine, and the September issue was special since it contained the picture taken on the 1932 Senior trip.

I wondered how many of the fellows I could identify, so I just started—hence the messy picture I am returning. Maybe it will be of some help.

Sincerely,

Art Austin, '32

Dear Mrs. Petty:

Enclosed is a copy of the picture that appeared in the September Mines Magazine; also a list of names that are my recollection of the men shown. There are other familiar faces but I can't fit a name to them.

This is just a partial answer to your question—Who are these men? Maybe someone else can add a few more names.

This picture brings back a lot of great memories and I hope to get the chance to see some of these fellows at the 50th reunion.

Very truly yours,
Ezell Flournoy, '32

Editor's Note: The list below is compiled from the letters we have received in answer to our question "Who are these men?"

1. Phi Warren, '13
2. Prof. Carpenter
3. A.B. Austin
4. Thomas E. Northrop
5. Louis Bartholomees
6. George W. Heim
7. A.C. Savage
8. Prof. Signer
9. Prof. Underwood or Underhill
10. Harry F. McFarland
11. Vincent N. Burnhart
12. Eugene Pressett
13. Harold C. Harris
14. Luther J. Dempsey
15. George A. Setter
16. Walter H. Zwick or Earl Adams
17. Frank J. Hong
18. Robert J. Dalton
19. John A. McClave
20. Prof. Huleatt*
21. Ezell Flournoy
22. R.A. McClevey
23. Thomas V. Canning
24. C.D. Michaelson
25. William P. Morris*
26. Milton N. Tobin*
27. Samuel A. Gustavson
28. Edgar C. Rice
29. Karl A. Von Den Steinen*
30. R.C. Jensen
31. Lewis (Bud) Honey
32. William Clark
33. William Morris
34. Earl Johnson

*=Not Positive

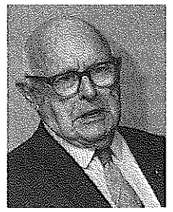
Dear Mrs. Petty,

I attended the alumni luncheon at the Hilton (San Francisco) yesterday and picked up a copy of the September magazine.

Your request for identification of those in the picture on page 31 is the reason for this letter. Both my Mother and Father would be angry if I didn't identify Dad in the front row. I have attached a photocopy of the print with his face circled. I also noted that Underwood is Underhill.

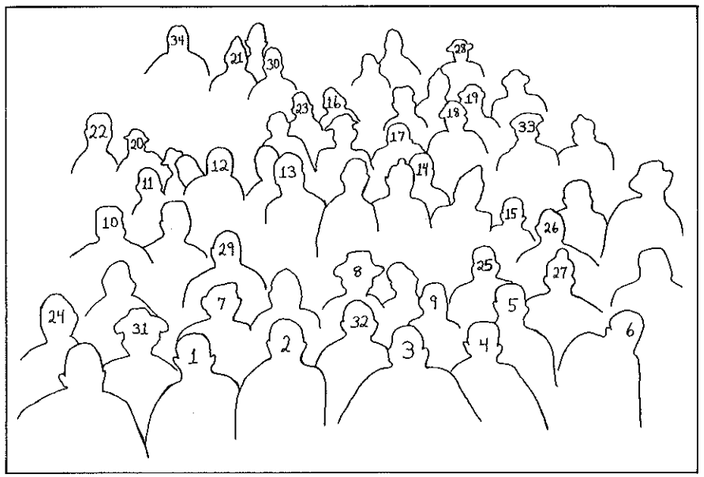
I enjoyed the luncheon and meeting people I haven't seen since college days.

Sincerely,
A. W. "Dub" Warren, E.M. '40



"Pi" Warren

NOTE: Sorry, we should have recognized that good friend, S. P. "Pi" Warren, E.M. '13, in the front row, second from left.



To the Students:

I was quite interested in our recent conference in Keystone, Colorado, in the discussion of international trade and business practices. There was a lot of time spent on the morality of business, both at home and abroad. In your interdependent, modern, differentiated, pluralistic society, international business takes on a new dimension. Since many of our graduates will be involved in international trade, a few thoughts to our student body. In order to proceed, a few definitions of terms which will be used as listed below:

1. Modern social order—This order is composed of Christians, Jews, Muslems, Buddhists, atheists, and others who all have varying visions of the world order.

2. Traditional societies—These societies have a premodern, precapitalistic, predemocratic view of social order. They tend to imagine that economic order will be characterized by charity and justice dispensed by some all-powerful government entity.

3. Democratic capitalism—This is described as a society which is differentiated into three social systems: a political system, an economic system, and a moral-cultural system. These systems should be influenced by each other, but this influence should never be so strong as to subordinate one to either of the others.

4. Socialistic societies—These societies are those in which all social and economic systems are controlled by the state or the governing body.

5. Corporation—The corporation is an invention of the law which has made democratic capitalism possible. A corporation is a social institution larger than the individual but smaller than the state. Its purpose is to provide continuity which transcends the life span of its participants. Its purpose is to use the talents, initiative, and cooperation of the individual participants, provide accountability to its owners and it must show a profit to continue to exist.

When you consider taking a job abroad, you will undoubtedly be employed by a corporation—more likely a multinational corporation. The business involved will be carried on under a minimum of two sets of national laws (U.S.A. and host country) in an environment which will be operated under a different vision of society, culture, and religion, and probably in a language different from English. These are formidable obstacles to contemplate for a new graduate.

In my experience, the first prerequisite is to enter into such a job with an open and inquisitive mind. You have as a basic tool a mineral engineering education which is second to none. Thus, you can deal with technical problems involved from a position of strength. Second, you have a heritage from your country and your home which has emphasized the value of importance of the individual. With these two basics and reasonable health and vigor you should be able to face international competition with confidence. The remaining factor of communication in your new environment presents a problem. Usually there are other Americans in the operation as well as many nationals of the host country. You have two choices. Either segregate and keep with your own kind (limiting your ability to communicate) or learn the language and customs of the host country and prepare yourself to live a broader, fuller, and more useful life.

The actual operation of a business in a foreign country requires accommodation to the local governing laws. It is difficult and usually unwise to attempt to impress American business, political, and cultural ways on the host people. One thing, however, is usually favorable. The fact the business is allowed to locate and operate in the host country means it is perceived to be needed. The degree of accommodation which a company achieves in the host country usually measures the success it achieves and its continuity. It must be valuable to the host country or it will not survive. Of course, there are other factors upon which survival depends. Unstable governments or the development of governments which have adverse political and economic principles threaten the corporate operation. From this short discussion it is immediately obvious that there are risks involved beyond the successful operation of the business itself.

United States corporations abroad represent not only an economic system but also political and moral-cultural systems. They are agents of democratic capitalism and unless they can establish and represent on foreign soil at least some of the political and moral-cultural ideas on which these systems depend, they are doomed to lose their moral legitimacy. Without this legitimacy, their continuity is doomed. Impossible political and cultural burdens cannot be imposed on business enterprises. However, they cannot escape the burden of carrying with them the presuppositions of their own native political and moral-cultural systems. Since both traditional and socialistic types of government attack the capitalist system, corporations must become aware of the deluge of ideas, beliefs, and practices into which they are entering and be qualified advocates of those ideas and principles which will allow their business to survive. Business enterprises are not designed to be either political or moral-cultural institutions. They do not have social responsibilities as such. They are, however, organisms which cannot flourish independently of the political and moral-cultural systems from which they have sprung. Their responsibility **to themselves** entails sophisticated attention to the political and moral-cultural requirements of their own existence. Such are the facts of life of democratic capitalism abroad.

In addressing an individual's position in the before-mentioned pluralistic differentiated society and developing a moral code for guidance, it is obvious that the ethical code of a practicing Christian is not necessarily a singular answer. Tradition and practice have determined the ethical code practiced in any particular host country. This moral code issue is an individual one and how you, as an individual, conduct yourself will depend on your specific world outlook and the moral code you have developed which satisfies your particular needs.

Sincerely,
T. A. Manhart, '30

Editor's Note: The foregoing letter was T. A. Manhart's thoughtful commentary on the moral and ethical questions raised by the student's at last summer's Keystone Conference. Manhart is a successful geophysicist, self-employed in Tulsa, Oklahoma. He is a moving force in the Energy Advocates, dedicated to disseminating information on the energy industry.

Dear Mrs. Petty:

I have just read your article in the September Mines Magazine—it gets here a lot earlier now that it comes by air. I refer to the article entitled "Construction and Philosophy". I am not an authority on either construction OR philosophy, but the article deals also with the subject of foreign operation. In the field of foreign operation, I am not exactly an expert, but I have had some experience in Latin America mostly and I was somewhat startled at a couple of the ideas advanced—particularly as they might be applied to those "foreign" countries where I have worked—not always for contractors, but mostly for American corporations, and mostly (also) in mining.

Your subject, Provost, mentions the U.S. tax structure as something adverse to "Americans working overseas". He mentions "double taxation" as one of the obnoxious features of overseas activity. Unless the situation has changed greatly in the last five or so years since I was actively employed, this would certainly not be true. In fact, it was the favorable situation with respect to income taxes that enabled me to save a little money above my normal living expenses over a period of many years. First, income taxes in Central America, at least, are far below the rates applicable in the U.S., second, they are usually deductable from the U.S. income

tax—and I believe, still are. Also, for individuals, at least, there has been a $20,000 to $25,000 exemption of U.S. income taxes for U.S. citizens working overseas—whereever in the world they worked. Under the Carter administration, the amount was reduced to $15,000, but even that reduced amount could be something of an incentive to work overseas. Actually, most Americans working overseas are in a position to pay little or no U.S. income taxes and much less local taxes than they would pay for similar incomes in the U.S. My feeling is that corporate income taxes paid in foreign countries by American corporations receive favorable treatment. In any case, U.S. taxes are applied only to profits, whereas, foreign governments try to get their hooks into American operations in many subtle and unobtrusive (?) ways. Maybe not subtle either.

Unfortunately, the situation has been changing recently. Latin American governments, for example, have recently cut themselves in for substantial participation in the exploitation of natural resources. They have also had a tendency to model their income tax laws on U.S. lines adopting the thesis that they do not need justification in order to apply exaggerated income taxes—that it is sufficient justification that they need the money to support increasing bureaucracy. In the Dominican Republic, the State first imposed exorbitant income taxes, demanded a 20% participation, then increased the participation by another 25% or so and finally bought out Rosario Dominicana for what amounted to approximately four months production of gold. Nice work if you can get it. I would advise Mr. Provost to familiarize himself with the rules before he plunges into foreign operation.

Sincerely,

Glen Fassler

P.S. In some 35 years of working overseas, I recall only two occasions when I paid foreign income tax and never was I required to pay U.S Income Tax. In 1958, I paid a few dollars for four months work in Panama. In 1936, I filed a return in the Philippine Islands, but do not remember whether I had to pay anything. If I paid anything at all, it was very little. In both cases, making out the return was more onerous than the tax I had to pay—for 10 months work.

Glen

FOUNDER'S DAY CELEBRATION

You'll have an opportunity—
—To enjoy meeting old friends
—To participate in important Association activities at the CSMAA Annual Meeting

CMA/CSMAA CONVENTION LUNCHEON—

Friday, February 13, 1981—Denver Athletic Club, 13th & Glenarm, Denver. Cocktails 11:30 a.m., Lunch 12:15 p.m.

Meet your industry friends at the National Western Conference.

FOUNDER'S DAY BANQUET—

Friday, February 20, 1981, Friedhoff Hall, CSM, Golden. Cocktails 6:30 p.m., Dinner 7:30 p.m., Dancing.

We'll welcome and install the 1981 Board of Directors of the CSM Alumni Association.

MAKE YOUR RESERVATIONS NOW for these important events. Our space is limited for the dinner, and only the first 100 reservations can be accepted.

RESERVATION
CSM Founder's Day Celebration
February 13-20, 1981

Complete and mail this form today to be sure you get in on all the events.

Name _____ Class _____

Address _____

Phone _____ Spouse _____ Guests _____

Please make reservation for me to—

		Price	Total
CMA/CSMAA Convention Luncheon—Friday	_____	@ $10.00	_____
Founder's Day Banquet—Friday	_____	@ $15.00	_____
		Total	_____

ENCLOSE YOUR CHECK (made to CSM Alumni Association) and THIS FORM AND MAIL TODAY TO: CSM Alumni Association, Golden, CO 80401 (303) 279-0300, ext. 2290.

_____ Please send me more information on the benefits of CSMAA membership.

From Farm to Ph.D.

by Brodie Farquhar

Patsy Wegner is unique—an East Helena, Montana farmgirl who is making an impact on higher education in the West. It isn't often that a doctoral graduate has not one, but two college presidents attend a graduate ceremony in her honor, much less have one add a solid kiss to the formal occasion.

Yet that's what happened to Patsy, daughter of Howard and Mabel Wegner, when she earned her Ph.D. in Student Personnel Administration at the University of Northern Colorado in Greeley this past summer. UNC President Richard R. Bond was there to congratulate the new graduates—with Patsy, now Dr. Patsy, a kiss seemed more fitting than a handshake.

In the audience was Colorado School of Mines President Guy T. McBride, Jr., waiting for his Director of Student Activites to accept his congratulations and his injunction to come back to work at Golden.

From left to right, UNC President Richard R. Bond, Dr. Patsy Wegner, Mabel and Howard Wegner.

Wegner had left CSM for a one year leave of absence, to pursue her doctorate at UNC. Her doctoral thesis, "Values of Conflict Between the Development of Career & The Orientation to Marriage and Family Among Engineering Students" was based on three years of work at Mines as Director of Student Activities.

Wegner was Mines' first such director when she came to CSM in 1976. Prior to that, she was the first program director for residence halls at Montana State University in Bozeman.

"Student activities are the other side of higher education.," said Wegner, noting that the learning, growing and maturing outside the classroom has lasting value. Throughout higher education, student activity programs are receiving high marks for enrollment retention, teaching stress and organizational management. "The whole mission of student activities and student development is to help students have a successful college experience," said Wegner.

"My job does not entail babysitting or being the 'party lady' to a bunch of party-loving students. I'm a professional educator, and I teach management, communication and leadership skills to students who want and need those skills," said Wegner.

There are no formal credits, grades or monetary rewards for CSM students who become active in student government, homecoming, clubs and service organizations. Nevertheless, many students do become involved, often giving as much energy to a special event, as to their final exams. The reward, Patsy notes, is in the doing itself.

"Volunteer students made it go and work, when I first started at Mines. Some of the staff and faculty were a bit leery about student activities at first, but they really got into it after a while. Thanks to that support and great student commitment, we now have office space, expanded programs, paid support staff and better planning," she said.

Dr. Patsy Wegner and CSM President Guy T. McBride, Jr., share a moment of congratulations.

Some of the expanded programs include a new counseling office, development of a campus-wide counseling network, stress management workshops, leadership seminars and work on an alcohol abuse program for students. All of this grew in four years.

"A lot of my thesis was based on growing up in Montana. Young women have a lot of conflicts between career and marriage, especialy coming from a conservative environment like Helena—women were expected to be wives and mothers. My parents, some 4-H leaders and high school teachers encouraged me to go on to college.

"If I could talk to the students at Helena High School, I'd say believe in yourselves—tap your personal powers. You're responsible for yourselves—no one can make you do something unless you let them. I think young women have choices to make—marriage, family, career—all are valid, and one doesn't cancel out the others," said Wegner.

Aside from the tremendous changes Patsy has effected at Mines, her impact on higher education in the West might be best illustrated by a quote from John Burke, UNC Vice President for University Development: "A large number of administrators and faculty who observed her as a student regarded her as a colleague as well. Many of us expect that she will someday become a national figure in her field."

—mm—

Colorado Gold

"There's gold in them thar hills!" not gold only
But silver, zinc, copper and moly.
But first there was gold. GOLD!
GOLD DISCOVERED IN COLORADO TERRITORY!
That was the story
Late in the year of '58.
It made the news both east and west
And caused a lot of men (and boys) to come;
In dirty overalls and pleated vest
The rich, the poor; the young, the old,
They came in search of gold. "There's gold
In them thar hills!"
From the streets of St. Louis, the farms of Missouri;
The black coal pits of Kentucky; by foot and buggy,
On horse and mule they came,
With shovel and a gold pan
And a mountain full of dreams
They came in search of gold.
And luckless '49'ers back from California
Would try their luck again.
Johnny Coley was a luckless '49'er
Of that there was no doubt.
Older now, but wiser maybe
He headed for Colorado Gold.

New Yorkers pushed and shoved to get the morning news.
"Nuggets found at California Gulch and Castle Creek."
Buckskin, Beaver and Clear Creek, too.
"They're picking them up at South Park and Georgetown."
In 1859, the boom was on. The sound
Of wooden wagon wheels on rutted roads was everywhere
As beaver ponds and aspen groves gave way
To canvas cities, and it didn't take a day.
With the dreams and stories
They brought the whiskey; but few, if any wives
Came in search of gold.
Soon the gravels were high graded
And the sluice box days were numbered;
Like the girls back home, they were short, but sweet.
Out of the creeks and aspen groves, through the furs
And spruce, above the Bristle-Cone pine to timberline
They followed the trail of nuggets, to veins.
Johnny was a little late at Gold Hill, so didn't stay
But headed on down Tincup way.

Now Tincup was a booming place, but the big news
Was already coming in
About the early strikes on south in the majestic
San Juan Mountains.
There's gold in them thar hills, all right. "Way in".
"In" a thousand feet and more. The nature of the business changed.
Evening and morning became the same as shift bells clanged
And men worked 'round the clock. No longer farmers with calloused hands
Digging gravel in the heat of day, but Miners;
Miners and engineers, powder boys and steel driving men.
Driving tunnels and sinking shafts, they started in for gold.
They found it pure as dew, in wire and leaf
In cracks and fizzures, with quartz and amethyst.
They mined the gold and threw away
That heavy black gangue.
The gangue that ran 35 ounces to the ton. . .
Silver, white gold, locked in sulfides they threw it out.
Profit is incentive,
Where there's incentive there's a way.
From Black Hawk to Silverton, the Sunnysides
And Pandoras came on line
To separate the silver from the muck and slime.
Johnny Coley worked the Camp Bird some
(When his stake was gone.) but didn't like it none.
Knee deep in cold black acid water
With rain pouring down his back from off the hanging wall
He mucked 10 ton an hour.

With timbers in the shafts and head frames
They had a place to hang their names.
The Tomboy, Yankee Boy, and the Highland Mary;
The Hilltop, Mountain Top, and Idarado, too.
'Course Molly and the Matchless often made the news.
With the mining came the need for tracks
And timbers, and carbide lamps;
Ore cars, pulleys and trams.
Then the mule packed tents gave way
To cabins that were meant to stay;
With wooden doors and dance hall floors,
Ridge poles and hand hewn logs fastened tight
With wooden pegs and square cut nails.
The import of material for the export of the ore
Necessitated the coming of the rails.
The Narrow Gage was yet another page
In the rush to Colorado Gold.
From Durango to Silverton, Creede to Victor;
They blasted rock and ore.
And hung those trestle bridges between the canyon walls.
The planks were layed, the rails were spiked;
Tunneled through mountain masses,
Over Marshall, Gunsight, and Independence Passes;
With long legged wooden water tanks
All along the way.
(Graded roads and trackless cinder beds
Mark their routes today.)
Now Johnny set out for new bonanzas
Following fractured limes around the great Sawatch.
He hadn't heard of Aspen, but then he hadn't asked.
He staked a little claim up in the rocks
Above a spring
That fed a short, but rugged stream
That helped build Castle Creek.
The rails changed things some
Bringing civilization in.
Gamblers and bankers, wives and school mar'ms;
Preachers, judges, lawyers, and the like.
Assayors, surveyors and engineers:
(Engineers from Bishop Randall's school.)
They designed the shafts and computed the timber,
They mixed the chemical to float the metal;
And made those tunnels meet a thousand feet
In solid rock.
In '76 a territory gave birth
To a State. And out of Randall's university was born
The School of Mines. A gold mine,
The Colorado School of Mines.
A wealth of good learning, a hundred years
And more.
The news was silver now, more than gold
As audits spewed out dumps along the mountain slopes.
"Hey, Johnny! Johnny Coley, have you heard?
They struck the mother lode a couple miles down.
In a little pit called the Silver Bell.
You were close, Johnny, sure enough
You were close."
Then came the crash of '93.
It shut the boom towns down, and closed a hundred mines;
Destroyed a thousand dreams, and left a lot of head frames
To stand a lonely guard.
But the crash of '93 didn't hurt Johnny none.
They buried him, somewhere, in '92.
Fifty eight and penniless, tired and lonely, too.
He headed for the pot of gold beneath the rainbow
Hung in the sky, after the afternoon shower
Of early September, just a week before the snow.

Jim Evans
Geol.E. '69
MSc.Geol. '73

—mm—

Nominate Your Favorite Professor

This is your chance. The Amoco Foundation, Inc. Teaching Awards are designed to recognize superior teaching and to provide encouragement and incentive for teaching achievement.

Each year, up to three cash awards of $1,000 each will be presented to outstanding Mines professors, with the Amoco Foundation, Inc. providing the funds.

Nominations are encouraged from alumni, faculty, administration, student organizations, individual undergraduate and graduate students, and others particularly knowledgeable of Mines. Deadline for the letters of nomination is March 1, 1981.

Criteria for Award

A. Nominees should have the following qualifications:
   1. The ability to present an interesting, informative, and challenging course.
   2. Superior technical ability and knowledge as reflected in the presentation.
   3. The ability to instill a sense of professionalism, integrity, and responsibility into the students.
   4. The ability to motivate the student to think independently.
   5. The ability to establish a relationship with the students based upon concern and compassion.
   6. Availability to students.

B. In comparison with other teachers, why is this professor outstanding and others not?

Eligibility

All full-time permanent faculty members are eligible except the recipients of the award for the immediate past three years.

1977-78

Samuel B. Romberger, Geology

E. Dendy Sloan, Jr., Chemical and Petroleum-Refining Engineering

1978-79

Stephen R. Daniel, Chemistry and Geochemistry

David K. Matlock, Metallurgical Engineering

1979-80

Ruth Maurer, Mineral Economics

Submit your letter of nomination, following the above criteria, to Dr. William Mueller, V.P. for Academic Affairs, Colorado School of Mines, Golden, CO 80401. The awards will be presented at the April faculty meeting.

—mm—

Unrestricted Grant

INLAND STEEL HELPS—The Colorado School of Mines metallurgy department received a $1,000 unrestricted grant from Inland Steel Company of East Chicago, Indiana. From left to right are Norman T. Mills, Inland Steel, associate director of research; Dr. William Mueller, CSM vice-president of academic affairs; Joe Mareta, Met.E. '56, superintendent of Inland's primary rolling mills and Dr. William Copeland, head of the CSM metallurgy department.

Environmental Sciences Program

The Colorado School of Mines' Environmental Sciences Program is offering a series of courses this spring that cover a host of environmental issues, problems and solutions.

The program is the only one of its kind in the state and specializes in information that is readily utilized by business and professional people. Courses are scheduled for once a week; one to four hours in the evening.

Course titles include:

- Fundamentals of Life Sciences
- Ecology Field Camp for Engineers
- Environmental Impact Statement Preparation
- Air Pollution—"Control and Technology"
- Seminar in Environmental Sciences
- Special Problems in Environmental Sciences
- Biological Oceanography and Marine Pollution
- Toxicology of Metals, Fuels and Industrial Substances
- Readings in Environmental Sciences
- Analysis of Environmental Problems
- Current Topics of Environmental Analysis
- Investigations in Environmental Sciences
- Energy, Environment and Natural Resources Law
- Ecological Considerations in Industrial Site Planning

The courses will be taught by a faculty group led by Dr. Beatrice E. Willard, professor of environmental sciences and director of the ES program. Willard's expertise is in plant ecology, particularly high tundra studies, in which she is a recognized authority.

She is backed up by Dr. John C. Emerick, an environmental biologist with a special focus on environmental impact on the marine environment.

Dr. Gregory R. McArthur has an extensive background in plant and environmental biology, and has developed new computer techniques for site selection and reclamation projects.

Finally, Roger P. Hansen, a Colorado attorney, has had extensive experience in environmental impact analysis, land use planning, environmental law and environmental permitting. His specialty is creating and managing interdisciplinary teams of scientists and technical specialists.

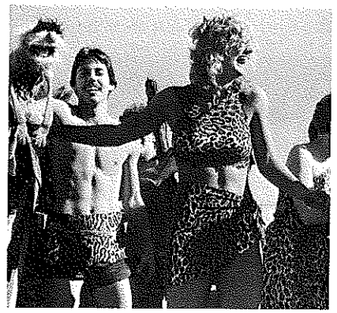
For further information about class descriptions, schedules, course credit and enrollment costs, contact the Environmental Science Program at the Colorado School of Mines, Golden, CO. 80401, or call Jean Shadwell at 279-0300, extension 2427.

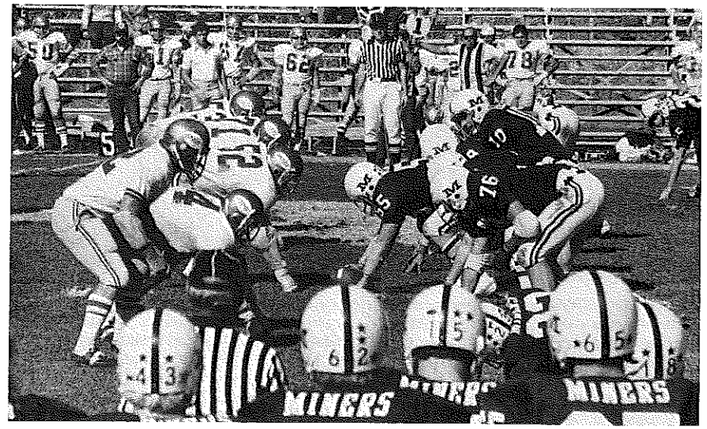
—mm—

Prank Time

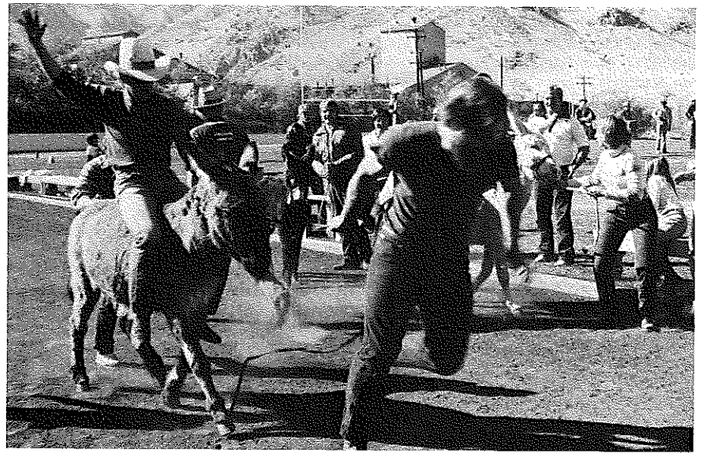
Jim Shaughnessy found his office strangely decorated on Halloween morning. Shaughnessy is purchasing agent for the CSM business office in Guggenheim Hall.

You did *WHAT* at Homecoming?!



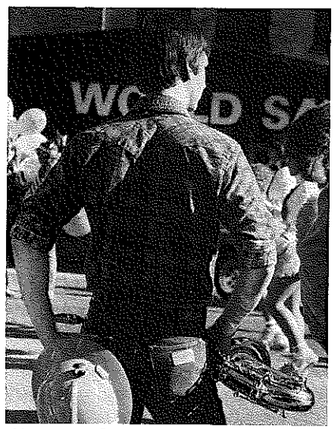


Above, students from the Single Student Housing Association show that residence hall living can get pretty "primitive" at times. At right, the Orediggers get set to hand the Western New Mexico Mustangs a 41-10 drubbing.

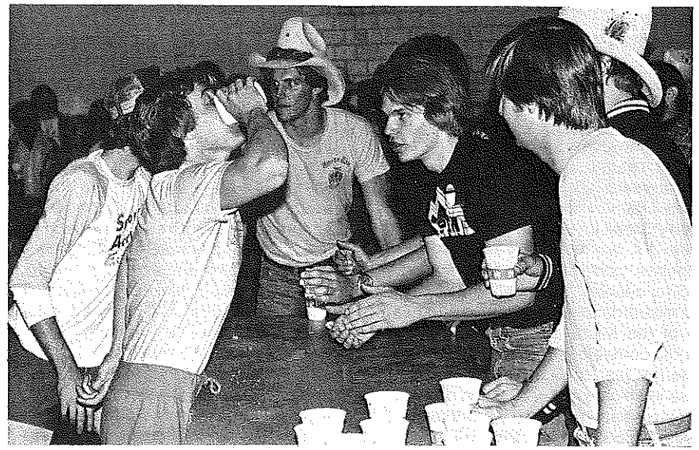


At right, students demonstrate why there are three industries in Golden; CSM, Coors and the pipeline inbetween. (Photo by Mike Leach)

Above, Kary Shafer of Sigma Alpha Epsilon is crowned 1980 Homecoming Queen.
At left, the traditional burro race pits Theta Tau against arch rivals Sig Gam at halftime. The burros won.

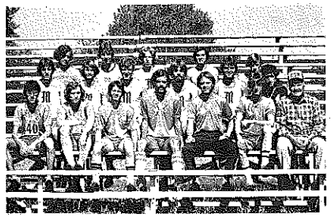


Above, an Oredigger band member ducks back through the crowd for a look at the Homecoming parade.



Photos by Art Lee

Sports Wrap-Up



CROSS COUNTRY—The Oredigger cross country team is extremely young—most are freshmen and sophomores. Though they placed last in the RMAC Championship Meet, they promise to evolve into a powerful team in years ahead. In front, left to right, are Steve Landstra, Mike O'Brien, Phil Heidt, Andy Jones, Bob Morris, Dave List and Coach Joe Davies. In the middle row are George Filfillian, Tom Brinegar, Randy Versaw, Mike Powell, John Guffey and Tom Dooley. In back are Todd Frauenhoff, Sig Mundhenke, Jeff Castor, Jon Schultz and John Schrandt.

OREDIGGER KICKERS—One of the youngest soccer teams in Colorado colleges, the CSM squad finished the season 3-11 overall, 0-8 in the conference. They are looking forward to a better showing next fall. In front, from left to right, are Darren Hadley, Steve Swinney, Rich Anderson, Steve Zobrist, Andy Szatkowski, Barclay Macaul, Coach Lazlo Frohs and Coach Bob Pearson. In the middle row are Regan Fujino, Randy Ellis, Dave Patterson, Kurt Lankford, Brian Swanson, Tom Young, Mark Barton, Mike Stallings, Bob Woods and John Hoff. In back are Ward Mahanke, Tor Tschanz, Mark McDermott, Rick McDonald, Tom Hathaway, Lance Johnston, Matt Berghorn and Jorge Lira, team captain.

VOLLEYBALL—The 1980 women's volleyball team ended their season 8-12 overall. In the Rocky Mountain Conference they were 3-5. Their last match against the championship team of Southern Colorado went to five games. The Orediggers played well winning two, losing two and—moving on to a final defeat of 16-14—a close game, well fought. Coach Gail Klock is looking forward to a better season next year with the returning experienced players.

In the front are Melisse Benefiel, Mary Jo Wier, Gail Vogt, Debbie Griebling and Sue Schulte. In the back are Lynne Hunter (manager), Brenda Crumb, Holly Flinian, Debbie Bouvier, Kathy McQueary, Sandy White, Terrie Tonkinson, Annamarie Mantei, Ann Humpert, Michelle Bell and Michele Raty (manager). The coach is Gail Klock.

The most valuable player on the Mines volleyball team was Sue Schulte who ranked fourth in team blocks, second in digs, tied for first in stuffs, made 98% of her serves, 92% of attacks, and 92% of serve returns. Best defense player was Sandy White. Most improved players were Sandy Schulte on the first team and Gail Vogt on the backup team.

Mines Tennis

The duo of Ted Dikmen and Mike Murray of the Colorado School of Mines tennis team, took third place last weekend at the Michelob Light Tennis Tournament, in the men's doubles competition. Mines competed against 14 Colorado universities and colleges, at the Gates Tennis Center in Denver.

Dikmen is a freshman Oredigger, and hails from Regis High School, where he took second place in singles competition in the state tournament last year. Murray returns to the Oredigger fold after a year's absence from the tennis courts. Murray was a solid player for Cherry Creek in 1978.

The pair were the only Miners in the extensive competition, which featured singles, doubles (both men and women) and mixed doubles. While that cut them out of the Michelob prize money, the pair did compete in singles and doubles.

Murray lost to Dudley Reichmen of Mesa in singles, 6-1, 6-4, then dropped the consolation round to Dement of Northern Colorado 6-0, 2-6, 6-4.

In doubles competition, the Miners lost initially to Stevens and Utyro of Colorado State University, 2-6, 7-5, 6-3. Yet in the consolation rounds, the Orediggers fought off the advances of Regis and Denver University. Murray and Dikmen romped over the Regis duo of Boldt and Towanyeff 6-1, 6-2. The Miners then held on to beat DU Pioneers Radford and Broderick 6-4, 7-6 and 7-5.

CSM tennis Coach Jack Hancock feels that this is only the harbinger of better things to come in the 1980-81 tennis season. "I think it really started last spring when we finished 8-1 on the season and took a step up in the RMAC. I couldn't believe it when 42 players came out this fall! We still have 38 players trying to find a place for themselves on the ladder," said Hancock.

According to the Oredigger coach, a 32 man team bracket (double elimination) began September 9th to determine the best six players for the fall season. "Surprises have been the rule, rather than the exception," said Hancock.

The survivors include Brian Housman—last year's top seeded single; Jeff Bolke, Mike Murray, Todd Grimmett and Ted Dikmen. Freshman standout Frank Gibbs could be the best of the newcomers after tournament competition this week, noted Hancock. "Gibbs played the number one spot for Fairview High School last year," said the coach.

Mines Ruggers Triumph

The Mines Rugby Club closed out the fall season October 25-26 by winning the Eastern Rockies Rugby Football Union's A-2 Division championship. The club's final record was 10-2, including two victories over A-1 Division clubs. Mines went into the tourney with a 7-2 record, good for first seed in the division. Mines defeated CSU, 24-4, in the first game and squeezed by Ft. Collins RFC, 10-6, in sudden-death overtime in the semi-finals on Saturday.

On Sunday Mines met Mile High RFC for the championship. Mines led 3-0 at half on scrum half Jeff Goodrich's penalty kick, scoring twice in the second half, once by second row Mike McKenty and once by inside center Charlie Beecham. The final score was 11-4. the club finished its season by traveling to Dallas Nov. 15-16 for the Our Gang Rugby Tournament.

Football Update

Coach Marv Kay said about the Oredigger football team, "When we play well, we can play with anyone—when we don't play well, anyone can beat us."

Mines has had an up and down season. Against the Mesa College Mavericks Mines lost 20-14 after a game full of fumbles near the goal line and missed opportunities.

The Orediggers came back to an upset victory over the Western State Mountainers, 28-27. The Miners did not fumble, did not lose interceptions and managed to stop Western State when they really had to—one foot short of the goal line in the final seconds of play.

Against Western New Mexico University the team won 41-10. The game, however, was full of fumbles on which, fortunately for Mines, WNMU couldn't capitalize. The Orediggers won the game based on the passing talent of quarterback Mark Gill, who hit nine out of 12 for 176 yards and three touchdowns.

The tables turned against Mines when they faced Adams State College in Alamosa and were thrashed 31-0. The Orediggers threw away a total of seven interceptions against the Indians, which left them with a total passing gain of 33 yards. The CSM ground game never got rolling—held to a meager 120 yards by the Indian defense.

According to Coach Kay, the Orediggers main problem is consistency, not a lack of talent in the players.

Alumnus Heads Military Science

Lieutenant Colonel Jerry Ilgenfritz, Engineer of Mines, '61, returned this fall after nearly 20 years to head the Military Science Department at CSM. After graduation in January 1961, Jerry entered active duty for what was to be a two year Reserve Officer tour. He has held command and staff positions with troops at Company, Battalion and Engineer group levels in addition to staff positions at U.S. Army Headquarters Europe and Heidelburg, and the Air Defense Command in Colorado Springs. In 1965, he received a Master of Science in Engineering Degree in Industrial Engineering from Arizona State University, and in 1967 was integrated into the Regular Army. He has completed military schooling through the U.S. Army Command and General Staff College at Fort Leavenworth. Prior to returning to Mines, he was the Inspector General at the U.S. Army White Sands Missile Range, New Mexico.

1981 Wrestling Schedule

Friday, January 2	**N.M. Highlands**	**Las Vegas, NM**
Sunday, January 4	**Arizona**	**Tucson, Arizona**
Monday, January 5	**N. Arizona**	**Flagstaff, AZ**
Tuesday, January 6	**Ft. Lewis**	**Durango, CO**
Wednesday, January 7	**Mesa**	**Grand Junction, CO**
Saturday, January 10	**Omaha**	**2:00—Golden**
Monday, January 12	**Grinnell**	**7:30—Golden**
Friday, January 16	**Adams State**	**2:00—Golden**
Saturday, January 24	**Western State**	**1:00—Golden**
Saturday, January 31	**S. W. Missouri**	**7:30—Golden**
Saturday, February 7	**Air Force Academy**	**Colorado Springs, CO**
Wednesday, February 11	**Wyoming**	**Laramie, WY**
Sunday, February 15	**NCAA II Qual. Tourn.**	**(TBA)—Golden**
Saturday, February 21	**Conference Tournament**	**Durango, CO**
T-S, February 26-28	**NCAA II Tournament**	**Davis, California**

For further information contact Coach Jack Hancock, (303) 279-0300 ext. 2374.

Oil Shale: Its Production, Properties and Utilization

Oil Shale: Its Production, Properties, and Utilization is a short course sponsored by the Colorado School of Mines. This intensive, up-to-date introduction to oil shale will be presented December 8-11, 1980, February 23-26, 1981 and June 1-4, 1981.

The course has been taught since 1975, and is designed for managers, engineers, economists, scientists, appointed or elected officials of government or regulatory agencies concerned with oil shale development.

The lecturers, representing academia, industry and the critical aspect of water law, presume no previous knowledge of oil shale technology on the part of the short course students.

*Dr. Phil Dickson, professor and head of the department of chemical and petroleum-refining engineering, CSM

*Dr. Vic Yesavage, associate professor, chemical and petroleum-refining engineering, CSM

*Dr. Mark Atwood, manager of laboratories, TOSCO, Inc.

*George Vranesh of Vranesh, Raisch and Schroeder, P.C., water law.

Material in the course focuses on a number of facets, beginning with a discussion of the potential methods of production, both above ground and in situ. There will also be an extensive comparison of the production processes, from economic, environmental and technological viewpoints.

The course lecturers will also focus on the differences between commercial, semicommercial and research stage processes. Analytical methods and alternative methods for the use of oil shale and water law will also be covered.

The course will consist of intensive lectures and discussion from Monday through Wednesday, with classes from 8:30 to 5:00 p.m. The registration fee of $475 includes course tuition, text materials and supplies. For further information, contact the Director of Continuing Education, Colorado School of Mines, Golden, CO 80401.

Research Grant

***OIL SHALE RESEARCH**—Taking one step closer to the goal of utilizing the oil shale resources of Colorado, Phillips Petroleum Company recently donated $36,150.00 to the Colorado School of Mines for research in oil shale for the academic year of 1980-81. A portion of this will be spent on graduate research studies on "Liquid Products from Steam Pyrolysis of Shale Oil" under the direction of Dr. V.G. Yesavage and Dr. P.F. Dickson. The balance is provided for graduate research on "Nitrogen and Arsenic Removal from Oil Shale"—two of the most common impurities found in oil shale. That project will be under the direction of Dr. J.H. Gary. Above, left to right, are Dr. William Mueller, CSM vice-president for academic affairs and dean of faculty; George M. Paulson, Jr., Phillips Petroleum attorney; C.A. Wentz, Phillips' manager of oil shale and oil sands natural resources group; Dr. Philip F. Dickson, CSM department head of chemical and petroleum-refining engineering; and Gene Watkins, Phillips' mining development director.*

Mineral and Energy Resources

According to a recent study published by Colorado School of Mines Press, the average safety cost for an underground coal mine is $3.73 per ton, while the cost for surface mines is $.15 per ton.

Published in "Cost of Safety and Health regulations at Selected Western Coal Mines" in the CSM periodical *Mineral & Energy Resources,* the above figures are at wide variance from industry figures. The cost of safety in underground mines is considerably higher than estimated by management and safety personnel. The average safety cost for surface mines was found to be unexpectedly low.

The figures were compiled by Tom Johansen, chief mining engineer with Snowmass Coal Company of Carbondale, Colorado and Robert Reeder, associate professor of mining engineering at CSM. Reeder is also director of the Mine Health and Safety Institute at Mines.

Based on suggestions from mine safety directors, Johansen and Reeder sent out a questionnaire to 26 coal companies. A total of 20 completed the questionnaire in time—of those, data was submitted for 13 underground and 8 surface coal mines.

The questionnaire focused on six areas:

1. Cost of training
2. Cost of accidents
3. Cost of inspections
4. Cost of assessments
5. General costs incurred by safety department
6. Cost of new safety equipment and machinery modifications.

Complete with tables of the data, the report concludes that accident reduction should receive the major thrust of the coal companies' attention. For example, by cutting accidents in half, a mine producing 1 million tons per year could save up to $1 million, according to the report.

The publication also includes the questionnaire used in the study. Single copies of *Mineral & Energy Resources* are $2.50.

Schedule of Events
1980 December Degree Convocation
December 18-19, 1980

THURSDAY, DECEMBER 18

6:30 p.m.	Alumni Cocktail Party—CASH BAR	Green Center
7:30 p.m.	**All Alumni Banquet—Spouses, guests and parents welcome. NOTE—Members of the Class of 1980 are sponsored by individual alumni (See reservation form)	Green Center Friedhoff Hall

FRIDAY, DECEMBER 19

10:00 a.m.	Alumni/Parent Lecture—Professor "Gene" Woolsey, Head, Mineral Econ. Dept., and one of Mines most entertaining and dynamic professors.	Green Center
2:30 p.m.	Military Commissioning Ceremony	Green Center
3:00 p.m.	**Convocation Ceremony	Green Center

**Reservations should be made in advance by completing the form below and returning it with your check, payable to the CSM Alumni Association. We ask your cooperation in making advance reservations.

RESERVATIONS
1980 December Degree Convocation

Name _____ Class _____

Address _____ City _____ State _____ Zip _____

Phone _____ Spouse _____ Guests _____

	# of Tickets	Amount
Alumni Banquet—Thursday	_____ @ $12.00 ea.	$_____
Yes, I'll sponsor _____ 1980 graduates to the Banquet	_____ @ $12.00 ea.	$_____
	TOTAL =	_____

—Please consider sponsorship even if you can't attend —

Enclose Your Check (made to CSM Alumni Association) and This Form and Mail Today.
CSM Alumni Association, Golden, CO 80401—(303) 279-0300, ext. 2290.

Mineral & Energy Resources Review

According to the July edition of *Mineral & Energy Resources* "Oil Sands: Resource, Recovery and Industry," the oil sands of Alberta, Canada and Utah could make a significant contribution to solving our energy problems.

Oil sand, tar sand, bituminous sandstone, oil-impregnated sandstone or bituminous sand has been identified in almost every country in the world and in almost every state in the United States. Alberta reserves are estimated at 1,000 billion barrels, while the United States has an estimated reserve of 30 billion barrels—29.5 of it in Utah.

An overview of oil sand industry, "Oil Sands: Resource, Recovery and Industry" was written by two project engineers in the Energy Division of the Colorado School of Mines Research Institute—Mr. Christopher H. Cox and Dr. Gary L. Baughman.

To date, only the oil sands of Alberta have yielded synthetic liquid fuels on a commercial scale, according to Cox and Baughman. Ironically, the Albertan oil sands support the *only* commercial synthetic fuel plants in the world, yet U.S. energy policy places little emphasis on development of this resource.

Their study goes on to explore the geology and reserves of Canadian and U.S. deposits; structural and chemical characteristics of oil sands; processing techniques; and examination of Alberta commercial projects and current research efforts in the U.S.

The Canadian outlook is a projected production rate of 1 million barrels per day by 1995, while the best the U.S. can look forward to is 60,000 bpd by 1990.

"Although minor compared to our material requirements," notes the study, "the domestic oil sand industry would be lucrative for those involved, and its implementation would demonstrate the commitment of the United States to use its multifaceted domestic energy sources."

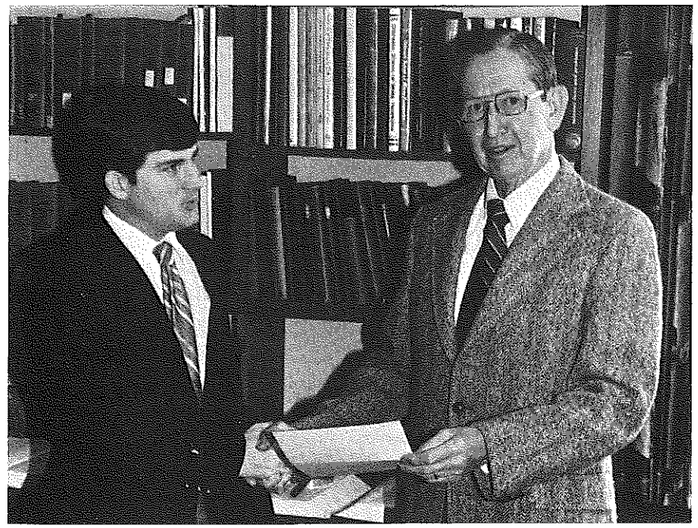
Mineral & Energy Resources (USPS 001-200)
ISSN 0192-6719

Subscriptions to this bimonthly publication are $10 for a year.
Single copies or back issues are $2.50 each.

Education Assistance

METALLURGY SAYS THANKS!—Jerry Harrington of Anaconda (center) hands a $1,000 check to Dr. William Copeland, head of the metallurgy department at the Colorado School of Mines. The donation is part of the ARCO program of assistance to higher education. At right is Dr. William Mueller, vice-president of academic affairs and dean of faculty at CSM.

Fourth Annual Grant



ENGINEERING SUPPORT—Colorado School of Mines President Guy T. McBride, Jr., accepts on behalf of CSM, a grant for $15,000 from the Halliburton Education Foundation, Dallas, for supplemental support of the engineering faculty for the 1980-81 school year. The check was presented by Bill Bartlett (left) of Otis Engineering Corporation. This year's contribution is the fourth annual grant awarded to the school's college of engineering by the foundation. "We are very pleased to receive such fine support from our friends in industry," said McBride. Otis Engineering is an operating unit of Halliburton Company, a Dallas-based international oil field service and engineering/construction organization.

Small Mine Symposium

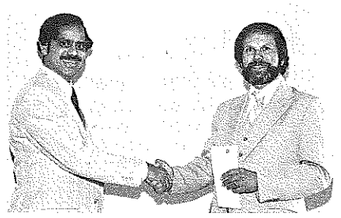
The First International Symposium on Small Mine Economics and Expansion will be held in Taxco, Guerrero, Mexico, from May 17 through May 21, 1981. Sponsored by the editors of *World Mining* and *World Coal*, it was originally scheduled to be held in Queretaro.

In addition to technical sessions on various aspects of mining technology and economics, delegates will have the opportunity to tour the Taxco lead-zinc-silver mine of Industrial Minera Mexico S.A. Speakers from over 13 different countries will present papers at these sessions.

The mainstay of the industry in many countries today is the smaller tonnage operation—mines that process less than 10,000 tons of ore per day. The symposium will address operating problems and economical considerations for starting up and expanding mines in this size range.

For details and registration information contact Cheryl A. Collins, Symposium Assistant, *World Mining/World Coal*, 500 Howard St., San Francisco, CA 94105.

ARCO Check



DONATION—G. (Ram) Ramachandran, (left) senior process engineer for the ARCO Coal Company, gives a $1,000 check to Dr. Phillip Dickson, head of the chemical and petroleum-refining department of the Colorado School of Mines. The money is to be used for an unrestricted grant.

eMbers

The opportunities for hearing exciting presentations of one sort or another have been so greatly expanded at Mines that it is a real temptation to neglect one's daily routine and just attend lectures, special events, luncheons and faculty sessions. Figuring prominently in these events lately is the Humanities department, sponsors of guest lecturers and actively involved in much of the intellectually challenging atmosphere on campus. The AMAX professor, ARCO special lectureship, current slide presentations and travelogues on art and architecture, selected visiting speakers all add up to a heady mixture in this engineering school.

Dr. Roger Wescott, AMAX professor, is an extraordinary man, with a rare ability to communicate. One expects a man with excellent scholarly credentials to somehow be a bit removed from the daily conversation of those lacking this background. Dr. Westcott, to the contrary, elucidates challenging theses in a perfectly understandable, very provocative fashion. In a recent faculty session, he talked about "enriching" the curriculum at Mines. These words are often greeted with a groan, conjuring up as they do, non-essential frills. Dr. Westcott's theories, however, were stimulating and practical. Along with suggestions and ideas for faculty interchanges, the question of alumni involvement in the curriculum was broached. It was not only exciting to me, but a program with which we have had a bit of success in the past four years. Dr. Ramon Bisque has conducted interesting seminars for some of his classes, which deal with the problems of "real" world—work world—communication, and planning. Several Mines graduates of varying ages have participated in this program, eliciting good response from the students. The Alumni office also conducts a program for individual interaction between an alumnus and a student. That we have enormous resources in this area, in terms of alumni with excellent engineering and business skills, is a fact.

How we can translate that fact into a program of value to the School and students gives us some administrative qualms. It is obvious that input directly relating to the lesson material must be the first criteria. There is an alternative possibility; special seminar or talk session types of interaction which would give the alumnus and student personal contact and would not conflict with the curricula of any class. We would welcome ideas.

Dr. Norman Banner, of the American Association for the Humanities, was recently on campus, addressing a group of faculty and administration, alumni and foundation personnel. Dr. Banner put into focus the very innovative work being done by the CSM Humanities group in the new "track" plan available to certain students under the Honors program. Some of the alumni remember with disdain the required Humanities course of yore; these people would be amazed at the new processes now in place. The most exciting facet of this is that Colorado School of Mines, an *engineering* school with stringent requirements in engineering courses, is among the leaders of new programs in Humanities. The program, sponsored by an initial grant from the National Endowment for the Humanities, is being watched closely by other engineering schools and many other organizations. It is quite possible that CSM will become well-known in academic circles, due to the current programs, as an example of exceptional Humanities emphasis— another recommendation for a school already recognized as one of the best of the engineering training grounds!

Another sort of presentation, gratefully, to our ears, has now passed into history. We will not have to listen to campaign rhetoric for the next while—only to speculation as to the course of the newly elected conservatively oriented U.S. government. What we can do now, after having cast votes in the recent election, is be sure that we have some effect on this newly elected government and its policies.

A sense of euphoria seems to pervade various gatherings I have attended since the election. I would caution that this euphoria, while understandable, may be premature and unrealistic. An enormously powerful structure of governmental controls and regulations has been built up for a number of years. It is naive to believe that this structure will automatically change, with the imposition of a new head on the body. That it can be changed over a period of time is certain. That it must be a joint process between those people who rebelled against the Carter administration policies and the representatives now charged with implementing new policy is, or should be, self-evident. For a long time now, the minerals and energy industries have been fighting from a defensive position. We have, in many cases, assumed the classic siege mentality, which feels impotent. Now, with an administration which is pledging less governmental control, we need to move to a positive offense position, sharing our knowledge, our expertise and our cooperation to enable our elected representatives to make wise and progressive decisions. We do not need to be told that the United States is facing a critical time. We do need to provide information and assistance which will help our government surmount this critical situation. Do not smile euphorically now, and relax. We have a chance to be heard. We have a chance to be effective. Use this opportunity—now!

Patricia Curtis Petty

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