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American Mining Congress Convention
7:30 a.m. Tuesday Sept. 29, 1970
Mezzanine Floor — Denver Hilton
President Guy McBride will attend

Alumni Reception
Society of Metals
6:00 p.m. Tuesday Oct. 3, 1970
Whitehall Room — Sheraton-Cleveland

Mines Luncheon
Society of Petroleum Engineers
12 noon Wednesday Oct. 7, 1970
Colorado Room — Rice Hotel
Houston, Tex.

Mines Breakfast
Society of Mining Engineers
7:30 a.m. Thursday Oct. 22, 1970
Stouffers Riverfront Inn
200 South Fourth St., St. Louis
Project CLARI on Schedule

PROJECT CLARI (Colorado Land Use and Environmental Resource Inventory) which is presently under study on the Colorado School of Mines campus, is on schedule and planned for completion in March of 1971. The project was granted by the Colorado State Department of Natural Resources.

According to Dr. Arthur J. McNair, project director and visiting professor from Cornell University, the State of Colorado has been divided up into 2,837 "cells," each cell being 10 kilometers (approximately six miles) on a side.

Within these "cells" over 360 land use and environmental resource items will be inventoried, under three major headings: 1) area and mass of the land being used, 2) linear features upon the surface, and 3) point data of small area or features but still necessary for the inventory.

With the use of quadrangle topographic maps, the CLARI project team has gathered and completed 30 individual land-use items from four of the 14 maps which cover Colorado. The four areas completed are the Lamar, Greeley, Pueblo, and Leadville quadrangle maps. Four other areas are presently under study which are the Ver- nal, Moab, Sterling, and Durango quadrangle maps.

In addition to the land use items, over two-thirds of the state's elevation and participation statistics have been gathered and over half of the state's linear features such as railroads, highways, pipelines, and lake and stream abstractions have been plotted.

In addition to the present reference data under study, letters have been forwarded to each of the state's county commissioners with supplementary data at this time.

(Continued on Page 6)

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"When we charge the mill," says Harry Trevaraine, "we want our rod straight. So we baby it. Face it! I buy rod for one reason. Production. I specify CF&I for the same reason, it lasts and it's straight. I get the production I'm after..."

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Thomas Turchan Always Ready to Fight For American Selling Price

I THINK the majority of elected officials are intelligent, vigorous and dedicated in making decisions. But Thomas Turchan—the American Cyanamid vice-president (chemicals sector) who has just begun his third straight one-year term as president of the Synthetic Organic Chemical Manufacturers Assn. (SOCMA)—also thinks citizens and industries should be intelligent, vigorous and dedicated in giving these elected officials information they need to make good decisions.

Providing such information—aggressively and tenaciously—has become a major activity of Turchan, who is leading his industry's defense of the American Selling Price (ASP) customs valuation system, which Congress has been asked to repeal.

Important to U.S. "It's not that we feel so strongly about ASP just because it's important to U.S. producers of benzenoid chemicals. We also believe the whole country can no longer make trade decisions on the basis of political or humanitarian considerations without reference to reciprocity, as we began doing after World War II, when it was acceptable and necessary. Today we're faced with a dangerous weakening of our international balance-of-payments position."

And so begins the logical and persuasive presentation Turchan has ticked off many, many times for business and civic groups and Congress.

This time the occasion is a private luncheon in a French restaurant in New York. The 58-year-old Turchan has arrived in a Cyanamid limousine from the company's Wayne, N.J., headquarters. He orders food knowledgeably, drinks coffee with it ("Easterners never do that, do they?") and spins tales of his childhood, youth, career and travels—with chuckles and almost total recall.

"My father was an itinerant coal miner. My parents left Czechoslovakia around 1900, stopped in Pittsburgh for a few years and then went West. I was born in Walsenburg, Colo., in an adobe house—my older sister was born in a coal camp tent. We settled down in Rock Springs, Wyo., where I went to school."

On the Way Up: A chance encounter with three physicists encouraged him to go to college—he had been driving a truck and working in a coal company store for three years after completing high school. In '35 he finished Colorado School of Mines with a degree in metallurgical engineering.

Read-out is in a data sheet or a map composed of the "cells." In addition, the read-out map may designate any area requested from state wide, to a specific county or group of "cells.

Dr. McNair has commented "the CLARI Project staff has been named general manager of American Cyanamid Company's Organic Chemical Division. Formerly general manager of Cyanamid's Industrial Chemicals Division, he has been with the company since 1952.

What followed was a string of jobs and tries at leading mines. That sent him all over the globe—the Philippines, Ontario, England, and to British Guiana, where he joined Cyanamid in '52 as manager of its bauxite operation.

He married Lucille Bywater in '42. They now live in Rumson, N.J. A daughter lives with her husband in Chicago and does biology research. A son, Thomas Jr., was graduated from Yale, joined the marines, went to Vietnam, was wounded within a week, got malaria twice and is now at Harvard Business School.

"Am I proud of him? He's not like those long-haired demonstrators. He was ready and did his duty." Thomas Sr. is ready to do his duty, too, which may be to testify further against repeal of ASP when new hearings on the trade bill begin in a month or two.

"We can go along with the bill, if ASP is kept out of it for separate treatment."

What does he think of a company that would keep quiet about repeal of ASP for a concession on oil or something else?

"One issue has nothing to do with the other, and each should be decided on its own merits. If any company should consider such an exchange, it would be shortsighted indeed.

"As for an alternative to ASP, it would have to be something worked out with care and objectivity before we could endorse it. Remember, Thomas was a doubter from way back."


**PROJECT CLARI ON SCHEDULE**

(Continued from Page 4)

...from the state's 61 counties. Another mailing to all communities over 100 population requesting information related to the city's water and sewage plants, airport landing fields and other allied data are presently being prepared.

Once each specific item is complete the record or inventory is placed on the memory storage bank of the Colorado School of Mines computer for future recall. When a specific item is then requested from the computer, the read-out is in a data sheet or a map composed of the "cells." In addition, the read-out map may designate any area requested from state wide, to a specific county or group of "cells.

Dr. McNair has commented "the CLARI Project staff is now around 35, with the staff members composed of every educational background and from instructors in geography at CSU to graduate and undergraduate students from both local and national colleges and universities."
Let's Look at Our "Image"*

THERE lure of gold or other potentially high profit metallic minerals often obscures the importance of nonmetallic minerals to our civilization. Without them the metal conveniences, appliances and services we use would be useless. The basic buildings structure as well as finishing and insulation of it is almost exclusively dependent upon portland cement, lime, gypsum, ceramics and all industrial minerals.

Unfortunately the entire minerals processing industry is accepted by the public as an activity without conscious thought—much like seeing or walking is to a person—until trouble signs appear. Then the industry attempts to use brush remedies instead of sensibly planned programs it should have had in effect all the time.

That's the situation today. The public—that's you and me as well—in spite of its own penchant for distributing garbage throughout the environment, is fed up with industrial pollution. This pollution takes the form of smoke, dust, noise, unsightly surroundings, dumps, pits, health and safety problems. And probably more than anything else, it takes the form of destruction of the area we used to call as "out in the country to hunt, fish or commune."

The blame for this falls disproportionately on the mining and mineral processing industry. But in fairness, it hasn't done much to change this image. More often than not there are alterations in process, planning and, particularly operating philosophy to reduce these disturbing factors. Often these can be done with little cost to operations; sometimes an alert company can make a profit in the alteration.

For example, nearly every city and town has sand and gravel pits on the outskirts that have taken over what used to be the young hunter's haven— at least that's how it's remembered even if it was the city dump. Private property or not, it is now an area of unsafe ponds, unsafe high banks, and an unsightly cross-section of roads. Proper planning in several cases now provides public recreation areas by replacing top soil, grading of banks, and layout of picnic areas. In the few areas in which this was done the result was a much needed city recreation area.

Company costs to do this were minimal, but their "image" was vastly improved. Not all operations can be handled as easily but the necessary part is that few operators are trying. Unless profit is our only god in living, we should never use the cliches, "not profitable."

Planning requires personnel oriented to these thoughts who are willing to experiment and plan. To get the specialists for this planning will require everything from company suggestion incentive plans to employing trained mineral industry engineers.

Trained personnel are in short supply but every company already has someone that can start the effort. Somehow it is necessary to reverse the processes of industrial apathy, public indignation and student non-involvement and convert them to industrial enthusiasm; public cooperation and student involvement.

The public's attitude toward pollution is the V-shaped. Either operators in the mining industry will plan for the changed attitude or the economics of legislatively dictated crash programs and oppressive administration will close your business. Here is an attempt to detail some of the factors that should be considered, written from a vantage point in mineral industry education.—J. R. Hoskins.

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THE ORIGINAL MANUFACTURERS OF SAFETY FUSE

SEPTEMBER, 1970 • THE MINES MAGAZINE
COLORADO SECONDARY SCHOOL TEACHERS AND ADMINISTRATORS view the Monarch Quarry facilities for limestone prior to their tour of the CF&I Steel Corporation, Pueblo, where the quarry’s limestone promotes the production of steel. A total of thirty-six students attended the six-week long course which included a one-week tour of the Colorado mining facilities. Expenses were furnished by the mining industry and the course was coordinated by the Colorado Mining Association and the Colorado School of Mines. The teachers received semester-hour credit for their studies.

"Raw Materials Essential to Growth Of All Economic Systems" - Boyd

D. JAMES BOYD, M.Sc. 1932, and D.Sc. 1934, chairman of the board of Copper Range Co., returned to the Colorado School of Mines where he served formerly as dean of faculty, to address a graduation luncheon July 17 of secondary school science teachers participating in the 1970 Field Summer Mining-Metallurgy Course, which was cosponsored by the Colorado School of Mines and the Colorado Mining Assoc.

Dr. Boyd, who received master of science and doctor of science degrees from the Colorado School of Mines, told high school instructors that raw materials are fundamental to society and economic systems progress in relation to the availability of low-cost raw materials.

"Perhaps one of the most disconcerting phenomena of modern society, particularly in the United States," Dr. Boyd said, "is the small amount of fundamental economics instilled into the students in our secondary schools, which permits some of them to go through college without a clear understanding of the very simplest principles of economics. To be able to understand the importance to society of science and engineering, it is essential that there be a clear concept of those principles.

"It has taken many generations for every nation that has reached an advanced stage of civilization to lift itself above the mere levels of subsistence. As long as a society depended upon muscle power to provide its food, shelter, and clothing, the people who constituted that society had to work from dawn to dusk every day of the week to eke out the simplest form of living. Man had to learn to supplement his muscle power with brain power, utilizing artificial energy and tools to convert materials into useful products."

"It was only when his productivity increased to permit him to provide beyond his immediate needs that he was able to find sufficient leisure time to permit him long enough periods for contemplation to conceive the development of a modern society. In such a society each member does for...

(Continued on Page 11)
Raw Materials Essential
(Continued from Page 10)
other individuals those things which he is best able to do in return for what they can do for him. This may sound like the simplest form of communism, but in a Democratic or Republican form of government, the stimulation for such services comes from incentives or rewards for hard work or imaginative mental processes.

"It is only as societies advance that it is necessary to create the fiscal and monetary mechanisms by which people trade their energies and skills against the construction of new requirements that necessitate immediate need. Many mistakes about raw materials and the environment have been made, not because of the nature of the raw materials derived from the forests, farms, mines, oil wells, or seas, to which they may be expanded, supplemented by new fuels, to create something more rapidly than would be possible to do with his own hands.

In the mining business, then, the raw materials were the essential ingredients, or the fundamental items of need in the economic systems, and those economic systems grew in proportion to availability of raw materials at relatively low prices. It is the objective, then, of the people to whom you have been listening in the last few weeks, to provide raw materials in abundance at the lowest possible cost. The kind of product, the most ideal product is the products available to those who need them. The miner provides the raw materials that the well being of man is in and by finding the raw materials with a growth of raw materials.

I am sure that you have learned how important it is to solve the problems of industry by means of raw materials. You have learned of the interdependence of raw materials with the economy of the nation.

I am sure that you have learned that the environment of the earth is a resource which must be managed with care and with foresight in order that it may provide the basic needs. If all the members are to live a relatively comfortable life, society will need raw materials, and also the ability to produce and use them.

The new plant is to be entirely finaned by Inco at a cost approaching $20,000,000. It is being undertaken, co-ordinately with expansion of the iron ore recovery plant and the construction of a new nickel refinery here, to eliminate the iron ore recovery plant as a complex as a potential source of air pollution, not only from sulphur dioxide, but also from dust. All dust must be removed as a prerequisite to sulphuric acid production.

The sulphuric acid plant is part of an environmental control program, costing about $40,000,000, which is being undertaken by Inco International Nickel in the Sudbury area. In another phase of the program, a 1,200-foot-high stack with associated precipitation equipment, is being constructed in Copper Cliff to cost approximately $15,000,000.

The plant will have a production capacity of 2,500,000 tons of sulphuric acid a day, and will be built as an adjacent to CIL's present sulphuric acid complex. The fourth plant in the complex, the new installation will increase production of sulphuric acid from Inco smelter gases to Copper Cliff to a total of 5,000 tons per day.

Canadian Industries Limited has started engineering of the new plant, but tenders have not yet been called and no contracts have been awarded. Completion is scheduled for the end of 1972.

Markets for the output of the new plant will be largely in the export field, and the operation will provide a number of strategically placed distribution depots, which in turn will be built at an additional cost. These will be serviced by Inco's own rail transport, and at least one of the depots will be on tide with rail service to reach areas by sea and access to world markets.

CIL inaugurated in 1950 the first air service to transport sulphuric acid from the Copper Cliff plant, and this service will also be utilized in connection with the new plant.

A pioneer in Canada in the production of sulphuric acid and liquid sulphur dioxide is CIL's sulphuric acid complex. CIL completed its first unit on the Inco site to manufacture sulphuric acid from this raw material in 1936. Since that time, recovery of sulphuric acid from Inco's smaller gas was begun at an ever increasing rate. Manufacture of solid sulphur dioxide began on the Inco site in 1952. Sulphuric acid operations throughout the world are growing. In 1967, 1963, and 1967, the plant, that came into production in 1957 with a capacity of 1,400 tons per day was at that time the largest in Canada. In contrast, the new plant will have a capacity of 3,000 tons. This steady expansion is the result of collaboration between Inco and CIL, and a continuous program of process development and marketing and distribution innovation.
Sure—Business Can Survive, But—

By Norman V. Lovett

It is no question that business—
the life blood of American enterprise—can survive—but it is a question if leadership, government bureaucrats, la
dry service, but whether free enterp
These required changes may be in
ment, must determine just how strong
Only businesses can be leaders in this manner. New businesses can be the
required changes. These may be in
management style, personal value systems, commitment to purpose and/or philosophy of operations. Whatever is needed in the manner of
change, we can rest assured that there will be change. It follows then, that the response to the question of business survival rests squarely on the shoulders of people. The people who are most involved in business must determine just how strong their individual desires are for business to be truly the dynamic vital en-
tity that it can and should be. Posi-
tive changes that will be required, and are already underway, cover a number of responsibilities and activ-
ities.

Human Resources—must be recog-
nized by word, act and deed to be "the most important asset" of any firm or organization. While in many instances this fact is acknowledged and given some lip service—it is far from being the truth. People can be made responsible for the business. In short, the business must respect its employees if the business is to be an entity. It will be of value if it is respected and not just tolerated.

Planning—must become a subject of serious attention. It is not enough to just state that "planning is a necessary tool of management." There must be a method to implement planning. If the planning is done in a methodical way, it will be more meaningful and result in an increased return.

Change will occur and we can react to it or preferably we can be leaders in the change. The change may be in the area of working conditions, in the area of new products, or in the area of new technology. If we can control the change, we can react and have a positive impact. If we cannot control the change, we can still react and have a positive impact. It is important that we are prepared to react and have a positive impact.

In summary, sure, business can survey—but before yet it can be an exciting experience, a person must first make the decision to move forward. The future is filled with opportunities, and the opportunities are available for anyone who is willing to take the risk. It is important to be prepared and to have a positive impact.


2. Frederick Herzberg, "Managing Morale As a Capital Resource," Personnel Journal, April, 1970

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Robert D. Turley, Geol.E. ’52, 1901 E. 17th Ave., Golden, Colo. 80401

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SURE—BUSINESS CAN SURVIVE, BUT—
By Norman V. Lovett

There is no question that business—

the life blood of American enterprise can survive—if business
leaders, government bureaucrats, labor officers and academic profes-
sionals are able to change to meet the needs of the future. The rea-
son is simple. The people of this country—more than any other on the
planet—are interested in survival, in a prosperous society, and they
have the capacity to bring about the changes necessary to assure this
survival. These changes are possible because men are unique entities
requiring special consideration and attention. They are also po-
sitive changes that must be made. The proper course of action will
be clearly defined when one restores the importance of people to
American business. It is not surprising that people are the most
important asset of a company, because they have the capacity to create,
render judgment, plan, move, produce, or reproduce themselves. All
companies—good and bad—depend on the creativity of people. They
are the only animate element. All other elements are inanimate.

We cannot conclude that people are the least important asset of
business because in themselves they are capable of creating, plan-
ing, building and organizing the future of business. The recognition
of this is the beginning of needed change.

I suggest that to implement this change in philosophy and percep-
tion, we must start with understanding that man is a unique entity that
is capable of individualized consideration and as such presents many
problems and challenges. Man’s worth in business clearly into focus
when one understands that people are the most important asset and
rewards, respected, and are already overdue, cover a
demand for increasing human resource changes, the re-
spective business strategy to the maximum of its value

Planning and then implementing the business strategy to the
maximum of its value is essential for the future.

In summary, sure, business can survive—but better yet it can be an
exciting experience, a mission to build a new, dynamic arena which
will produce outstanding performance and morale results. In other
words, everyone will achieve at a higher level if they can do the things
which involve their higher human capabilities. If in the future
and the country and our success. Business
executives who change their view of the
future will create a vital business en-
vironment and will be the leaders into
the future.
AN INVESTIGATION OF

Dasht-i-Biaz, Iran Earthquake

By Kenneth C. Bayer

On Aug. 31, 1968 at 10:47:37.4 G.M.T., the Khorassan Province of northeastern Iran was shaken by one of the most destructive earthquakes in Iranian history. The epicenter of the earthquake was about 250 kilometers south-southwest of Mashad, approximately 10 kilometers east of the measured surface fault. Its magnitude (M) was 7.3. A field investigation revealed that a number of villages were extensively damaged or destroyed, resulting in about 10,000 fatalities and 60,000 homeless residents.

Surface fractures were noted in several areas. Maximum horizontal displacement was a left-lateral movement of 4.1 meters east of Dasht-i-Biaz. The measured fault length was 25 kilometers, inaccessibility to part of the area and a time limitation factor curtailed a more complete analysis of the possible fault extensions, both to the west and east.

The extensive property damage is attributed principally to poor construction in the region. However, the location of some of the villages on alluvium with a shallow water table was a contributing factor in some instances. In particular, this paper analyzes the regional intensities, the effects on local structures, and the fresh surface faulting phenomenon resulting from the earthquake. Also presented are the results of the investigations on the temporal, spatial, and magnitude characteristics of all recorded seismic activity, before, after, and including the major event.

GEOLeGIC SETTING

The Dasht-i-Biaz Earthquake took place on Aug. 31, 1968, in the high central plateau region of the central Iran northeast basin. This region is characterized by a continental basin environment and is relatively

The maximum displacement observed on the strike-slip fault was left-lateral at a point approximately 15 kilometers east of Dasht-i-Biaz. Here, surface dikes crossing the fault zone were offset 4.1 meters (See Figure 4). West of Dasht-i-Biaz the south side of the fault appeared to have dropped approximately 1 meter relative to the north side (See Figure 5). On the east end of the fault the apparent vertical displacement may be reversed to a lesser degree. It was difficult to separate true vertical displacement from slumping and setting as a result of lateral displacement.

The fault varied from a single irregular fracture to a fracture zone 100 meters (330 feet) wide in the Dasht-i-Biaz vicinity where numerous tension cracks were evident. Approximately 2 kilometers southwest of the village of Dasht-i-Biaz, the fault bilaterates. The main branch continues generally westward in the direction of Firdows, and the less prominent rupture can be traced 2 kilometers toward the northwest.

Extrapolation of the two fault branches, west toward Bagham and northwest to the north on the other leg toward Kalkh, could account for the surface damage in these two areas. However, it should be pointed out that there was no visible surface evidence of faulting in these areas. Progressing easterly, the fault cuts through an agricultural region where there are few roads and no settlements of significance. The measured fault length was 25 kilometers. Inaccessibility by vehicle off the west end of the surface fault and a time limitation factor curtailed a more complete analysis of possible fault extensions, both to the west and east.

Tucker (1938) has shown a relationship between fault length, L (measured in kilometers), and magnitude M:

\[
M = 2 + 2 \log_{10} L - 10
\]

The maximum displacement observed on the strike-slip fault was left-lateral at a point approximately 15 kilometers east of Dasht-i-Biaz. Here, surface dikes crossing the fault zone were offset 4.1 meters (See Figure 4). West of Dasht-i-Biaz the south side of the fault appeared to have dropped approximately 1 meter relative to the north side (See Figure 5). On the east end of the fault the apparent vertical displacement may be reversed to a lesser degree. It was difficult to separate true vertical displacement from slumping and setting as a result of lateral displacement.

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\[
M = 2 + 2 \log_{10} L - 10
\]
Tocher (1958) has shown a relationship between fault length, \( L \) (measured in kilometers), and magnitude \( M_s \): 

\[
M_s = 5.65 + 0.98 \log_{10} L
\]

For our measured length, \( L = 25 \) kilometers. The magnitude equivalent is 6.9, or 0.4 magnitude unit lower than the historic earthquake. This fact correlates with findings documented in the Annual Iranian National Reports (1961, 1963-65). The epicenter of the Aug. 31 earthquake lies along the trace of a known fault between Firdows and Birjand.

A search through the CGEO data file did not reveal any major earthquake of Class B \((M = 7.0)\) equal to or less than \( M = 6.8 \) or equal to or less than \( M = 6.5 \) to be expected. Thirteen events were recorded as Class C since 1968 or one approximately every 23 years.

In many ways the Aug. 31, 1968, earthquake was similar to the devastating earthquake of magnitude 7.5 which centered 125 kilometers west of Tehran on Sept. 1, 1968. The felt region almost coincides with the same area, but extends to the Firdows area. The relation between faulted area and the width of the water table was previously described by Tschernitz (1958).

SEISMIC HISTORY

Iran occupies an active section of the Alpide seismic belt and is subject to frequent shallow earthquakes. This region is one of the most highly seismically active areas in the world. The Alpide belt includes the Alborz, the Zagros, and the Khorasan zones. These zones are tectonically active and have produced numerous major earthquakes.

Tschepanovsky (1961) reports that seismic activity has continued in ancient times and that it has accelerated in recent years. The earthquake that occurred in 1962 and the one in 1968 were of great significance. Tschepanovsky and other geologists have noted that the earthquakes are related to the tectonic activity in the region. The earthquake of 1962 was a significant event in the history of the region.

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Aftershocks throughout Sept. 1 were concentrated off the main fault. Considerable aftershock activity, both large and small, was centered beyond the zone of initial rupture. Aftershock activity was observed by the Mashad Observatory, August 30 to October 1, 1968.

Six hypocenter solutions were made of the principal event. Data from Kabul, Afghanistan at approximately 5° west, were used. Figure 9 shows the computed epicenters plotted on Figure 9. The epicenters plotted in Figure 9 show a pattern which closely correlates with faulting delineated in the Annual Iranian National Reports (1961, 1963-65). The epicenter of the Aug. 31, 1968 earthquake lies along the trace of a known fault between Firdows and Birjand.

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stratified. Their average residual was 3.5 seconds. Sixty-eight stations were used in the computation with a standard deviation of 0.6. This epicenter is 12 kilometers south of Solution 1 and 13 kilometers southeast of the surface fault. Focal depth is 10 kilometers.

Solution 4: P data were again restrained in the 5° to 20° distance range. Twenty-two relatively late stations were additionally restrained, with an average residual of 3.6 seconds. The total number of stations used was 79, with a standard deviation of 0.6. This epicenter is 12 kilometers south of Solution 1 and 9 kilometers southeast of the surface fault. Focal depth computed above the datum is 18 kilometers.

Solution 5: P data were restrained in the 5° to 20° distance range. Fifty-four stations were used in the computation with a standard deviation of 0.5. This epicenter is 12 kilometers south of Solution 1 and 8 kilometers southeast of the surface fault. Focal depth computed above the datum is 18 kilometers.

Solution 6: P data were again restrained in the 5° to 20° distance range. Sixty stations were used in the computation with a standard deviation of 0.5. This epicenter is 12 kilometers south of Solution 1 and 8 kilometers southeast of the surface fault. Focal depth computed above the datum is 18 kilometers.

The location of the foreshock is shown in Figure 11. The initial earthquake was followed by an aftershock of magnitude 7.3, with an epicenter near the surface fault. As previously noted, it may be inferred that the surface fault was not ruptured by a magnitude 7.3 earthquake, one foreshock, and corresponding aftershocks.

Over 40 major villages were inspected and the earthquake effects evaluated prior in leveling and cleanup work by bulldozers in the area. Some streets had been made passable by heavy road equipment, but villages were still untouched by these machines and remained deserted as we progressed with our analysis. In addition, 60 single-family settlements, pump stations, and other small compounds were evaluated via helicopter and land vehicle. The limitations did not permit a comprehensive damage-fatalities analysis. These data are shown on the isoseismal map (Figure 11). On the last day of inspection the heavy road equipment had started to level the towns we had previously surveyed.

As shown in Figure 12, the intensity values assigned to the damaged area varied from VI to IX. Intensity VI, "felt by nearly everyone," covered a vast area and is not included on the map. It should be added that the "most" between Kakh and Baghistan was inferred from topographic and structural control. This is an area of competent ordinary quality of high relief. Due to the inaccessibility of this mountainous region, only helicopter reconnaissance was carried out. It is interesting to note, on using the formula of Gutenberg and Richter (1942) for converting magnitude to intensity, that a magnitude 7.3 earthquake

\[ M = \frac{0.3 + 0.6 \text{ Imax}}{0.6} \]

was strongest in magnitude 11.3. The initial earthquake of Aug. 31, 1968, was felt strongly in Mashad. A 20 kilometer zone (124 miles) distant. Fresh cracks were observed at the Central Mining Camp and the Danesh Abad station, a distance of 175 kilometers (110 miles) from the epicenter. Soils with water pools were authentically reported in Lashkargah, Afghanistan, at a distance of the epicenter of 175 kilometers (110 miles). Five villages, Dashli-Biaz, Meinchaj (Reihab), Buskhab, Kabast, and Miam, were assigned an intensity rating of V. All were totally destroyed and situated very close to the surface fault. Mashad and Khorez were listed as intensity IV by the region. The units located in the epicenter area of the initial earthquake of Aug. 31, 1968, Bughan, near Firdous, was given a IX intensity. This was sustained due to its location on alluvial deposits in conjunction with a shallow water table.

In the towns of Firdous and Kakh, two-story buildings were prominent. Generally, they were commercial establishments at ground level and residences on the upper level (See Figure 13). Construction in which kiln-dried brick was used was checked with wood or steel beams were more substantial. Although badly cracked and bent out of shape, the resistance of this type structure was quite substantial. It did not collapse. Several of the commercial buildings had planks nailed to the sides of the structure. Fifty to seventy-five percent of the glass was broken. Broken glass was observed both inside and outside the buildings and fragments were scattered out to a maximum of two meters from the window frames. At times, entire glass panels would be intact, while adjacent panels would be totally shattered.

The most severe damage observed was a smoke stack (chimney) located several kilometers from Firdous, on the road to Tabas. The chimney is about 40 meters high with a 4-meter diameter base. It did not collapse for several reasons: (1) It was located south of Firdous, where shaking appeared to be less severe; (2) It was not located on alluvium, but on more competent clays and bedrock; (3) It is part of the oven used for making kiln-dried bricks; the best bricks are made from the drier, more permeable; (4) The walls were solid, interlocked, kiln-dried brick with a sand and cement mortar. Several bricks had been knocked off the very top of the chimney, however, only a few minor cracks were observed throughout the structure. The chimney was made by nearly everyone," covered a vast area and is not included on the map.
several of the figures ran directly through the village of Salalani. The largest of these fissures measured 3 to 4 meters deep.

Neither multi-story nor reinforced structures were noted in these four villages. Damage was very heavy, ranging from about 70% to 90%. However, few casualties occurred (12 fatalities of 943 population), since most injury occurred from the glass of windows and doors flying against buildings and other broken, but held upright, glass objects. The principal damage was due to the absence of any type of rigid framework. In the commercial stores with glass-panelled display windows, over half of the glass was broken and glass fragments were strewn both inside and outside the stores. Telephone poles on the main streets of Firdows were reinforced concrete pylons, about 12 meters above ground, tapered toward the top, and well anchored into the ground. None was broken or down, but several were ripped around the base. On side streets and alleys, unstrengthened wood and adobe houses were twisted or bent, but did not collapse. Telephone lines were torn down, and in some instances broken. The small villages of Firdous and Muzdabad are located less than 5 kilometers south of the surface fault. Firdous is located at the edge of the alluvial plain adjacent to the greatest surface rupture. Muzdabad, at the entrance to the pass between the two mountain ranges, overlooks the plain from low rolling hills. There were 28 deads reported from a population of 140. About 50% of the dwellings were destroyed, and those remaining were extensively damaged.

Kakh, a small village southeast of Muzdabad, reported 10 fatalities from a population of 166. The village is located on hill terrain south of the fault. Asadabad is a small village which lies within the alluvial valley. It is inundated during heavy summer rain underlain by bedrock. This town of approximately 600 residents was 35% destroyed, but damage was limited to the adobe houses owned sustained cracks and other damage. The death toll was 23.

Charmas, a village of 2100 inhabitants, is located in the mountains south of the fault. Thirty deaths were reported and property damage was estimated at 25%.

This investigation was made while the author was on temporary duty status in Kabul, Afghanistan, initiating a project in seismology during the installation of a world-wide (WWNNS) set of seismograph instruments. Special thanks are extended to Dr. F. Buckholdt and to Dr. R. A. Carlin. The other members of the three-man team who made the field trip exceed expectations, is gratefully acknowledged.

(Continued on Page 30)
"Wanting more food from the ocean is one thing. Getting it is another," says Art Tuthill of International Nickel.

"Extracting food from the ocean in large quantities takes special machinery. Special machinery to get the food. Special machinery to transport the food. Special machinery to process the food. Special machinery to transport the food. And most important, special machinery that can stand up to the sea.

"Machinery made of materials that will last. Reliable materials priced reasonably enough to make large, intricate machinery self-sufficient and financially practical. That's my job at International Nickel," says Tuthill. "Working with the marine industry, interpreting their needs to our researchers, in an effort to develop special materials that will resist the sea's extreme pressures and corrosion. We already have alloys of copper and nickel, nickel alloy steels and certain stainless steels, that fulfill these requirements.

"Nickel maraging steel enabled Lockheed's Deep Quest to dive to a record depth of 8,310 feet withstanding fantastic pressure and stress. Copper nickels have made desalination possible at reasonable costs. And special grades of stainless steel assure the sanitary conditions necessary for processing the catch. We have the materials now. And the faster they're made into machines the sea can't destroy, the faster the relief for the one billion underfed people of the world."

Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion...to advance engineering in vital fields—power, desalination, electronics, transportation, aerospace. We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago. We count our blessings and respect our surroundings. From nickel ores, we recover platinum, palladium, twelve other commercially useful elements.

Machines the sea can't destroy.
C&GS, for his helpful editorial comments.

The author would like to express his appreciation of the USAID Mission in Kabul, Afghanistan for assisting in preparing texts of the papers, and to Messrs. Murphy, Jordan, and Gordon, C&GS, for their constructive comments.

The four-day visit there was sponsored by the Friends of the University of Belgrade, the Belgrade Mining Faculty, and the Yugoslav-American Commission for Educational Exchanges in Belgrade. Contributing to the arrangements, in part, were the publishing firms: the Institute of International Education, the Yugoslav Ministry for External Affairs, and the U.S. State Department, among others. Prof. Boshkov's lecture trail began at the University of Zagreb in Yugoslavia, where he lectured on rock mechanics and ground control: the design of surface and underground mining structures. Dr. Boshkov is an internationally-known authority in that field. His talks in Zagreb became an integral part of a first-year graduate program ever given at a Yugoslavian university for mine engineers, an indication of growing academic activity.

Aside from his academic duties, Prof. Boshkov visited a number of mining companies, including the University of B. and C. F. Richter (1942). Earthquake Magnitude, Intensity, and Depth. "Amencan books on science and engineering are in great demand," he added, "as books, that the Yugoslavs use in American-made. The Bulgarians also use some American equipment, but there are problems that make that practice difficult. He explained how a Bulgarian mine purchased two large-sized drill bits, but got only very small a size. "They then had to wait," he said, "at least six months before they could get U.S. replacement parts from Aus­­-ter." Prof. Boshkov was particularly impressed by the friendship toward America expressed by the people he met in Yugoslavia and Bulgaria. He said, "I am very fond of Americans, and want to be like us. As a mark of friendship, I hope to visit you next year, and perhaps, other visits.

The Yugoslavs, he added, were very impressed with the Apollo moon landings, and when American astronauts Neil Armstrong, Edwin Aldrin and Michael Collins hoofed it to the moon, "It seemed as if half of Belgrade turned out to see it."

The Bulgarian engineer also found a good deal of private enterprise flourishing in Yugoslavia. As an example, he gave the Mining Institute in Belgrade, which serves the national mining industry and pays its own way by private contracts, with no government subsidies.

On the Bulgarian leg of his tour, Prof. Boshkov went to Sofia, where he was born in 1898, and where he was met with the city in a country that field. His mother, he said, still lived in Sofia, which reminded him of his short stay in the country.

Moreover, he added, most of the heavy mining equipment, such as trucks, that the Yugoslavs use is American-made. The Bulgarians also use some American equipment, but there are problems that make that practice difficult. He explained how a Bulgarian mine purchased two large-sized drill bits, but got only very small a size. "They then had to wait," he said, "at least six months before they could get U.S. replacement parts from Aus­­-ter." Prof. Boshkov was particularly impressed by the friendship toward America expressed by the people he met in Yugoslavia and Bulgaria. He said, "I am very fond of Americans, and want to be like us. As a mark of friendship, I hope to visit you next year, and perhaps, other visits.

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Portable Power Wrench (556)
Collins Machinery Corp., Monterey Park, Calif. 91754, is marketing a new application for their versatile Amaz-O-Thred® Portable Power Tool. Amaz-O-Wrench is a precision mechanism that adapts Amaz-O-Thred's power to turning 1/4" to 2" dia. pipe, conduit, bolts, etc. It features a patented design for automatic chucking, i.e., chucking, centering, and turning.
Circle 556 on Reader Service Card.

Conveyor Idlers (562)
Barber-Greene Co., Aurora, Ill., introduced a completely new series of heavy-duty roller bearing belt conveyor idlers incorporating design improvements that allow virtually unlimited idler life by overcoming the major causes of bearing failure. Truly a revolutionary design, the five-pass labyrinth seal has two zero clearance faces, a nylon face seal and a Buna "N" lip seal, both lubricated for minimal wear. There is no metal-to-metal contact.
Circle 562 on Reader Service Card.

Mini-Mags (558)
Mini-Mags are small, portable magazines designed for the safe transportation and storage of explosives and other hazardous materials. Designed and manufactured by Explosives Engineering Corp., 1830 S. Baker, Ontario, Calif. 91761, Mini-Mags are safer and more rugged than ordinary day boxes. They incorporate the same quality standards used in EEC's line of large steel magazines. Circle 558 on Reader Service Card.

Hydrostatic Transmission (565)
A revolutionary new infinitely variable hydrostatic transmission featuring a unique "divided power" concept that provides operating efficiencies of 85 per cent or more has been introduced by Sedra Power, Inc., 479 W. 54th St., Chicago, Ill. 60637. Designed for stationary industrial applications, the new transmission provides constant output horsepower and infinitely variable speed and is available in a series of sizes from 7/16 to 75 HP, rated at 10,000 hours minimum service. Circle 565 on Reader Service Card.

Dowtherm Inhibitor (561)
A new product, labeled Dowtherm 209 Inhibitor, is being marketed by The Dow Chemical Co. The product, designed for use in solutions of Dowtherm 209 coolant, ethylene glycol or water for truck, bus and off-highway equipment, provides an added margin of corrosion protection during the summer months when users dilute the coolant with water. Circle 561 on Reader Service Card.

El Burro (563)
After studying the all-terrain vehicle market, Worth Industrial Products, Lexington, Mich. 48171, researched, tested, developed, and marketed the four season all-terrain vehicle, "EL BURRO." This inexpensive, two-wheel fun machine combines dependability, power, performance, and maneuverability to create one of the best buys on the go-anywhere vehicle market. Circle 563 on Reader Service Card.

Bob-Tach System (560)
A quick-change system for changing attachments on its loaders has been introduced by the Melroe Division of Clark Equipment Co., Gwinner, N. D. 58040. The Melroe Bob-Tach system permits the operator to change attachments in seconds, without leaving the machine. Circle 560 on Reader Service Card.

Metal Detector (564)
A new concept in the detection of "tramp metal" mixed with iron ore or other metals on belts conveying ore to the crusher has been developed by Tecinco Engineering, 3017 S. Haliday St., Calif. These new Tecinco Metal Detector Coils save many, many thousands of dollars in down time for each piece of metal detected on the belt before it can enter and damage the ore crusher. Circle 564 on Reader Service Card.

Want more information?
Use MINES Magazine's convenient READER SERVICE CARD, circling numbers that correspond to items interested in, then drop card in mail. No stamp needed!
**At Sperry Rand Laboratory**

**Scanning Electron Microscope (SEM)**

The Scanning Electron Microscope, or SEM, uses a focused electron beam rather than a light beam to create images of objects. The SEM has a useful magnification range from 20x to 5000x and is capable of examining a wide variety of materials, including plastics, metals, and biological samples.

**At Sperry Rand Laboratory in Rockville, Md., on a machine-tools**

**Inexco Oil Co.**

The company is a primary oil-producing organization.

**To Develop Uranium Deposits**

The Swindell-Dressler Co., a division of Inexco Oil Co., is currently involved in developing uranium deposits in the United States and abroad. The company is working with various government and private organizations to identify and explore uranium resources.

**Efficiency, Lowers Production Costs**

The Swindell-Dressler Co. is using advanced technology to improve the efficiency of its uranium production processes. This includes the use of more efficient mining methods and the development of new processing techniques to reduce production costs.

**For Leadership Awarded**

Mr. J. E. McFadden, executive officer of AMAX, has been awarded the 1976 Golden Spike Award by the Mines and Minerals Magazine. The award recognizes outstanding contributions to the mining industry.

**Send Us Your Bulletins**

Send your bulletins to the MINES Magazine, 300 West Adams St., Denver, Colo. 80202. All bulletins received through January 1, 1977, will be included in the bulletin issues of the magazine. The editors reserve the right to edit and abridge selected bulletins.

**Catalogs and Trade Publications**

**Strain Gage**

**Service Card.**

A new bulletin (103) from Metco Inc., Westbury, N. Y., 11590, describes the five sizes of one HP to 15 HP metalizing processes. The bulletin explains how a new Harris cutting tip for oxy-fuel gas and water-blast cutting is available from W. F. Ehrsam Co., Abilene, Kans. 67410, covering their line of heavy-duty belt conveyor idlers, self-aligning idlers, and stationary idlers. Reading 70565940 on Readers Service Card.

**Pipe Line Bolting**

A new bulletin (103) from Metco Inc., Westbury, N. Y., 11590, describes the five sizes of one HP to 15 HP metalizing processes. The bulletin explains how a new Harris cutting tip for oxy-fuel gas and water-blast cutting is available from W. F. Ehrsam Co., Abilene, Kans. 67410, covering their line of heavy-duty belt conveyor idlers, self-aligning idlers, and stationary idlers. Reading 70565940 on Readers Service Card.

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T he 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, technical and management personnel.

Companies needing qualified men with degrees in Geological Engineering, Geophysical Engineering, Metallurgical Engineering, Petroleum Engineering, Petroleum Refining, Chemical Engineering, and Mathematics are invited to list their openings with the Alumni Placement Service, Guggenheim Hall, Colorado School of Mines.

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

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Commodities Conference Sept. 28-30 in New York

Purpose of the Conference is to provide the public with a discussion of major issues facing the world economy. It is bringing together members of the international commodity profession who are affected by commodity futures.

The Conference will also serve to underscore the importance of futures markets in protecting against price shocks. It is not making full use of hedge protection opportunities.

Engineering Conference Big in Mexico City

The Fall American Federation of Engineering Societies (UPADI), the body that represents engineers in the Americas, will hold its 34th annual conference in Buenos Aires. The conference will be held July 13 in New York City.

The program for the SPE Meeting will be held Oct. 4, and the technical sessions Oct. 5 and 6. The technical sessions will consist of 28 technical sessions, which will be held in Houston (Sept., 1968) some 125 booths, at the Albert Thomas Convention Center in Houston, Texas.

The program for the SPE meeting was formulated from more than 300 papers submitted to the Society for possible presentation. The selection of the final program for the meeting was made by the SPE Program Committee headed by J. Ed Smith, Consulting Services Inc., Amarillo, Texas.

The program will be divided into 28 technical sessions, which will be conducted over a 3-day period. Registration begins on Sunday, Oct. 4, and the technical sessions will begin on Monday, Oct. 5. Highlights of the meeting will be on "Oil-Spill Pollution Control," "Petroleum and Polycystin Control," "Offshore Operations," "Environmental Geotechnology," and "Economics and Finance." In addition to a special session on "Supervision and Energy Requirements for the '70's," will feature key management personnel from some of the nation's major oil companies as speakers. Participation in these sessions will be announced at a later date.

Other sessions at the SPE meeting will cover topics such as well logs, reservoir production, automation, and computer control, education and professionalism, gas storage, thermal recovery, reservoir simulation, drilling and rock mechanics, and well completions.

In addition to the large technical program, the SPE Fall Meeting will also feature a large display provided by leading petroleum service and manufacturing companies.

Engineering Conference Big in Mexico City

The Fall American Federation of Engineering Societies (UPADI), the body that represents engineers in the Americas, will hold its 34th annual conference in Buenos Aires. The conference will be held July 13 in New York City.

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Other sessions at the SPE meeting will cover topics such as well logs, reservoir production, automation, and computer control, education and professionalism, gas storage, thermal recovery, reservoir simulation, drilling and rock mechanics, and well completions.

In addition to the large technical program, the SPE Fall Meeting will also feature a large display provided by leading petroleum service and manufacturing companies.

Engineering Conference Big in Mexico City

The Fall American Federation of Engineering Societies (UPADI), the body that represents engineers in the Americas, will hold its 34th annual conference in Buenos Aires. The conference will be held July 13 in New York City.

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In addition to the large technical program, the SPE Fall Meeting will also feature a large display provided by leading petroleum service and manufacturing companies.
R. W. Crabtree of Hercules, Inc.

Mr. Crabtree has announced his retirement from the firm. He has served in the Los Angeles office in the company's sales service representative in Arctic Western Sales, Inc., and as resident manager of explosives sales to the Arizona, New Mexico, and Texas areas, working from the company's headquarters in Wilmington.

Mr. Crabtree was born in Reno, Nevada, and during his 36 years of service has received his degree in mining engineering from the Colorado School of Mines. His future home will be in Modesto, California.

Robert Potthast;

Mr. Potthast, a supervising engineer for the Colorado School of Mines, Mr. Potthast has been an active member of the Society of Mining Engineers for 10 years. He is a member of the Colorado School of Mines staff and is an active member of the School's AIME student chapter.

G. A. Lawrence Leaves

Mr. Lawrence is one of the company's key employees in the explosives sales division. He has been with the company since 1950 and has been instrumental in developing the company's sales force.

Bert Davidson Becomes President

Mr. Davidson has been with the company for 36 years and has held a variety of positions within the company, including sales manager, division manager, and vice president. He has been instrumental in the development of the company's sales force.

Bert Davidson, Jr., president of the company, has been appointed to the position of president of the company. He is succeeded by Mr. Davidson, who becomes vice president and general manager.

C. B. Campbell Becomes President

Mr. Campbell has been with the company for 40 years and has held a variety of positions within the company, including sales manager, division manager, and vice president. He has been instrumental in the development of the company's sales force.

Stefan P. Choquette Awarded S750 PESA Scholarship

The S750 PESA Scholarship was awarded to Stefan P. Choquette, a student at the Colorado School of Mines. The scholarship was awarded based on academic achievement and financial need.

Burdge Managed General Manager of Refineries

Mr. Burdge has been appointed general manager of refineries for the company. He has been with the company for 15 years and has been instrumental in the development of the company's refinery operations.

George W. Wunder Appointed Director of Technology

Mr. Wunder has been appointed director of technology for the company. He has been with the company for 10 years and has been instrumental in the development of the company's technology programs.
W. H. Walt joins MSME, heading McKinstry

WILLIAM H. WALT, E.M.'55, production manager for the Western Mining and Smelting Co.'s 200 million dollar processing plant at Champion, Ariz., has quit that post to join Mountain States Mining Enterprise, Inc., Tucson, as head of the mechanical engineering section. Mr. Walt has had 12 years' experience in engineering, process industries, and mining. He recently installed an automation surveying, estimating and selection of materials system. Previously, he was chemist, supervising 30 technicians, in a Western Mining and Smelting Co.'s quality control laboratory and a member of the city planning staff of Richmond, Calif.

Just off the "Strip" in Las Vegas

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Las Vegas, Nevada 89104

McKinstry joins Dow Chemical

K.

McKinstry joins Dow Chemical

E. M. NEWTON, who received a Ph.D. degree in Chemical Engineering from the Colorado School of Mines, has joined Dow Chemical Co. at Midland, Mich., as manager of the Monomers Research Laboratory.

H. C. Meabon appointed Senior Planning Associate for Marathon Oil Company

H. C. MEABON, M. Sc., 1965, has been appointed senior planning associate in the planning and development department of Marathon Oil Company. Mr. Meabon, who had been (1959-65) assistant manager of planning and projects in the marketing and design engineering department in Chicago in 1961, and district manager at Casper in 1960, was transferred to the general office at Chicago in 1965 as manager of sales affairs for American Company.

G. Newton named to the Colorado School of Mines with a degree in Petroleum Refining Engineering. He is a member of the American Society of Military Engineers. Prior to his employment with Standard, he served as petroleum refinery engineer in a refinery in Kansas.

U.S.G.S. Geologic References

Do you still look for USGS geologic references by place names? The quick, accurate way is by latitude and longitude. Our Geologic Index is a cross-reference finder kept current by monthly supplements. $15.00 per year, Quarterly, $9.00, or Yearly, $3.00. See Mines Magazine "Book Review" August, 1969 or write for details. Price $25.00. Used extensively in U.S. and Canadian libraries.

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Dow Chemical Engineering from Colorado School of Mines. He has been with Dow Chemical Co. at Midland, Mich., as manager of the Monomers Research Laboratory.

McKinstry joins Dow Chemical

reflected recently on a stroke which has resulted in a permanent disability.

G. March, Chupman, Geol., E. 1938, who was previously located in Cleveland for the past 10 years, has moved to Anchorage, Alaska, where he is a team leader in the Marine Geology Division, the Henshaw Chupman Institutes, Inc. He has been at the Marine Geology Division, the Henshaw Chupman Institutes, Inc. He has been in Anchorage since May 16.

Allan P. Noshok, M. Sc., 1965, has returned from the U.S. Army in Europe as a major general. He is now the head of the U.S. Army's Chemical Corps in Europe. He has been on leave of absence by the Belsen Corp. to begin work on the "Helmet" Project at the University of Virginia, effective September 1970. His new address is: 6225 Founders Dr., University Gardens, Charlottesville, Va. 22904.

Richard W. Webb, P. E., 1964, who has been an engineer with Marathon Oil Co., has been transferred to Wichita. At this time we do not have his new address.

Jonathan Dufnam, Geol. E. 1966, who was accepted by the Chinese Government to pursue graduate studies leading to a Ph.D. degree in China in 1965, has returned to the Royal School of Mines of the Imperial College. His new address is: 63, Savona Close, Thorley Hill S.E. 15, London, England.

Donald J. Nishlund, Geol. E. 1958, who was a member of the U.S. Geological Survey's Water Resources Research Branch in the St. Louis area and have moved to Rapid City, S.D. He has been here about a month in Rapid City, S. D., and has been here about a month. Best regards.

Steve W. Hackett, Geol. E. 1968, who was formerly with Union Oil Co. of California, has moved to Colorado City, Colo., to work for Union Oil Co. in Anchorage.

August 3, 1970

August 3, 1970

Dear Mr. E.,

We have been here about a month now and I feel that this is the life we've been looking for. We've been here about a month now and I feel that this is the life we've been looking for. We've been here about a month now and I feel that this is the life we've been looking for.

I turned over all my CRM files to Mr. E. W. Markwardt, F. E., Munich, P. O. Box 48, O'Fallon, Ill., who has been here about a month now and I feel that this is the life we've been looking for.

I intend to look up some of the people I know here at the P.O. Box 2250, Nevada City, Ca. 80501.

Sincerely,

Best regards.
In Memoriam

Arthur E. Falvey

A. E. FALVEY, A.E., 83, died on June 30 in Sheridan, Wyo., after a brief illness. He was a retired mining engineer.

Services were held July 3 at the St. John's Catholic Church, Sheridan, Wyo., with the Rev. C. O. Galbreath officiating. Burial was in Evergreen, Colo.

Mr. Falvey was born on April 13, 1898, in Bloomfield, Neb., and grew up in Omaha. He married the former Lillian Erickson in Denver on June 5, 1920.

After graduating from the Colorado School of Mines in 1914 as a Mining Engineer, he worked as an engineer in Idaho Springs for several years. For 16 years he worked for the Minerals and Chemical Co. in Georgia.

During World War II, he worked for the government as an engineer and later was employed by the U. S. Bureau of Mines for 16 years. He and his wife then moved to Buffalo in 1956 and now reside in Fountain Valley, Calif.

Mr. Falvey is survived by his wife, Lillian, whom he married Oct. 17, 1923; three children, Gary E., Richard G., and Nancy M.; and three grandchildren.

Robert J. Ise

F. T. "Tom" ISE, '55

Mr. Ise was born on July 21, 1936, in Colorado Springs, Colo., and passed away on March 21, 1970. He was survived by his wife, Patricia, and his parents, Mr. and Mrs. L. F. Ise.

Mr. Ise is survived by his wife, Patricia, and his parents, Mr. and Mrs. L. F. Ise.

Geoffrey H. Wighton

G. H. WIGHTON, E.M., 1925

Mr. Wighton was born on March 25, 1904, in Colorado Springs, Colo., and passed away on October 5, 1970. He was survived by his wife, Anne, and their two children, David and Robert.

Mr. Wighton's active life in the mining industry spanned nearly five decades. He was a leading expert in the field of extractive metallurgical engineering and authored numerous papers and books on the subject.

The Colorado School of Mines Department of Mining Engineering mourns the loss of this distinguished alumnus and offers its condolences to the Wighton family.

Cleveland O. Moss

O. M. MOSS, E.M., 1902

Mr. Moss was born on January 1, 1881, in Oakland, Calif., and passed away on May 7, 1970. He was survived by his wife, Laura, and their three children, John, Dorothy, and Richard.

Mr. Moss was a leading figure in the mining industry and held numerous positions at the Colorado School of Mines, including chairman of the Mining Department. He was also a member of the American Institute of Mining Engineers (AIME) and the Mining Engineering Fraternity.

Mr. Moss's contributions to the mining industry have left a lasting legacy, and the Colorado School of Mines pays tribute to his memory and the impact he had on the field.

Leonard E. Waters

E. WATERS, CSM Purchasing Agent, Retires

Mr. Waters is survived by his wife, Jean, and their four children, Michael, Elizabeth, John, and Anne. He was a beloved member of the Colorado School of Mines community and will be deeply missed.

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International Nuclear Corp.

International Nuclear Corp., a subsidiary of Westinghouse Electric Corp., announced the death of Mr. Robert E. Farenthold, on July 1, 1970. Mr. Farenthold was a key figure in the development of nuclear energy technology.

Mr. Farenthold is survived by his wife, Virginia, and their two children, Susan and Robert Jr.

Morton E. Frank

M. FRANK, E.M., 1904

Mr. Frank was born on May 1, 1886, in Denver, Colo., and passed away on April 25, 1970, in Colorado Springs, Colo. He was survived by his wife, Anna, and their two children, Richard and Jane.

Mr. Frank was a highly respected figure in the extractive metallurgical industry and made significant contributions to the field of mining engineering.

The Colorado School of Mines Department of Mining Engineering mourns the loss of this distinguished alumnus and offers its condolences to the Frank family.
DOW GIVES SCHOLARSHIP. Roland Fischer (right) of the Dow Chemical Co.'s Rocky Fork Division is shown presenting a $500 scholarship check to Dr. A. W. Schwab, vice president for Academic Affairs at the Colorado School of Mines. The gift will be used in the Metallurgy Department. This is part of Dow's Aid program for colleges and universities throughout the country. In 1968 Dow gave $1.6 million in scholarships.

Schelchten, vice president for Academic Affairs at the Colorado School of Mines. The coveted sterling silver diploma which his son, Charles Ray Miller, 1898 Yarrow School of Mines received Mines' Bachelor of Science in American Exploration and Production Engineering from Sun Oil Co.'s North American Exploration and Production Group with headquarters in Dallas. The recipient of the scholarship, to be announced in the fall, will be selected by the School of Mines.

President of the Viola Vestal Coulter Alumni Association, and is a Registered Professional Engineer in the State of Colorado. He is also a member of Phi Gamma Delta and Theta Tau. From 1947 to 1949 he served in the U.S. Army Air Forces and was discharged as a First Lieutenant.

Regarding the construction of three additional horizontal instruments with a recording house at site "Scotty's," and two horizontal instruments to be added to the "Davey" site. A vertical strainmeter will also be built at one of the multi-component sites.

William Crowe Kellogg, '43
Kellogg Exploration Company
Geologist-Geophysicist

The School of Mines will maintain the gathering of all data from the instruments until March 1, 1971. The data, besides being pertinent to certain ground-controlled studies, will also contribute to earth strain research studies now involving a larger network of strainmeters at more locations in Colorado. This Network of strainmeters is being supported by ESSA, U. S. Department of Commerce.

The School of Mines has just received a $500 Scholarship in petroleum engineering from Sun Oil Co.'s North American Exploration and Production Group with headquarters in Dallas. The recipient of the scholarship, to be announced in the fall, will be selected by the School of Mines.

During the presentation Dr. Steinmetz said that Sun Oil is aware of the growing need for highly qualified scientific and professional personnel. "The company is pleased to be able to participate in a positive aid program," he said.

$2500 Check From Amax

Dr. Alfred Petrick, Jr., Appointed Mineral Economics Coulter Professor

Mr. Coulter was one of the founders many years ago of the program under which a Mines' graduate is sent annually for further training at the Harvard Business School. The Trustees of the Coulter Foundation join me in wishing all the Colorado School of Mines' great success in the appointment of Dr. Petrick, Jr., as Coulter Professor in Mineral Economics.

THE MINES MAGAZINE • SEPTEMBER, 1970

1970 Homecoming Oct. 30-31

Dr. John F. Hager, CSM Metal­lurgy Department, has been as­signed a $100,000 research project grant from Kennecott Corp. based in Salt Lake City.

The project, entitled "A Mass Spectrometric Study of the Fundamental Properties of Reactions Involving in Copper Smelting and Refining," will be conducted during a one-year period on the CSM campus.

The research project was prompted due to previous research which re­sulted in direct application of mass spectrometer techniques in thermal dynamic measurements. Direct application of this process can now be applied to numerous copper alloy systems.

In addition, results obtained from previous research have provided in­formation required for insight into the possible mechanisms of side­ reactant volatilization and their related vapor transport reactions.

Research Grant From Kennecott

THE MINES MAGAZINE • SEPTEMBER, 1970

170 Students Earn Diplomas

The School of Mines received Minus' coveted silver diploma which is awarded to seniors for having completed four and one-half years of study at the school. The graduates are as follows:

Colorado:...
ROTC Scholarships at Mines

C OLONEL Cecil C. Baldwin, pro-

fessor of Military Science at the Colorado School of Mines, has been named to the Headquarters of the Fifth U. S. Army that three return-ning

the students at the University of

 Portugese and Spanish majors have been offered three-year ROTC scholarships.

Ronald H. Busset, son of Mr. and Mrs. Robert J. Bissett, Spenard, Alaska. John will be a sophomore in Geophysical Engineering for campus semester courses, and 24 for the summer field session, 258 CSM Summer Students 1795 Sheridan Denver, Colo. 80214 Engineering Consultants—Plant Layout Equipment Service Engineering and Electronic Distance Measurements Remote Sensing Aerial Photography (Color & Infrared) Photo Interpretation PHOTOGRAMMETRIC ENGINEERING

A TOTAl of 596 students attended summer courses this year at Mines with 304 students registered for the summer field session, 238 for campus semester courses, and 24 for the summer field session. These sessions allow the student to take field, laboratory and classroom courses for full credit.

The summer session program is divided into three independent units, the 8-week Denver field session a six-week period for required field and labora-

tory courses in basic, geological, geophysical, metals, chemical and petroleum refining, chemistry, mathematics and physics.

The on campus summer courses offer required subjects to the students in fields such as chemistry, mathematics, and physics. In addition, the intensive course in English for foreign engineering students enrolled at CSM is also offered during the normal summer session.

Special Studies 29 "Tertiary Volcanic Rocks of Neenah Ranges, Western Utah" (Special Studies 99) is available for $2 from the University of Utah Geological Survey Bldg., Salt Lake City 84112. In its conclusions the paper states that utilization of igneous rocks in a geological unit in determining the Tertiary structural geology in the east central Basin and Range Province is highly successful. The igneous series serve as perfect marker beds and, once the stratigraphy within an area is worked out, the investigator can determine with considerable accuracy the sequence of events in that area.

Dust You Can't See

A new safety training film on respiratory protection for coal miners has been produced by Mine Safety Appliances Co., Pittsburgh, Pa., 1970. The 13-minute color motion, "Dust You Can't See," is available for safety meetings by the coal mining industry. The film's message is directed to the miner, but is interestingly presented by a crop-dusting pilot who relates the hazards of his job to those of the coal mining industry.

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Westward Ho! 1898

"Westward Ho! 1898" by Carrie Winthrop is the title of a book published by the Exposition Press Inc., 50 Jericho Turnpike, Jericho, N. Y. 11753, $5. This autobiographical novel provides readers with a lively journey from horse-and-buggy days to the Space Age. Writing with unusual perception and vigor, both recalls the exciting, often humorous, incidents of traveling about the West with her successful mining engineer father, her mother and two sisters. Readers will be entertained and moved by this story of the development of America's West. This book is richly illustrated with over 200 photographs of people, places and events of the period. All of the incidents are actual发生的, giving the book its wholly believable quality. Carrie Winthrop is the author's pseudonym.

From the Local Sections

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

PETROLEUM GEOLOGY

Book Reviews

Petroleum Geology

"Sourcebook for Petroleum Geo-


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Anchorage Alumni Section

On Aug. 11, 1970 Mrs. Fortig and I had the pleasure of meeting with the members of the Anchorage Chapter of CSM Alumni. The purpose of the meeting and a list of those in attendance will be presented later.

However I did want to take this opportunity to thank the members there for their courtesy extended during the visit and the successful meeting which was organized by Ken Clodfelter. Reggie Lee has been appointed as corresponding secretary and Reggie, who is working for Union Oil, is out of the city so now you have a new president, so Ken Clodfelter has agreed to take over.

In addition to this August meeting the group had a luncheon on June 4th which was well attended. It is a pleasure to welcome this new section to our list. —WWF

Los Angeles Alumni Section

On July 20, 1970, our first of a long series of Alumni meetings in Anaheim, Calif. Don Snyder had arranged the meeting but at the last moment was unable to attend. Those who were there seemed to enjoy the meeting and the exchange of information concerning what is happening on the campus.

Those in attendance were: Richard C. Clark, Jr. Al Lee, 70; Ernest Buxton '88; Hal Rizk '90; Chalt Woltemuth '82; Ross Reed '77; and Marshall '89.

St. Louis Alumni Section

H. A. Dumont, who has been a long-time member of the Alumni Association, has moved to El Paso, Texas, and has sent all of his friends to Albert F. Wright, 40 E. Monroe St., (P. O. Box 641), El Paso, Texas. I hope to see him during the Annual Society of Mines Engineers Convention which will be held in St. Louis on Oct. 3-5 inclusive. I have asked Markwardt, 74 E. Monroe St., in hosting the annual Alumni breakfast during the SME Convention. —WWF

Alumni Dinner Meeting

Aug. 7th in Seattle

A group of about 20 Alumni assembled for a dinner meeting while Mrs. Fortig and I were in Seattle last week. Felt at this time, will send a report on the meeting together with a list of those in attendance. This was a particularly fine meeting since the Miners and their wives made up the meeting group ranging from Bill Douglas of 1913 to a more recent graduate of 1967. This was an excellent cross section of the men who have attended Mines.

During the meeting Dick Barnes, 1955 was elected president and Roy Cederstrom, 1960 secretary-treasurer. It was a pleasant unusual election as both men were present at the time when they were elected. —WWF

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Those in attendance were: Richard C. Clark, Jr. Al Lee, 70; Ernest Buxton '88; Hal Rizk '90; Chalt Woltemuth '82; Ross Reed '77; and Marshall '89.

St. Louis Alumni Section

H. A. Dumont, who has been a long-time member of the Alumni Association, has moved to El Paso, Texas, and has sent all of his friends to Albert F. Wright, 40 E. Monroe St., (P. O. Box 641), El Paso, Texas. I hope to see him during the Annual Society of Mines Engineers Convention which will be held in St. Louis on Oct. 3-5 inclusive. I have asked Markwardt, 74 E. Monroe St., in hosting the annual Alumni breakfast during the SME Convention. —WWF

Alumni Dinner Meeting

Aug. 7th in Seattle

A group of about 20 Alumni assembled for a dinner meeting while Mrs. Fortig and I were in Seattle last week. Felt at this time, will send a report on the meeting together with a list of those in attendance. This was a particularly fine meeting since the Miners and their wives made up the meeting group ranging from Bill Douglas of 1913 to a more recent graduate of 1967. This was an excellent cross section of the men who have attended Mines.

During the meeting Dick Barnes, 1955 was elected president and Roy Cederstrom, 1960 secretary-treasurer. It was a pleasant unusual election as both men were present at the time when they were elected. —WWF

Anchorage Alumni Section

On Aug. 11, 1970, Mrs. Fortig and I had the pleasure of meeting with the members of the Anchorage Chapter of CSM Alumni. The purpose of the meeting and a list of those in attendance will be presented later. However, I did want to take this opportunity to thank the members there for their courtesy extended during the visit and the successful meeting which was organized by Ken Clodfelter. Reggie Lee has been appointed as corresponding secretary and Reggie, who is working for Union Oil, is out of the city so now you have a new president, so Ken Clodfelter has agreed to take over.

In addition to this August meeting the group had a luncheon on June 4th which was well attended. It is a pleasure to welcome this new section to our list. —WWF
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