In view of this earthquake research effort on the part of American scientists, it might be worthwhile to take a look at the current Soviet work in the same field. One fifth of the Soviet Union's territory is located in earthquake prone areas. This area comprises all of Russia's colonies in Central Asia, with a non-Russian population of 25 million. Soviet interest in earthquake prediction studies has been spurred by the great Ashkhabad earthquake of 1948 and especially, by the Tashkent earthquake of April 26, 1966. The city of Tashkent, in Russia's Uzbek colony, lay at the very epicenter. The earthquake had a felt intensity force of over 7, and the shock waves lasted for about 12 minutes. The epicenter of the earthquake is located in the "seismie study" well in the Tashkent epicenter area. The well is 1,105 meters deep, is now being drilled. When completed, it should sample the complete layer of solid limestone bedrock, 30 m underground. The special well, equipped with a horizontal strainmeter (quartz tube 40 m long, with a 10 m outside diameter) and mohrographs with increased sensitivities for high frequencies; an installation for registering oscillations with periods of 0.15 to 30 seconds; an installation for registering oscillations with periods of 8 to 10 minutes; a seismograph for horizontal and vertical recordings. In a two-year period following the Tashkent earthquake, about 80% of all earthquakes in the Tashkent epicenter area were recorded. The new Central Geophysical Observatory (CGO) is located in the "seismie town" of Obinak in the Kaluga Province, southwest of Moscow. The Observatory is directed by Professor I. Popov, and it serves as the center of the Soviet Unified Seismic Observation System (USOS). Such an Observatory coordinates the recording work of all seismic stations in Russia and acts as a data processing center. CGO also operates a school for seismologists where the geophysicists in charge of the different seismic stations are trained in uniform recording techniques.

In addition, the Obinsk center conducts independent studies especially in the field of elastic waves and long waves with periods of up to 24 hours. The CGO's recording instruments are installed in chabins cut out in a black layer of solid limestone bedrock, 36 m underground. The instrumentation includes broad-band electromagnetic seismograph with increased sensitivities for high frequencies; an eight-channel system for recording long seismic waves with periods from 0.15 to 30 seconds; an installation for registering oscillations with periods of 8 to 10 minutes; a seismograph which has also 10 m inside diameter and a 10 m outside diameter which may register the earth's tides (long waves with periods of up to 24 hours); and photoelectronic apparatus for registering the earth's tides (down to one millionth of a second) from the horizontal.

The Tashkent Seismological Institute (TSI) is directed by Professor G. A. Mavhanov and has a technical staff of about 100 persons. The TSI continues on a greatly expanded scale the work of the Tashkent Central Seismic Station operated by the Tashkent Institute for Seismic-Proof Construction. The TSI operates, therefore, two institutes expected to coordinate closely their activities.

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A variation of earthquake studies also suggested the possibility of utilizing natural earthquakes as an exploratory tool for geophysical work. According to the report, the first successful attempt made in Moscow to use natural earthquakes as a method for preparing geological profiles involved natural waters that eventually emitted radon gas. This was achieved by analyzing the correlation between the radon concentration and the content in these waters. These studies led to the detection of cyclic patterns. On that basis, Fedotov then worked out a mathematical model of the structure prepared on the basis of both technical and seismic data. This method makes it possible to determine the effects of earthquakes of different intensities on the dam. These studies are still being pursued.

Detailed topographic surveys carried out by the Tashkent Seismological Institute showed that as a result of the 1960 Tashkent earthquake, the ground surface of the entire Tashkent epicenter area rose 2-3 cm. Since that time, there have been underground discharges attributable to the location of underground reservoirs undergoing great stress. A method known as "film" was used to determine radon gas concentration. The Tashkent Seismological Institute has also conducted detailed magnetic and gravimetric surveys of the epicenter area to find the changes in the geomagnetic field that were recorded by local and regional seismic stations. These studies carried out so far point to an indirect relation between the radon gas content and the geomagnetic field phenomena and the earthquakes.

Although the TSI subdivided the epicenter area of the Tashkent earthquake into seismic zones of different intensities, the earthquake was observed as a single event. After the Chilean earthquake the continents began drifting westward, shifting a total distance of 16 m. Other studies have also been conducted to understand the relationship between seismic and electromagnetic phenomena. For example, Russia has just (Fall 1969) put into operation five automatic installations on the ocean bottom. In this project, the Russians have just (Fall 1969) put into operation five automatic installations on the ocean bottom. In this project, the Russians have just (Fall 1969) put into operation five automatic installations on the ocean bottom.
Soviet Earthquakes

(Continued From Page 7)

anomalies. It is suggested, therefore, that individuals with sufficiently high potential who have opportunities to be sensitized to new developments in earth science or electromagnetic fields taking place imperceptibly in the last stages preceding that particular earthquake.

CONCLUSION

The effort undertaken in Russia on earthquake prediction studies, especially since the Tashkent earthquake of 1966 (it is already three and one-half years) and the scientific talent employed in these studies should lead to significant results in the near future. Some of this work is unique; e.g., the drilling of deep wells down to the epicenter zone of the Tashkent earthquake. Other Russian studies are conducted along the same lines of research as our own, even employing similar instrumentation, e.g., the quartz tube strain meters. It will be interesting to see whether such results will have any significant bearing on future work. For example, in universities, where formal training of mineral scientists and engineers occurs, out of 35 departments of mining engineering accredited in 1962, only 17 remained in 1967. A sampling of the industry in 1964 indicated a 10-year need for at least 162 new mining engineers per year, between 1962 and 1967 only 132 bachelor degrees were granted in this field. At the graduate level, almost half of the students in mining, extractive metallurgy, and petroleum engineering are foreign.

The Committee adds: "We also find an amazing lack of coordination and cooperation between the research and development programs of both federal and state governments as compared with the organization and funding of research on agricultural problems. The country is not running out of mineral resources but the need for improved production and processing in world competition is prompting a greater need for the mineral industry to support increasing mineral science and technology.

Two University of Nevada professors submitted a Committee on Mineral Sciences and Technology to the National Academy of Sciences, with the task of "determining the state of the mineral science and technology in the United States and providing information and recommendations according to the health and effectiveness." The seven-volume "Mineral Science and Technology" is the outcome of that endeavor.

Soviet Republic.

The National Academy of Sciences


Iron Ore Pumpeced in Slurry Form

TINYL STEEL MILL in the Pacific Northwest caught the attention of the cost-conscious steel industry. The mill receives its iron ore by pipeline.

The finely ground ore is pumped through pipelines or slush-like form from tanker ships anched offshore in deep water. As a result, the mill doesn't need to dredge a harbor or build costly port facilities, and its handling costs are particularly for labor, have been cut sharply. The slurries are extremely attractive to steelmakers with coastal plants. And for other steel processors, the slurry system could make the coasts, in particular the Pacific and Gulf areas, more attractive for expansion—especially for operations of limited capacity to serve regional markets.

Last year, the U.S. industry used more than 3 million tons of ore, most of it going into the long, tower-like blast furnaces where it is reduced to metallic iron that is then fed into steelmaking open hearth and basic oxygen furnaces. Steelmen now use the Portland, Ore., mill of Oregon Steel Mills, a division of Gilkey-Gibbs Corp., of San Francisco. The mill has an annual steel capacity of about 600,000 tons and turns out steel slabs to be rolled into plate. The key to its operation is its firm-handling process called Marcouvez, developed by San Francisco-based Marcouza Corp., a mining and materials transportation concern.

Marcouza moves the ore to Portland from the San Nicolas Iron mine in Peru, where it has been ground and concentrated to raise iron content to about 75 per cent solids is pumped aboard ship and allowed to settle. Then most of the water is drained off, leaving a cargo of about 200 tons of ore, which can be loaded at the mill site, high-speed jet service to a harbor or loading complex port facilities. The finely ground ore is pumped from the tankers and concentrated to raise iron content to 99% recovery of concentrates under commercial operating conditions. Capacities are high; operation is economical, simple and automatic.

Most minerals are subject to this process including taconites, oxides, sulfides, carbonates, silicates, etc. Each installation must be designed to the conditions encountered at the specific mining site, the equipment employing similar instrumentation, e.g., the quartz tube strain meters. It will be interesting to see what extent Soviet results will corroborate our own.

This article was submitted to give a detailed review of Russian earthquake research but merely to give a general outline and direction of Soviet work in this field. The article is based entirely on information found in publications of different general character listed in references. Unfortunately, the scientific information on the subject could be found in about 50 different Russian geological and geophysical technical and scholarly journals published by the different Soviet republics, university, government ministries. U.S.S.R. Academy of Sciences, and the Academies of Science of each Soviet Republic.
Introduction

It has been estimated (1) that during the period 1970-1990 approximately $65 billion will be construction oriented and $4 billion for mining oriented. It is expected that much of the excavation will be done using tunnel boring machines. Machines have been used to bore tunnels of various diameters (up to 30 ft.) and lengths (in excess of 12 miles) in both hard and soft rocks with mixed success. A major problem has been the inability to satisfactorily predict machine and cutting performance from the exploratory data obtained before the tunnel is commenced. Some incorrect selections of excavation techniques, drilling and blasting or tunnel boring machine methods, for a given environment have been costly mistakes for the contractor.

The recently completed 19,970-ft.-long tunnel (12 ft. bore and 18 ft. finished diameter) that was bored as part of the Southern Nevada Water Project of the United States Bureau of Reclamation is a case example in which the correct method was missed. The tunnel will bring water from Lake Mead to Las Vegas, Henderson, and other communities in southern Nevada. (c) the twenty bids submitted for its construction, the bid by Utah Construction and Mining Company, $39 million, was 16 percent lower than the next closest bid and $5.5 million below the highest bid (2). The tunnel bid could be based on:

(1) drilling and blasting
(2) using machine tunneling,
(3) a cost per linear foot, (using any method).

The U.S.B.R. supplied all bidders with the basic geologic data listed below on which to make their engineering estimates (3):

1. A 3,000-ft. wide surface geologic strip map having a scale of 1 inch equals 400 ft., along the tunnel line.
   (Rock types were delineated and major discontinuities were noted.)
2. Petrographic descriptions of hand samples collected along the surface above the tunnel route were available.
3. Cores (normally NX) from holes drilled at eleven different locations, along the tunnel line were logged in detail. Petrographic studies and physical property tests (compressive strength, Young's modulus, specific gravity, etc.) were performed on the cores.
4. Two series of water were examined for ground water and temperature surveys were run in most holes.

From these studies the U.S.B.R. (3) predicted that (a) rock type and geology would be the two predominant rock types to be encountered, (b) these rocks would vary in hardness from very hard, (c) several fault zones containing clayey gouge or intensely broken rock would be encountered, (d) these faults would be widely spaced and usually well bailed, (e) water would not be encountered, and (f) rock temperatures of 80°F should be expected, and (g) rock temperatures of 80°F should be expected. (1) their diameter (up to 36 ft.) and lengths (in excess of 12 miles) will be construction oriented and $34 billion mining oriented. (2) blasting or boring methods, for a given environment have been costly mistakes for the contractor.

Of tunnels in the future and is concerned about supplying the best, most complete information possible to the bidders of these tunnels. The Mining Department of CSM has published results in which disc-type cutters were used to cut various rock types. From these studies some idea of the variations in thrust and torque forces to be expected under different test conditions could be found. The present authors have performed a large number of tests using the cutter shown in figure 1.

The present study differs significantly from the previous studies (at least those for which results have been published) in that laboratory results of tests performed on 6 inch and NX cores taken from the walls of a bored tunnel were obtained. The cutters used in this study were being compared directly to actual boring data at corresponding locations. It is hoped that correlations between field and laboratory results will hopefuUly be continued and expanded in the future. This is necessary to provide engineers with the best, most complete information possible to the bidders of these tunnels. The Mining Department of CSM has published results in which disc-type cutters were used to cut various rock types. From these studies some idea of the variations in thrust and torque forces to be expected under different test conditions could be found. The present authors have performed a large number of tests using the cutter shown in figure 1.

As can be seen, a milling machine has been adapted to accommodate the cutter head arrangement. The cutter wheel is mounted on a shaft held in place vertically and horizontally by ball-bearing supported arms. Strain gages attached to the arms record the vertical and horizontal forces generated as the rock is moved beneath the cutter. These forces are related to the thrust and torque components in a tunnel boring machine. The machine is mounted in a special jig that is clamped to the table of the milling machine. The thrust of the cutter is fixed and the rock sample moved under the cutter. Figure 2. Figure 3. Figure 4. Figure 1. Figure 2. Figure 3. Figure 4. The cutting depth of the cutter is determined from the strain gage records. Frictional forces on the cutting edge and the release of elastic energy as the rock breaks. The brittle-ness and homogeneity of this rock is reflected in the very sharp force peaks. The force, at which tunnel boring machines would be used, was determined by the cutting depth of the cutter and the size of the bits used. The size of the bits used was based on the size of the machine, the type of rock to be bored, and the depth of the tunnel. The size of the bits used was based on the size of the machine, the type of rock to be bored, and the depth of the tunnel.

Linear Cutter Investigations

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Conclusions

In the future, more and more underground construction will be done by tunnel boring machines. More effective use of present machines and improved design of future machines require the ability to extrapolate from simple laboratory tests to prototype machines. A knowledge of how rock fails under a cutter should enable designers to construct machines which can better take advantage of natural weaknesses in the rock. It has been suggested that the uniaxial compressive strength is an indicator of rock burden. However, the tensile strength of rock should, if possible, be taken advantage of in new design. Our studies, although presently quite limited in scale, will hopefully be expanded and expanded in the future. This situation is necessarily dependent upon the interest, cooperation, and support of manufacturers and users of tunneling machines. It is felt that much could be gained from a cooperative program.

Acknowledgments

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Use of a Linear Cutter to Predict Large Diameter Tunnel Boring Rates

By Norman Ross and William Hustrulid

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F rom the beginning of his career with the Aluminum Company of America (Alcoa) as a geologist, in his retirement 40 years later as president and board chairman, Lawrence Litchfield Jr. achieved what few men attempt and still fewer attain. He possessed the traits which allowed him to gain distinction as an engineer, designer, artist, business director, and public relations expert. Responsible executives have certain characteristics which distinguish them at the qualities at the highest degree-confidence in himself and others, tenacity, an aversion to adventure, widely varied interests, a willingness to learn from his own, and perhaps more important, from others' experiences. He developed the versatility to indulge competently in each of his interests. He exploited the potential energy to develop these traits beyond the point at which most others find gratifying success.

Lawrence Litchfield, Jr., was born June 18, 1900, the son of a prominent Pittsburgh physician. In early pre-college days he studied almost three years in Berlin, Germany, and Lausanne, Switzerland, during which time he learned German and French. At the age of 17, on graduating from Peabody High School of Pittsburgh, he enrolled in college days he studied almost three years in Berlin, Germany, and Lausanne, Switzerland, during which time he learned German and French. At the age of 17, on graduating from Peabody High School of Pittsburgh, he enrolled in the University of Pittsburgh, from which he received a bachelor of science degree in 1922.

His first job was with the U.S. Bureau of Mines in the mineral leasing division: field work on coal. In this job he traveled extensively to inspect mines throughout the U.S. and Europe. In 1925, Mr. Litchfield joined the Republic Mining and Manufacturing Co., a subsidiary of Alcoa. During his first year of employment, he was assigned to mining properties in the U.S., Mexico, Africa, and South America. After the first year, he went to Dutch Guiana (now Surinam) and began one of the most adventurous episodes of his life. He traveled extensively to inspect mines throughout the country. His knowledge of the country brought him respect among the people of Surinam—their language, customs, and problems. He soon picked up some Takki-Takki, the Surinamese language, which is a mixture of Dutch, Portuguese, English, and African dialects. He also acquired the ability to eat the food of the natives—even the monkey meat and turtle. After the first year, he went to Dutch Guiana (now Surinam) and began one of the most adventurous episodes of his life. He traveled extensively to inspect mines throughout the country. His knowledge of the country brought him respect among the people of Surinam—their language, customs, and problems. He soon picked up some Takki-Takki, the Surinamese language, which is a mixture of Dutch, Portuguese, English, and African dialects. He also acquired the ability to eat the food of the natives—even the monkey meat and turtle. After the first year, he went to Dutch Guiana (now Surinam) and began one of the most adventurous episodes of his life. He traveled extensively to inspect mines throughout the country. His knowledge of the country brought him respect among the people of Surinam—their language, customs, and problems. He soon picked up some Takki-Takki, the Surinamese language, which is a mixture of Dutch, Portuguese, English, and African dialects. He also acquired the ability to eat the food of the natives—even the monkey meat and turtle.

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Shaft Sinking and Site Clearing Progress at Shebandowan Mine

Shaft sinking at the important new nickel mine being developed at Shebandowan, Ontario, by the International Nickel Company of Canada Limited, has reached the 1,200-foot mark on its way to a planned depth of 2,075 feet. Begun last in 1969, the new shaft will be used to hoist some 500 men.

The new Shebandowan nickel mine in northwestern Ontario, where activity is now at the signing and constructing the present Mattawin River. International Nickel reports that the temporary headframe of the production shaft at International Nickel's new Shebandowan nickel mine in northwestern Ontario, where activity is now at the signing and constructing the present Mattawin River. International Nickel reports that the temporary headframe of the production shaft at International Nickel's new Shebandowan nickel mine is part of the $600 million program has helped increase aluminum production capacity in the state, having started its first operations in the bauxite field in 1967. Arkansas has become one of the state's largest industrial employers with an annual payroll of approximately 300 million.

The Reynolds facilities make Arkansas the only state in which bauxite ore is mined, refined into aluminum, fabricated into aluminum, and fabricated into expanded and functional products for the production of Paper, the white aluminum pigment used in the manufacture of paper.

Shaft sinking is an important part of the program, which includes the installation of equipment in the new mine. The temporary facilities on the site will be constructed on the company's pollution control operations.

The development of the Shebandowan mine plan is part of the 850 million International Nickel is spending in Canada during the period 1970–1972 to increase its nickel production capability there to more than 600 million pounds annually in 1972.

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APRIL, 1970 • THE MINES MAGAZINE

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15

REYNOLDS Metals Co., with six facilities located in Arkansas, has become one of the state's largest industrial employers with an annual payroll of approximately 300 million.

The Reynolds facilities make Arkansas the only state in which bauxite ore is mined, refined into aluminum, fabricated into functional products for the production of Paper, the white aluminum pigment used in the manufacture of paper.

The Patterson reduction plant at Gut Springs near Arkadelphia has increased its capacity by 8,000 tons annually. The plant produces primary aluminum, extrusion billet, sheet ingot. The Alumina Research Division of Reynolds is located at the Hurricane Creek plant. This facility conducts research related to aluminum products and processes.

Reynolds is a comparatively new company in the state, having started its first operations in the bauxite mine near Benton in 1942. The Hurricane Creek and Jones Mills plant, which opened in 1945, and the Patterson plant in 1944.

The company operates a sales office at Little Rock. Recently, Reynolds moved its South Central Regional Public Relations office to Little Rock where it administers public relations activities throughout a 10-state area.

Although Reynolds has 40 plants in 17 states, Arkansas and the Pulaski-Saline-White Creek County represents one of the company's largest concentrations of investment capital, operations and payrolls.

Vice President

EXPLORATION PROJECTS

A public corporation engaged in mining and developing exploration efforts for minerals is seeking a Vice President to work and report directly to the President. The position

Vice President—Exploration Projects

This executive would evaluate the technical and economic factors presented to determine the economic viability of the various exploration efforts. The Vice President—Exploration Projects would have responsibility for the technical and economic viability of the company's exploration efforts. The position is located in New York City, Compensation is in the $40,000 range with large stock options available. Applicants are required to have a BA in economics, geology and/or geophysics. A degree from a school of mining and knowledge of market conditions is an advantage.

This position is open to candidates with experience in the mining industry and have expertise in economic and financial transactions, field experience in exploratory engineering, exploration and/or geology is required. A degree from a school of mining and knowledge of market conditions is an advantage.

The Vice President—Exploration Projects should have a fundamental grasp of the company's exploration and development efforts. The position requires excellent communication skills and the ability to work under severe conditions.

ALBERT C. HARDING, '37

Partner, Black Hills Bentonite Co.

Casper, Wyoming

Box 1, Mills, Wyoming

For more information, please write to: P. M. Lalde, 20th floor, 277 Park Ave., N. Y., N. Y. 10017,
Joseph B. Kennedy Jr., E.M. 1935 and Medalist 1964, is a profile of his career in the oil business and his role in Imperial-American. He was executive vice president of Atlantic Refining Co., subsidiaries of The Colorado Corporation. The effective date of his new position was Jan. 1, 1969. From 1965 to 1969, Mr. Kennedy was executive vice president of the largest Sinclair Oil Corp. in New York.

Mr. Kennedy was graduated from a Colorado School of Mines. He has performed in every aspect of the oil business, including geology, production, operations, petrochemicals, acquisition and marketing. Working for Imperial-American and with the outstanding men in the Colorado Corporation complex, to become president of Imperial-American.

"I've been interested in the things John King has been doing," Mr. Kennedy said. "I admire his enthusiasm. His philosophy of doing that job was that of making acquisitions," Mr. Kennedy recounted. "Sinclair was one of the first to recognize the diminishing supply of oil and gas reserves and that our exploration effort wasn't particularly keeping up with it. So, we didn't supplement our exploration effort, but we supplemented it by forming an acquisition department. Prior to joining Imperial-American, Mr. Kennedy's one and a half billion dollars worth of companies. We managed to improve our reserves to present our company as a major force in the oil field by the late 1960s.

Another highlight in Mr. Kennedy's career came in 1957 when he directed a Sinclair exploration team in Alaska. "Our conclusion was that Alaska was a very, very attractive oil area," Mr. Kennedy said. "From that time on, Sinclair took an increasingly active role in acquiring acreage in the seven we had graded Number One, Number Two, etc. We worked Cooper, Smith, Inland and North Slope second. So, things turned out very well for Sinclair in Alaska from 1957 on.

Mr. Kennedy, again, was modest about his role. As even casual newspaper readers know, the areas described by Mr. Kennedy are among America's major oil booms.

"Our exploration and the results give you an idea of the potential in the oil field," Mr. Kennedy said. "Prudhoe Bay was only 'discovered' last year. We were up there in 1955, making field trips, checking various literature, investigating reports of the U.S. Bureau of Mines and U.S. Geological Survey and doing all the other things that are necessary to the exploration process."
Titanium Deposits
In Northern Florida

American Cyanamid Co. and Union Camp Corp. have announced plans looking forward to the formation of Titanium Enterprises, a joint venture which would develop a titanium-bearing heavy minerals deposit in northern Florida.

The deposit, which is owned by Union Camp, extends over 5,000 acres and is considered one of the major undeveloped titanium mineral deposits known in the United States. The companies have worked together in conducting feasibility studies during the past year. They now plan to proceed with construction drilling and will set up a pilot plant to further define the size and grade of ore deposits. Carippo Research and Engineering Co., Houston, Tex., has been retained to perform the preliminary work.

Should the development work continue, the companies contemplate the mining and beneficiation of the heavy minerals deposit. This would be shared on a 50-50 basis and would start producing by mid-1972. In addition to titanium ore, the operation would produce ilmenite and monazite.

Dr. Pierce Named Director
Of Nuclear Education

Robert E. Hollingsworth, general manager of the Atomic Energy Commission, has announced the appointment of Dr. Elliot S. Pierce as director, Division of Nuclear Education and Training. He succeeds Dr. Russell S. Poor.

Dr. Pierce has been deputy director of the Division since November 1967. From 1963 to 1968 he was a chemist and in 1968 became deputy assistant director in the Office of the Assistant Director for Chemistry Programs, Division of Research.

Dr. Pierce received a B.S. degree in chemistry in 1943, an M.S. in organic chemistry in 1946, and a Ph.D. in physical-organic chemistry in 1953, all from Yale University.

He was a research chemist with Sperry-Vickers Oil Company 1960-64 and from 1964 to 1966 served in the U.S. Navy. After serving as instructor in chemistry at the University of Massachusetts from 1956 to 1957, he held a number of progressively more responsible positions between 1960 and 1966 with American Cyanamid Company including research chemist, research group leader, college relations representative and Washington technical representative.

Dr. Pierce received a B.S. degree in chemistry in 1943, an M.S. in organic chemistry in 1946, and a Ph.D. in physical-organic chemistry in 1953, all from Yale University. He was a research chemist with Sperry-Vickers Oil Company 1960-64 and from 1964 to 1966 served in the U.S. Navy. After serving as instructor in chemistry at the University of Massachusetts from 1956 to 1957, he held a number of progressively more responsible positions between 1960 and 1966 with American Cyanamid Company including research chemist, research group leader, college relations representative and Washington technical representative.

NOVEL CORRELATION OF
Earth's Magnetic and Gravitational Fields

Two years ago, March 23, 1968, an article written by Dr. Raymon E. Bisque and graduate student George E. Rouse, both from Colorado School of Mines, appeared in The Mines Magazine. This article described a novel observation concerning the earth quake noise of our planet and postulated that it might have some relationship to the metallic core 3000 kilometers below the surface.

The following month, April, 1968, these two scientists traveled to the American Geophysical Union meeting in Washington, D.C., and presented a paper which further popularized a common cause for variation in the earth's gravitational and magnetic fields. Based on the observations previously presented, this second paper suggested that bulges or bumps on the metallic core surface were responsible for the global patterns of gravity and magnetic variations.

The hypothesis, spread via the wire services and featured in Time, Newsweek and numerous other magazines, aroused popular curiosity, a sprinkling of scientific analysis from other quarters, and elaborated upon from certain segments of the scientific community.

Last month the British Journal Nature, the counterpart of the U.S. published Science, featured an article by two scientists that have reached a very similar conclusion from independent considerations. This latter scientific communication entitled "Novel Correlations Between Global Features of the Earth's Gravitational and Magnetic Fields" was summarized in the February 19 issue of New Scientist.

Within this summary, the article pointed out that several months ago at a Royal Astronomical Society meeting, Dr. Raymond Hilde of the Meteorological Office, Bracknell, presented the following idea, unknown to the society. He showed an analysis incorporating the earth's molten core from its solid mantle might be expected on a vast scale. The seismological techniques which reveal the existence of the interface itself at a depth equivalent to just under half the earth's radius would fail to detect such "bumps" even if they were several kilometers high. Dr. Hide argued, irregularities of this magnitude would nevertheless perturb the fluid motions in the core sufficiently to explain the observed non-uniformities of the geomagnetic field which results from those motions.

Following this presentation, Dr. Hide and A. J. C. Malin of the Institute of Geological Sciences, Herstmonceux Castle, have produced supporting evidence in their publication of their hypothesis which appeared in Nature, vol. 235, p. 660. Within this publication these scientists took the mathematical and statistical approach to the hypothesis, stating there is a significant relationship between the Earth's gravitational field and the non-dipole part of the geomagnetic field, provided the latter is displaced in longitude.

An interrelated correlation to the hypothesis developed at the Colorado School of Mines two years ago also showed the correlation of active crustal zones of the earth with planes tangent to the outer core. This hypothesis was supported on the theory that the surface pattern was a result of a global stress system that originated at the core-mantle interface and results from differential movements of core and mantle material.

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Dr. V. A. Altekar of Bombay University Greatly Respected
For His Pioneering Work in Metallurgical Engineering

Dr. V. A. Altekar, 1913, professor of Metallurgical Engineering at the UDCT (University Department of Chemical Technology), Bombay University, which has been appointed to the National Metallurgical Laboratory, Jamshedpur, is doing outstanding work in the field of metallurgical engineering. His research work has helped in utilization of the lead-ore area of Satara and the setting up of the Electro-Thermal Zinc-Dust Smelter. He has developed two processes for chemical upgrading of minerals.

Altekar was a student of mineralogy at the Banaras Hindu University. He took his B.Sc. in 1936 and got a scholarship from the B.B.U. to carry out research work on the utilization of the lead-ore area of Satara. This work was well received and he was awarded the M.Sc. degree with a scholarship for post-graduate work. Working under Prof. C. B. Carpenter and Prof. A. F. Wichmann, he obtained his Master's and Doctor's degree in Metallurgical Engineering. He was also assigned industrial problems. He worked for some time with the U.K. Bureau of Mines and then joined a private company in Bombay and then in the mining and milling company in Arizona. On return from the U.S., Altekar re-joined his alma mater and worked on many mineral projects. In 1957, he left Banaras Hindu University and re-joined the UDCT, where a chair was specially created in recognition of his contributions to the field of mineral processing and chemical metallurgy. In 1968 in recognition of his contributions to the field of industrial research and education, the Government of India named him "Mohaliq of the Year." The award carried a prize of Rs.5,000. His paper on "Selective Obliteration of Lime in Flue Dust Re-ectors", published in "Nature" in 1925, is considered a good lesson plan for cricketers and scientists. Dr. Altekar, who was born at Satara in 1925, is married and has two daughters and a son. His wife, Mrs. NaMni Altekar, is an Arts graduate. Altekar has raised a beautiful terrace garden at his place in the town of Satara in 1925, is married and has two daughters and a son. His wife, Mrs. NaMni Altekar, is an Arts graduate. Altekar has raised a beautiful terrace garden at his place in the town of Satara.

He also is a member of the Indian Institute of Geologists and the Geological Society of India. Altekar's main hobby is photography. His other interest is in art and stamp collecting. He has started a beautiful view of the garden at his place in Banaras. The award carried a prize of Rs.5,000. His paper on "Selective Obliteration of Lime in Flue Dust Re-ectors", published in "Nature" in 1925, is considered a good lesson plan for cricketers and scientists. Dr. Altekar, who was born at Satara in 1925, is married and has two daughters and a son. His wife, Mrs. NaMni Altekar, is an Arts graduate. Altekar has raised a beautiful terrace garden at his place in the town of Satara in 1925, is married and has two daughters and a son. His wife, Mrs. NaMni Altekar, is an Arts graduate. Altekar has raised a beautiful terrace garden at his place in the town of Satara.

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You're living dangerously, and you love it.

You fought the professor all semester, and got an A in spite of it.

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It's spring. That's dangerous.

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Kaiser Trading Co. subsidiary Kaiser Trading Co. Inc. has entered a broad range of commodity trading activities, including ores, metals, minerals, and chemicals. In addition, Kaiser Trading Co. will continue to handle other corporations in their sales to Japan and the Far East.

Alcoa Advanced System of Air Pollution Control

Alcoa has developed a new system for license to the industry what appears to be the most advanced air pollution control system that far deviates from a conventional air pollution control system and near aluminum smelting plants.

The new system developed by Aluminum Company of America removes fumes and particles collected during the production process and minimizes, so that virtually none escapes into the atmosphere. Many new and available control methods are far less efficient and do not possess the ability to remove nearly all of the captured fumes from electronic cells in which aluminum is refined from its ore.

U.S. Steel May Help Solve Need for New Housing Units

United States Steel is one of the companies now planning to develop new systems of housing construction that will also provide a new approach to muck removal, ore hoisting, mining, and elimination of the need for special buildings. A band saw is all that is needed to cut short lengths.

Send Us Your Bulletins

Want more information? Use MINES MAGAZINE's convenient READER SERVICE, circling numbers that correspond to items interested in, then drop card in mail.

April, 1970 * THE MINES MAGAZINE
Dear Col. Fertig:

I spent a week in the Molucca Islands (south of Halmahera) so got a chance to visit the natural world, combining business and pleasure.

I have been in the area for testing of extensive coal deposits at Piney Creek, about 50 miles North of Spokane near the Idaho-Washington border. You can see the Idaho-Washington border from the highway, and you may wonder where Platinum, Alaska 99651, is located. It is about 50 miles West of Anchorage on the Belt Highway.

The diversion dam is being built of concrete at Piney, 101 feet wide and 42 feet high. The ball bounces are often the ones you want to see. The water at the lake calls for the diversion work to be done with a tunneling machine and a laser scanner. The tunneling will be done on Lake DeSmet and Piney Creek, the outlet area for the lake being 375 feet thick at this location. The coal is classed as sub-bituminous "C."

I hope this will probably give you an idea of what I am doing.

Sincerely,

Arthur E. Palley, P.E.

448 North Main

Buffalo, Wyo.

Feb. 19, 1970

Dear Wendell:

The mining division of Reynolds Metals Company is engaged primarily in exploration and testing of extensive coal deposits at Lake DeSmet and in developing the water resources which Reynolds Metals has acquired.

The diversion dam is being built of concrete at Piney, 101 feet wide and 42 feet high. This will divert the water through a conduit to a 200 foot deep channel at which point the tailrace tunnel will run the water from the shaft through the tunnel and up another 16-foot shaft to an enlarged Lake DeSmet. The outlet area for the water at the lake calls for the construction of a 20-foot high dam to be located north of the present dam. The 30-foot diameter tunnel is being bored by a tunnel-boring machine and a laser scanner is being used to keep the tunnel in line.

The tunnel will be concreted and will have ventilating holes every 200 feet. The tunnel is 300 feet in at the present dam. All this work is in coal, the seam being 375 feet thick at this location. The coal is classed as sub-bituminous "C."

(Above is a thumbnail sketch of the project so far which I am the Mining Engineer and Safety Engineer for the Eagle-Western Construction Company.)

It probably will give you an idea of what I am doing.

Best regards,

George W. Wunder, E.M.

Patterson Engineering Co.


Feb. 20, 1970

Henry T. Fish, M.E. 1932, writes that he retired from the Tennessee Valley Authority on March 1, 1970 after thirty years as a mining engineer with TVA. His address is Box 204, Eagle Mountain, Calif. 92335.

Lawrence J. Gralla, E.M. 1964, who has completed his service in the U. S. Army, has joined Kaiser Steel Corporation as vice president effective Nov. 15, 1969. His address is 190 California St., San Francisco, Calif. 94111.

Phillip R. Hammond, E.M. 1948, has joined Carboy Chemical Corporation as manager of sales and marketing. His address is 101 Colorado St., San Francisco, Calif. 94114.

Virgil L. Eastridge, Geo.E. 1949, formerly with GeoTech Services, Inc., is an environmental engineer, Water Supply Service, Environmental Health Branch, Department of Public Health, Room 303, 303 Fifth St., Buffalo, Wyo. 82834.

Stephen M. Nicolais, E.M. 1969, has been appointed manager of Mining and Mineral Law Department of Western States Legal Services, Environmental Health Supply Service, Environmental Health Training, assigned to the Intelligency Office of the Corps and will be studying image interpretation. The change is later this month. Although I miss the Colorado School of Mines, I am very pleased with the Environmental Service Administration in Rockville, Md.

George R. Downs Jr., Geo.E. 1961, a principal officer in Center for Environmental Studies, Inc., 4300 Tuesday Dr., Alexandria, Va. CWA, will coordinate studies of defense related activities and marine science studies.

The following item, in the Reno, Nev. Gun tackle, contains a quotation of an acceptable person, Victor A. Perry of Yerington. He graduated from the University of Nevada in 1961. Now he's a candidate for a position on the University of Nevada's Board of Trustees, a job he was looking for a house in the Denver area.

John R. Fohey, M.E. 1964, is chief metallurgist of the Wire Rod and Bar Department of Kaiser Steel Corporation. He is serving on the Board of Directors of the Mansfield Journal and was selected as "Outstanding Jahres of the Year." He and his wife, Mary, and his infant daughter, Karen Elizabeth, are living in Mansfield, N.Y.

From the Executive Secretary's Desk

ANNUAL BANQUET — The Annual Banquet will be held on the evening of Thursday, May 28, 1970 in the Ballroom of the Denver Hilton Hotel. The club is located in the 1300 block on the north side of the East Colfax Avenue parking available. The location is convenient to our visitors who are attending the meetings, staying in the downtown hotels. These arrangements have been made in cooperation through the courtesy of Jim Colasanti, Mr. E.M. 1923.

I hope to have an excellent attendance at the Annual Meeting, which is a stiff affair. Should the hour change be the opportunity for arranging a dinner or other entertainment for the benefit of the membership, there will be possibility that could be arranged at the Club and, if necessary, later.

ANNUAL MEETING — The Annual Meeting is normally held in January of each year but several of our members from outside the city of Denver have suggested that the meeting be held on the Thursday evening preceding the Annual Convention of the Colorado Mining Association. E. E. Lewis, E.M. 1942 and M.E. 1947, has been most vigorous proponent of this change. Each year he has been the first to offer a letter recommending the change, and this year the directors took action and agreed that the necessary change would be made in the bylaws of the CSM Alumni Foundation. The Annual Meeting will be held on the Thursday evening preceding the Annual Convention of the Colorado Mining Association. Full details will be mailed to the members later.

It is hoped that this change will offer opportunity for many members living outside the Denver area to attend our Annual Meeting. As you know, this is the only meeting sponsored by the Alumni in which the CSM Alumni Foundation is the only sponsor. The directors hope that this change will meet with the general approval of the membership.

CLASS REUNIONS — The time is growing short and the letters to the editor concerning the Alumni Class Reunions will be mailed this coming week (March 30, 1970). They would have been mailed earlier, but the postal strike intervened and the mails 24 were delayed. It is hoped that each of you who receives this letter will return the unopened postcard as promptly as possible. These postcards enable the membership to make definite plans for your entertainment during the reunion. These plans will be announced to the membership, which we hope to mail about the 16th of April.

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Roberts

Robert T. Roberts, E.M, 1965, is president of Inter­continental Oil Corp., Los Angeles, Calif. He was appointed re­gional manager of sales for the company in 1969 after serving as a project engineer for the Mining Division of the Ana­conda Co. in Arizona. He joined the Ana­conda Co. as a junior engineer in 1963 at the camp­us in Ana­conda, Mont., where he worked on the position of re­search engineer in the mining division and assistant general manager-mining in 1965. The year follow­ing he was transferred to Chaucampi­cana and be­came assistant general superintendent in October 1967 and assistant superintendent since July 1967.

MINERAL EXPLORATION—Mili Design and Consulting Services

P. A. Meyer Named President of Inter­national Geo­logic

ARTHUR MEYER, E.G., 1959, geologist for the Mining Division of the Natural Resources Division of Union Pacific Railroad, was named president in October 1969 of the Inter­mountain­an­s Association of Geologists.

Mr. Meyer, a native of Brooklyn, N.Y., was graduated from the Colorado School of Mines in 1959 with a degree in geologic engineering.

Prior to joining Union Pacific in 1967, he was senior exploration geol­ogist with American Metal Climax, Inc., in Denver.

IAG has some 150 members through­out the Intermountain Area who are engaged as consultants, company employees, and as independent indus­trial roles.

During World War II Mr. Meyer was trained as a naval fighter pilot. Edward Keller, graduate of the Colorado School of Mines, was elected first vice president.

MINERAL EXPLORATION

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Alumni News

Alumni News

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MINERAL EXPLORATION INC.

The Mines Magazine • April, 1970

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The Mines Magazine • April, 1970

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Two Mines Alumni Now Presidents of DU Law College Student Bar

TWO Colorado School of Mines alumni are now presid­ent of the student government of the Uni­versity of Denver College of Law. Mr. Elkins was elected as president of the Student Body Association in Denver, Colo., in 1962. The annual di­vision Student Bar president is Wil­liam R. Hendrickson, E,M., 1962, formerly president of the Denver M i n ­ing Club.

Hendrickson Project Engineer at Hecla's Lakeshore Property

ROBERT S. HENDRICKS, E.M. 1962, is project engineer for the mining division of the Ana­conda Co. He is responsible for the betterment and progress of the mining division at Lakeshore Property, 30 miles south of Casa Grande, Ariz. The Ana­conda Co. has discovered—estimated to contain $3.7 billion worth of metals—on an area owned by Hecla and E.I. du Pont de Nemours & Co.

Mr. Hendrick received his E.M. degree in 1962 from the Colorado School of Mines and majored in econ­omies at Yale University. He joined Hecla in mid-1956 and worked in the industrial engineering before his promo­tion to Laboratory Engineer at Lakeshore Property.

Krebs and Wilking Working at Inspiration Copper Co.

MILITARY personnel—D. B. Krebs and R. G. Wilkin—recently returned from the Southeast Asian Theater of Operations. Mr. Krebs, a retired general manager of New Mont­anna Company, is chief engineer in the Mining Department at Inspiration Consolidated Copper Co. in Arizona. Both men were first lieutenants in the Corps of Engineers; both are members of the Society of Mining Engi­neers, and the American Military Engineers; both are recipients of the National Defense Service Medal, Viet­nam Service Medal and the Vietnam Cross of Valor.

David E. Krebs, E.M. 1966, is a senior engineer in the Mining Department. Following graduation from the Colorado School of Mines in 1966, he joined the Corps of Engineers with an Engineer of Mines degree, took a short time at Pittsburg and Midwest Coal Mining Co., and is now chief engineer in the Mining Division.

Most engineers in the division are in the late 20s and early 30s.
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 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 for which they may qualify.

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

MEETING — BOARD OF DIRECTORS
Colorado School of Mines Foundation
February 26, 1970

MEETING was called to order by President Hal Addington at 7:30 p.m. Those present were: Hal Addington, president; Harrison Hays, vice president; Nextor Berr, secretary; Robert F. McClelland, treasurer; William L. Magee, president; W. H. Goff, executive secretary; Dr. Anthony Peggs, administrative assistant, CSM.

A special report on the resignation of Dr. Orlo Childs, president of the Colorado School of Mines, was made by Dr. Peggs. Also, Dr. Peggs expressed a desire to work more closely with the Alumni Association in his new administrative duties.

The minutes of the meeting of Jan. 13, 1970, were accepted.

The financial report for January, 1970, was reviewed and accepted. There appears to be no adverse effects from the dues increase instituted during 1969.

OLD BUSINESS

1. Insurance companies have no interest in writing insurance on small loans, primarily because principal amounts are not great enough.

2. Ken Nickerson has been suggested as replacement for Dr. Lewis, and has accepted this appointment.

3. Election of Col. Fertig as assistant secretary.

4. Membership — Dick Seal was nominated and will be contacted.

5. Life Membership Accounts discussed. Two individuals needed to discuss and handle security transactions for this account. Bob Magnlo and Col. Fertig were selected to fulfill this requirement by resolution.

6. Alumni loans to freshmen were discussed:
   a) Five years necessary to recover loans.
   b) Affiliation rate on freshmen is quite high.
   c) Other loans available.

Mention was made of the future of the Alumni Asso.-ciation, "from the standpoint of giving additional services to those who wish to return to the school during the summer months to receive their degrees or to receive additional training.

7. Rivkin letter read — was critical of news content of Mines Magazine and implied there was too much emphasis on subscriptions. It was agreed that this letter and rebuttal be printed in the next issue.

8. Freshmen scholarships for Tulsa group discussed, and it was concluded that we cannot earmark one of our few freshman scholarships to one alumni group on a yearly basis.

9. Annual Meeting could be changed to coincide with the timing of CSM. It was moved and approved.

10. The next meeting was set for 7:30 p.m., Thursday, May 17, 1970.
In Memoriam

Howard A. Storm

Hazard A. Storm, M.E., May 29, 1918, died Jan. 13, 1976, in San Francisco, Calif. Services were held in Thousand Oaks, Calif., with the Rev. Roger Meriwether officiating. Interment was in Valhalla Memorial Park, Westlake Village, Calif.

Born Mar. 7, 1899, in Charleston, S.C., Mr. Storm was graduated in 1918 from Lowndes, Colo., High School and received his Metallurgical Engineering degree in 1929 from the Colorado School of Mines. While at Mines he was a member of Tau Beta Pi, Sigma Gamma Epsilon, and AEWR.

Mr. Storm was employed by Allis-Chalmers Mfg. Co. from May 29, 1929, to July 1930 as a machinery salesman. From January 1931 to August 1932 he was in the manager of Phelps Dodge Copper Co., Morenci, Ariz. From 1934 to 1940 Mr. Storm was employed as an engineer and as secretary to the manager of Cyprus Mines Corporation, Cyprus, N.M. Returning to the United States, he was employed as a mechanical engineer by Climax Molybdenum Co. and later (1941 and 1942) taught drafting and designing at the Colorado School of Mines. During World War II (1942-1945) he was a captain in the U.S. Army (air-soldier).

In 1941 at the death of his wife, Mena Schilling Storm, he retired from the U.S. Atomic Energy Commission. Mr. Storm, where he had been for 13 years. The last five years he spent in South Africa as the procurement representative for the United States.

Survivors are his wife, Mrs. W. C. Wycoff of Santa Monica, Calif.; four children, Mrs. J. G. Massey of Thousand Oaks, Calif.; and a sister, Mrs. W. L. Alcorn of Santa Cruz, Calif.

Eugene E. Dawson, '24

American Independent Oil Co.

Kuwait, Arabian Gulf

Elmer R. Whipple, '14

Wycoff Casinghead Pumps

Denver, Colorado

In Appreciation of Charles Joseph Hares

Charles Joseph Hares, D.Eng. 1956, one of the nation's outstanding petroleum geologists, died suddenly at his home in Boulder, Colo. (2506 N. 263 St.), after a long illness. Services were held Wednesday with eulogy by Charles Loring, who in 1968 was awarded a silver honorary degree of Doctor of Engineering by the Colorado School of Mines.

An excellent feature article entitled "Who the Devil Is Charlie Hares?" (in the 1966 Summer Issue of Petroleum Engineering) presented the background and accomplishments of this wonderfully successful petroleum geologist, who is credited with recommending explorations leading to discoveries of more than one billion barrels of oil and 400 million cubic feet of natural gas. Early in his career Mr. Hares discovered the fossil of a tiny marine animal, the first in a new genus of mollusks designated "Haresecia" by the U.S. Geological Survey.

Born May 6, 1911, on a farm near Merrells, N.Y., Mr. Hares took seven years to complete high school because his parents expected him to become a farmer and allowed Hares to attend classes only between Thanksgiving and Easter. Not satisfied by fields but rocks and ground formations excited him, and he was permitted from his parents to study geology at Syracuse University—"with the proviso that he continue his classical duties below the plow. But farming lost out—he earned a Bachelor's degree in Geology, went on to receive a Master's and then a fellowship for further study at the University of Chicago. Joining the U.S. Geological Survey, Mr. Hares spent seven years in the field, mapping vast sections of Wyoming and the Dakotas, and developing a keen eye for the smallest of geological clues, such as the tiniest mollusk fossil.

One spring day in 1917, while surveying an area near Medicine Bow, Wyo., Mr. Hares came upon a crew of drillers and an oil rig. He told them flatly they would never drill there because they were drilling. When six months later they didn't, his prediction came to the ears of the Ohio Oil Co.'s division manager, John McFadyen, who asked: "Who the devil is Charlie Hares?" Subsequently McFadyen talked with Charlie Hares and convinced the company president that the unorthodox, maverick geologist should be hired.

Within a year after Mr. Hares joined the company, his geological deductions resulted in three major discovery wells in Wyoming. In each case the drilling superintendent had been examined and dismissed by other oil hunters.

Throughout his career, which extended nearly 33 years not in practice with his retirement in 1944 as research geologist for Ohio Oil, Mr. Hares' sharp eyes helped him in good stead: "We were driving in south Texas years ago," his wife (Harriet Leonard, a former Dallas school teacher) recalled, "Traveling a pretty good clip as you always do in that country. Suddenly Charlie slammed on the brakes and jumped out of the car. There beside the road was a fossil, so big around a dollar bill, but he spotted it." 

When Mr. Hares received his honorary degree from the Colorado School of Mines, he was described by Colorado's U.S. Senator Goldwater as one who "has contributed much to the prosperity of the Rocky Mountain Region," and who was being honored "for his contributions to the general fund of man's knowledge... his development of young geologists and engineers whom he guided and inspired." Mr. Hares was one of the geologists appointed in 1933 by the Committee of Eleven of the American Petroleum Institute to study the national oil supply. His publications include articles on glaciation, stratigraphy, geology, and natural resources of Illinois and the Rockies.

He was a founder in 1945 of the Wyoming Geological Association, was its first president, and was an Honorary Member. In 1954 he established the Hares Section of the Geological Society of America and served as chairman in 1968. Mr. Hares had been a member of The American Association of Petroleum Geologists since 1923. He served as a representative on the National Strategic Mineral Policy Committee in 1941 and was a member of the 1949 Nominating Committee.

He was a fellow of the American Geological Society of America, a member of the American Institute of Mining and Metallurgical Engineers, the Geological Society of Washington, D.C., the Colorado Mining Society, the Denver Petroleum Club, and the Rocky Mountain Petroleum Engineers. He held honorary memberships in the Mountain Association of Geologists.

Survivors include his wife of 33 years; a daughter, Mrs. Dorothy M. Wolfe of Denver; and a brother, Evan J. Hares of Bridger, Mont. Funeral arrangements may be directed to the Charles J. Hares Memorial Fund Foundation, Colorado School of Mines.
Professional Society Meetings

American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME)

**API Meeting Apr. 27-29**

AIME is official technical sponsor of Rocky Mountain Institute's Spring Symposium scheduled April 27-29 at the Colorado Convention Center, Denver. The Symposium and the Annual Idea Conference will be held May 6-8 at New Mexico Institute of Mining and Technology, Socorro, N.M., for more information write to Dr. Paul H. Johnson, N.M. State Bureau of Mines, Campus Station, Socorro, N.M. 87801.

**Second Inter-American Conference on Materials Aug. 24-27, Mexico City**

More than 1,000 engineers and educators from the Western Hemisphere, the U.S., Canada and Europe are expected to attend the Second Inter-American Conference on Materials Technology, to be held at the United Nations Conference Center, Cleveland, Ohio, May 11-14.

For the first time there will be a group exhibit by over 40 companies, sponsored jointly by the Association of British Mining Equipment Exporters and the British Board of Trade. This display will feature new heavy-duty powered supports developed specially for U.S. mines, as well as ancillary equipment for hydraulically operated longwall face working, conveyors and conveyer equipment, cutting elements and tools for mining machinery, and underground drilling machinery.
JOINTS MINES FACULY

Dr. Lawrence Holland joins Mines Faculty

Dr. LAWRENCE R. HOLLAND, has joined the Colorado School of Mines faculty as an associate professor of Basic Engineering.

Dr. Holland is a member of the Harvard Engineers and Scientists, American Association of University Professors, American Association of Physics Teachers, American Physical Society, Sigma Xi, and the Harvard Club of Philadelphia. He is the author of numerous publications and inventions.

Dr. Holland and his wife live at 15 Mines Park inGolden.

CSM Receives $38,293 NSF Traineeship Grant

Dr. ORLO E. CHILDS was recently notified that Mines will receive a $38,293 grant from the National Science Foundation for traineeship for seven graduate traineeships for a period of two years.

The training is expected to begin in the fall semester of this year. The other seven graduate traineeships for a period of two years will be awarded to other institutions.

The program is designed to provide training in the fields of science and engineering and to assist in the development and student affairs.

Dr. Pegis will supervise the student-related offices of the CSM faculty, registrar, and director of admissions in addition to his present duties.

The CSM faculty will be under the direction of Dr. A. Ray Moore, dean of the Colorado School of Mines.

Dr. Pegis is presently secretary of the Colorado School of Mines Foundation, incorporated.

Jimmy Tarara Elects Treasurer of CACV

A Colorado School of Mines student, Jimmy Tarara, was elected treasurer at the first official meeting Feb. 26 of the Colorado Association of Collegiate Veterans. Officers of the newly organized group include: (1) Helping to enrich and fulfill a student veteran's college career, (2) Assisting a student veteran to make his college life successful, and (3) Encouraging good fellowship among all student veterans, and (4) Participating in state, regional, and national projects which are of mutual interest to the Armed Services, Democracy, and Freedom in the U.S.A.

The National Association of Collegiate Veterans will meet April 22 in Laramie, Wyo. Questions concerning the CACV should be sent to Sam Nasser, president, CACV, c/o Veterans Affairs, Colorado School of Mines, 900 W. Orman Ave., Pueblo, Colo.

Mines Wins Second RMAC Swimming Championship Meet

C RADOLO State College won their second RMAC Championship title on March 7, by defeating Colorado Mines, Western State College, and Adams State College.

During Friday evening's competition, Colorado Mines placed third, with 50 points, while Western State placed second and ASC fourth. Two records during Friday competition were broken. Records of Western State broke in the 200 individual medley and set a new conference record. Records of Colorado Mines broke the old 200-yard individual medley with a new record of 2:00:0, 2:4 seconds faster than last year's conference record.

Six conference records were broken during Saturday's competition. Records were set in the 100-yard freestyle, 100-yard backstroke, 200-yard individual medley, 200-yard backstroke, 100-yard butterfly, and 200-yard breaststroke.

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Crestview 9-2313 Golden, Colorado 80401
HU 8-2396 Houston, Texas 77058
26II W. 6ih Ave., Denver, Colo. 80204
Ronald E. Diederieh ’57
Mining Geologist and Engineer

COMPUTER PROGRAMMING

Robert McMillan, ’41
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HU 8-2396
1916 Diana Lane
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Ronald McMillan, ’41
Sinl DENVER MACHINE SHOP, INC,
HU 8-2396
HU 8-2396
Minerals Petroleum Engineering
Houston, Tex.
DATA PROCESSING

Diana Lane
Metallurgical Engineers
Consultants
Terrsearch, Consultants
Commercial
EDWIN F. WHITE, ’36
Metallurgical Engineers
Consultants

15 rebounds. haun scoring 15 points and recovering both teams, totaling 16. The Raiders
bounds, backed with the efforts of Jay Godley’s 17 points, and Tom Applegate’s 13. Dave Rolfe
scored on a layup to even the score at 26-26, followed by a CSM rally, leaving the half-time score at
49-36 with the Orediggers leading. Following the first half, the Raiders, led by Jay Godley,

Regis Overtakes Mines 81-70

CSM Wrestlers Close Out Season

TOM MONCHAK of Colorado School of Mines receives from James Makey, executive chairman of the Rocky Mountain
Conference, third place trophy team mines won in the Rocky Mountain

CSM Swimmers Win Two Out Of Three

Colorado School of Mines hosted Colorado College and Wayne State of Nebraska on Feb. 15 in a tri-meet on

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Oil Pollution Study

Recent disasters involving large-scale oil spills in coastal areas have brought the problem of oil pollution to general attention. To meet the need for an in-depth state-of-the-art report on this vital topic, leading research workers have prepared a volume published by Piscataway Press, New York.

The work brings together, in one unique volume, a description of biological damage caused by oil on the sea, the engineering problems encountered in attempting to clean up oil pollution, the trends in oil tanker design, the legal problem of just who is liable for damages caused by oil spills, and governmental regulation of production and transportation.

The interrelation of the problems is of utmost importance. As the editor, Professor John P. Houry of the Massachusetts Institute of Technology, states in his preface, "...the government can only enforce control procedures if these procedures are technologically feasible." He reminds us that "...the detergent used in cleaning up the Torrey Canyon spill was biologically more destructive than the oil spilled."

To prevent similar errors in the future, every facet of oil on the sea must be explored. How the sinking of an oil spill may cause the oil to enter the marine food chain, the effects of long-term poisons derived from crude oil, disintegrating, or "fingerprinting," oils produced from different oil-bearing horizons, and low-level effects of crude oil pollution must be studied.

Included in the volume is a survey of oil pollution methods in Australia, with emphasis on coal properties, a report on oil investigation in the USSR, and a review of in-place-deployment by dredging techniques.

The third in a series of CASE STUDIES OF SURFACE MINING is 526. It is available to AIME members for $3.50, nonmembers for $8.75, and is distributed by the American Institute of Mining and Metallurgical Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017.

Education for Engineers

The third in a series of monographs on Continuing Engineering Studies (CES) has just been published by the American Society for Engineering Education. The 96-page book contains the papers presented at the third meeting of ASEE's CES Division in Minneapolis, Minn., June 28-30, 1969. Under the chairmanship of Chester E. Briley, professor and director, University Extension, University of Wisconsin — Milwaukee, the conference enabled industry and education to come together to discuss the increasingly important areas of continuing education for engineers.

The first two books in the series

(Continued on Page 42)
Major Landladies

The California Division of Mines and Geology has been investigating the landslide-prone southern front of San Gabriel Mountains since 1970. Nine two Division geologists have found that sliding is as common throughout that range, in Los Angeles and San Bernardino Counties, as it is in the coastal slope.

Many areas of sliding, large and small, are marked on recently released Digital Map of San Gabriel Mountains, Map Title 34, titled Reconnaisance Map of Major Landslides, San Gabriel Mountains, California.

The authors, D. Morton and R. Stroo, classify each area of landslide movement according to the extent to which it can be identified as a landslide. The four classifications are (1) clearly recognizable landslide with well-defined bounds, (2) clearly recognizable landslide with poorly defined bounds, (3) areas of unusual topography that could have been formed by landsliding and (4) areas of talus and stream terrace that may be the result of landsliding, at least in part. The direction of land movement is shown for each slide.

The map may be purchased at Division offices in Los Angeles (103 Broadway), San Francisco (Forty Building) and Sacramento (Resource Building) for $1. Mail orders are accepted only at the San Francisco office.