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Calendar

Elements of Ferrous Metallurgy (ASM, Intensive Course), Four Seasons Motor Hotel, Toronto, Canada, Dec. 14-16.

Pacific Southwest Section of American Society for Engineering Education, Calif. State Polytechnic, Kellogg Campus, Pomona, Calif., Dec. 29-30.

Cooperative Education Division of ASEE, University of Southern Florida, Tampa, Fla., Jan. 20-22, 1971.

Annual College-Industry Conference of ASEE, Ariz. State Univ., Tempe, Ariz., Jan. 28-29, 1971.

Tempe, Ariz., Jan. 28-29, 1971.
74th National Western Mining Conference & Exhibition, sponsored by Colorado Mining Assn. and Affiliated Organizations, Denver Hilton Hotel, Denver, Colo., Feb. 4-6, 1971.

CSM Alumni Breakfast, Denver Hilton Hotel, 7:30 a.m. Saturday, Feb. 6, 1971.

AICHE 68th National Meeting, Petro-Chemical & Refining Exposition, Rice Hotel and Houston Exposition Center, Houston, Tex., Feb. 28-Mar. 4, 1971.

Western Metal & Tool Exposition, Conference, Design & Scientific Precision Instruments Exhibit (sponsored by ASM, SME and ASNT), Exhibit Center and Los Angeles Hilton, Los Angeles, Calif., Mar. 8-11, 1971,

Angeles Hilton, Los Angeles, Calif., Mar. 8-11, 1971.

Annual Meeting of Northeastern Section, Geological Society of America, Hartford, Conn., Mar. 18-20, 1971.

Gulf Southwest Section of American Society for Engineering Education, Louisiana Polytechnic Institute, Ruston, La., Mar. 25-27, 1971.

Annual Meeting of Cordilleran Section, Geological Society of America, Riverside, Calif., Mar. 25-27, 1971.

Midwest Section Meeting of ASEE, University of Missouri, Rolla, Mo., Apr. 1-2 [97]

Apr. 1-2, 1971.
AIME Pacific Southwest Mineral Industry Conference, Reno, Nev., May 5-7, 1971.

Underwater Mining Institute, Downtown campus of Univ. of Wis., Milwaukee, Wis., May 20-21, 1971.

The MINES Magazine

Volume 60

December, 1970

Number 12

Front Cover

On Friday evening, Oct. 30, 1970, the traditional Home-coming Bonfire flared and the traditional senior with his Stetson and companion honored his last Homecoming as a student for the class of 1971.—Photo by Kent Higgins.

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Official organ of and copyright 1970 by the Colorado School of Mines Alumni Association. Second Class postage paid at Golden, Colorado. Subscription price \$6.00 per year United States and possessions; foreign \$7.50. Single copies 75 cents except special editions. Published monthly (12 times), plus Annual Year Book and Directory of Mines Men Issued separately. Address all correspondence relating to The MINES Magazine to CARTER KAANTA, EDITOR, 2177 WEST 77H AYENUE, DENVER, COLO. 80204, except matters of advertising interest, which should be sent to W. V. BURGER, ADVERTISING MANAGER, The MINES Magazine, Golden, Colo. 80401.

Project Each One Get One

COLORADO School of Mines alumni are invited to participate in an effort to recruit more students from outside Colorado for the University.

In a joint program involving the CSM Alumni Association and President McBride and the administration, alumni will be asked to contact qualified potential students in their communities, local sections, and foreign countries

Approved by the Board of Trustees, the project, titled "Each One - Get One," is aimed at increasing the national and international reputation and influence of the School.

Organization of the plan is being coordinated with the Alumni Association by the administration and the Admissions Office. It is felt the local alumni sections throughout the United States and abroad represent an able contact network for student recruitment.

* Director of Public Relations, Colorado School of Mines.

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Each alumnus soon will receive a letter from the Admissions Office requesting his help as a volunteer in the "Each One — Get One" recruitment campaign.

This letter will include an outline of the plan, asking alumni to contact potential students and their high school

A reply card will be enclosed with the letter, to be returned to the Admissions Office by alumni who wish to join the project. From the reply cards received, alumni will be sorted into their appropriate sections.

The alumni sections then will be encouraged to host prospective students and high school counselors at their meetings; a Mines representative will be in attendance to explain fully the School, its programs, and its importance.

Timing of the program is set for early spring of 1971, to continue annually, preferably in the fall of the year.

For alumni too far removed from section activity, contacts can be made with follow-up done by correspondence from the Admissions Office.

As President Guy T. McBride, Jr., points out, "This student recruitment plan is one of the principal building blocks in the development of national and international leadership by the Colorado School of Mines in undergraduate training, graduate study, and research. This objective is being aggressively pursued, as it represents the future of the School at a period when more minerals, metals, and fuels must be provided to meet the evergrowing demands of the U.S. public and foreign nations."

The guidepost has been set in a recent report by three consultants to the Colorado Commission of Higher Education. They said, "Mines operates the most efficient engineering program in Colorado. This program should be elevated to make Mines one of the nation's great technological institutions."

Mines, therefore, has a need to attract more out-ofstate students as an integral part of the overall objective of achieving national prominence.

Alumni will play a vital part in the future of the Colorado School of Mines by participating in the student recruitment program. When asked what influenced their decision to come to Mines, many students remark, "The contact and guidance of a graduate of the School."

In this respect, the activities of the Tulsa Alumni Section have been most successful in attracting students to Mines. Its members have arranged contacts with potential students and high school counselors in the Tulsa area for visits by Mines representatives, and have raised funds to provide scholarships and to transport interested students and counselors to the campus for Engineers' Day.

All expenses are paid for the trip with the exception of a nominal fee charged to the students.

As alumni participation in the "Each One - Get One" effort is developed, plans call for future involvement in out-of-state student recruiting by present Mines students and the parents of enrolled students.

It is hoped each alumnus and alumni section will give the "Each One - Get One" program their full consideration and support.

Burma's Bawdwin Kine

By DeWitt Deringer*

THE Bawdwin Mine is located in the Northern Shan States of Burma approximately 50 miles northwest of Lashio, the starting point of the Burma Road which took such a prominent part in supplying China with war material, and approximately the same distance to the Chinese border.

There is evidence that the Chinese were the first people to work the outcrops in the Bawdwin area. In Chinese literature, there is mention of silver being mined in Bawdwin as early as the 12th century, and it was this silver which supplied the Chinese rulers for over 700 years. Actual physical evidence of the Chinese occupation remain in a small 16th century arch masonry bridge in the market place of Bawdwin.

There are old Chinese workings with typical bamboo supports found 200 feet below the surface. However, it was hundreds of slag piles, mostly litharge, scattered over the hillsides which had accumulated over the centuries as a result of small hand operated "Scotch Hearths" that attracted Mr. Herbert Hoover to the Bawdwin area.

The Chinese continued operations until 1851, mining only the oxidized ores near the surface, when the Mohammedan Chinese changed the political climate. In turn they eventually had to leave and the territory was occupied by the Burmese from the south, with the British following soon thereafter. During the Chinese occupation, an estimated 10,000,000 ounces of silver was extracted in and shipped to China.

From 1851 until the British took over the property in 1906, there was essentially no mining in the Bawdwin district. After examining the old Chinese workings and slag dumps in 1906. Mr. Hoover returned to London to organize and get finances for a corporation known as Burma Mines Limited. This stock incidentally is still quoted on the American Exchange at about 50 cents per share.

The first capital expenditure of the newly formed Burma Mines was for a 47-mile narrow gauge railroad from Bawdwin to Namtu to connect with the Burma railroad, and a smelter was constructed in Mandalay some

*Mr. Deringer, E.M. 1924 & M.Sc. 1933, a consulting engineer living in Golden, presented this address to the Denver Mining Club several

THE MINES MAGAZINE . DECEMBER, 1970

150 miles from Bawdwin. Collecting the litharge slags from the hill sides of Bawdwin and treating them in a smelter in Mandalay proved disappointing, but in the meantime exploration of the ore body had revealed such high grade ore, silver-lead-zinc, that the administrative offices, smelter and mill were established at Namtu. 12 miles from the mine, and mining operations began in Bawdwin.

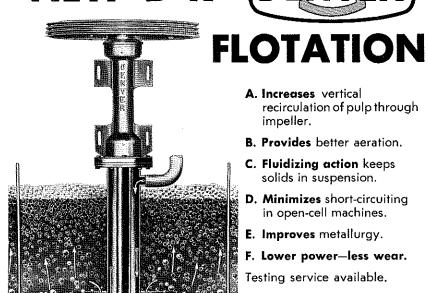
It can be surmised that Herbert Hoover acted only in an advisory capacity for the first four years, because even with high grade ore the operation was not particularly successful until Mr. Hoover took active charge of the management of the corporation in 1913. Under his able guidance and direction, the corporation was solvent and soon became recognized as one of the foremost mining operations in the world.

In 1916 Mr. Hoover resigned his active direction of the Burma Mines operations, and in 1918 resigned from its Board of Directors. There is little question, however, that much of Mr. Hoover's early reputation as a mining engineer-he was only 32 when he first examined the Bawdwin area -and the foundation of his fortune can be attributed to this operation.

There were periods prior to World War II when the British extracted ore with an average grade of 35% combined lead and zinc, with high silver values.

The Japanese occupied the northern part of Burma from 1943 to 1945 and extracted only 200,000 tons of ore during this period. The Americans had hampered the operation by bombing the mill and one hydroelectric plant. The British re-entered the property soon after the war to rehabilitate the operation, but because of the war destruction, insugent activities, rising nationalism and other reasons, the rate of production never approached





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pre-war levels. The British, understandably, were reluctant to invest large sums of capital required to revive the operation to full scale, because the political climate was not attractive to capital investment.

In 1951 the Burma government entered into a Joint Venture Agreement with Burma Mines of London, and the Burma Corporation (1951) Ltd. was formed with equal number of "A" shares issued to the Government and "B" shares issued to the British interest, with the British retaining active management of the mining operation. Both classes of shares had an equal number of members on the Board of Directors. The Burma government had contributed something like \$1,500,000.00 to the new Corporation's treasury as the price to have equal equity in the operation of the enterprise.

Under the arrangement, productivity did increase but it was apparent that the British policy to convert the maximum amount of the assets of the Corporation into cash was more important than an efficient operation. There was little evidence of forward planning in exploration, mining, milling or smelter techniques which would have lower cost of production. Management was left in the hands of forestry officers, engineers and accountants, all with experience limited to Burma.

Essentially the mining method remained the same as that initially introduced in 1908, namely square-set stoping. The result was that after 55 years, the subsidence throughout the mine was serious. The quantity of high grade ore remaining was limited, and it was apparent that if the existing policy were not changed, the mining enterprise could only last a very few years.

The Burma Government realizing the conditions of the mine, appealed to the United Nations to conduct a survey to determine what could be done to extend the life of the mine. It was at this point that I entered the picture.

I was asked to make a preliminary feasibility study of the proposed U.N. Project, In February 1962 I went to Bawdwin, Namtu, to study and examine the various aspects of the mining operation in order to decide whether a survey by the U.N. would render the results anticipated. On my return to New York to report my findings, I stopped in Rangoon where a series of meetings with Cabinet officials were to take place.

We had two meetings with the third meeting to take place at 9 the next morning. I got out of the car the next morning at the appointed time and started in the door of the government building where the meetings were held, when a soldier pointed a rifle at me and would not let me pass. The chauffeur quickly ran over to inquire from the soldier what was the difficulty and was told that there

had been a revolution and Gen. Ne Win had taken over the government at 5 that morning. I was later instructed to stay around until called for a continuation of the meetings which was two days later.

At the meeting with the new officials, mostly army officers, I was told that the new government was much interested in knowing the possibilities of the Bawdwin Mine and would I kindly start my story all over again. As I looked around the group, all very friendly, I said: "Before reviewing my findings, I wish to thank you gentlemen for making me feel at home in your country, because this is the 23rd revolution I have been through. The climate I now find is soothing because I must confess this one has been the most bloodless and pleasant of my experience." It was very obvious that their sense of humor was not the same as mine as not a smile was visible in the crowd. For a few moments I was not at all certain I would get through the day. It was one of my most awkward moments.

The statistics and information on the Bawdwin Mine are interesting. Since Herbert Hoover started the operation in 1908, there had been extracted from the mine 10,000,000 tons of ore averaging about 19 oz Ag 22% Pb, 13% Zn, and 1% Cu. There remained in the recorded reserve 2,000,000 tons of 15 oz Ag, 16% Pb, 10% Zn, and 0.30% Cu. It was obvious from the records and maps that there were in addition to the recorded reserve appreciable tonnages of lower grade ore, but the quantity, grade and exact position would require a survey to determine.

There were, however, many problems to solve before a mining operation could be commercial. The existing mining, milling and smelting practice had a total cost of \$35 per ton of ore extracted i.e. \$35 per ton was the cut-off grade. It was evident that every phase of the enterprise had to be examined and ways and means found for improvement.

Square-set stoping, with a total extraction of 10,000,000 over a period of 55 years, had resulted in serious subsidence throughout the mineralized zone, making mining by square-set stoping very expensive. Transportation of ore over a 12-mile railroad, cost \$1.30 per ton. Milling and smelting were also relatively expensive, and not too efficient.

It was obvious that if the survey were to be successful in pointing the way for a commercial operation in the treatment of the lower grade ores, not only a survey staff of experienced and capable engineers were essential, but consultants in the various departments should be employed on a short time basis to assist the survey team.

(Continued on Page 8)

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Burma's Bawdwin Mine
(Continued from Page 6)
Returning to U.N. Headquarters in New York, I presented my findings for conducting the project. The committee at U.N. accepted my ideas. I returned to Burma in late April of 1962 to direct and manage the U.N. Survey. Fortunately I found some very capable mining and geologic engineers for the survey staff.

Equally fortunate was the fact that the U.N. appointed Eddy Bortcherdt of Anaconda as mining consultant and Bob Carpenter, professor of Geology at the Colorado School of Mines, as consultant in geology, both of whom spent two or three weeks at the Bawdwin Mine. The CSM Research Institute was appointed to conduct flotation experiments on ore sent from Bawdwin, and O. W. Walvoord and his organization made a preliminary mill layout and cost estimate.

A metallurgist by the name of Jan Riemers of Toronto made a feasibility study for an electrolytic zinc plant, and Parsons Jurden made a study of pipeline transportation for the ore from mine to mill. A Thai hydroelectric engineer, Kanuk Pranich, working for the U.N., made a study of power development.

Some \$800,000 was granted to conduct the proposed survey, 50% of which was from the U.N. and 50% from the Burma Government. The survey was completed in mid-1964, and I returned to Golden to write the Final Project Report.

It should be mentioned that Pi Warren, Met.E. 1913, assisted me greatly in developing the many tabulations on capital requirements, cost of production, and anticipated metallurgical balance sheets that accompanied the report. After six months of labor, the final document was presented to the United Nations and since has been published in 1000 copies for distribution throughout the world.

The report established an ore reserve of approximately 7,000,000 tons of 7.8 oz Ag, 11.2% Pb, 5.6% Zn, and 0.30% Cu. Furthermore exploration gave promise of possible tonnages in the halo areas around the ore zone much beyond the known ore reserve, and there is also the possi-

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Coal As a Fertilizer

MOLORADO farmers in the future may be spreading coal on their fields as a fertilizer, if a study now under way at the Colorado School of Mines proves feasible.

This possibility will be brought out in a progress report, "Use of Coal as a Fertilizer and Soil Conditioner," by Dr. James H. Gary, head of the CSM Department of Chemical and Petroleum Refining Engineering in a talk Sept. 30 before the Denver Coal Club in the Petroleum Club.

In cooperation with the Colorado Department of Natural Resources and Cameron Engineers of Denver, Mines has been working on a study to produce organic nitrogen in low grade Colorado coals, and using the coals as a soil conditioner and fertilizer. John Rold, State Geologist, has administered the project for the Department of Natural Resources.

bility of discovering another completely new zone of mineralization several hundred feet to the west of the known zone.

By changing the mining method to "cut and fill" using sand as fill; grinding the ore at the portal of the main haulage level and transporting the ground ore by pipeline some 12miles to a new all-flotation mill; constructing an electrolytic zinc plant, which metal could be sold to nearby markets; increasing the hydroelectric power generation, and making certain improvements in the present lead smelting practice—all with a total capital expenditure of \$13,000,000—the annual net profit is estimated at over \$3,000,000.

More important to a developing nation, the net generation in foreign currency would be \$8,000,000 per year, more than twice the present rate. The known ore reserve sufficient to keep the Bawdwin mine in operation for 35 years, if not well into the next century. The total gross sale potential of the products from the known ore reserve over the 17 years would be well over \$200,000,000.

In brief, the famous Bawdwin Mine, under capable and well-financed management, could become once again an important silver, lead and zinc producer. Whether it will be in the near future appears at the moment to be somewhat problematical. Notwithstanding what might be the immediate future of this great mine, it is a certainty that sometime in the future it will once again take its rightful place among the world's major producers.

The Department of Natural Resources has provided \$25,000 for the study, and an additional \$25,000 has been appropriated by the 1970 Legislature. It is hoped the Federal Office of Coal Research will provide matching funds to expand the proj-

In the study, low grade Colorado coals unsuitable for use as a fuel have been crushed, oxidized, and then reacted with ammonia to provide nitrogen available for plant food.

The study at Mines has shown that the whole process can be completed in two hours, producing nitrogen contents of up to 48 per cent. Similar tests in other countries have taken from 80 to 120 hours.

"The nitrogen enriched coals provide an inexpensive soil conditioner and fertilizer for the farmer, and their slow release of nitrogen can permit only one annual application which will save the farmer time and money," Dr. Gary says.

Other benefits of using coals as a fertilizer and conditioner include higher oxygen content improved moisture penetration of the soil and moisture retention, higher absorption of heat thus extending the growing season by up to two weeks, and stimulation of the growing rate of plant

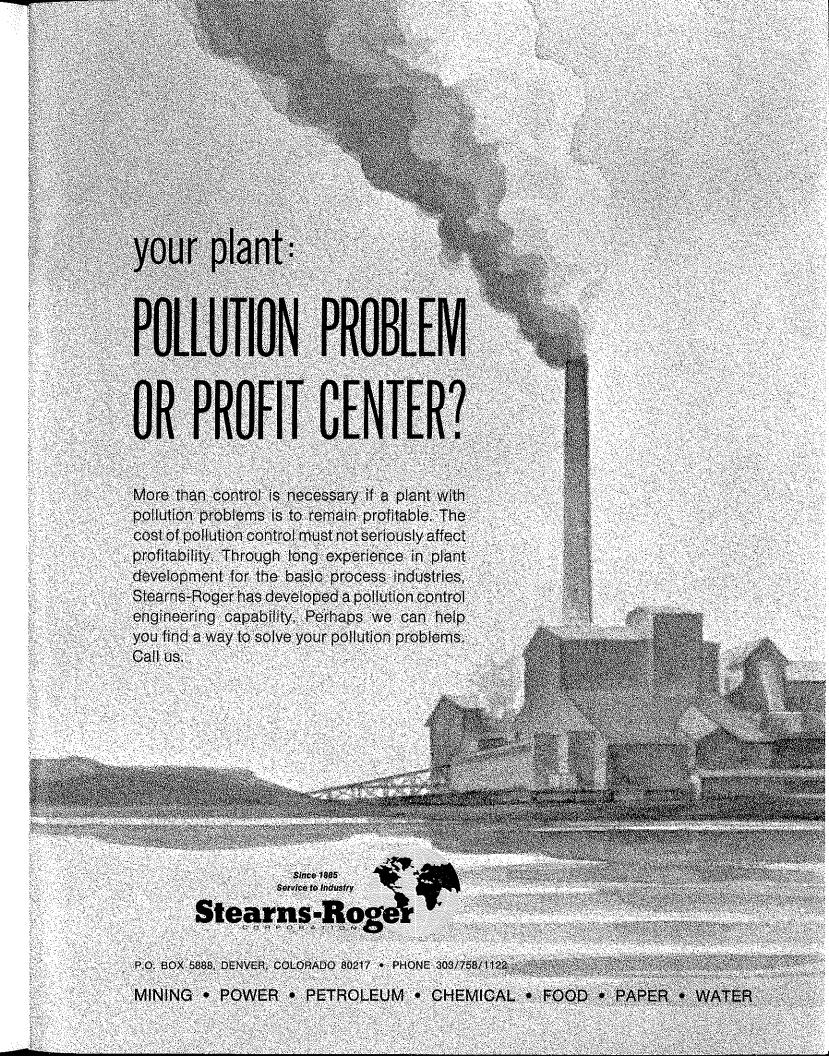
The important factor of the slow release of the nitrogen in the coals also contributes to pollution control. as fertilizers currently used tend to release rapidly and wash into rivers and streams.

So far the study at Mines shows that Colorado coals can be reacted with nitrogen compounds to produce plant foods.

A big challenge facing the researchers is to minimize the cost of the product and to fix the nitrogen in a form which will be released to the plant as the plant needs the food. It is planned that a project will be set up sometime in October with Colorado State University to test the coal fertilizers on greenhouse plants.

When additional funds become available, more research with additional Colorado coals, developing improved processing, design and construction of a pilot plant in cooperation with the Colorado School of Mines Research Institute, and further testing of the effectiveness of nitrogenenriched coals will be carried out.

"This research will be very beneficial to the economy of Colorado and will be helpful to both the industrial and agricultural interests in the state," Dr. Gary points out.



A Proposal for Private Scholarships To Support Study of Scientific Russian At the Colorado School of Mines

By W. John Cieslewicz

QURRENTLY the number of scientific and technical U books published each year in the Russian language is greater than the number of books of the same two categories printed in all other principal languages-including English-put together. In 1967 about 35,000 scientific and technical books were published in the Soviet Union.2 Much of this material is available to us through several bookstores handling Soviet publications.3 In addition American scientists can subscribe to nearly 500 different scientific and technical Russian journals in the fields of mathematics, physics, chemistry, geology, mining, petroleum, metallurgy, and engineering alone.

Assuming that only 10 percent of this enormous volume of material contained significant scientific data, it would already make it worthwhile for our scientists to read or at least look through it. In many fields Russian science and technology is as advanced as ours or even leading. This is true of such fields as mathematics, nuclear physics, geochemistry, airplane design, large-diameter drilling in mining, and theory of flotation in metallurgy-to name a

The development of high-yield nuclear warheads and of the anti-missile are further dramatic and grim demonstrations of the capacity of Soviet science. Recently U.S. News and World Report commented as follows on the Soviet development of the anti-missile missile:5

American scientists, unaware at the time, did not work on the X-ray effect in their own high-altitude tests of 1963. It was by accident that the U.S. scientists started giving serious attention to the X-ray effect at all. A Soviet scientist, assuming that the X-ray effect was common knowledge, discussed it in the presence of a group of U. S. scientists at a meeting. The U.S. scientists rushed back to their laboratories and prepared tests to be carried out underground. To their horror, said one authority, they found that the Russians not only had something and were years ahead in theory, but had already tested it out in space and probably were starting to build their antimissile system around it.

Are we able to use Russian scientific material? In fact, Soviet work on the first space satellite in orbit ahead of our own was also common knowledge among the Russian scientists. They had been discussing this project in considerable detail in their scientific journals for one entire year prior to the actual launching date. However, we did not know about the project because our scientists did not and could not read these journals. Even now, 10 years after Sputnik, only about five percent of our scientists can read Russian. Actually, this estimate is probably too high.

1V. Feinberg. Advice to Despairing Linguist, Jour. Sputnik, Oct. 1968, Moscow.
Publishing in USSR in 1967, published by All Union Book Chamber, Moscow,

1968.

See: Monthly catalogues published by V. Kamkin Bookstore, Inc., Washington, D.C.

List of Soviet Publications Offered for Exchange by the USSR Sci. Tech. Library, published by GPNTB, Moscow, 1967.

SU, S. News and World Report, February 6, 1967.

The need for scientists with reading knowledge of Russian is so critical, at least in the opinion of the U.S. Government, that back in 1958 the Congress passed a special bill, the National Defense Foreign Language Development Act. Title VI of this Act names Russian as the No. 1 "critical language" to the national defense, and provides funds for Russian language programs in our schools. This official encouragement of Russian language studies initially gave rise to hope that our schools at lower levels would meet this urgent need.

Statistics show this hope to be a pure illusion. In 1964 only 0.2 percent of the total number of the high school student population took Russian, and as of that year the trend was already down from the peak enrollment figures of previous years. The corresponding figure for the total number of junior-college, four-year-college, and university students taking Russian in the fall of 1965 was 3.5 percent. This somewhat higher figure for our colleges and universities is due to a two-million-dollar annual federal subsidy of Russian programs. Yet, all of these programs are language and literature oriented, and not a single program in Russian science or technical translations has been organized

Likewise, only students majoring in Russian language or literature are eligible to receive the \$2,000+ annual NDFL fellowships. No Russian language scholarship of any kind are available to the science or engineering student who might also want to gain a good reading knowledge of scientific Russian along with his major technical field. Deprived of this special encouragement, only very few science majors ever make the ffort to study scientific Russian. The recent widespread trend among our graduate schools to reduce from two to one the number of foreign languages traditionally required of the doctoral candidates is certain to decimate even further the cadres of our future scientists capable of using Russian material in their research work.

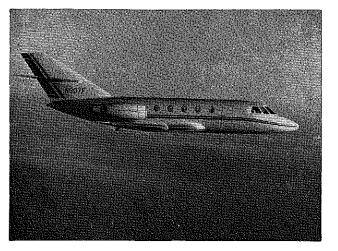
As a stop-gap measure many private and government research organizations-e.g. the National Bureau of Standards-have tried for several years to give "in service" instruction to their scientific personnel. Under these programs highly paid Ph.D.'s take time out regularly from the busy workday to learn the ABC's of scientific Russian. Most of these programs have proven to be costly, impractical and unsuccessful, and have been discontinued. Other organizations subscribe to very expensive⁸ commercial services offering selected translations of some scientific journals or individual articles. However, the above efforts are at best half measures, and the vast bulk of Russian scientific material remains simply inaccessible to us.

matic translation machine would solve the problem. Over the last 10 years the National Science Foundation and the U. S. Department of Defense spent close to 20 million dollars sponsoring a joint project to develop such a machine. In 1966 the National Research Council, after two years of study conducted for the NSF on computer translation, pub-

In this connection many people had hoped that an auto-(Continued on Page 12)

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Even with two powerful fan jet engines only a few feet away, these people can converse in normal tones. How? The interior designers of this Fan Jet Falcon business aircraft specified a lead impregnated vinyl sheet to be sandwiched between the plane's outer skin and interior trim. Lead's density effectively bars both noise and vibration-makes flying more productive, more enjoyable.

Lead alone, or combined with other materials, is one of our best weapons against noise pollution; it's being used in planes, boats, offices, schools and heavy machinery. Designers and architects know that "lead can make life more liveable-by hushing things up."

⁶Wall Street Journal, August 11, 1965. ⁷Foreign Language Annuals, April 1967

Possibility of Critical Shortage Of Metals and Minerals by 2000

THE possibility of a critical shortage of metals and minerals for the U.S. by the year 2000 was foreseen recently by Ian MacGregor, chairman and chief executive officer of American Metal Climax, Inc.

Addressing the Fall Management Meeting of the Metal Powder Industries Federation at Buck Hill Falls, Pa., Mr. MacGregor enumerated several steps that must be taken if the U. S. is to avoid a raw materials crisis. He stated that in view of the proposed Mining and Minerals Policy Act now in Congress, consideration should be given to strengthening tax incentives for the mining industry.

In a discussion of tax incentives, Mr. MacGregor noted that unlike manufacturing, where a worn-out facility can be replaced by applying the tax allowances granted over its life, a mining operation is finished once the mine is depleted. "Considerable time and effort, not to mention luck, are needed to locate a new viable deposit and bring it into production. This burden of exploration, much of it completely unrewarding, is a unique characteristic of the industry."

He also noted that mineral deposits in general are becoming of increasingly lower grade and less economical to develop under present technologyresulting in the further need for more favorable tax considerations.

A potential bar to domestic mineral development lies in current U.S. anti-trust legislation. "Competition has made our American free enterprise system grow and prosper," Mr. MacGregor said. "Times have changed, however. We have today to think beyond our borders. Anti-trust laws which related well to the growing and insulated U.S. of the last century may impair our country's competitive position in the new oneworld industrial sphere."

Another potential obstacle faced by the industry is continuing government restrictions on the export of capital that could interfere with development of mineral projects abroad. "This country will never again be self-sufficient in most of the metals it requires," Mr. MacGregor stated, "indicating continued and increasing dependence on foreign sources. . . . Other governments make a calculated balance-of-payments decision in actively encouraging their mining industries to search for metals wherever they may be located around the world. The logic is clear to them."

In this connection, Mr. MacGregor noted that investment abroad, and particularly in the so-called emerging nations, is no longer an attractive proposition in the absence of safeguards against nationalization and appropriation. "But while the American mining industry worries about prospective foreign investment, mineral companies in Japan and elsewhere actively pursue worldwide mineral development," he asserted.

"I suspect their confidence stems from an expectation of support or some kind of indemnity from their government. . Perhaps our government should examine ways to improve its support for mineral investors in the foreign ventures which seem to be subject to so much risk."

Most important of all, Mr. Mac-Gregor concluded, is the encouragement by government for the domestic mining industry to step up its exploration and development activities. "When the Mining and Minerals Policy Act reaches its final form, it must be a document which will offer guidelines for the development of a strong mining industry able to maintain for the U.S. adequate and competitive sources of basic raw materials . . . the building blocks of our society."

Russian Scholarships (Continued from Page 10)

lished a report which concluded with the following statement.

To date there has been no satisfactory machine translation of scientific texts and none is expected.

Study of scientific Russian the only true solution. We will be able to take real advantage of Russian scientific knowledge only if large numbers of our science and engineering students learn to read scientific Russian. An average student can develop this skill by taking two years (12 semester credit hours) of Russian. However, Russian is a rather difficult language and to study it along with a heavy load of science or engineering course work requires indeed a true dedication.

Therefore, those students who are willing to make the effort really deserve a scholarship. Without this encouragement very few indeed will ever do it. As I have already pointed out, paradoxically the students majoring in sciences or engineering are not eligible for the government scholarships. This means, of course, that only private donors, who recognize the national need of making Russian material available to our scientists and engineers, can help them. We are, therefore, asking you to support our effort to establish a number of special scholarships for

Our scientific Russian scholarship program. We have restricted the eligibility of recipients in such a manner as to make virtually certain that each scholarship will accomplish its intended special purpose-namely, to help graduate a student of science or engineering who will have also acquired a good reading knowledge of scientific Russian. To this end the scholarship award of \$700 each will be made to junior, senior, or graduate students who have already completed the first year (six semester hours) of Beginning and Scientific Russian, and have earned a grade of A or B, and who have registered for the second year. The payments will be made in two installments, one during the Fall and the other during the Spring semester of their second year of study; and the payments will be contingent on the maintenance of the A or B grade in the course.

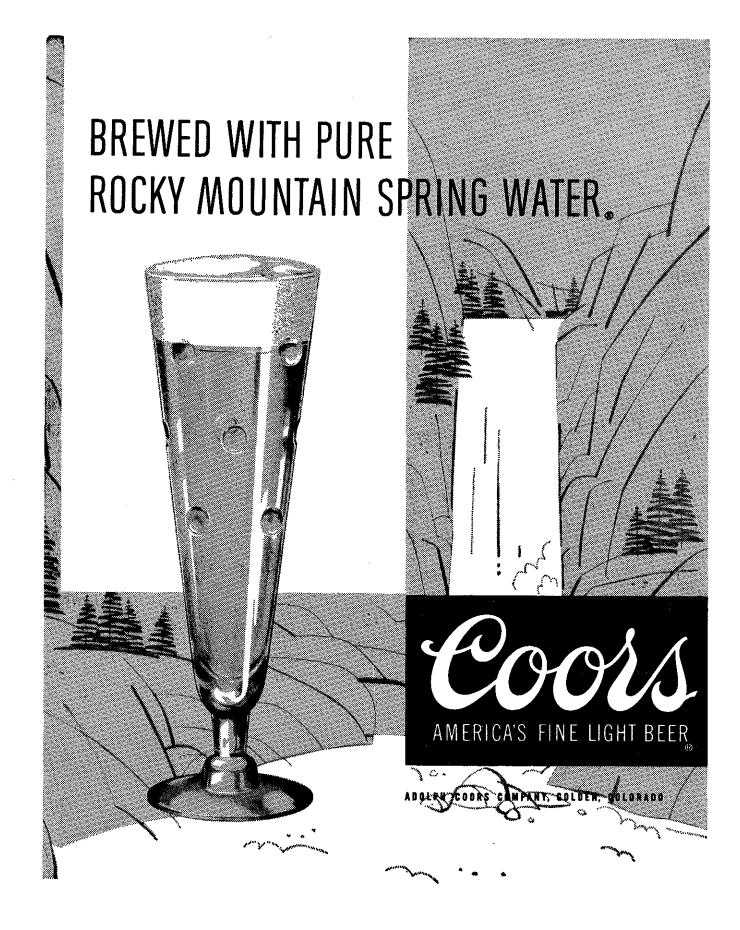
Graduate students complying with the above requirements will be given priority. The students of first-year Russian will also become eligible providing that some scholarships will still be left after making of the awards to all qualifying students of second-year Russian. Each scholarship of \$700 will be awarded to a specific student who will be advised of the donor's identity. Likewise we shall report to the donor on the recipient's progress.

Qualifications of CSM for the scholarship program. Has any other university presented a similar program for your consideration? The Colorado School of Mines is doing it, because we have given this problem a thorough review and realize the great need to implement such a program. In fact, we have an active interest in Russian scientific work and have already started a program, for the time being of limited scope, of publishing reviews of Soviet research in such fields as mining, oil shale, earthquake prediction, and geochemistry.

For the last five years CSM has been offering a oneyear course in Beginning and Scientific Russian. By insuring a reasonably large and stable enrollment, the proposed scholarship program would make it possible for us to offer and maintain a two-year program. All of our students are either science or engineering majors.

Finally, our Russian language courses are taught by an assistant professor who holds both the M.S. degree in Earth Sciences and the M.A. degree in Russian language.

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our students of scientific Russian.

⁸E.g., The 1968 price list of Faraday Press Translators, Inc., of NYC shows an annual subscription rate of \$160 for six issues of the Soviet Fluid Me-chanics Journal. *OUPI release, Washington, D.C., November 23, 1966.

Energy and Environment* By Dr. Glenn T. Seaborg

Chairman, U.S. Atomic Energy Commission

WITH so much that seems irrational in our world today perhaps I am foolhardy to attempt to speak on a rational outlook on energy and environment. When discussed separately these subjects - energy and environment — seem to evoke some fairly emotional responses from many people. When approached together they often have the effect of creating their own "critical mass" in terms of a public reaction. In spite of all this, I feel pretty daring, so to paraphrase a familiar expression I say "Come, let us reason together" about this matter of energy and the environment.

As a point of departure for my discussion I would like to refer to an important event. What I am referring to is the national "Environmental Teach-In" across the country. The general tenor of the thinking I have in mind is the philosophy that all additional growth in our newly recognized limited environment is essentially destructive — suicidal — and that the release of any additional energy in support of that growth can only hasten the demise of man and the biosphere.

Let's examine some of the background and logic of this trend of thought. To begin with, a number of events, many revelations and still more forecasts have combined in recent years to engender a strong public attitude about growth and the environment.

The population explosion has become a major topic of discussion and a source of alarm as new Malthusian statistics are brought to public attention and the crowded conditions of our stressful urban life — with their growing number of riots, crimes, accidents, etc. - seem to back up the doomsday feeling behind them.

Industrial production figures — once unanimously considered as an indication of human progress — are now viewed by many with apprehension and alarm as the impact of industrial growth on the environment is stressed over the positive effect of the products produced. Increasing environmental degradation, dwindling natural resources and mounting waste are singled out as effects of a growing Gross National Product (GNP). Instead of looking forward to a trillion dollar GNP, there are those who see it only as a forecast of ecological disaster, who demand that we reverse our economic trends and seek to establish not only a zero population growth rate but a zero economic growth rate as well.

And in addition, man's latest technological triumph his journey to the moon and much of the information obtained from it — is being used by anti-technologists to argue against further technological developments here on earth. The full view of this beautiful blue and green planet, apparently the only heavenly body covered with life in millions — most likely billions or trillions — of miles of black space, offers a most effective argument against any forces that might upset the delicate mechanism responsible for sustaining that precious life.

I throw all this trend of thinking at you — all these devastating attitudes and the harsh questions they raise - all at once not merely to be perverse. I do it to give you the feeling of the tide of action and reaction that is sweeping a good part of this country today. This, I believe, is a prevailing and growing climate of opinion we

* Dr. Seaborg delivered this address before the Ninth Annual Meeting of The Southern Interstate Nuclear Board, Lake Eufaula, Okla., April 20, 1970.

are going to be living with, not just during the day of the Environmental Teach-In but for some time. And what is most disturbing to me about it is that this trend of thinking is filled with enough logic and truth to suggest that many of the nightmares projected by today's doomsayers could come true — if we were to continue unresponsively and irresponsively on our current course. That is a very big if which I plan to deal with in a moment. But first let me continue the thrust of the pessimistic argument, relating it now to the role of energy.

Looking at energy strictly in terms of the villain that some see it, what has been said about it? Just as energy is the basis of our growing economy and affluence, so is it the root of all our environmental evils. It is cheap, ubiquitous power that allows us to mutilate our landscape, devour our natural resources, manufacture wasteful and waste-producing products (that must be forced on us by advertising), to congest our cities, to assault our ears, poison our air and befoul our water. In addition (and let me emphasize that I am still paraphrasing others' thinking) energy itself is responsible directly for much of our ecological disaster.

If you believe I am exaggerating the anti-energy feeling being engendered today - and particularly among the young people who were the most involved in the Environmental Teach-In - let me quote directly from "The Environmental Handbook," a best selling item prepared for the teach-in by a leading conservationist organization. Here is how the section titled "Energy" begins:

All power pollutes.

Each of the major forms of power generation does its own kind of harm to the environment. Fossil fuels - coal and oil - produce smoke and sulfur dioxide at worst; even under ideal conditions they convert oxygen to carbon dioxide. Hydroelectric power requires dams that cover up land, spoil wild rivers, increase water loss by evaporation, and eventually produce valleys full of silt. Nuclear power plants produce thermal and radioactive pollution and introduce the probability of disaster.

We are often told that it is essential to increase the amount of energy we use in order to meet demand. This "demand," we are told, must be met in order to increase or maintain our "standard of living." What these statements mean is that if population continues to increase, and if per capita power continues to increase as in the past, then power generation facilities must be increased in-

Such statements ignore the environmental consequences of building more and more power generation facilities. They ignore the destruction of wild rivers by dams, the air pollution by power plants, the increasing danger of disease and disaster from nuclear power facilities.

These effects can no longer be ignored, but must be directly confronted. The perpetually accelerating expansion of power output is not necessary.

Having gotten off to this strong start the author continues his indictment of power by elaborating on such things as the growing per capita use of power, the evils

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of the present-day automobile and the possible effects of the buildup of CO2 in the atmosphere. He concludes with the suggestion that "one goal of the environmental movement should be the reduction of total energy use in this country by 25 percent over the next decade." And as a few steps towards this goal he urges that we press for more public transportation and more bicycles and walking paths as well as changing the price system for power use to encourage decreasing the consumption of electricity. Again there is a mixture of thinking and ideas here that one can neither dismiss dogmatically or accept wholeheartedly.

DUT having presented some of the general feeling that all these ideas convey, I want to go back now and rethink with you some of these broad concepts and many specific points.

Let me begin with some straightforward observations that do run counter to much of the pessimistic thinking I have reviewed.

First of all let me make clear, to those who do not realize it, that energy throughout the ages has done far more to advance the human race, to uplift man in body and spirit, than it has to harm either man or his environmen. As not too long ago I devoted an entire speech, "The Human Side of Energy," to this very subject I am not going to defend that premise in detail. However, I would like to offer the observation that man's use of energy. like his use of many things, is subject to something akin to the "Law of Diminishing Returns" and when his unwise or excessive use of it results in feedback that tells him to reduce his use of energy or use it in other ways, he will do so. Today through our environmental problems and from other sources we are getting such feedback, and I think we are reacting to it.

But in addition to the question of reacting in time and in proper measure to such problems, which I will cover later, there is also the question of overreacting, which also poses many great dangers. Let me offer some specific examples of this.

The first that comes to mind is the delay in the construction of currently necessary electric generating facilities caused by the protest of various public groups concerned with conservation, the preservation of scenic areas and the natural environment. The basic intentions of such groups may be fine but are they weighing all the consequences of their actions?

The delay of certain generating facilities could result in blackouts and brownouts in the urban areas depending on that increase in power. To those areas such power is a vital element — the lifeblood — of its man-made ecology. The results of a power loss or reduction in those cities might range from an occasional nuisance to a serious problem. To avoid being accused of "scaremongering" I will not go into detail on those problems. It does not take much imagination to figure them out.

But the point I want to stress is that the protesting groups who delay power plant construction and expose the public that needs that power to potential problems which range from minor inconveniences to extreme dangers are often foisting their own value judgments on a larger segment of their fellow citizens. Such protesting groups must be responsible to those other citizens.

They must either make the case successfully for their reduced use of electric power and inaugurate the acceptable "load shedding" that might allow eventually for fewer power plants to be built, or they must work cooperatively with the electric utility to find alternate methods or sites that would supply the needed power with the least harmful environmental impact. I think this can be done — better. We must find public methods of evaluating and balancing the needs of the natural environment with that of the man-made environment. Obviously we live in both and cannot ignore either.

In line with what I have said about power needs and some of the diverse opinions being expressed on this today, let me discuss a few ideas that I think must be aired today fully and frankly.

It must be stressed that the economic relationship between energy and our man-made environment cannot be overlooked. Many of our younger environmental enthusiasts tend to ignore the fact that by far the larger portion of our total energy goes to industry and transportation, not to residential use.

Any cutback in the use of energy in those sectors which affects production so that employment is also affected can play havoc with people's livelihoods. This is another human factor involved with energy that must be weighed by those who believe our energy systems can just be turned off or on, or up or down, at will, I point this out not to show we are in the grip of some technological system that we cannot control — this is an argument frequently heard today too - but again to make those whose sense of urgency to save the environment is overwhelming realize that there are human and environmental aspects to economics that they cannot ignore.

This is an unpopular argument with many for reasons that will probably be clearer as I proceed — but it is the kind of painful truth that sooner or later must be recognized. And I have a feeling that as soon as it is more broadly appreciated, when we start to factor into our economic system the costs for a clean environment and provide economic incentives for achieving it, we may make much more progress than we are now.

ONE subject that I can only touch on this evening but which is going to be widely debated in the days ahead is, how much power do we really need? And this boils down further to a question of the relationship of our energy level to our standard of living. As I indicated before, there is a school of opinion among today's environmentalists which sees our high standard of living as a major villain, and those of this school often make their case by showing the per capita consumption of resources and expenditure of energy of a U.S. citizen and comparing them with those of a citizen of a lesser developed country. Naturally, the contrast is startling.

But arguing the extremes — resorting to the "excluded middle" approach — in discussing living standards and the relationship of energy to our environment is actually misleading and harmful. We are not faced with an eitheror situation in the use of resources and energy as many would have us believe. And at this point I want to present some thoughts that lead me to believe that we can and will find and follow a reasonable path in the coming years to allow us to grow in many ways and yet remain compatible with our natural environment.

The first thought I have is that, prompted by our present recognition of, and concern over, environmental problems, we are going to see a vast restructuring in our approach to using energy and resources. The old Industrial Age approach of applying every technological development to the hilt is drawing to a close.

In its place we are going to see a whole new philosophy of development — one that is based on wide systemization, great efficiency, recycle and a balancing of economic and environmental relations. And, I must add, one that has a highly human orientation. In this regard there is no doubt that Technological Assessment is an idea whose time has come. I also have the feeling, based on observing many of our young people today and the "counter culture" a number of them are pursuing, that we will see a shift in many values and a corresponding change in our use of technologies.

Changes involving all these aspects of what has been referred to as our "Post-Industrial Age" are beginning to happen today and their implementation and effects will grow and be felt increasingly in the years ahead.

The effects of all this on our use of energy will, of course, be significant. For one thing, I believe it will eventually reduce the growth rate of energy use. For example, the doubling of electric capacity demand every 10 years is not going to continue indefinitely even with electricity capturing a larger share of the total energy market, Greater efficiency and the miniaturization of many technologies will be responsible for allowing us to accomplish more with less energy. And in technologies where more energy may be used — as will be the case in its application for materials recycling — we will have the trade-off of an environment free from the pollution of solid waste as well as a limiting of the drain on many natural resources.

What about the thinking to which I referred earlier in my remarks — that all power pollutes, and that the environmental effects of growing power demands are ignored? Neither of these assumptions is fully true or justified today and both will have decreasing validity in the future.

Pollution must be viewed as a relative term and we cannot say that all power pollutes any more than we can say that all life or all nature pollutes. Every release of waste material or energy does not constitute pollution. Furthermore, today hundreds of government, industrial and research organizations are engaged in a vast number of studies and active programs that will lead to increased control over the environmental effects of producing power and find many alternatives to energy sources that are harmful at present.

WHAT are some of the results we may expect from these varied efforts?

We will see a cleaner burning internal cumbustion engine using fuel that releases less pollutants. And coinciding with this will be a shift to other modes of transportation — mass transit, fuel-cell or electric powered vehicles and more cycling and walking — that will have many beneficial effects on our environment.

We will see a measurable success in the work of reducing certain contaminants, such as sulfur dioxide and particulate matter from fossil fuels.

We will see the thermal effects of steam generating plants on the environment more fully understood and dealt with. And this will involve the use of good national and regional plans for the siting of such plants. Probably such siting plans, which should be forumulated and put into effect as soon as we feel confident we have the necessary knowledge, will go beyond the consideration of thermal effects and take into full account the preservation of scenic areas and wildlife and other aesthetic considerations. Technological innovations now under development, such as cryogenic cables capable of carrying huge loads of electricity over very long distances, will be most helpful in making such plant siting possible.

Finally, the growth of nuclear power will play a significant role in giving us more power with less environmental pollution. And I would like to elaborate briefly on this subject, since it is one of major interests.

The growth of nuclear power, which has taken hold economically only in recent years, has come under fire recently on environmental grounds. Some of our critics tell us, as if to assuage our unhappiness, that we should not take it too personally, that nuclear power is just one of many forces caught in this historic period of environmental concern. Some of the same critics also admit that in their assaults on nuclear power they are resorting to a bit of "overkill" to drive home their points. Certainly it is regrettable that both these conditions exist. But I somehow feel they will not turn out to be all bad.

Much of the environmental controversy now raging will have a positive effect on the growth of nuclear power, which I believe, when the smoke clears, will come out better than ever. As I indicated before, we must and we will solve the problems involved with thermal effects of all steam generating plants. A variety of solutions already exists. It is mainly a question of bringing them and new alternatives — including ways to put the waste heat to beneficial use — before the public and making clear what considerations and costs are involved in balancing their need for electricity with their need for a healthy environment.

Relating to matters having to do with radioactive effluents, there are a variety of considerations. All the dis-

cussions on radiation standards notwithstanding, I believe that nuclear power is by far the safest and most environmentally advantageous method of generating electricity we have today, and in this regard it will continue to improve. The radiation exposures for the general public are such that the average person receives much less radiation from nuclear power activities than he does from natural radiation background. Most of the nuclear power plants on the line today are releasing in the normal course of their daily operation only a small fraction of the radioactivity allowed by our standards, and we are putting into effect a regulatory approach that would virtually assure that this activity is kept close to this low operational level., Even with the projected growth of nuclear power, radioactive effluents can be kept well below the level at which they will produce any harmful effects on the environment or the population.

Of course, radiation standards and the data behind them are under constant review, and Federal Radiation Council is now in the process of a thorough reevaluation of them at the request of its chairman, Robert Finch, secretary of the Department of Health, Education and Welfare. While some people believe that changes might result from the extensive review, others feel that the current standards will receive a clean bill of health. In either case, nuclear power plants, as they are operating today and will operate in the future, will be found environmentally safe and desirable.

The most important basis for their desirability must be in their comparison with other methods of generating electricity — primarily coal, since it is the chief competitor of nuclear power. In such a comparison there can be no doubt that nuclear power comes out looking like Mr. Clean. One has only to examine the statistics on air pollution to realize the advantages of a fission plant over a fossil fueled one.

The estimated annual cost of the adverse effects of air pollution in the U. S. is now about \$15 billion. And this does not include the human costs of illness and death resulting from respiratory ailments such as lung cancer and emphysema. A major factor in such air pollution is the sulfur dioxide released from fossil-fueled plants. Such plants are responsible for about three-quarters of the 35 million tons of SO₂ now released annually in the U.S. — and this figure may well rise to about 95 million tons annually by 1990. Fortunately, a shift toward nuclear power will help to alleviate this problem as well as those associated with other combustion products.

Of course there are a number of other environmental advantages of nuclear power — the more aesthetic appearance of the plant, the absence of the traffic, noise and eyesores associated with the hauling, dumping and storage of coal and the removal of ash. All this leads me to believe that in the final analysis nuclear power is going to make a major contribution toward our efforts to balance our needs for energy with those for a healthy environment.

How we use the power we will be able to draw in abundance from the atom — from today's light water reactors, from tomorrow's advanced converters and fast breeders and hopefully someday from controlled fusion — should not depend merely on the amount of power available or even how economic it becomes. We will have to be wiser than that

Other values — human values — will ultimately determine how and to what use we put this great energy. I have a feeling though, that we, and this new generation which is so rightfully concerned with these problems, will more than meet the challenges posed today by the confrontations that have resulted between our technological civilization and our natural environment. I think we can muster both the intelligence and the will to do this. Our whole world, and our whole life, has now become an "Environmental Teach-In" — and we are learning. We are learning very fast.

Trip Through Alaska

By Robert A. Baxter

CSM Professor Emeritus, Chemistry

N mid-August my sister and I left
Denver by plane to Vancouver,
B.C., to catch a boat for Alaska via
the "Inside Passage." Our ship, the
Glacier Queen, left that evening for
three days and four nights of very
pleasant and smooth riding with excellent food and plenty of time to look
at the scenery.

On the evening of the second day, we had a three hour stop at Ketchikan to see the totem poles and the city's excellent little museum. The tremendous rain gauge which used to adorn the street near the dock is no longer there, so they now admit but no longer brag about their tremendous rainfall of about 160 inches per year.

The next evening we had a five hour stop at Juneau with a bus trip to see the Mendenhall Glacier and several streams full of bright red salmon fighting their way up to spawning areas.

We left the ship the next morning at Skagway and had several hours to look over that interesting little town before boarding the narrow gauge train on the White Pass and Yukon R.R. for Whitehorse. The passenger cars are similar to those on the train between Durango and Silverton, Colo., except that the people sit on loose chairs which can be moved for convenience in looking out of the windows. The old-style coal stoves have been modified to burn propane, and we were glad they were operating.

Passenger cars were attached to the rear of a long freight train pulled by diesel engines. White Pass is not high, but is in very rough country where we could see the Gold Rush Trail over which men climbed and stumbled on their difficult path toward the Klondike. Going down the north slope from the pass, we stopped for lunch at Bennett Lake, a beautiful area where the Gold Rush people of the turn of the century made boats or rafts for their trip on down the river. Our lunch was served on long tables except for the hot dishes which were brought in as soon as we had been herded into our seats. The food was excellent and the ladies who served it were pleasant and took good care to see that everyone had plenty to eat during the brief half-hour stop.

After lunch we proceeded more rapidly through relatively level areas via

Carcross (caribou crossing) to Whitehorse, the town is modern and booming. Two long freights go each day to Skagway. By being in Skagway only in the morning, I was spared the pain of a melodrama performance of "The Shooting of Dan McGrew," which takes place every night during the tourist season. However, we did see the cabin of Sam McGee, which has been moved into Whitehorse from Lake Labarge, so we did get to see one item from the writings of Robert W. Service.

We next had a two-day bus ride from Whitehorse to Fairbanks via Haines Junction and Tok Junction with an over-night stop at the Alas-Kon Border Lodge, where we left Yukon Territory and entered Alaska. The long bus ride was through an area of impressive mountains, lakes and rivers but with no towns of any size and no large trees. The explanation for scrub trees and for anything else one may not like in the North Country is always "Permafost," which stunts the trees, heaves the roads, and tilts the buildings. It is an area of hot summers and cold winters and is a mecca for taxicab drivers in both Whitehorse and Fairbanks. since people drain their cars and put them up on blocks in the winter. Taxi drivers run their engines day and night and charge what the traffic will bear. They complain in warm weather when they do not have their monopoly.

The next morning we were out at the airport ready to fly to Point Barrow on a plane scheduled to leave at 8 a.m. but which did not get started until late in the afternoon, When the plane finally left, we had a good flight over the low mountains of the Brooks Range to Point Barrow, the farthest north place in Alaska. Four years earlier I had spent two days riding taxis between town and airport, trying to go to Point Barrow. On that previous trip I had gone out to the University and had seen the largest and most gorgeous dahlias imaginable. The long hours of sunshine in the summer make wonderful flowers, but the small amount of sunshine in the winter "leaves me cold."

At Point Barrow we watched Eskimos toss children (not heavy fat men) in a blanket, and we enjoyed their singing and ceremonial dancing. We ate muk tuk. It tastes all right but takes a lot of chewing. There was no grass and the loose sand, six to eight inches deep, made walking difficult. The rather primitive hotel had furnished us with loose overshoes and heavy parkas so that we might

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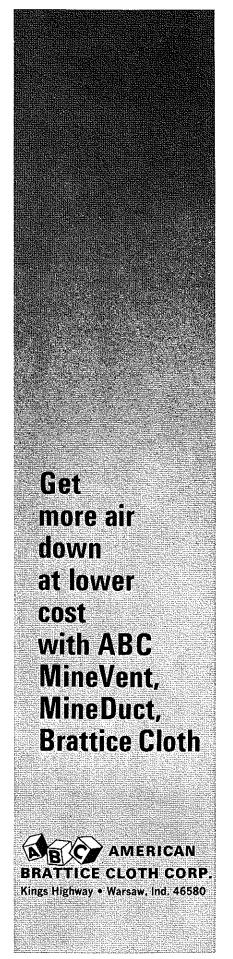


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see the scant tundra vegetation, where it had not been destroyed by vehicles. The most impressive sight for me was the annual supply ship which had arrived in July and was still trapped there on Aug. 26 by the sea ice which had blown in before the ship could leave after unloading its supplies.

Some people call the town "Point Barrels" from the large number of empty oil drums which are not worth salvaging. Natural gas in good quantity is now available from wells near there, so the danger and discomfort in that remote area has now been greatly decreased. We were lucky on our flight there, as we got off promptly the next day and flew to Nome, but the weather got bad the next day and the next group had the "pleasure" of two nights at Point Barrow before they could get out.

We stayed one night at Nome, a peculiar town on a beach of gold-bearing sand with no real port facilities. All cargo ships must anchor away out at sea, and the freight is brought in by lighters. An attempt has been made to protect the town by spending what we were told was about \$3,000,-000 to pile large rocks along the shore to stop erosion. It seems strange that the town remains where it is, because there is a bay with a good anchorage about 13 miles down the coast. Perhaps if gold recovery from the sands becomes more profitable, some changes might be made.

Several large gold dredges stand unused in the area, some apparently maintained and others abandoned. We saw gold mining and panning operations at one of the old dredges, and we were shown the effects of scraping off the tundra from a permafrost area, with resultant melting and slumping of the ice-cemented loose soil.

From Nome we flew to Kotzebue where we saw cutting and polishing of jade mined in the hills nearby. Time did not permit a visit either to the jade mine or to the archeological diggings. Relics of the earliest inhabitants of this continent have been discovered in recent years. Kotzebue has good air and sea transport facilities. With the minerals already known in the area, there are distinct possibilities of industrial development. After a very interesting morning in Kortzebue, we flew back to Fairbanks. The next morning we took the train to McKinley National Park.

The train reached the Park at noon, and we spent the remainder of the day admiring the first trees we had seen since leaving the White Pass area that were more than six inches in diameter. The next morning we were awakened at 3 o'clock to take the park bus to see Mt. McKinley. It was a gorgeous sight, with its elevation of over 20,000 feet rising from its low base. We were lucky in having a bright and sunny day for seeing not only the highest point in North Amer-

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ica but also birds, bears, moose, caribou and mountain sheep. The clearness of the day was even more appreciated when we were informed that it was only the sixth such clear day in the season. The bus trip included a stop at a ranger station to see a demonstration of a dog team used for sled travel in the winter. The bus trip was concluded just in time to catch the noon train for Anchorage.

· We reached Anchorage in the evening and spent the next day on a plane trip to Kodiak and return. Kodiak is an interesting small town with a good harbor. The climate on Kodiak Island is favorable to cattle raising. The Kodiak brown bears hunt the cattle, trophy hunters and sportsmen hunt the bears, and the local people are ahead either way. The flight down the Kenai Peninsula involved stops at Kenai and Homer, and we saw the oil-producing area along Cook Inlet. The next two days in the Anchorage area included a bus trip through the Matanuska Valley where farmers produce 70-pound cabbages and other amazing products during the long daylight hours of the northern summers.

Anchorage is a lively and progressive city. Traces of the earthquake damage have been pretty well removed. People in Anchorage have a pleasant location for good living, and the oil, gas, minerals, forests, and fishing ensure a bright future.

On the morning of the fourth day, we took a plane for Juneau, flying along the shore of the Gulf of Alaska and putting down at Cordova and at Yakutat. The flight along the south coast of Alaska allowed us an excellent view of various 16 and 18,000-foot snow-capped mountains near the coast, which made them look even higher than Mt. McKinley. This flight was also over the enormous Malespina Glacier and permitted a good view of many other glaciers. East of Yakutat we also got a good view of the mouth of the Alsek River, appropriately named Dry Bay because of the enormous amount of gravel and silt which this river has carried to the ocean from the glaciers which feed it. The burden of debris carried by the rivers which flow from glaciers in many instances produces a problem in trying to harness these streams for generating power.

We stayed in Juneau over night and flew to Glacier Bay the next morning. Glacier Bay National Monument is one of the most beautiful and interesting places I have ever seen. The Lodge is at Bartlett Cove, near the entrance of Glacier Bay, and has dock facilities for float planes and for boats such as the large yacht of John Wayne, the movie actor, who came while we were there. The Lodge is also served by the airport at Gustavus, about 10 miles away on Icy Straight. Immediately adjoining the Lodge is an amazing rain forest with

more luxuriant ferns, mosses, mushrooms, swamps, and big trees than I have ever seen along the Gulf Coast of what the Alaskans call "the Lower 48."

The second day we took a motor launch ride to the face of Muir Glacier, where we saw hundreds of seals riding comfortably on ice chunks and diving off when our boat came too close. The most spectacular operation was at the face of the Riggs Glacier, which is just east of Muir Glacier. The captain blew the ship's whistle to set up vibrations which brought down such huge blocks of ice that the waves rocked our boat a quarter of a mile away. Not only were there seals but also several whales and many kinds of birds. Along the shores of the Bay were signs left by the retreating glaciers.

At the Lodge a black bear and her cubs climbed trees, raided garbage cans, and otherwise conducted themselves in the familiar manner of bears at Yellowstone Park. In addition, there was a big male bear who was brown in color but was said to be a member of the black bear family. He not only stole the apples which had been delivered to the kitchen porch, but also bit through a carton of cans of soup, apparently liked the soup and tore the carton apart to get more cans. Then he clawed and bit our luggage, which was outside the door as we were preparing to leave, and pumped at the young man who rescued the bags. As we left we saw the bear lumbering up the road into the woods pursued by rangers armed with rifles loaded with tranquilizer shells. To all these aspects of this interesting area must be added the fact that the airport attendant said he had good showings of tungsten and molybdenum in a prospect he was trying to develop and that various friends of his had some gold and other minerals in the area.

On the third day, we flew from Glacier Bay to Sitka, where we stayed over night before flying on the Wrangell. We visited the lumber mill which prepares wood for shipment to Japan and also saw some of the many fishing boats which operate in the area.

The following day we flew to Petersburg, a very rich and beautiful fishing town, where we stayed two nights and had a float plane ride to beautiful Thomas Bay and its Baird Gla-

cier on the mainland. There is a large timber cutting area near Point Agassiz. We also had a float plane ride to LeConte Bay and part way up it toward LeConte Glacier until turned back by violent winds near the glacier, one of the very few Alaskan glaciers now advancing. Most Alaskan glaciers are retreating, making them more interesting for people interested in prospecting for minerals, since areas formerly covered by ice are now becoming exposed.

From Petersburg we flew back to Sitka in a very heavy rain. This is not too surprising when one realizes that each of these interesting and otherwise pleasant towns has rainfall of about 100 inches per year. Wrangell and Juneau have about 110 inches, and as mentioned earlier, Ketchikan gets about 160 inches, which earns Ketchikan the wet towel or some other such prize. There is supposed to be a zone somewhere in the middle of this southeast panhandle with only about 50 inches, but I will have to go back to try to find it.

Our final day dawned bright and clear, so we had an excellent bus tour to see both modern and historical sights of Sitka, the original capital of Alaska. The airport on small islands in the bay is being extended and improved so passengers will no longer need to ride a peculiar little harbor boat and have their baggage transported on an amphibious truck.

The activity in prospecting is such that Sitka needs and wants an assay laboratory so that samples will no longer need to be shipped out for analysis.

The flight home from Sitka via Seattle was uneventful, and I got home Sept. 11 to return to regular duties the next day.

I feel well pleased with this trip and am confident of Alaska's bright future as soon as the land problems of the natives are settled. Perhaps homesteading may again be allowed. I regret that time did not permit me to see either end of the proposed pipe line from Prudhoe Bay to Valdez. When enough geological, geochemical and geophysical work in the islands of the southeast is completed to justify investments, the result will be important development of this very interesting area.

There's one good thing about all these protest marches, comments Porphyry Pete—they prove that people still can walk.

The clergyman was preparing his Sunday sermon while his small daughter watched. "Daddy," she finally asked, "does God tell you what to say?"

"Of course, honey," he replied. "But why do you ask?"

"Oh," was the reply, "then why do you scratch some of it out?"

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Long Range Uranium Supply Is Major Item of Concern

ETWEEN now and year 2000 . . . Uranium supply will be "a matter of major concern" even if economic breeder reactors are developed in the 1990's.

Availability of natural gas will depend "on the rate and price that natural gas is made available to the market" as demand for this clean fuel will continue unabated if the "price is right."

A shale oil industry with production "as high as 2 billion barrels annually" by year 2000 is possible; it is equally possible that no shale oil industry will develop at all in the next 30 years.

Demand for petroleum is expected to continue high both here and abroad in the next 10-15 years, but by year 2000 demand may be met in part by synthetic liquid fuels made from coal, oil shale and tar sands.

Coal will be available to make up for any shortage in other fuels, and by year 2000 the top demand for coal may be for the production of synthetic gas and liquid fuel.

These projections are drawn from the advance sheets of the 1970 mineral yearbook of the U.S. Bureau of Mines. The yearbook will be published near the end of the year. The projections vary widely for all fuels because no one can foresee the extent of technological developments nor what action will be taken by future Administrations on import controls, taxes, leasing federal lands, environmental considerations, and research on competing energy sources, notably synthetic liquid fuel. Actions by foreign governments are even more unpredictable.

Uranium is the one source of energy that is projected to be in short supply, although the Bureau of Mines chapter on uranium is based only on non-military uses; military requirements are classified. Domestic demand for uranium in 1968 was 2,700 short tons. It is projected to range from 61.000-67.000 short tons of uranium by year 2000, according to the Bureau of Mines. It will be used mainly to run power plants.

Because of the rapidly growing requirements for uranium, there is considerable concern over the adequacy of domestic supplies of low-cost uranium to meet the nation's needs to the end of the century," the Bureau said.

"Even with the probable release by the Atomic Energy Commission of 50,000 short tons of surplus uranium oxide and the possible development of an economically viable breeder reactor by the 1990's, the likely prospects are that the price per pound of uranium will rise from its 1968 level of \$9.43 to \$20 per pound by the end of the century unless the development of new uranium reserves can keep pace with the projected demand," the Bureau

Because of concern over uranium supply, AEC has given the breeder reactor program "its highest development priority," the Bureau noted. For if breeder reactors were successfully developed they would forestall the danger of depletion of the uranium-thorium resources base beyond year 2000.

"Even in the most optimistic case, the uncertain resource base becomes a matter of major concern," according to the Bureau.

As the light-water and advanced-converter reactors already in service or projected to be put into service

will be long-lived, they "will continue to exert a drain on the increasingly scarce resources of uranium," it said.

The only alternatives to scarce, high-cost domestic uranium by year 2020 are likely to be foreign sources of uranium with "questionable availability" due to high foreign demand, and a shift to a different energy mix, according to the Bureau. It said that different mix might include direct energy conversion systems, increasing quantities of fossil fuels, fusion reactors and possibly solar energy.

Natural gas will continue to be in high demand because it is a clean-burning, convenient, low-cost fuel, according to the Bureau. Domestic demand for natural gas in 1968 totalled 18,957 billion cubic feet, exclusive of natural gas liquids. Of this total, imports from Canada and Mexico accounted for 3 per cent.

By year 2000 annual "consumer demands for natural gas could range between 34.8 to 55.7 trillion cubic feet," the Bureau forecast. Demand for natural gas might skyrocket due to stiff air quality control laws and regulations affecting power plants, homes and industries. It is certain to increase in transportation as vehicles become equipped with dual-fuel conversion systems, the Bureau said.

Only increasing costs, insecure long-range supplies and availability of alternative energy sources would cut demand for natural gas, according to the Bureau. It is likely that, at some point before year 2000, there will be "the increasing substitution of electricity for direct fuels and the dislocation of a part of the natural gas market by synthetic gas," the Bureau stated.

This second assumption is based on the likelihood that over long-term, the cost of natural gas will go up under demand pressure and higher recovery costs until synthetic gas will be less costly and then displace some domestic natural gas in the market place.

In years ahead an increasing amount of domestic supplies of natural gas will come from Alaska, off-shore areas and deep reservoirs. More imports from Canada and Mexico and elsewhere - such as liquified natural gas (LNG) from North Africa - will meet domestic

And it noted, "The use of nuclear energy and liquid chemical explosives to fracture low permeability gas sands could result in a substantial increase in domestic

The prospect of producing gaseous fuels from coal and possibly oil shale and petroleum liquids may be the most secure domestic source of long-range gas fuel supplies. . . . The development of technology to enhance natural and synthetic gas development must be accelerated; otherwise domestic consumers will not have adequate supplies of gaseous fuels at reasonable prices.

"The policies and practices of exploiting federal and other lands must be measured in terms of its impact on the availability and costs of supplies. . . . Regulatory policies must be sensitive to their causal effect on supplies. There is a need, moreover, to identify the problems and benefits of depending on foreign sources of supplies and the practicality of such dependency," the Bureau of Mines said.

(Continued on Page 21)

CASE HISTORY OF A MINER

From Petroleum to Crushed Stone

A FTER graduating from the Colorado School of Mines with a Petroleum Engineering degree (1958). Jon F. Hamlin worked for about four years in the petroleum business.

In 1962 he was employed by one of the major crushed stone producers in Florida. During his stay with this company, he became involved in the design and construction of many different plants covering crushed stone, sand, and gravel operations.

At the time of his initiation into the company, there was only one other engineer who was moved almost immediately into a management position. Jon was saddled with all the company's technical problems of production and expansion.

By the time five different plants had crossed his drawing board, he had become what might be called an expert in the design and construction of processing plants for the aggregate industry. His title had grown to that of "chief engineer" but his salary had not increased proportionately. He also found to his chagrin that increasing one's elevation up the ladder of success adds to the number of one's "political" enemies within the com-

Striking out on his own Jon's first adventure as a consultant was to take over the management of an ailing trucking company. After six months of scrimping and scraping and haywiring junk equipment and poor credit. Jon managed to sell the business before the owner lost his entire investment.

During his employment in the rock business. Jon Hamlin had managed to get his professional registration and to acquire a reputation among the competition as a man who knew what he was doing. This fact led to his first engineering consulting job of any consequence. Since that time, he seems to be winning the uphill battle of spreading his reputation around. As a result he has completed several jobs outside of his home area and recently erected a complete rock plant in Freeport, Grand Bahama

Jon subscribes heartily to a saving in the trade: "If a man wants to find work, the rock business is the right place to find it." He has also noticed a lack of technically trained people in the business. Those who are in the rock business seem to get by with trial-and-error methods . . . at best a costly practice. He concludes: "While I must admit that much of my knowledge was obtained this way, I feel that the education from the Colorado School of Mines and a healthy application of imagination have given me a decided advantage over the competition-of which there is none with the exception of the major equipment dealers."

Long Range Uranium Supply

Whether a shale oil industry develops here or abroad will be determined by such factors as price-cost relationships of competing resources, technological advances in converting oil from shale, continuation of the oil import program, and implementing a federal oil shale policy, the Bureau said.

Similarly, it said, although there would be "relatively strong growth in petroleum demand" for the next 10-15 years, "the future demand and supply of petroleum is very uncertain" for the overall 1970-2000 period. Technological, economic and political factors here and abroad would directly influence the demand on petroleum, it said.

U. S. consumption of petroleum in 1968 was 4.9 billion barrels, an all-time high, and about one-third of total world demand. The Bureau forecast annual consumption in year 2000 would range from 7.3 to 16.4 billion barrels. Under any group of assumptions it is likely that domestic production would have to be supplemented, it said.

"As much as 3.2 billion barrels of liquid fuels may be produced from coal in year 2000 and 2 billion barrels may be supplied from oil shale" to supplement domestic demand for petroleum by the turn of the century, accord-

Demand for coal has fluctuated widely in the past four decades, and this trend is likely to continue, according to the Bureau. Even so, it forecast 1,275 million to 2,639 million tons of bituminous coal and lignite will be the annual domestic demand level by year 2000.

Production of coal from United States mines in 1968 was 545 million tons, while total consumption and exports came to 550 million tons, the deficit being made up from stocks on hand.

Should conversion of coal to synthetic pipeline gas and to liquid fuel become economically competitive with natural gas and petroleum, the demand for coal for this purpose could be "unprecedented" by year 2000, the Bureau said.

It earmarked 1,274 million tons of its (year) 2000 projection for such conversion of coal to synthetic gas and liquid fuel. Utilities are likely nearly to double their demand for coal in the period 1970 to year 2000, it said.

These projections assumed that many problems facing the coal industry, including air and water pollution, would be solved and that productivity would continue to increase while per-unit costs would decrease.

Duval Building Pilot Plant

To Evaluate New Direct Reduction Process

NEW direct reduction, pollution-A free process for recovery of electrolytic grade copper has been announced by Duval Corp., which operates three large copper properties in

Duval is currently constructing a pilot plant at its Esperanza mine south of Tucson for large-scale evaluation of the process, which has been under development for quite some time, involving facilities and scientists scattered half-way around the world. The plant was scheduled for completion in

"In the Duval process," the company's announcement said, "the copper concentrates are leached with a metal chloride solution, metallic copper is separated and the leaching solution is regenerated. The continuous process, which is carried out in a substantially closed system, accomplished pollution-free extraction of copper and recovery of elemental sul-



MINERAL EXPLORATION

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phur, iron oxide and other valuable metals. The roasting and burning steps associated with conventional pyrometallurgical smelter operations are eliminated. Also electrolytic grade copper is produced, avoiding the necessity for a subsequent refining operation."

Tremendous pressure and restrictive

legislation is being placed upon the

mining industry in Arizona and else-

where in the nation to control its con-

tribution to pollution. Much of the em-

phasis to date has been on air pollu-

tion, with the smelters the center of

Bulk of the industry's attack on this

1. Attempting to capture and remove

pollutants, primarily particulate mat-

ter and sulphur oxides, from the emis-

sions from conventional smelters, and,

2. Development of a direct reduction

process that will recover the values

in a pollution-free manner. Part of the

problem has been to perfect a system

that will recover, in addition to the

copper, associated metals, such as

gold, silver and molybdenum, in the

ores. Often it is the recovery of the

associated minerals that makes the

Every major copper producer that

operates smelters is conducting ex-

perimental research and development

programs seeking to eliminate smelter

Phelps Dodge Corp, is building an

acid plant at its Ajo smelter, seeking

to enlarge and improve a similar plant

at its Morenci smelter, building an experimental plant at Ajo to convert

sulphur oxides into elemental sulphur and teaming with American Smelting

and Refining Co. in a joint venture on

an elemental sulphur plant using an

approach different than the one at Ajo.

Inspiration Consolidated Copper Co.

is experimenting with a pilot plant at

its Inspiration smelter with a process developed by Golden Cycle Corp. to

electro-winning facility to utilize the

The Asarco smelter at Hayden is

constructing a conventional sulphuric

acid plant, while the company is con-

ducting other experimental programs

The acid plants devised thus far

have not been able to achieve much

more than 80 percent efficiency in re-

moving sulphur oxides. In addition,

they are expensive to build and can-

tankerous to try to maintain and oper-

ate. In other words, they are not the

correct answer-but the best known at

the moment as the companies attempt

DECEMBER, 1970 . THE MINES MAGAZINE

elsewhere

ore profitable.

problem has been two-pronged:

most of the controversy.

"Hydrometallurgical extraction of copper was proposed over a hundred years ago," the company announcement continued. "Many of the basic chemical reactions involved in the Duval process are well known. However, despite repeated efforts during this extended period of time, it had not been possible to carry out these reactions under conditions and in such combination as to produce copper economically.

"The Duval process resulted from a fresh new approach to the problem, and the combining of old techniques with Duval's new developments and technology. Bench scale testing and other experimental evaluation of the process have confirmed the validity of the basic chemistry involved. . . . While laboratory testing conducted to date indicates that the process may have economic advantages over conventional smelter techniques, the commercial feasibility of the process cannot be determined prior to the completion and operation of the pilot

plant." Duval said it also intends to conduct further work to determine adaptability of the system to processing other ores, such as those containing nickel, lead and zinc,

Duval President W. P. Morris estimated the pilot plant will cost about \$1 million to build and put into opera-

recover elemental sulphur. Kennecott Copper Corp, has built a **GEOCHEMICAL SERVICES** conventional acid plant at its Hayden smelter and has constructed a leach-

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J. Kent Perry, '58 Geological Engineer Delmer L. Brown, '63 Geological Engineer

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to comply with new and severe pollution regulations.

Duval Corp, has no smelter, having bulk of its concentrates processed by Asarco at Hayden and elsewhere, as well as exporting some overseas for treatment.

In an approach similar to Duval'sdirect reduction - The Anaconda Co. is constructing an experimental pilot plant at its big research center near Tucson, Anaconda's multi-million-dollar pilot plant is operating successfully on a limited basis, but construction will not be completed until about the end of the year, following which fullscale testing will move into high gear.

Francis L. Holderreed, director of metallurgy for the company, said the plant is being built by the Treadwell Co. of New York City, which holds the patent on the process.

Both Duval and Anaconda have announced that in the event they are successful in perfecting economic and practical direct reduction processes, they will make them available to the industry on a reasonable royalty ba-

In connection with the effort by Duval, which is a subsidiary of Pennzoil United, Inc., it is interesting to note the scope and location of the talent and facilities which have been brought to bear. For a report on that, we turn once again to the recent announcement by Duval:

"The Duval Process was developed in Duval laboratories in Tucson, Ariz., and in Pennzoil laboratories in Shreveport, La., under the direction of W. P. Morris and G. E. Atwood, president and executive vice president, respectively, of Duval.

"Among those who were particularly active in the development of the process were Charles H. Curtis, vice president, Research, Richard W. Livingston, Dr. Gordon E. Agar, and Frank E. Lamb, all of Duval at Tucson, and Dr. Dysart E. Holcomb. vice president, research, engineering and development, Dr. John B. Sardisco, and James W. Bulls, all of Pennzoil at Shreveport, E. D. Bowman, Jr., vice president, development and M. S. Cook, project engineer, both of Duval. at Tucson, have participated actively in the design and construction of the pilot plant.

"In developing the process, Duval was fortunate in having the consulting services of two famous scientists: Dr. Ralph W. G. Wyckoff and Dr. M. R.

"Dr. Wykoff, professor of Physics and Microbiology at the University of Arizona, has provided guidance and advice based upon his experience in over a half century of work in physics and chemistry. Dr. Wyckoff received his Doctorate from Cornell University in 1919, and his professional accomplishments since then have spanned many scientific fields. Many awards and honors have been bestowed upon him in this country and in Europe in recognition of his contributions to

"Dr. Bloch has served as a consultant in the development of the Duval process for over a year. He received his Doctorate from the University of Bern in 1926, and was head of the Department of Metallography and Xray Spectrography at the Technische Hochschule in Karlsruhe for several years. After heading several research projects and publishing important scientific papers, his work was interrupted by the advent of the Nazi regime. Thereafter until the end of World War II Bloch did research and development work in connection with mineral production in the Middle East, and from 1948 to 1960 served as a member of the Research Council of Israel

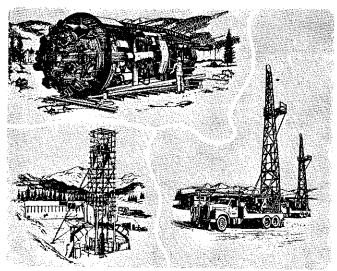
"Since then he has served as Visiting Professor of Geochemistry at the Hebrew University in Jerusalem, as consultant for the Dead Sea Works Ltd., as Visiting Professor at Max-Planck Institute of Nuclear Physics at Heidelberg, Germany, and as a consultant to Duval Corp.

Christmas Is Coming

Children in the cities. The country and each town. Are waiting for old Santa Claus To climb the chimneys down.

The grown folk, too, are waiting To hear the big snow sled, And get their share of presents From the jolly "Man in Red."

-Pearl Anoe



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Plant News

Uranium Oxide Order

The Susquehanna Corp. has received orders for 1,580,000 pounds of uranium oxide for delivery in 1970, 1971, and 1972. The announcement was made by Emmett H. Bradley, executive vice president and chief operating officer of Susquehanna.

New Atlas Copco Facility

Establishment of its tenth district nationally - a new facility to serve the Southern California market, head-quartered in its rapidly growing Orange County - has been announced by Atlas Copco, Inc.

The new office is located at 18109 Mt. Washington Street, Fountain Valley, Calif., 92708.

Record Centrifigal Bearings

The world's largest centrifugally cast bronze bearings were shipped in September by Wisconsin Centrifugal Inc., Waukesha, Wis. The record bearings were shipped to the Dominion Engineering Works, Ltd., Montreal, Canada, and will be part of a huge ball mill for crushing ore.

The 7,500-pound bearings are 10 feet in diameter and have bearing widths of 26 inches. Two were shipped along with three companion bearings with 89-inch diameters. The bearings were shipped semi-machined.

Melpar Develops New Use For Anthracite Coal

Melpar scientists have developed a new use for antracite coal, J. P. Chambers, President, announced. Anthracite, a once popular fuel, has been replaced by oil and gas in home heating.

Melpar's Patent, Number 3-460-925, describes a new method that uses solid sodium hydroxide (caustic) and anthracite coal (carbon) in a hot homogeneous stream to make sodium carbide. Sodium carbide (like the calcium carbide used in camping lights) can be mixed with water to produce acetylene. A by-product, producer gas, is also generated that can be used to help heat the sodium hydroxide-coal mixture during processing. Acetylene is the starting material used in making neoprene, vinyl plastics and other types of plastic materials.

"The time is near," said Melpar officals, "when a plastics producing industry can build in the anthracite region and use the coal to develop new products and a new economy for the now depressed anthracite industry."

Melpar, a major electronics firm, with main facilities in Fairfax, Va., is an American Standard Co.

U.S. Steel Subsidiary Will Assist Companhia Siderurgica Nacional

Contracts to provide a broad technical assistance and training program for one of the largest steel companies in South America have been signed by USS Engineers and Consultants, Inc., according to J. Donald Rollins, president of the U. S. Steel subsidiary.

Under the agreements, Companhia Siderurgica Nacional, a Brazilian steelmaker based in Rio de Janeiro, will receive technical assistance in all aspects of steelmaking at the company's Volta Redonda steelmaking complex; and similarly, appropriate personnel of the firm will be trained at plants and offices in the United States.

The agreements call for assistance in planning an expansion of the South American steelmaker's facilities.

Allis-Chalmers & Siemens AG Sign Licensing Agreement

Allis-Chalmers and Siemens AG, of Germany, have signed a licensing agreement under which Allis-Chalmers will manufacture and sell a wide range of electrical products and systems to the utility and industrial markets.

David C. Scott, president and chairman of the board of Allis-Chalmers, said that the agreement gave Allis-Chalmers "immediate access to the advanced technology of Siemens, and that it made available a broad range of research and development, design and engineering in these product lines."

Industrialists Tour Sweden

W. E. Koger, vice president of Ingersoll-Rand Co., is among a group of industrialists, government officials and concerned citizens taking a special study tour of Swedish pioneering efforts to fight pollution.

The tour, arranged by the National Business Council on Environment, is to include a look at such projects as the revival of polluted lakes with compressed air and the reduction of noise in mining operations.

Earth Resources Co. Announces \$35 Million Copper Contract

Earth Resources Co. has entered into an agreement to sell to American Smelting and Refining Co. its production of low-sulphur, high-copper concentrates to be produced beginning in mid-June 1971 at its Nacimiento copper project in New Mexico.

The agreement involves the sale of concentrates produced from the project for a five-year period beginning in June 1971 at an estimated rate of 7,000 tons of copper per year. At current prices, this would place the yearly value of this contract at approximately \$7 million, or \$35 million for the five-year period.

William Crowe Kellogg, '43

Kellogg Exploration Company Geologists—Geophysicists

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Consultants in Petroleum and Natural Gas

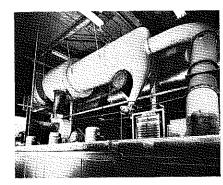
Engineering, Appraisals, Geology Reserves
Property Management

910 C & I Building
HOUSTON, TEXAS 77002 CApitol 3-1346

With the Manufacturers

Pipe Welding Clamp (312)

Jewel Manufacturing Co., P. O. Box 672, Saint Paul, Minn. 55102, has introduced a new simple, light and easily operated clamp. No longer will the pipefitter need to burden himself with carrying separate line-up clamps for each type of weld fitting. Pipe and weld fittings up to eight inches in diameter can be positioned with this one tool. Circle 312 on Reader Service Card.

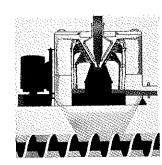


Dust Collector (313)

This Aerodyne Type "S" Dust Collector meets local and state air pollution code requirements in cleaning air from a cereal plant belt air dryer. Manufactured by Aerodyne Development Corp. of Cleveland, the Type "S" Dust Collector is installed horizontally between the dryer and the plant ceiling, requiring no insulation or structural change in the building. Aerodyne Development Corp. manufactures water and air pollution control equipment. The company's main office is located at 24340 Miles Road, Cleveland, Ohio 44128. Circle 313 on Reader Service Card.

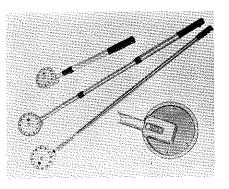
Bistable Device (321)

A new experimental class of two-terminal bistable devices with many attractive features for switching and memory purposes has been developed at IBM Research. The devices have desirable characteristics in terms of speed, as well as of voltage and current requirements. A feature desirable for memory applications is their relative non-volatility. Although one of the states (the low-impedance one) is thermodynamically "unstable," at zero bias this state persists for as long as three weeks at room temperature. Moreover, the devices are formed from well-understood crystalline materials similar to those used for transistors, in contrast to bistable devices formed of amorphous or glassy materials. Circle 321 on Reader Service Card.



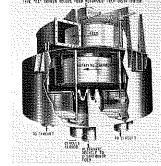
Continuous Centrifuge (329)

A separating or dewatering continuous centrifuge, available from CF&I Engineers, Inc., 3309 Blake St., Denver, Colo. 80205, handles this slurries or highly viscous mixtures with excellent results and without significant degradation of solids even when very soft crystals are involved. Principal uses to date have been in the sugar and salt industries. The automatic centrifugal machine is the product of a subsidiary of the CF&I Steel Co. Circle 329 on Reader Service Card.



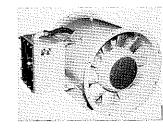
Measuring Devices (315)

A new product line of "one man" measuring devices for industry and consumer use consist of three models of the "Measure-Meter", an all-purpose measuring device, manufactured by Industrial Specialties, 19631 Prairie St., Northridge, Calif. 91324. These meters, composed of a 36" rod-handle with plastic hand-grip are used to push a 4-inch measuring wheel, to which a footage meter is attached. The manufacturer claims accuracy to within one inch in measuring distances from one inch to 1,000 feet. Circle 315 on Reader Service Card.



Denver Pulp Distributor (323)

A built-in circuit by-pass system on Type "EA" DENVER Volute Feed Motorized Pulp Distributors enables an operator to cut off the discharge from any compartment of the pulp distributor when desired. This unique by-pass system is used when it is desirable to shut down one or more banks of flotation machines for inspection, maintenance, or other reasons. Circle 323 on Reader Service Card.



Adjustax Fan (324)

American Brattice Cloth Corp., Warsaw, Ind. 46580 has introduced a new portable, Auxiliary Fan designed to help miners meet rigid new mine safety standards for reduced dust levels at the working face. The fan meets all requirements of the U.S. Bureau of Mines, and is said to feature economy, high capacity and rugged construction. Circle 324 on Reader Service Card.

Shallow Water Sparker System (330)

Alden Electronic & Impulse Recording Equipment Co., Inc. announces the introduction of the Model OS-300 Shallow Water Sparker System for use in oil exploration, marine dredging and construction and offshore mining. This low power profiling system covers the gap between crystal transducer sonar profiling systems and high power, heavier and more costlier systems. Circle 330 on Reader Service Card.

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Donald R. Stewart '61 — W. H. Thornley, Jr.

Catalogs and Trade Publications

BACKHOE-LOADER SYSTEM (439)
A colorful 8-page brochure spells out the ABC's of the versatile new Case modular system for Case Construction King Loader-Backhoes. It is available either through Case dealers or J I Case Co., Racine, Wisc. The Case Modular System offers the user a choice of three basic options (Hthing the same trader): (1) backhoe module with fitting the same tractor: (1) backhoe module with optional buckets and claws; (2) heavy-duty hitch module which provides 4-way hydraulics for powering and controlling box scrapers, mowers, powering and controlling nox scrapers, mowers, rototillers, rakes, augers and many other 3-point hitch tools; and (3) counterweight module for fast, high-production loading. The three modules are quickly interchangeable, giving the basic tractor exceptional versatility at modest investment. Circle 439 on Reader Service Card.

FLUORIDE ION ANALYZER (440)

The Model 900F Fluoride Ion Analyzer which is designed for the continuous measurement and control of fluorides in potable water and water pollution is described in a new eight-page bro-chure from Beckman Instruments, Inc., Fullerton, Calif. 92634. Bulletin 4102 describes the principle of operation, electronic circuitry, and applications of the analyzer. Illustrations show both the external and internal appearance of the unit and diagrams illustrate operation principles and mounting requirements. Special reference is made to the rugged lanthanum trifluoride crystal electrode which was developed by the company' Process Instruments Division to provide long life and stability. The principle of selective ion measurment is also discussed. Circle 440 on Reader

PUMPING LIQUID EXPLOSIVES (441)
Two Spark Free Model M8-B Wilden Air Operated Diaphragm Pumps were used on this excavation project to pump water-gel explosives rather than hand load them in the conventional way. Weighing only 72 lbs. these recently introduced 2" pumps loaded 33,000 lbs. of explosive six times faster than by hand loading methods. Made of spark free materials, the Wilden pumps can handle extremely viscous and abrasive materials with ease. Using air as the motive power meets most safety requirements for use with explosives or volatiles in marine and refinery applications. Wilden Pump and Engineering Co., 22069 Van Buren, Colton, Calif. 92324, Circle 441 on Reader Service Card.

WATER DISCHARGE HOSE (442)

The Industrial Products Division of Uniroyal (P.O. Box 667, Sandy Hook, Conn. 06482) has introduced a radically new and different type of water discharge hose. The new hose (P-1,172) combines extreme light weight (100 ft. of 1½'' hose weighs only 22 pds.) with great strength and resistance to chemicals, oils, weather extremes and ozone. The secret of these attributes is a unique, patented construction which combines a continuous extraction which combines a continuous extraction of Core reducers on the a continuous extrusion of Ozex polymer on the outside and inside tubes, and between the tubes, a liner of high pressure, shock resistant polyester integrally bonded to the tubes by Uniroyal's exspinning process, Circle 442 on Reader

AIR COMPRESSOR PLANT (443)

AIR COMPRESSOR PLANT (443)

A 4 color, 8 page brochure. Form 11200, illustrates Ingersoll-Rand's newest air compressor plant. The booklet completely describes this plant air compressor package available in sizes from 400 through 1300 acfm at 100 psig. Known as the PAC-AIR, the unit has been sound engineered with overall space, accessibility and appearance of prime consideration. Each component is of the highest engineering and manufacturing standard; the single-stage compressor, separator/receiver, oil cooler, and controls. These are enclosed in an acoustically lined sheet metal housing Only the on cooler, and controls. These are enclosed in an acoustically lined sheet metal housing. Only the drive motor and oil filter are mounted outside the enclosure. Write to Ingersoll-Rand Co., Axi Compressor Division, 1101 Northampton Street, Easton, Pa. 43042, Dept. TEF, or Circle 443 on Reader Service Card.

LIQUID LEVEL CONTROL (444)

A new AquaTone interface liquid level maintenance control has been introduced which will monitor liquid level and maintain it, with solid state reliability. Model MLI monitors for a low liquid level and automatically maintains it by means of activating a pump, solenoid, or other load. Model MHI monitors for a high liquid level and automatically sets off corrective action to maintain it. Load is activated by means of a special interface sensor which responds instantly special interface sensor which responds instantly and is accurate to within \(^4\)-inch, 4-inch interface is standard; shorter or longer interface is available. For data sheet and price write Ziegler Electronics, Inc., Dept. AP, 17310 S. Western Ave., Gardena, Calif. 90248, or Circle 444 on Reader Service Card.

Send Us Your Bulletins

Send your publications to The MINES Magazine, 2177 W. 7th Ave., Denver, Colo. 80204, for review in these columns. To all MINES readers these publications are FREE, and may be ordered by giving index

On requesting publications from manufactur-ers, please mention the MINES Magazine,

TRACK MATERIALS (445)
Buyers and specifiers of frogs, switches and trackwork will be interested in a new, four-page, two-color illustrated folder which describes the full range of track materials and accessories available from L. B. Foster Co., Seven Parkway Center, Pittsburgh, Pa. 15220, In addition to outlining the stocks available—from Tee Rail and Crane Rail to switch stands and replacement parts for industrial sidings, in-plant trackage, crane runways and similar industrial and construction applications—the folder describes the components of a typical turnout and the various designs and use of frogs and switches for all types of service from light, to moderate, to heavy duty industrial trackage. Circle 445 on Reader

LABORATORY SUPPLIES (446)

LABORATORY SUPPLIES (446)
Laboratory supplies are graphically described
with specifications, sizes and prices in a bulletin
available from Sepor Laboratory Supply, P.O. Box
4255, Long Beach, Calif. 90804, Circle 446 on

AIR INTAKE FILTERS (447)

Dollinger Corp., Rochester, N.Y. 14603, has made available 16 new product information sheets covering the company's complete line of air intake filters and filter//silencers. Offering both high efficiency and the lowest initial resistance to air flow, Dollinger air intake filters are designed to meet the varying filtered air requirements of all types of engines, compressors and blowers. For use wherever compressor intake noise is obror use wherever compressor make most so objectionable to personnel or neighborhood, filter/silencers incorporate an efficient dry-type intake filter with a series of tubes around the inside periphery of the filter housing. Circle 447 on Reader Service Card.

AUGER DRILL HEAD (448)

A new auger drill head called SUPER-D (trademark) has been announced by Mobile Drilling Co., Inc., 3807 Madison Ave., Indianapolis, Ind. 46227. The new cast steel bit designed for use in gravel, shale, till and sandstone, has hardfaced wear surfaces and heat treated, carbon steel, replace able teeth. The new bit is available with 1½", 15%" and 2" hex connections for 4½" and 6" hole size. The new SUPER-D (trademark) bit is illustrated in auger Catalog no. 875, Circle 448 on Reader Service Card.

BIGGER CAPACITY FORKS (449)

Detachable forks for shovel loaders are now available in 6,000 lb, and 8,000 lb, capacities from J. E. Coleman Co. 342 Madison Ave., N.Y., N.Y. 10017, manufacturers of "Scoop Forks." Previously made only in 4,000 lb, capacity, the forks are temporarily attached to loader buckets for unloading materials such as pipe, lumber, block, etc. Also available is a new line of forks for use on 4-in-1 type shovels. The company has organized a new affiliate. Coleman Methods Corp., which will market the forks and other equpiment for the construction field. Circle 449 on Reader Service Card.

BALANCES AND WEIGHTS (459)

The Ohaus Scale Corp., of Florham Park, N.J.
07932 has announced publication of a new 32page full line Catalog. In full color, it describes
all of the Company's balances, weights, and
accessories for the industrial laboratory, plant,
or production facility. Several new products are
included: Check-O-Gram Over-Under scales with
an end reading tower that rotates. 4 full 3809. an end reading tower that rotates a full 3600: Count-O-Gram ratio counting scales offer magnetic damping, stabilized ratio pans, completely enclosed mechanism, a housing-mounted zero adjustment knob, and true portability; the Dial-O-Gram Series 2000, magnetically damped general purpose laboratory balances with dialvernier readout to e.lg; and the Model 6010PC, a moisture determination balance designed specifically for Pollution Control. Circle 450 on Reader Service

SCRAPER CATALOG (451)

Caterpillar has published a conventional-scraper catalog (Form No. AE020044) to assist the customer on his selection of the right machine for his job. The 20 page, four-color booklet covers all the specifications for Caterpillar wheel tractor scraper models 621, 631C, 641B, 650B, and the 660B. This is the first of four catalogs covering the full line of Cat scrappers including Tandows the full line of Cat scrappers including Tandem Powered Scrapers. Elevating Scrapers, and Push-Pull Scrapers. Such major features as the cushion hitch, power unit, and scraper bowl are discussed for greater understanding of each component. Gradeability performance curves are given to calculate the performance of each machine under differing working conditions. Circle 451 on Reader

JIGGLING FLOWSHEETS (452)

Bulletin M7-F118, (Denver Equipment Div., Joy Mfg. Co., P. O. Box 5268, Denver, Colo. 80217). presents a study of four types of flowsheets where jiggling of unclassified minus ¼" feed is often applicable. The problem is to recover the mineral values at a coarse size as soon as freed and eliminate slime losses or increase the over-all recovery of an all-gravity concentration plant. One Flowsheet illustrates how free gold from mill classifier circuits in flotation and evanide plants is recovered with the DENVER "Selective" Mineral Jig. Flowsheet No. 2 shows how alluvial deposits containing gold, scheelite, cassiterite, diamonds, etc., are effectively treated by a DENVER Mineral Jig. In Flowsheet No. 3, slags and industrial residues containing metallic values are processed by gravity methods, Flowsheet No. 4 shows how friable heavy minerals (such as sheelite, ferberite, huebnerite, wolframite, manganese, chromite) are treated. Circle 452 on Reader Service Card.

MAGNETIC INSPECTION TOOL (453)

Literature from United States Magnet, 1108 S. Western Ave., Los Angeles, Calif. 90006, describes and illustrates Detecto-Mag, a portable magnetic inspection tool that takes the guesswork out of crack detection. It is completely portable and simple to use. Being non-electric, there is no possibility of serious shock through grounding the body on a damp surface. Circle 453 on Reader Service Card.

REFERENCE ELECTRODE (454)

A new polymer composite pH reference electrode is virtually unbreakable and functions without a conventional flowing electrolyte junction is described in a bulletin by Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton, Calif. 92634. Bulletin 4108 also gives field test data for the new Lazaran Reference Electrode which is designed for use in pH, ORP, and selective ion measurements in a wide range of process industrial applications. Full specifications are included. Circle 454 on Reader Service Card.

WANT MORE INFORMATION?

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Mineral Industries

Mineral Exploration Off Coast of Greenland

Marine Resource Consultants, Inc. has begun mineral exploration off the southwest coast of Greenland, according to an announcement by W. David Grammer, president of the Santa Monica-based oceanography firm, According to Grammer, the entire program is expected to run approximately four months.

"During the recent glacial epoch,

large amounts of minerals were moved by glaciers acros the land surface of Greenland and deposited in the form of moraines in the shallow waters off the southwest coast. These deposits form the basis for potentially rich mineral deposits in readily accessible offshore areas. Initially, we are looking for chromite, rutile and platinum." Grammer said. "However. as the exploration program progresses, the search may be expanded to seek other minerals."

Mining Safeguards Environmental Values

Preparations for the 1970 Christmas Pageant of Peace in the nation's capital are under way in the iron mining country of northern Minnesota, according to an announcement made by the American Mining Congress in Washington, D. C.

J. Allen Overton, Jr., AMC executive vice president, said 57 balsam fir trees are being selected and tagged by Erie Mining Co. to represent the states and territories at the annual Pageant of Peace at the President's Park in Washington. Arrangements for donation of the trees were made by Pickands Mather & Co., Cleveland, Ohio, managing agent for Erie Mining Pickands Mather is a unit of Diamond Shamrock Corp., also of Cleveland.

Keith S. Benson, chairman of Pickands Mather, said the trees, which are to be cut in the late fall, illustrate the emphasis the mining industry places on safeguarding environmental values of the nation's mineral areas.



Basic earth science systems, inc.

Exploration Management James M. Nienaber, Geol.E. '54 Robert D. Turley, Geol.E. '52 Guenter B. Moldzio, M.Sc. '69

Usibelli Completes Purchase of Vitro Coal Properties

Usibelli Coal of Fairbanks has completed its purchase of Vitro Minerals Corp.'s coal properties and mining equipment. The purchase involved more than \$1 million and leaves Vitro Minerals with no operating mines in Alaska, However, Earth Resources Co., owner of Vitro, is participating in a minerals exploration program

Concerns Alaskan Miners

Alaska miners and prospectors are gravely concerned over a recent addition to the Alaska Native Land Claim Bill S.1830. This addition, Sec. 23(a)(1), was added just before Senate passage of the bill, and provides for a five year land freeze on all of Alaska's unreserved public lands. Such a freeze will effectively stop exploration in most of Alaska. The bill is now in the House Interior and Insular Affairs Committee and much pressure is being brought to bear for final passage before Congress adjourns this year so that settlement of the Native Claims may finally pro-

It is generally agreed that passage of a Native claims bill is necessary if Alaska is to progress. The purpose of the present land freeze is to keep the lands intact until passage of such a bill. Sec. 23(a)(1) would continue the freeze with even more restric-

Two points seem clear: (1) Section 23(a)(1) has nothing to do with settling the Native land claims-it should not be in the bill-and (2) needed land classification can be accomplished without prohibiting exploration. This has been demonstrated.

All persons interested should express their views to their Congressmen and other influential parties. Representative Howard W Pollock is Alaska's lone member of the House. He is a member of the House Interior and Insular Affairs Committee and is dealing directly with the bill. Colorado's Representative Wayne N. Aspinall is the chairman of the committee.

New Director of SMPD

Frank E. McGinley, a metallurgical engineer with the Grand Junction AEC Office since 1955, was appointed director of the Source Material Procurement Division effective July 26. McGinley succeeds W. S. Hutchinson, Jr., who is retiring from active service. A native of Arizona and a metallurgical engineering graduate of the University of Arizona, Mr. McGinley has been engaged in uranium raw materials work with AEC since 1952. having worked for the AEC at Plant City, Fla. in 1952-55,

Denison Mines Concludes \$300 Million Contract

Denison Mines Limited has concluded a major long-term contract valued in excess of \$300 million for sale of uranium to a Japanese power company.

Involving 33.5 million pounds of concentrates (U-308), it is the nuclear industry's largest private uranium contract so far negotiated.

Deliveries will commence in 1974 from the company's Elliot Lake, Ont., uranium mine and will be made over a 10-year period.

Edward J. Johnson, '49

Petroleum Geology Room 300

3535 N.W. 58th Street 943-8536, Office; 721-5353, Home

Oklahoma City, Okla.

Edward P. Jucevic, '60

Consulting Mining and Metallurgical Engineer

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U.S. GEOLOGIC REFERENCES

Do you look for USGS geologic references by place names? The quick, accurate way is by latitude and longitude, Our GEOLOGIC INDEX, \$25.00 completely up-to-date is efficient and easy to use.

Monthly Supplements, \$15.00 per year keep it current. Quarterly Supplements only \$9.00 per year and Yearly Summaries \$3.00 each.

See BOOK REVIEW in Mines Magazine, August, 1969, or write us for particulars. Widely used all over the U.S. and southern Canada.

GEOLOGICAL PUBLISHING COMPANY

P. O. Box 2041

Denver, Colorado 80201

Technical Societies

ASEE Appointments

The American Society for Engineering Education has appointed John W. Starke as manager of Administration and Eugene M. Knight, Jr., as advertising manager.

Mr. Starke will be responsible for over-all headquarters administration and personnel, and will assume many of the public relations duties now being performed by W. Leighton Collins, executive director emeritus, when Mr. Collins retires from ASEE in June, 1971.

NSF Fellowships

The National Research Council has been called upon again to advise the National Science Foundation in the selection of candidates for the Foundation's program of graduate and regular postdoctoral fellowships. Panels of outstanding scientists appointed by the Research Council will evaluate applications of all candidates. Final selection will be made by the Foundation, with awards to be announced on Mar. 15, 1971.

Applicants for the graduate awards will be required to take the Graduate Record Examinations designed to test scientific aptitude and achievement. The examinations, administered by the Educational Testing Service, will be given on Dec. 12, 1970, at designated centers throughout the United States and in certain foreign countries.

The annual stipends for Graduate Fellows are as follows: \$2400 for the first-year level; \$2600 for the intermediate level; and \$2800 for the terminal-year level. The basic annual stipend for Postdoctoral Fellows is \$6500. Dependency allowances and allowances for tuition, fees, and limited travel will also be provided in both programs.

Underwater Mining Institute Planned

An institute on "Underwater Mining" will be held Thursday and Friday, May 20-21, 1971, at the downtown campus of the University of Wisconsin in Milwaukee, 600 W. Kilbourn, beginning at 8:30 Thursday morning. It is a continuation of a successful conference held last year and will involve the latest developments in new exploration methods, economic assessment of discoveries and legal conflicts. The institute will be of particular interest to engineers, geologists, and technical management personnel.

For further information call 414/228-4323, or write University of Wisconsin, University Extension, Engineering Dept., 600 W. Kilbourn, Milwaukee, Wis. 53203.

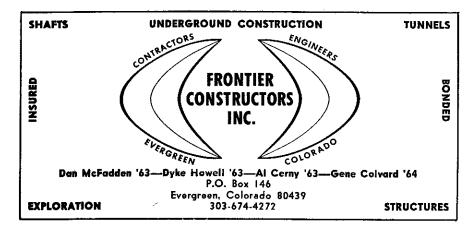
AMAX Vice Pres. Predicts \$3 Per Ounce for Silver

A silver price of \$3 per ounce by the mid 1970's was predicted by Alexander Schmidt-Fellner, vice president of the AMAX Copper Division of American Metal Climax, Inc.

Mr. Schmidt-Fellner told the 1970 Mining Convention of the American Mining Congress that he did not, however, expect "a straight upward curve under which the price will rise from its present to this much higher projected level.

"I foresee that increases will occur in plateaus," he declared, "and that each plateau—say, one at \$1.90-\$2.00, one at around \$2.25, another at around \$2.50, etc.—will undergo substantial fluctuations upward and downward before the price will ultimately settle at the higher levels.

"The plateau levels, and their timing," Mr. Schmidt-Fellner said, "will be determined by supply and demand and by speculative upward or downward momentum sparked not just by factors with direct influence on the silver supply picture, but by political and economic turns, even if these have no direct connection."



Energy Goal Must Be Defined Dorsey Believes

Environmental concerns and the scarcity of energy require the United States to define its energy goals more carefully, according to B. R. Dorsey, president of Gulf Oil Corp.

In a speech to the Society of Petroleum Engineers in Houston, Mr. Dorsey said:

"Put bluntly, what we need are guidelines from the government that don't keep shifting on us. We need to encourage rather than inhibit the ingenuity that has long characterized the energy field in this country."

Mr. Dorsey said the nation "must decide whether we want to develop secure sources of energy within the United States or become increasingly dependent upon foreign sources of energy,"

Once the decision is made on domestic or foreign energy dependence, he said, "future changes in policy will be clear." The lack of a firmly established policy to develop our domestic energy sources, he noted, brought about the debate on import controls.

"If it takes more studies to define our goals, let's have them," he continued. "If it takes more prodding to get a national energy policy established — one which also brings our government and the government of Canada closer together on solutions to problems—let's have that, too."

In commenting that "we in the energy business do not create demand" but are sensitive to it and try to supply it, Mr. Dorsey said:

"We in the United States are starting to challenge some basic assumptions. One of them is that we as a nation can adapt indefinitely to the rapid rise in population and the rapid rise in demand on our technological knowhow and capacity to provide newer, better, and more comforts and conveniences.

"We hear the roaring crescendo of the consumer's demand for more cars, more trucks, more motorbikes, more air-conditioners, more jets, more bulldozers, more electric guitars, more home appliances. We have been mesmerized by this incessant tempo. We have too readily called this progress."

In concluding, he said:

"We must recognize also that we have a very pressing commitment to a crucial matter that must be faced by all of us—in and out of the energy business—and that is this: How high a rate of economic growth can be achieved consistent with the maintenance of high standards of public well-being. And by well-being I mean social and physical, not just economic."

Personnel Placement

THE COLORADO SCHOOL OF MINES ALUMNI PLACEMENT SERVICE functions as a clearing house for alumni and former students who wish to receive current information about employment opportunities for which they may qualify. It also serves the oil, gas, construction and related industries and many government agencies by maintaining current listings of openings they have for qualified engineers, technical and management personnel.

Companies needing qualified men with degrees in Geological Engineering, Geophysical Engineering, Metallurgical Engineering, Mining Engineering, Petroleum Engineering, Petroleum Refining Engineering, Engineering Physics, Engineering Mathematics, and Chemistry are invited to list their openings with the CSM Alumni Placement Service, Guggenheim Hall, Golden, Colorado.

Listed below are coded references to the graduates of the Colorado School of Mines who were available for employment at the time this issue of The MINES MAGAZINE went to press.

Client's Code Number	Degree	Age	Marital Status	No. of Children	Preferred Fields of Work	Locality Preferred	Languages Spoken
MN 34	Mining	39	M	1	Mining Geology	Western USA/Foreign	English/Spanish
MN 37	Mining	29	M	2	Production	Rocky Mountain or Western U.S.A.	English
MN 39	Mining	32	M	2	Mining Supervision and Management	Open	English
MN 44	Mining	28	M	2	Manufacturing & Marketing	Open	English
MN 46	Mining	36	M	6	Exploration Development	S.WU.S.A. or Alaska	English
MN 47	Mining	39	M	2	Technical Sales	U.S.A.—Foreign	English
MT 48	Metallurgy	35	M	2	Development, Project Management	Colorado	English/Spanish
MT 51	Metallurgy	26	S	0	Met. Engineering Systems analysis	Foreign	English
MT 52	Metallurgy	23	M	0	Metallurgical Engineering	Rocky Mountain	English
GE 34	Geol. Engr. Civil Eng.	39	M	3	Prefer Management	Open	English
GE 36	Geology	43	M	1	Production—Mining or Non-metallic Processes	Western U.S.	English
GE 38	Geology	35	M	2	Mineral Prop. Evaluation Mine Manag, & Planning	Western USA/Foreign	English
GE 40	Geol. Engr.	43	S	-	Exploration, Engineering or Research Geologist	Western U.S.A. or Foreign	English
GP 15	Geophyics	49	M	3	Petroleum Expl.	Rocky Mountains	English
GP 17	Geophysics	34	M	1	Geophysics	Colorado	English
GP 18	Geophysics	23	S	0	No Mgmt. Trainee	Rocky Mountain	English
GP 19	Professional Engineer	24	M	0	Mineral Exploration	Southwest U.S. or South America	English
GP 21	Geophysical Engineering	39	M	3	Dynamics & Acoustics	U.S.A.	English
PE 15	Petroleum	24	S	0	Reservoir Engr.	Rocky Mtn. Region	English
PE 17	Pet. Eng.	34	M	4	Pet. Engr.	Open	English
PE 48	Pet. Eng.	49	M	3	Petroleum Engineering	Rocky Mountain	English
PE 49	Pet. Eng.	35	M	3 .	Petroleum Engineering or Related Technical Sales	Denver or Tulsa	English
PH 02	Physics	23	S	0	Engineering Physics	Rocky Mtn. Region	English
PH 04	Engr. Physics	27	M	0	R.& D. Engr. Marine Engr.	Coastal except N.E.	English
PR 11	Masters in P.R.E.	30	M	2	Management Systems	U.S.A.	English
PR 12	Chem./Ptrlm. Refining	22	s	0	Chemical-Petroleum Refining Industry	Open	English/French
PR 14	Petroleum Rei Engineer	in 39	M	5	Petroleum Refining or Chemical Engineering	Rocky Mountain	English
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In Memoriam



Otto Jay Myers

OTTO JAY MYERS, E.M. & M.Sc. (geol.) 1942, vice president of Reichhold Chemicals, Inc., of White Plains, N. Y., died at his home, 115 Marcourt Drive, Chappagua, N. Y., on Saturday, Sept. 12, 1970.

Mr. Myers, who was born Sept. 11, 1915, in New York City, grew up in New Rochelle and was graduated from Blair Academy, Blairstown, N. J. He received his Bachelor of Arts degree from Princeton in 1937.

In 1942 he was awarded the degree of Engineer of Mines from the Colorado School of Mines and also holds a Master's degree in Geological Engineering from that school.

During World War II, Mr. Myers worked for the Wright Aeronautical Corp. in Lockland, Ohio, From 1945 to 1956 he was associated with the Archer-Daniels-Midland Co. of Minneapolis, Minn. as technical director of the Foundry Products Division.

In 1956 he joined Reichhold. He was a member of both the board of directors and the executive committee and was chairman of the board of Reichhold Chemicals (Canada) Ltd.

A senior member of the American Institute of Mining and Metallurgical Engineers, he was also past vice president and director of the American Foundrymen's Society.

He leaves his wife, the former Johanna Lyon; a son, Stephen, and a daughter, Ellen, both of the home address; his mother, Mrs. Viola Myers of Bronxville, N. Y.; and a sister, Mrs. Philip Lowe of Newton Centre. Mass. Another son, Jay Louis, was killed in an automobile accident in 1965.

A memorial service was held at 8 p.m. Wednesday, Sept. 16, at the First Congregational Church in Chappaqua. Burial was private. Instead of flowers, the family would appreciate contributions to the Northern Westchester Hospital Building Fund, Mt. Kisco, N. Y.



Stanley O. Reichert

CTANLEY ORVILLE REICHERT, D.Sc. 1953, died unexpectedly on July 5, 1970 in Perth, Australia, where he had recently accepted a position as a consulting geologist and engineer. The cause of death was "accidental carbon monoxide poisoning." Burial was in Karrakatta Cemetery, Perth, Western Australia.

Dr. Reichert left his home in Graniteville, S. C. on May 5, 1970 for Australia after having been employed for nine years as a geologist and hydrologist with the Radiological Sciences Division of the Savannah River Laboratory. He had previously served on the faculties of the University of Florida, Louisiana State University and the Colorado School of Mines.

Dr. Reichert had also been employed as a research engineer for Battelle Memorial Institute at Columbus, Ohio, and had been engaged in geological and mining activities in the United States, Mexico and Central America.

Born April 29, 1912 in Cincinnati. Ohio, Dr. Reichert was the son of the late Gustav and Clara Wunderlich Reichert, He held a B.Sc. degree in Geological Engineering from the University of Cincinnati and a Doctor of Science degree from the Colorado School of Mines.

The author of 23 scientific publications, mostly in the field of geology, Dr. Reichert had lectured at seven universities as a traveling lecturer for the Oak Ridge Associated Universities. He was listed in American Men of Science, was a fellow of the Geological Society of America and was a member of the American Institute of Mining, Metallurgical and Petroleum Engineers.

Quoting from a letter from Mrs. Reichert: "All of Stanley's letters were glowing about his job, the people, and the country. He said it was 'the land of opportunity, the land of the future.' He was so enthusiastic that the children and I could hardly wait to get the house and furnishings sold so we could see for ourselves. I am sure we will still make that trip some dav."

Survivors include his widow, Mrs. Mary L. Reichert, and two daughters, Amy Diane, 6, and Ann Frances, 5, all of Graniteville, S. C., and an aunt, Mrs. Peter Yockey of Cincinnati.

Edward F. Taylor

TADWARD FRENCH TAYLOR. L executive vice president of American Snowblast Corp (snow removal equipment company) died unexpectedly of a heart attack Oct. 26 in New York City. Memorial services were held Oct. 29 at St. John's Cathedral in Denver.

Born March 10, 1914 in Denver, Mr. Taylor was graduated from Kemper Military School and attended the Colorado School of Mines for about three years. He married Miss Irene Keene at Denver in 1937.

During World War II he developed an artic survival training program and air-search rescue system for the U. S. Army Air Corps. Mr. Taylor was the first living member named to the Ski Hall of Fame. He was a National Ski Patrol director, helped organize Winter Park Ski Area, was president of the Southern Rocky Mountain Ski Assn., and was active in the National Ski Assn. He was national chairman of Alpine events for the Federation Internationale de Ski in Aspen in 1950 and sat on two Olympic ski committees.

Mr. Taylor was a member of Beta Theta Pi fraternity, the Denver Country Club, Arlberg Ski Club, Mile High Club, Denver Athletic Club, and the Denver Press Club.

Surviving, in addition to his widow (2727 E. Alameda Ave., Denver), are three daughters: Mrs. Thomas Cooley of Denver, Mrs. James Hatfield III of Cincinnati, and Miss Martha I. Taylor of Denver, and four grandchildren.

Contributions may be made to the Edward Taylor Memorial Fund, c/o First National Bank, 621 17th St., Denver. The fund will be used for an annual award to the nation's outstanding junior ski patrolman.

G. C. Weaver, '26

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From the Local Sections

Section news should be in the Alumni Office by the 20th of the Month preceding Publication.

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
labama Birmingham			Wm. Haynes, '54	On call of the president.
laska Anchorage			Ken Clodfelter, '51 2402 E. 49th Ave, Anchorage, Alaska 99502	
rizona Arizona	Guerdon E, Jackson, '52	W. E. Saegart, '53	James D. Sell, '55 2762 W. Holladay St. Tucson, Ariz. 85706	Annual Meeting, Dec. 7, 1970, Western Motel, Tucson.
alifornia Bay Cities	Carl Foget, '61	Dave Strandburg, '61	Tom Aude, '62 54 Woodford Drive Moraga, Calif. 94556	Meetings held on call of the Secretary.
Santa Clara Valley Sacramento	Gail Penfield, '56		Stanley Y. Ogawa, '53 F. B. Sweeney, '57 6619 Auburn Blvd., Citrus Heights	1
San Joaquin Valley	R. A. Ganong, '47		B. A. Ellison, '61	
Southern California	Bob Snyder, '67	Marsh Chapman, '38	Bob Governski, '64 (Sec.) Phone: 213 — 349-4155 Clark Wollenwoeber, '63	Nikolas Restaurant, 1449 W. Sunset Los Angeles, 2nd Thursday of each month.
olorado Denver	A. E. "Ted" Seep, Jr.,	Hal Kellogg, '55	Jack Dressel, '50	Luncheon meeting held third Tuesday of each month, Denver Press Club 1330 Glenarm Pl.
Grand Junction	Robert F. Barney, '35	Roy C. Kirkman, '66	Robert P. Moston, '58 1359 Bunting Ave.	
district of Columbia Washington	A. A. Wyner, '25	Louis DeGoes, '41	Hal Cronin, '26 106 Buxton Dr. Falls Church, Va. 22040	Regular meeting at noon, second Tues- day of each month at the Shrine Temple, 1315 K St. N.W.
linois Great Lakes	C. R. Fitch, '49 7915 Exchange Ave. Chicago 17, Ill.			
(ansas Wichita	Francis Page, '39		James Daniels, '51 307 Schweitzer Bldg., Wichita, Kans. AM 5-0614.	Meetings called by secretary, Contact secretary for date of next meeting.
ouisiana New Orleans	Charles Tyler, '53	Joseph L. DuBois, '50	Monte Richard, '60 Pan American Petr. Corp. P.O. Box 50879 New Orleans, La. 70150	Regular luncheon meetings — last Wednesday of the odd-numbered month except July.
Lafayette	John J. Wallace, '51	Edward J. Gibbon,	Stephen D. Chesebro, '64 P. O. Box 51345 Lafayette, La. 70501.	Regular luncheon meetings at La fayette Petroleum Club on fourth Thursday of each month.
inneseta Iron Ore Range	Paul Shanklin, '49			
lissouri St. Louis			E, W. Markwardt, '32 104 E. Monroe St. O'Fallon, Ill. 62269	
Iontana Butte	John M. Suttie, '42 Continental Dr. Butte			
evada Northern Nevada	Paul V. Filio, '40	H. R. Fitzpatrick, '36	James H. Bright, '52 1450 E. 2nd St. Reno, Nev. 89502	Meetings held four times per year a call of the Secretary.
ew Mexico Carlsbad	John Magraw, '53			
Four Corners	Lou Amick, '50	Al Loleit, '50	N. E. Maxwell, Jr., '41 405 S. Church St. Aztec, N.M. 87410	Special meeting at the call of the president.
ew York New York	Robt, B. Kennedy, '38	Board of Governors: Raiph Hennebach, '41 C. D. Michaelson, '32 C. Bellm, '34 R. B. Kennedy, '38	E. T. Benson, '33 1175 Broadway, New York, N. Y.	Meetings on call every month or six weeks from September to May, usu ally at Uptown Mining Club, 49th and Park Ave.
hio Central Ohio		R. B. Remeuy, 35	Raymond M. Schatz, '35 Battelle Memorial Institute Columbus	
Cleveland	Harold M. Knudsen, '59	Theodore Solim, '53		Meetings held on call of president.
klahoma	Bill Frederick, '56	Charles Strong, '58	Robert Feige, '66	Regular meetings held every Tuesday at noon, YWCA, 411 S. Johnston St
Bartlesville Oklahoma City	Ed Johnson, '49 844 First Nat'l Bldg.		9 WWFrank Phillips Bldg.	Regular meeting held at call of the president.
Tulsa	Todd C. Storer, '47		Jerry McLeod, '57 1708 East 60th Pl. Tulsa, Okla. 74105	Meetings held at call of the president
regon Lower Columbia River Basin	Michael DiLembo, '58	D. H. Griswold, '30	Wendell Cloepfil, '62	On call of the president.
ennsylvania Eastern Pennsylvania	Samuel Hochberger, '48	Arthur Most, Jr., '38 1345 Woodland Cr., Bethlehem		
Pennsylvania-Ohio	Vincent G. Giola, '56		David P. Rihl, '58 Dravo Corp., Pittsburgh and Terrace Rd., Carnegie, Pa. 15106	Meetings held first Wednesday of each month (noon), Cafe "B," Golder Triangle YMCA, 4th and Wood Sts. Pittsburgh.
exas Coastal Bend	Ray Gouett, '52	Charles R. Russell,	Irwin M. Glasser, '43 Humble Oil & Regining Co. Corpus Christi, Tex. 78401	Luncheon Meeting — First Wednesday of each month at the Petroleun Club.
El Paso	Peter A. DeSantis, '51	William F. Dukes,	L. G. Truby, '48 4320 O'Keefe Dr. El Paso, Texas 79902	Meetings held on last Wednesdays of January, March and May, Specia meetings on call.
Houston	Ronald E. Diederich, '57	Edward B. Reynolds,		Luncheon meetings held at 12 noon on first Thursday of each month at

Dr. Kuhn Visits Alumni In Saudi Arabia

On Thursday, Oct. 22, 1970, E. F. (Ed) and Louise Vormwald invited Dr. Truman H. Kuhn to their home in the ARAMCO Compound at Dhahran, Saudi Arabia, to meet other Mines alumni working for ARAMCO. Those who were free stayed for dinner at the Vormwalds. Mines men attending the pre-dinner reception were: Mr. and Mrs. William R. Bartlett, Mr. and Mrs. Handren K. Fitzgibbons, Mr. and Mrs. Raymond M. Loeb, Jr., Mr. and Mrs. Robert H. Muench, and David McMurrin.

James A. Bowler and Albert S. Griffin are in Dhahran, but were unable to attend the Vormwald reception. David McMurrin left Caracas, Venezuela just a short while ago to join ARAMCO at Dhahran. William A. Harrison and R. S. Munsell are listed in the Mines directory as being in Dhahran, but they are not in the Dhahran telephone book and Vormwald did not remember seeing them at any time.

The Vormwald's daughter, Linda, is a freshman at Mines. I also met Mr. and Mrs. John Hoke and Mr. and Mrs. Herbert Blank, both of whom have sons who also are freshmen at Mines.

While in Dhahran Dr. Kuhn attended an AIME-SPE meeting, and listened to a talk on "Sub-Surface and Surface Facilities Optimization of the

Gas Reservoir Using Computer Models."

In Jeddah Dr. Kuhn saw Fadil K. Kabbani, M. A. Bhutta, and J. J. H. Kouther. On the return home Dr. Kuhn visited with W. N. Paiboon, '57, in Bangkok, and Hugh Templeton, '36, in Hong Kong.

Alumni at SMS Breakfast

CSM alumni attending the Mines Breakfast during the SME convention at Stouffer's Riverfront Inn in St. Louis, Mo., on Oct. 22 were as follows:

1924—Howard F. Keller. 1932—Earl W. Markwardt, James Boyd.

1933—Neil O. Johnson.

1934—H. David Squibb. 1935—Albert M. Keenan.

1935—Albert M. Keena 1936—Carl Morris.

1938—Sam Bousman, Jack Tufts (Ex-38).

1939—Tench Swartz, Robert M. Wheeler.

1941—Walter Crow.

1943—William C. Kellogg, Leon D. Kellor, Bob Lintner.

1944—Jack V. Hill.

1945—Clyde V. Johnson.

1947—Earl L. Rau.

1948-Bruce C. Clark, Robert E.

Hochscheid, A. W. Lankenau. 1949—Bob Coleman.

1950—Henry Ehrlinger, J. S. Hast-

1951—Jesse Auvil.

1952—Charles Mallette, Bob Turley.

1953—G. S. Ryan, Abelardo Trevino. 1954—James Mulryan, Jim Nienaber

1955—Bob Metz.

1957—Jerry Ott.

1959-Gary Milickian.

1961—Carl Gerity. 1962—John MacFadven.

1964—John Schmidt.

1968—Steve C. Brady, Tom Johnston, John Volosin.

1970—Henry Mullen, Alan Noble.

Alumni Office — Dean Emeritus William V. Burger, Col. Wendell W. Fertig, '51.

El Paso Alumni Section

The first meeting of the 1970-71 year was held by the El Paso Alumni Section on Wednesday, Oct. 28, at the Fort Bliss Officers' Club. The following members were present: Glenn Allen '29, Marion S. Bell '49, John H. Church '50, Peter A. DeSantis '51, William F. Dukes '50, H. A. Dumont '29, Francis C. Johdon '23, Harold W. McCullough '27, John A. Skokowski '50, Lester G. Truby '48.

The election of officers was held. Those elected were William F. Dukes, president; John H. Church, vice-president; Lester G. Truby, secretary.

H. A. Dumont, P. E. 1929, has recently moved to El Paso and will be a regular member of our group. Our next regularly scheduled meetings will be on the last Wednesdays of January, March and May of 1971.

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
Permian Basin	Hal Ballew, '51	Harry B. Hinkle, '59	Al Wynn, '65 4313 Princeton, Midland, Tex. 79701	Meetings held in Jan., Mar., May, Sept., and Dec.
Dallas-Ft. Worth	Harold E. Potter, '27	Dewey D. Bowling,	Peter A. MacQueen, '50 P.O. Box 2050 Ft. Worth, Texas 76101	Meeting held on call of president.
South Texas			William A. Conley, '19 1515 Haskins Rd. San Antonio	Meetings held at 7 p.m. on first Thurs- day of February, May August, No- vember at Old Town Inn, 416 8th St., San Antonio.
Utah Four Corners	See N.M. for officers			
Salt Lake City	John Weber, '66		Gregory H. Hoyl, '68 1356 Kennecott Bldg. Salt Lake City, Utah 84111	Four meetings annually on dates set by officers.
Washington Pacific Northwest	Richard O. Barnes, '55		Robert R. Cederstrom, '60 11011 N.E. 9th St. Bellevue, Wash. 98004	
Eastern Washington			Arden Bement. '54	Meetings on call of president,
Wyoming Central Wyoming	,		George S. Rogers, '59 3209 Aspen Drive Casper, Wyo. 82601	
Canada Calgary	Richard C. Slegfried, '50 Canadian Superior Oil Ltd. 703 6th Ave., Calgary Tel.: 267-4110 Local 429			Calgary Section meets for a noon luncheon on the 3rd Monday of Sept., Nov., Jan., Mar., May—at Calgary Petroleum Club. Visiting alumni invited to attend.
France	Resident or visiting alum	nni may contact Bernard	Turpin, '60, 33 Rue de la Tourelle, 92-Bo	ulogne, France.
Libya	R. E. Palmer, '61, Corre	sponding Secretary, c/o	American Overseas Petroleum, P. O. Box	693, Tripoli, Libya,
Peru	Martin Obradovic, '53			Meetings first Friday of each month (April thru December), 12:30 p.m., Hotel Crillon, Other meetings on call
Philippines Baguio	Francisco Joaquin, '26			
Manila	J. R. Kuykendall, 41	Jesus Jalondoni, '40	M. E. Natividad, '40 c/o Northern Motors United Nations Ave., Manila	Meetings held at noon, second Tuesday of each month.
Puerto Rico	Resident or visiting alum Puerto Rico.	nni may contact L. L.	Hagemann, '60, Apt. 17, El Monte Apartr	nents, Avenida Munoz Rivera, Hato Rey,
Turkey Ankara	Alumni visiting Turkey	contact Ferhan Sanlav, '	49. Turkiye Pettrolleri A. O. Sakarya Ca	idesi 24, Ankara, Telephone 23144.
Venezuela Caracas	Z. Saucevie, '57	Jean Pasquall, '60	Ian Achong, '58 Cla. Shell de Venezuela	

Executive Secretory



Each One - Get One. This matter was mentioned in both the Secretary's column and the minutes of the October meeting which appeared in the November issue. Elsewhere in this magazine there will be a release from the administration setting forth more details of the plans to increase enrollment, not only within the state but nationally.

Mr. Burdick, director of Admissions, in discussing this matter, conceived the idea of applying the same principle to recruiting that has been applied to teaching the illiterate, i.e. each person teaches another person. This idea seemed most applicable to our circumstances, since MINES is chronically short of funds and will continue to be even more so in the future. Therefore, this program would substitute individual effort for funds, so that well trained amateurs can function as admissions counselors to visit high schools in their immediate

Dr. McBride presented the plan to the Board of Trustees on Nov. 6 when it was tentatively approved.

Dr. McBride has said: "This student recruitment plan is one of the principal building blocks in the development of national and international leadership of the Colorado School of Mines in undergraduate training, graduates study, and research. This objective is being aggressively pursued as it represents the future of the school at a period when more minerals, metals, and fuels must be provided to meet the ever-growing demands of the U.S. public and foreign nations."

Basic Facts at Issue. There is a general assumption on the part of those here in Golden that each of you is familiar with the background that lead to this conclusion, Since I am sure that many of you are not, the sequence of events began in 1964 when the State Legislature created the Colorado Commission for High Education, which was given the responsibility for the general supervision of education, curricula and academic conduct of all institutions of higher learning in the State of Colorado. Nearly two years elapsed in completing the organization of this commission, and during that time consultants

were hired to study the various problems and their reports have been presented in some detail in The MINES Magazine.

Possibly the most pertinent conclusion in the consultant's report was that "Colorado School of Mines operates the most efficient engineering program in Colorado. This program should be elevated to make MINES one of the nation's great technological institutions."

In discussing this conclusion, the report mentioned that MINES had a great reputation but that it stood on the threshold of even greater development, since the school is specialized to a greater extent than any other institution in the State of Colorado. It was recognized that this was true not only within the state but nationally, as more and more schools of mining, metallurgy and natural resources dropped their undergraduate courses. The report concluded that it was essential that MINES must grow to meet this challenge, if it is to survive in the future as a great institution.

Scholarships, Dr. McBride and the Board discussed the relationship of the character of the student body in relation to the national reputation of the school and concluded that in the past the great reputation of MINES was founded on the cosmopolitan nature of the student body. Prior to 1950, a United States scholarship was given to one resident of every state in the Union. As the economic pressure developed these scholarships were dropped and a privately financed program to achieve the same purpose was developed. At present that program funds some 10 or 12 U. S. scholarships but has never been able to fulfill the goal of the original plan.

It Is Late. Although it is rather late to start this program in the hope of influencing enrollment in the school year 1971-1972, Dr. McBride feels that a start should be made and that there is a possibility of at least some results this year. Considering that this as a pilot program, it can be expanded effectively to include full operation beginning in the fall of 1971.

Funding. The institution, together with help from the Colorado School of Mines Foundation, Inc., will fund the initial cost of this program, and the Alumni participation will consist essentially of volunteer effort to provide the manpower to achieve the desired results.

Additional material in the magazine which has been prepared by the administration will outline at least in some detail a proposal of the method of operation that is planned. Of course the program will prove to be evolutionary, since this particular effort has not been tried previously and much more work will have to be done before the plan is placed in final form. The concept appears to be sound, and

with your help as volunteers it will be possible to meet the goals set for the future, which after all are realistic since the top enrollment considered feasible for MINES is a maximum of 3,000 students by 1985.

Soon after you receive the December magazine you should receive a letter from the Dean of Admissions outling what is needed and asking that you volunteer by returning the card enclosed. The officers of the CSM Alumni believe that the response will be overwhelmingly favorable.

MINES Breakfast - St. Louis. This meeting was most successful as more than 60 attended. At the breakfast were several Alumni (from the St. Louis and Southern Illinois area) who have not had an opportunity to attend such a meeting for several years. The names of those who gathered at the Stouffer's Riverfront Inn on Oct. 22 are recorded elsewhere.

Homecoming. In my opinion, this was the most successful Homecoming that we have had for many years. The enthusiasm generated by the students, the energetic committee and the whole-hearted support of the student body and the entire area was responsible for this success. Of course, both the weather and the football team came through, when MINES won its Homecoming game from Western State in a flurry of scoring in the final minutes of play. Those who saw that 38 to 36 victory will remember it.

Following the game, many gathered in the Integral Club for coffee and donuts at the reception sponsored by the Barbs. According to those who attended the Homecoming dance, it was as successful as the rest of the day.

The sincere thanks of the entire Homecoming Committee must be extended to the Army and Air Force for their support by permitting units from Ft. Carson and Lowry Field to march in the parade. A special vote of thanks should go to the Lakewood and Golden High Schools for furnishing their outstanding bands and other units.

It was a great day.

Parent - Student Day. Nearly 350 parents and students interested in attending MINES gathered at the gymnasium on Nov. 14 for the annual open house. This was the largest attendance at any parent-student day, and it may indicate that increased interest of prospective students in attending MINES.

Moving Day. Sometime after Dec. 15, we will be back in our new office in Guggenheim Hall. Come to see us in our newly decorated office.

Christmas 1970. The Holidays will be in your home by the time you receive this magazine, and we will want to add our warmest wishes for your good luck and continued success. The longer I work with the MINES Alumni, the more I appreciate the quality of graduates from this outstanding in-

Book Reviews

Oil-Impregnated Sandstone Deposit

A subject of absorbing interest to the people of Utah in general and the petroleum industry in particular is the presence of oil-impregnated sandstone in the state. Recent exploration shows deposits of great extent in Northeast Utah, in Uintah and Grand Counties.

The Utah Geological and Mineralogical Survey has recently released a report on these deposits. Written by William D. Byrd and designated Special Studies 31 in the Survey's series. it describes oil-impregnated sandstone beds which underlie at least 214 square miles and which contain an estimated 3.7 billion barrels of oil varying from 6° to 12° API gravity. The oil occurs in the Green River Formation of Tertiary (Eocene) age. Seventeen plates, 14 stratigraphic sections and three maps are contained in the study.

Special Studies 31, P.R. Spring Oil-Impregnated Sandstone Deposit, Uintah and Grand Counties, Utah, is for sale for \$5.00 over the counter at 103 Utah Geological Survey Bldg., University of Utah, Salt Lake City, Utah 84112. Cost is \$5.50 by mail.

Fluid Power Textbook

'Industrial Fluid Power''—Volume 2, by Charles S. Hedges. This is a new, second edition, just published. The original text has been in print about five years. It has now been completely revised, re-written, and expanded to include 56 additional pages of text with about 50 new illustrations. It is the second volume in a three-volume series of textbooks dealing with the practical usage of fluid power-how it works and how it can be applied to many jobs in the industrial plant.

Volume 2 shows by means of sketches many ideas for use of air and hydraulic cylinders, with numerous sectional views of control valves and many circuits for the use of valving to control such cylinder actions as automatic reciprocation, synchronization, sequencing, dwell, and others. Examples of electrical control of cylinders are included.

Published by Womack Educational Publications, Box 35027, Dallas, Texas 75235. Paper bound, 200 pages, 350 illustrations, 81/2 x 11-inch size. Price \$5.80 postpaid.

Sulphur Industry

Domestic demand for sulphur has grown by about three percent a year during the past two decades-about the same rate as that of the U.S. economy as a whole-but from year to year the relationship has been erratic.

At various times during the presen century periods of sulphur shortage and glut have followed one another. The new study appraises the conditions under which future supplies are likely to be available from both tried and untried sources.

The author of Economics of the Sulphur Industry, Jared E. Hazleton, is in the Department of Economics, University of Texas. 184 pages, \$3.50. Library of Congress Catalog Card No. 76-75181. Distributed for Resources for the Future by The Johns Hopkins Press. Baltimore, Maryland 21218.

Alumni Headliners

Mr. and Mrs. Truebe Will Teach At Oceanics School of Norway

TTENRY A. TRUEBE, E.M. 1964, and M.Sc. 1968, and his wife, Elizabeth, are now in Bergen, Norway. They have accepted appointments to teach in the Oceanics School of Norway. Henry will teach mathematics and geology. His wife will teach English and Tour Planning.

The school will be housed in a threemasted bark (a training ship leased to Norway). Students and teachers will be active in operating the ship. The ship will call at ports in Africa, South America and in the Mediterranean,

The Truebes may be addressed as follows: Mr. and Mrs. Henry A. Truebe, c/o Oceanics, Staadsrad Lemkuhl, Bergen, Norway.

Jack F. Earl Organizes Petro-Form Industries, Inc.

TACK F. EARL, Geol.E. 1953, has formed a new organization called Petro-Form Industries Incorporated in Houston, Tex., for the purpose of exploiting a new resin-catalyst that is being used to control crude oil solidification. When mixed with crude, exothermic reaction results and the crude oil solidifies into a solid, smooth matrix in from three minutes to three hours, depending on mixture. The use of cheap crude with the resin makes it possible, for example, to pour a form for the wall of a prefabricated house and to remove the set wall, ready for erection, in five minutes.

Other possible uses indicated for this crude oil combination: spray coating for downhole tubular goods to protect against corrosion, pipe insulation and lost circulation material, to say nothing about roofing coats, auto undercoating, building bricks, or virtually any product that is formed in a mold. The resulting solid hydrocarbon will adhere to other surfaces, can be sawed, nailed, and will receive screws.

Jack Earl writes: "We're taking a two component liquid system of which 40 per cent of that liquid is oil and

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C.S.M. Alumni

Golden, Colo. 80401

converting it into a solid, foam (rigid or semi-rigid), rubber or any degree of resilient material. . . . I thought you might be interested in this product, and as we progress with its develorment, I'll keep you informed."

Paul A. Archibald Honored; Made "Fellow" by ASME

DAUL A. ARCHIBALD, Met. E. 1935, chief metallurgist at Standard Steel Division, Baldwin-Lima-Hamilton Corp., has been elected to the grade of Fellow of the American Society for Mechanical Engineers. Fellow is the highest grade attainable in the Society and is achievable only through nomination by members of the ASME and by approval of that nomination by the ASME Council.

The ASME Constitution stipulates that "A Fellow shall be an engineer who shall have acknowledged engineering attainments, 25 years of active practice in the profession of engineering or teaching of engineering, and shall have been 13 years in the

grade of Member."

Archibald was cited for his outstanding contributions to the field of metallurgy through a career that encompasses nearly 30 years of metallurgical research at Standard Steel. The nominating petition summarized his achievements by stating "Throughout his career Mr. Archibald has been at the forefront in developing ways to meet industry's needs for new materials and processes. His research work in the early forties on boiler materials for steam locomotives led to a patent on molybdenumiron for stay bolts. During the forties, from strain rosette data, he developed a simplified formula for calculation of principal stresses in wrought steel railroad wheels.

"Later he developed manufacturing processes for industrial forgings and rings utilizing production equipment designed for manufacturing locomotive forgings and tires; also responsible for development of melting and processing techniques for a new family of 'maraging' steels for super strength requirements in aerospace and hydrospace vehicles; has supervised development of process for melting, forging, and rolling of high temperature and titanium alloys for missile and jet engine applications."

Archibald studied metallurgy at the Massachusetts Institute of Technology and received the degree of Metallurgical Engineer in 1935 from the Colorado School of Mines. He divided his next four years as a metallurgist between the United States Steel Corp. and the Denver & Rio Grande Railroad. He joined Standard Steel in 1941 as a research metallurgist and became chief metallurgist in 1949. He was on leave of absence from Standard for three years during World War II while serving as a major in the Army Corps of Engineers.





Archibald

Archibald's honors are many and varied. He is a member of Tau Beta Pi, Sigma Gamma Epsilon, and Scabbard & Blade scholastic honor societies and is active on committees in numerous professional organizations. These include the American Society of Mechanical Engineers, Railway and Turbine Divisions; Society of Automotive Engineers, Aerospace Material Specifications Division; American Society for Testing and Materials, former director and technical committee chairman; American Society for Metals, including cofounder of the Denver Chapter in 1938; American Ordnance Association, Artillery Division Technical Committee; and Society for Experimental Stress Analysis, charter member: American Iron and Steel Institute, technical committee on railway products; and Forging Manufacturers Association, metallurgical and research committee.

He is also a member of the American Institute of Metallurgical Engineers, British Iron and Steel Institute, and Iron and Steel Institute of Japan.

Archibald received an award of merit in 1967 from the American Society for Testing and Materials, is listed in several professional "Who's Who" publications, and has published and presented numerous papers in technical and professional journals and at national and international sem-

He and his wife, Ellamay, live at Church Hill Manor, Reedsville, Pa.

Dube Receives Appointment As AMAX Group Vice Pres.

T AWRENCE E. DUBE. Met. E. 1941, has been promoted to group vice president of AMAX Aluminum Co., responsible for AMAX Aluminum Mill Products, Inc., and AMAX Aluminum Extrusion Products, Inc.

Mr. Dubé has been acting president of Apex Smelting Co., and was previously president of AMAX Aluminum Extrusion Products, Inc., both operating units of AMAX Aluminum Co. He was made a vice president of AMAX Aluminum Co. in 1969.

Mr. Dubé joined AMAX in 1953 and has been associated with the aluminum industry for 28 years. He is a graduate of the Colorado School of Mines with a degree in Nonferrous Metallurgy. He is a member of the American Society for Metals.

The AMAX Aluminum Group headquartered in Greenwich, Conn. consists of AMAX Aluminum Co., Inc. and the following operating units -AMAX Aluminum Building Products, Inc., AMAX Aluminum Extrusion Products, Inc., AMAX Aluminum Foil Products, AMAX Aluminum Primary Metal Division. Apex Smelting Co., Kawneer Co., Inc., and AMAX Aluminum Mill Products, Inc.

Homecoming 1970

Here are the names of alumni who attended and registered at Homecoming, but we are sure that many came to the game and to some of the functions and did not register.

1909—Mills E. Bunger.
1910—Emil J. Bruderlin, John B. Carman.
1911—K. H. Mathews.
1913—S. P. Warren, Harvey Mathews.
1923—Robert Baxter.
1925—William Jude.
1926—Russell H. Volk.

1927—Claude Fertig, X. T. Stoddard, 1928—Walt Lofgren, 1929—Dr. Walter H. Dumke,

1931—Harrison Hays. 1932—William P. Morris, Harry F. McFarland.

1933—John Vincent. 1934—Ed Matsen, H. David Squibb, Sid Hanley, Warren Yarroll. 1935—Max Coats, F. Neal Bosco, James Cola-

santi.
1939—Fritz Weigand.
1940—Fran Smiley (CSM Faculty).
1941—Martin Heggiund, Victor Martin, Frank
W. Todd. Robert L. Poundstone, E. L. Mayhew.
1942—Phillip Morrow, Neel Beckner, Horace
Goodell, Jack Chelius.
1943—H. W. Addington, Bob McCulloch, Kenth Ward. Warger Meace, Tod Stockner, Ken-

neth W. Ward, Warren Mason, Ted Stockmar.

1944—Joe Soper. 1947—Bob Magnie, W. P. Gillingham, Fred Just,

W. A. Comburn. 1948-Frank Persse, John Howbert, Jim John-stone (CSM Faculty), Don Craig. 1949-Frank Pettit, Howard Garrett, R. D. Brace, Jerry Whalen, Col. William Leckie, George

Fentress.

1950—Dr. Roshan B. Bhappu, Donald Ashe,
Allan Loleit, Ronald Lestina, Niles Grosvenor, Robert Marsh, Jack Dressel, Leo Borasio, Donald Herron, Donald L. Johnson, Ed Howard, 1951—R. W. MacCannon, George Berlin, Clinton

Knox.

1952—Lloyd Best, Jim Butler, Dave Cole, Harry Kent (CSM Faculty).

1953—Harvey McCann, Fred R. Schwartzberg, Darrell Beckley, George Minick.

1954—Ed Cutrell, Neal Harr.

1955—Harold Kellogg, John Austin, Don Wienecke, Norman F. Vote, Dean Laudeman. 1957-Walt Tyler.

1959—Bob Pearson, Joe Hiller, Sam Miller, George Welch, III. 1960—Doug Patten, Don Howell, Artemus L. Holmes, Bob Hoffman, Albert Wieder, Ken Spalding, Ralph Rockwell.

1961-Jerry Ilgrenfritz.

1962-Bob Morgan. 1963-Art Pansze.

1964—Jim White, Lloyd Nordhausen.

1965-Michael Cruson, Jerry Schulz, Robert Dunn, R. Frank Erisman, John Burgess. 1966—Richard Beach, Mary Beth Beach, Jim Applegate, Walt Johnson.

1967—Joseph E. Bochatev, Jr.

1968-Chuck Hahn, Jim Cannell, Steve Mc-1969-James Riddle, Doug Pitts, George D.

1970—Bob Davis, Dave Armstrong, Dick Kehmeler, Eric Bayley, Charles Crew, Corwin Rose, Barry Sauve, Bill Gumma, Vaughn Goebel, Walt Freeman, Carl Winters, John Reid.

1971—Rick Kenney, Bill Messer, Robert D. Wunder, Leonard Jones, Terry Krupp, Charles McNeill, Larry Fisher, Stefan Choquette, Ed

Prof's Emeritus—Dr. Van Tyle, Robert Osborn, Hildrith Fletcher, James Everett.

Adm. and Faculty-Gurnett Steinhauer, Col. M. Lemke, Anton Pegis, Chuck Morris, Gene Woolsey, Joe Lee, Carl Hiltrop, Fritz Brennecke, George Bator.

Guests—Dr. and Mrs. Guy McBride, Jr., Dr. and Mrs. Harlan Bryant, Niles Swenson, Mr. and Mrs. John Andren (Mayor of Golden), Dr. Lloyd

Kirby Promoted to Senior Engineer At Humble's Baytown Refinery

MHARLES E, KIRBY, P.R.E. 1967. has been promoted to senior engineer in the Process Engineering Section of the Technical Division at Humble Oil and Refining Co., located in Baytown, Tex.

In his new assignment, he will be engaged in facilities planning for lube oil manufactured at the Refinery, He is also involved in studies to optimize raw materials processed at the Re-

A graduate of Colorado School of Mines with a degree in Petroleum Refining Engineering, Kirby received a Master of Science degree in Chemical Engineering from the University of Texas in January 1969. He is a member of the American Institute of Chemical Engineers.

Mrs. Kirby is the former Suellen Jones, daughter of Mr. and Mrs. Frank A. Jones of Houston, Kirby's parents are Mr. and Mrs. R. E. Kirby, also of Houston. They have one daughter, Kristi Ellen.

Class Notes

Howard E. Keller, E.M. 1924, who has been with Compania Fresnillo S. A. Naica, Chihuahua, Mexico for many years, expects to retire soon. Howard will probably stay on with Fresnillo for a while, as they are developing a new mine.

William G. Jackson, P.E. 1932, has been ill for almost two years and has spent most of this year in a hospital. Mrs. Jackson writes: "Jack has brain damage resulting from a plane trip to Dallas in a small private plane. They flew too high without properly pressurizing the cabin. The doctors say there is nothing they can do about it. It is heart-breaking to see him waste away physically and mentally. We send men to the moon, but there is much medical science does not know about the ailments of mankind . . . Our new address is P. O. Box 1337, La Porte, Texas 77571.

James S. Hastings, Geol.E. 1950 and M.Sc. 1958, is now located in Denver (Suite 307, Coffey Building-1800 South Sherman St.) Jim moved from Salt Lake to Denver when the Exploration Department of Hecla Mining Co. was transferred to the new address given.

Jesse H. Auvil, Jr., Geol.E. 1951, State Geologist and Director, Georgia Dept. of Mines, delivered a paper at the Society of Mining Engineers Convention (St. Louis, Mo.) entitled "Experience With Georgia's Mined Land Reclamation Law" as part of the session on New Concepts in Mined-Land Rehabitation.

Robert E. Johnson, P.E. 1952, currently mayor of Arvada, successfully ran for the office of state representative from District 24. He will join another alumnus, George Fentress, Geol.E. 1949, in the House of Representatives. Bob's campaign manager, Larry O'Brian, is also a Mines graduate. Geol.E. 1951.

Robert A. Metz, Geol.E. 1955, geologist, Duval Corp., Tucson, gave a paper entitled "Rapid Geologic Mapping in Large Tonnage Open Pit Mines" at the Society of Mining Engineers Convention held recently in St. Louis. The session was devoted to Open Pit Mining. Bob has a great deal experience in this area, as he was chief mine geologist at Kennecott's Open Pit at Ray, Ariz., before accepting a similar assignment with Duval Corp. at their Sierrita Pit. At present Bob is assigned with the Exploration Office of Duval in Tucson.

Roger C. Banghart, M.Sc. 1957, has joined American Exploration & Mining Co. of San Francisco as district geologist and has opened an exploration office at 689 Lyons Avenue in Ely, Nev. He was graduated with a B.S. degree from Missouri School of Mines and has an M.S. from Colorado School of Mines.

John Gerald Cronen, Jr., P. E. 1962, who has been carried as "address unknown" in our records, has written concerning membership in the Alumni. His address is 6020 Burke Way, Bakersfield, Calif. 93309. We are happy to have this information and expect to have Jack back as an active member.

H. Joe Boyd, P.E. 1963 & M.Sc. 1969. had been teaching at the Mississippi State University but resigned last year to enter consulting work in that state. Joe was in the office in early October at which time he reported that he and John T. Chandler, P. E. 1959, who is vice president of the Deposit Guaranty National Bank in Jackson. Miss.. would get together occasionally as a twosome to hold a Mines luncheon. It is rather interesting that the two successive entries in our guest book were Joe Boyd from Starkville, Miss., and Dennis Peperkorn, Geol. E., 1967 who is with the Navy BU-3. Gulfport, Miss.

Jonathan E. DuHamel, M.Sc. 1968, writes that he has completed his active duty with the Army and has taken a position as an exploration geologist with Phelps-Dodge Copper Corp. His business address is Drawer 1217, Douglas, Ariz, 85607. His home address is 1607 Tenth St., Douglas, Ariz.

Frederick E. Kastner, M. Sc. 1970, writes that he is working with the Continental Oil Co. in Hobbs, N. M. 88240 where his address is 616 E. Yucca Drive.

etters

5151 East Peach St. Tucson, Ariz, 85712 Oct. 22, 1970

Dear Mr. Kaanta:

Just a few lines to express my appreciation for the excellent quality of the Mines Magazine and to notify you of a change in address. I have been working in mining exploration for Asarco out of their Tucson office for the past 1½ years. During the past year much of my time has been spent working in Mexico. Now I am going to spend some time in Spain to improve on my pocho Spanish. Please send all forthcoming issues of the Mines Magazine to me in care of the following address:

American Smelting and Refining Co., y Cia, S. R. C., Avenida del Generalisimo 52, Entreplanta, Madrid 16,

Other correspondence should also be sent to me at this address.

> Best regards Bruce E. Kilpatrick, Geol. E. "66

Phillips Petroleum Co. Bartlesville, Okla, 74003 International Department

Nov. 20, 1970

Dear Mr. Kaanta, This letter is to advise you of my recent change of address, I have been transferred back to Bartlesville, Oklahoma, by Phillips Petroleum Company and assigned to the home office as an area petroleum engineer in the International Department.

Our assignment in London was shorter than expected. We are still trying to get settled down and adjusted to living in the States after almost five years overseas.

Our new address is as follows:

1401 Arbor Drive

Bartlesville, Oklahoma 74003 Best wishes for the coming holiday season. Sincerely,

Eugene E. Dawson, '38

Robert G. Martin, PE 1955

American Independent Oil Co.

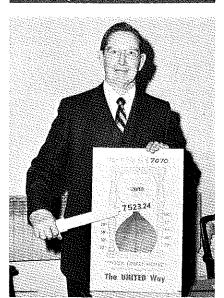
Kuwait, Arabian Gulf

Elmer R. Wilfley, '14

Wilfley Centrifugal Pumps

Denver, Colorado

Campus Headlines



CSM EXCEEDS UNITED FUND GOAL. President Guy T. McBride, Jr., uses his slide rule to proudly point out that CSM faculty, staff, and employees engineered 106 percent of their \$7,070 goal in the just-ended United Way campaign. Mines raised a total of \$7,523.24, exceeding its goal for the sixth consecutive year.

Modern Decision Methods Course Jan. 18-22, 1971 "Trigineering Economy and

"Investment Decision Methods" will be the title of a short course to be offered Jan. 18-22, 1971, at Colorado School of Mines by Dr. Frank Stermole, professor of Chemical and Petroleum-Refining Engineering at CSM. The course will cover the use of modern decision methods that may be utilized to evaluate the economic potential of engineering projects and general investment opportunities.

Organized for industrial managers, practicing engineers, scientists and business personnel, the course is concerned with economic evaluation of alternative engineering projects and corporate investments. Example problems presented have been chosen to illustrate investment decision methods to managers and technical personnel with widely varying industrial backgrounds and current interests.

Three offerings of this course during the summer of 1970 had good representation from mining, petroleum, chemical, electronic and public companies. The course fee is \$240.

Those interested in obtaining industrial references or more detailed information for the course may contact Dr. Frank Stermole, Colorado School of Mines, Golden, Colo. 80401, or phone 303—279-3381, ext. 354.

CSM EXPERIMENTAL MINE

THE Experimental Mine, located just north of Idaho Springs, Colo., has been a great success to the Colorado School of Mines for the past 49 years as a practical classroom for future mining engineering students. The experimental mine was obtained by the school in 1921 and utilized at that time for mine surveying, but with the addition of the mine's first compressor in 1935, the facility became an actual experimental underground classroom.

The mine, originally developed in the 1870's as the Edgar Mine, was named after the Edgar Vein which cuts across the east slope of the Rocky Mountains at Hukill Gulch from an elevation of 8,125 feet with a strike of N65E and dips of 70-85 degrees NW. The vein consists in thickness of only inches to a maximum of three feet and is rich in silver, gold, copper, zinc. and lead.

The early records of the Edgar Mine show that the vein carried a high percentage of silver, averaging 80 ounces of silver, and 0.5 ounces of

Mrs. Childers Retires

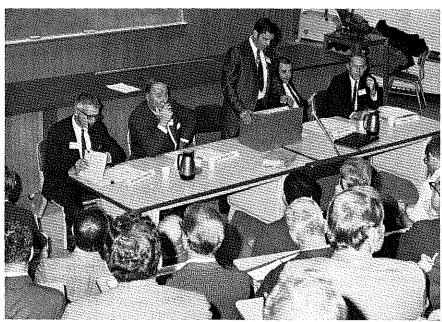
Mrs. Ingra Childers, former secretary for Dean Signer and Dean Kuhn, retired after many years with the Dean's office on Nov. 30, 1970. Coworkers and friends sponsored a farewell reception, which was held in the faculty lounge of the Ben H. Parker Student Union.

gold per ton, and seldom less than 45 to 50 per cent lead. Some of the ore from the vein carried as much as 165 ounces of silver per ton, probably the result of a supergene enrichment. In addition some of the ore contained 1.5 to 6.5 per cent copper and up to 16 per cent zinc.

The actual mine, which presently does not process any of the vein's ore, is made up of more than 4,000 feet of tunnels and other workings, and is presently furnished with more than \$250,000 worth of equipment, much of which has been contributed by manufacturers of mining equipment.

The Gardner-Denver Co., a leading supplier of mining equipment throughout the world, has through the past continued its support in contributions to the CSM Experimental Mine. Gardner-Denver has also utilized the mine since 1935 as its major center for drill testing of its new and redesigned equipment.

A unique feature of the mine is that public tours of the facility are conducted each year from Memorial Day to Labor Day six days a week. During the 1970 summer the mine was toured by a total 11,200 people, and an additional 1,000 will be hosted during the remainder of 1970 through specially arranged tours conducted by the CSM Mining Department. The mine will also be open on Saturdays for special tours for elementary and secondary students in the metropolitan Denver area schools.



"The Economics of Copper" was the subject discussed by a special panel during the month of November by CSM's Mineral Economics Department, with graduate students seeking answers from the four guest panelists. Introducing the panel was Coulter Chair Professor Alfred Petrick, Jr., of the economics department. From left to right, the panelists were: Sheldon P. Wimpfen, assistant director of Mineral Supply, Bureau of Mines, Department of the Interior, Washington, D.C.; C. D. Michaelson, vice president of Mining, Kennecott Mining Corp., New York; Dr. Paul Bailly, president of Occidental Minerals Corp., Denver; and Orrin H. Main, assistant to the president, Freeport Sulphur Co., New

DECEMBER, 1970 . THE MINES MAGAZINE



CSM'S WOMEN'S RESIDENCE HALL, formerly a fraternity house, was named during homecoming in honor of Florence Caldwell, the first woman to graduate from Mines in 1898. Miss Caldwell received a degree in civil engineering. She married Frank H. Jones, also a member of the class of 1889. The naming of the residence hall was approved by the Board of Trustees at their October meeting following the suggestion from girls in the hall to President McBride.

World Authority On Rock Mechanics

R. N. G. W. COOK, director of the Mining Research Laboratory of the Chamber of Mines of South Africa, recently visited the Colorado School of Mines Mining Department staff. Dr. Cook has directed the Mining Research Laboratory since 1964, pioneering work in mine design using analog computer techniques, rock burst detection and prevention, rock cutting, and the concept of mine stiffness.

He is co-author, with Prof. J. C. Jaeger, of a textbook, "Fundamentals of Rock Mechanics," 1969, and was recognized with Professor Jaeger in 1969 by the AIME for the outstanding contributions to rock mechanics.

Dr. Cook received his B.Sc. degree in Mechanical Engineering from the University of Witwatersrand in 1958, and subsequently gained a Ph.D. in Geophysics from Bernard Price Institute for Geophysics Research at the same university.

Earlougher Engineering

R. C. Earlougher, '36, Registered Engineer

Petroleum Consultants
Core and Water Analysis Laboratories

3316 E. 21st St. P. O. Box 4597 Tulsa, Okla. 74114 He served as a research officer at Bernard Price Institute from 1959 through 1963. He was a visiting assistant professor in the School of Mineral and Metallurgical Engineering at the University of Minnesota for the 1963 to 1964 academic year. This University appointed him as Adjunct Professor in 1968, after Dr. Cook had instructed a quarter with them as visiting professor.

Annual Student-Parent Day At Colo. Mines

Colorado School of Mines hosted its annual Student Parent Day on Saturday, Nov. 14, on the Golden, Colo., campus. Major emphasis was placed upon all junior and senior high school students in Colorado visiting CSM with their parents to aid in formulating the students future college plans.

Registration of parents and students began at 8:30 a.m. in the CSM gymnasium at 14th and Illinois Streets. Tours were offered immediately after registration, thus allowing the students and parents to become familiar with CSM's facilities including laboratories, classrooms, and student facilities such as the dorms and student center.

At 10:15 a.m. both the students and parents were introduced to Charles McNeil, Associated Student president; Dr. Guy T. McBride, Jr., president of CSM; Dr. Albert W. Schlechten, vice president for Academic Affairs, and Dean of Students Francis E. Smiley. Introductions were made by Dr. Anton G. Pegis, vice president for Development and Student Affairs. Following the introductions of the administrative staff and the department heads at CSM, additional tours to specific departments were offered during the morning

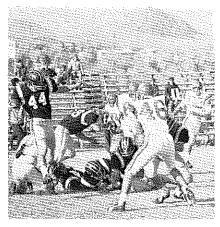
Lunch was served in the Ben H. Parker Student Center, followed by an invitation to students and parents to attend CSM's last home football game against Adams State College at Brooks Field at 1:30 p.m.



CSM RECEIVES \$1,000 FROM 1957 ALUMNUS. Dr. Guy T. McBride, Jr., left, CSM president, accepts a \$1,000 check to the CSM Foundation, Inc. from Mark J. Waltch, right, a 1957 graduate of Mines with a master's degree in mining engineering. Looking on is Prof. George T. Bator of the Mining Department. Waltch, who is currently engaged in real estate planning, development, and consulting in the Boston Area, presented the check to CSM as his expression of support for the continued growth and progress of his alma mater.



A NEW INTRAMURAL FIELD, 16th and Elm Streets, was dedicated during Homecoming to Nils A. Swenson, a retired Denver businessman, in recognition for his outstanding interest and support of the Colorado School of Mines. Swenson, now 83 years old, led a very successful career in the construction, trucking, lumber, coal, oil, and uranium industries. From left to right, are Charles McNeil, student body president, Dr. Guy T. McBride Jr., President of CSM, Mr. Nils A. Swenson, and Russell H. Volk, member of Colorado School of Mines Board of Trustees. Photo by Kent Higgins



HOMECOMING VICTORY, Senior running back, Jim Taylor, No. 44, was one of several outstanding players who gained CSM their first victory of the season and a homecoming win over Western State College 38-36. Jim carried across, CSM's first and third touchdowns for the game, with CSM scoring a total of five touchdowns in the game. Jim is CSM's leading rusher, averaging 77 yards per game on the ground. In addition Jim has averaged two received passes per game for 9.1 yards per catch.

Mobil Foundation Gift For Research Project

THE CSM Petroleum Engineering Department has received from the Mobil Foundation a gift of \$2,000 for unrestricted use on CSM's reservoir simulation research project. Development of models, which can be permanently used for instructional purposes and with the introductory course in reservoir simulation, will be applied partially towards the gift.

Osborn Memorial Fund

For Foreign Students Prof. Robert B. Osborn, retired from the CSM Mathematics Department, has established a memorial fund, to be known as the Stephen B. Osborn Memorial Fund, in memory of his son.

Interest free emergency loans will be offered to foreign students at CSM with no interest charge, in amounts up to \$50.00 on a 60-day short-term basis. A \$2 handling charge will be applied to each loan.

All loans through the memorial fund will be administered from the Colorado School of Mines Financial Aid Office.

Crileys Presented With Lifetime Letterman's Pass

T the Mines-Adams State football A game Nov. 14, 1970, Lawrence Criley was presented with the "M" sweater and a Lifetime Letterman's Pass and his wife, Blossom, received a corsage. In making the presentation, CSM Director of Athletics Fritz Brennecke declared:

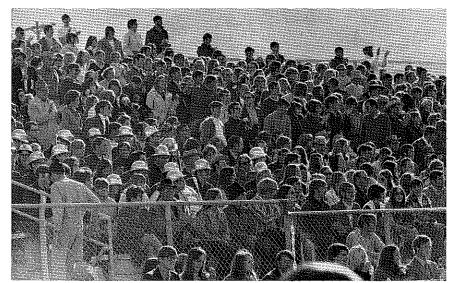
"More than 50 years ago, Mr. Lawrence T. Criley moved to Golden, entered business, and became a resident of this community. He developed great interest in the activities of the students of the Colorado School of Mines, particularly the athletic program.

"Since arriving in this community, Mr. Criley and his wife, Elizabeth, better known as 'Blossom' have been among the most loyal fans and supporters of Mines football. During all these years that they have lived in Golden, they have attended practically every Mines home game, come rain or shine. Quite a record! Fifty years going to Mines football games.

"As a small gesture of appreciation for these many years of loyalty to the Oredigger Football Team, the Mines Athletic Association would like to make you, Laurence, an Honorary Mines Letterman, and present you with this sweater and Lifetime Letterman's Pass. This pass will admit you free to all future Mines home athletic events.

"And to you, 'Blossom,' we'd like to give this corsage.

"Congratulations, and our most heartfelt thanks to you both. We hope you will be back to see the Miners play many more games."



CSM'S 1970 HOMECOMING was accompanied by good weather, warm temperatures, a winning football game, and a happy over-capacity crowd of spectators. The end results were fulfilment of many happy past moments among the students and alumni during the weekend's festivities.



MARCHING "M" BAND was part of the Annual Homecoming Parade which passes through Golden on Washington Street. The parade this year was one of the largest to take place in Golden, with the school, community businessmen and organizations, high schools, and regional organizations participating.



THE DAMES RETURNED at this year's Homecoming with a vastly improved "powder puff" football team, which through their extended efforts were able to tie the CSM coeds. The Dames appeared in numbered jerseys and took the game seriously, only to gain a 12-12 tie when the event's time ran out.

Bechtel Grant

To Mining Dept.

A GAIN this year, the Bechtel
Corp. of San Francisco has awarded a \$1,000 unrestricted grant to the Colorado School of Mines through the Bechtel Foundation.

The grant was presented to Dr. Albert W. Schlechten, vice president for Academic Affairs at CSM, and will be used by the Colorado School of Mines Mining Department.

C. T. Draney, vice president and director of Bechtel Corp., is sponsor of this gift. He is a 1932 graduate of the Colorado School of Mines.

Soccer Team

The CSM soccer team has been offered and has accepted a bid to participate in the NCAA-college division, western regional championships at Fullerton, Calif., Nov. 27th and 28th.

Teams involved in the tournament include Chico State College (11-2), California State at Fullerton (10-4-1), Mines (6-3) and Cal Poly of Pomona

The Orediggers finished fourth in the Rocky Mountain Intercollegiate Soccer League, behind Denver University, Air Force Academy and Colorado College. Since these three teams are all classified in the university division of the NCAA, Mines is the college division entry.

First round games will be Friday, Nov. 27th, with losers playing at 11 a.m. Nov. 28th and winners playing for the championship at 1:30 p.m.

The CSM soccer team will be represented by 20 players; thirteen of these are from the United States, one from England, one from Peru, one from Saudi Arabia, one from Iran, one from the Philippines, and two from Turkey.

Dept. Grants By Mobil Oil

P. ALBERT W. MUSGRAVE, Geol.E. 1947 and D.Sc. 1952, senior geologist and scientist manager of the Exploration and Development Division of Mobil Oil Corp., recently presented a check for \$750 to the CSM Geophysics Department and a check for \$500 to the CSM Mathematics Department in behalf of Mobil Oil. The grants were made in accordance with Mobil's practice of presenting department grants rather than student scholarships so that the faculty may determine the expenditure of funds provided by the grant.

SCSC Downs Mines In Last Game of Season

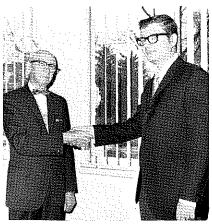
Southern Colorado State College racked up 511 yards on offense to hand Colorado Mines a 41-12 loss in their final game of the season. The loss put Mines' season record at a disappointing 1-9 mark while SCSC finished .500 with a 5-5 record.

Southern Colorado ran for 379 yards and passed for another 133. Two of their touchdowns came by way of their aerial attack. Kurt Enzminger hit Frank Grant for a 41-yard TD and Robert Murphy for 36 yards and another score. Enzminger also scored himself on a four-yard run to lead SCSC's scoring.

Mines was limited on their scoring but quarterback Dennis Ulrich took the Mines eleven across the goal line twice. Ulrich scored on a four-yard run and then passed 58 yards to Nelson King for the other score.



MINES ANNUAL STUDENT PARENT DAY was held Nov. 14 on the Golden. Colo. campus. Shown above are some of the junior and senior high school students and their parents who assembled in the gymnasium before being conducted on tours of laboratories, classrooms, and student facilities.



DR. FRANCIS M. VAN TUYL, professor emeritus of the Colorado School of Mines, left, recently greeted the recipient of his Francis M. Van Tuyl Fellowship Award. The recipient, Steven Joseph Maione, graduated from the Colorado School of Mines with a B.S. Degree in Geology in 1969, and is currently enrolled in CSM's graduate school working towards a Master of Science degree, Maione's hometown is Flushing, N. Y. Dr. Van Tuyl served as head of the CSM Department of Geology from 1919 until his retirement in 1953. This is the third year for the Van Tuyl Fellowship, being first awarded to John D. Mayhew during the 1968-69 academic year.

Cryptographer

Few people in Golden or in Colorado, for that matter, realize that Dr. D. C. B. Marsh, professor of mathematics, is the president of the American Cryptogram Association and is one of the world's most distinguished cryptographers.



Trends in Physics Held in Meyer Hall

THE Physics Department of the Colorado School of Mines again held its open house called, "Trends in Physics," on Dec. 3, in Meyer Hall.

The program is presented annually as an opportunity for students to observe both the academic and laboratory facilities offered by the School of Mines; but also many major displays, assembled by CSM physics students and demonstrated to the public during the day's activities. A number of informal lecture demonstrations were offered throughout the day, thus showing how physics is applied in our lives to the visiting students and public.

Numerous hallway exhibits, illustrating single concepts, involved the visitor in actual miniature laboratory experiences in several classrooms and laboratories.

\$28,000 Research Grant to Mines

THE Colorado School of Mines has received a \$28,000 research grant from the National Oceanic and Atmospheric Administration (NOAA), formerly ESSA, to involve the studies of earth strains of Denver, Colo., and Salt Lake City, Utah. The research is for a period of one year, and will be under the direction of Dr. Maurice W. Major and Dr. Phillip R. Romig, both professors at CSM.

The research program will be a continuation of the intensive studies of the earth's strains in seismically active areas. Emphasis will be placed upon the continuation of operations on the Denver-GOL subnet and studies of, tidal strains, secular strain rates, residual strain fields associated with the Denver earthquakes, possible strain transients associated with fluid injection into the subsurface, and earthquake predictions.

The study will conclude under this grant during the late summer of 1971.

Albert C. Harding, '37

Partner, Black Hills Bentonite Co.

Casper, Wyoming
Box I, Mills, Wyoming

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Selection Committee For All-American Team

A 17 - man selection committee headed by Springfield College Coach Ted Dunn has been named by the American Football Coaches Association to choose the third Kodak College Division All-America team during the 1970 season.

Outstanding players selected to the Kodak squad last year included Terry Bradshaw of Louisiana Tech, and Richard McGeorge of Elon, giant tackle Doug Wilkerson of North Carolina Central, and record-setting Jack Maitland of Williams College.

Player selections are made annually for Kodak by a nationwide committee of coaches appointed by the AFCA. In addition to Coach Dunn, the 1970 committee includes: Fritz Brennecke, Colorado School of Mines; Norm Amundsen, Valparaiso; Earl Banks, Morgan State; John Bell, East Tennessee State; Fran Curci, Tampa; Rollie Dotsch, Northern Michigan; Vic Fusia, Massachusetts; Cally Gault, Presbyterian; and Robert Griffin, Florida A&M.

Joining them are Gordon Larson, Akron; Bob Mitten, West Chester State; Jim Ostendarp, Amherst; Hanley Painter, Lenoir Rhyne; Tubby Raymond, Delaware; Jim Root, New Hampshire; and Dick Towers, Southern Illinois.

Coed Rifle Team Wins First Match

A four-girl team of the Colorado School of Mines ROTC Rifle Team delivered their first win for the season against the University of Colorado. Under the leadership of Captain Sandy Thielen, of Golden, the first year team of coeds appear with very bright prospects. A total of six coeds are presently practicing for the rifle team.

The coeds will face the shooters from Colorado State University and Southern Colorado State College on Nov. 21 in preparation for the national competition tournament at Kansas State Dec. 4 and 5. CSM's male ROTC team will be the main participants in this triangular meet scheduled to start at 9 a.m. Other meets s c h e duled include meets against Illinois State and South Dakota State, and the Air Force Academy tournament.

Antelopes Down Miners

The Orediggers lost to Kearney State 17-14 on Nov. 7 in a game that saw the Antelopes pick off five of Dennis Ulrich's passes, twice deep in Kearney territory. The loss puts Mines 1-4 for conference action this season

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Address Changes

1910-1939

Frank T. A. Smith, '16, 649 Paseo de la Playa, Apt. 104, Redondo Beach, Calif. 90274, H. Roland, '23, 7540 Charlin Parkway W., Or-

lando, Fla. 32807. Lewis H. Height, '24, 3003 Highland Drive, Colorado Springs, Colo. 80909. Guy R. Plumb '29, P. O. Box 1244, Sedona, Ariz.

Randolph R. Langlois, '33, Clayton House, 4800 N. 2nd St., Rockford, Ill. 61111.

John R. Tower, '35, 4112 Amherst, Dallas, Tex.

John R. Lower, 53, 4112 Addition, Danial, Act. 75225.
Vincent K. Jones, Jr., '36, 3645 South Oneida Way, Denver, Colo. 80237.
Eugene E. Dawson, '38, 3133 Frontera Way, #119, Burlingame, Calif. 94010.

1940-1970

Logan V. Caldwell, '40, P. O. Box 9434, Char-Logan v. Canuwen, 20, 10tte, N.C. 28205.
O. G. Hesseigren, Jr., '40, 3100 N.W. 84th St., Oklahoma City, Okla, 73112.
S. Fillmore Peavey, '40, Gen. Del. Grand Juncatral tion, Colo, 81501.

Herbert D. Thornton, '40, P. O. Box 521, Corpus

Christi, Tex. 78403.
Thomas E. Howard, '41, Apt. #401 Somerset Pl., 202 Hespeler Rd., Galt. Ont. Canada.
John B. Botelho, '42, 9th Floor PLDT Bidg., Legaspi St., Makati, Rizal Rep. of the Philip-

pines.
Burt R. Kramer, '42, 530 W. Maxzim St., Fullerton, Calif. 92632

lerton, Calif. 92632.

James E. Schmuck, '42, 3322 So. Stanley Place,
Tempe, Ariz, 85281.

Robert L. Froemke, '43, 1516 Argonne Road. Talianassee, Fla. 32303.
Robert H. Galiaher, '43, Route 1, Box 338, Ever green, Colo, 80439.

Joe A. Peery, 43, Rt. #3, Box 268-A. Hemp-

stead, Tex. 77445.
Frank L. Johnston, Jr., '45, 17410 N.E. 36th St., Redmond, Wash. 98052. Edwin F. Frederick, '46, P. O. Box 4153, Bar-

tonville, Ili. 61607.

T. J. Barbour, '47, R-3502 Boxdale, #2, Memphis, Tenn. 38118. Thomas A. Warburton, '47, 229 East 20th St., Idaho Falls, Ida. 83491.

Gilbert D. Borthick, Jr., '48, 1725 Twelfth Ave,.

Greeley, Colo. 80631.
Karl W. Mote, '49, 1426 Ardmore Drive W. Spokane, Wash. 99218.
T. H. Tepper, '49, 1801 Collins, Lawrenceville,

III. 62439. Clyde W. Kerns, '50, Box 900, Mobil R & D, Dallas, Tex. 75201.

James W. Warfield, '50, 232 South Missouri, Morton, Ill. 61559.

Harry L. Shively, '51, P. O. Box 38, Sahuarita,

Ariz. 85e29.

Richard M. Zoerb, '51. c/o Prescott Square,
Bronxville. N.Y. 10708.

H. Don Adams, '52. Amoco Europe Inc., 46-47

Pall Mall, London, S.W. 1, England.

David R. Cella, '52. 2110 Laurel Lane, Midhand,
Migh. 2650.

Mich. 48640. Stuart A. Jones, '52, 5216 Corteen Place, N.

Sulart A. Jones, S. 22, 5216 Corteen Place, N. Hollywood, Calif. 91607.
George T. Coker, Jr., '53, 3671 Chelsea Court, Pleasanton, Calif. 94566.
P. R. Collier, Jr., '53, P. O. Box 95, Rockledge, la. 32955. Frederick H. Campbell, '54, R.D. #1, Califon,

N.J. 07830. John C. Capshaw, '54, 1502 Wagon Gap Trail, Houston, Tex. 77090.
Pablo G. Carpo, '54, 22 Scout Madrinan, Quezon City, Rep. of the Philippines.

John L. Cook, '54, 1033 Sixth Street, #102,
Santa Monica, Calif. 90403.

John W. Erwin, '54, 2685 Everett Dr., Reno. Mark G. Spaeth, '54, 16805 George Washington Dr., Rockville, Md. 20851.

Edward J. Douze. '55, 5924 E. University, Apt. John G. Fidel, '55, 3804 La Hacienda Dr. N.E.

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