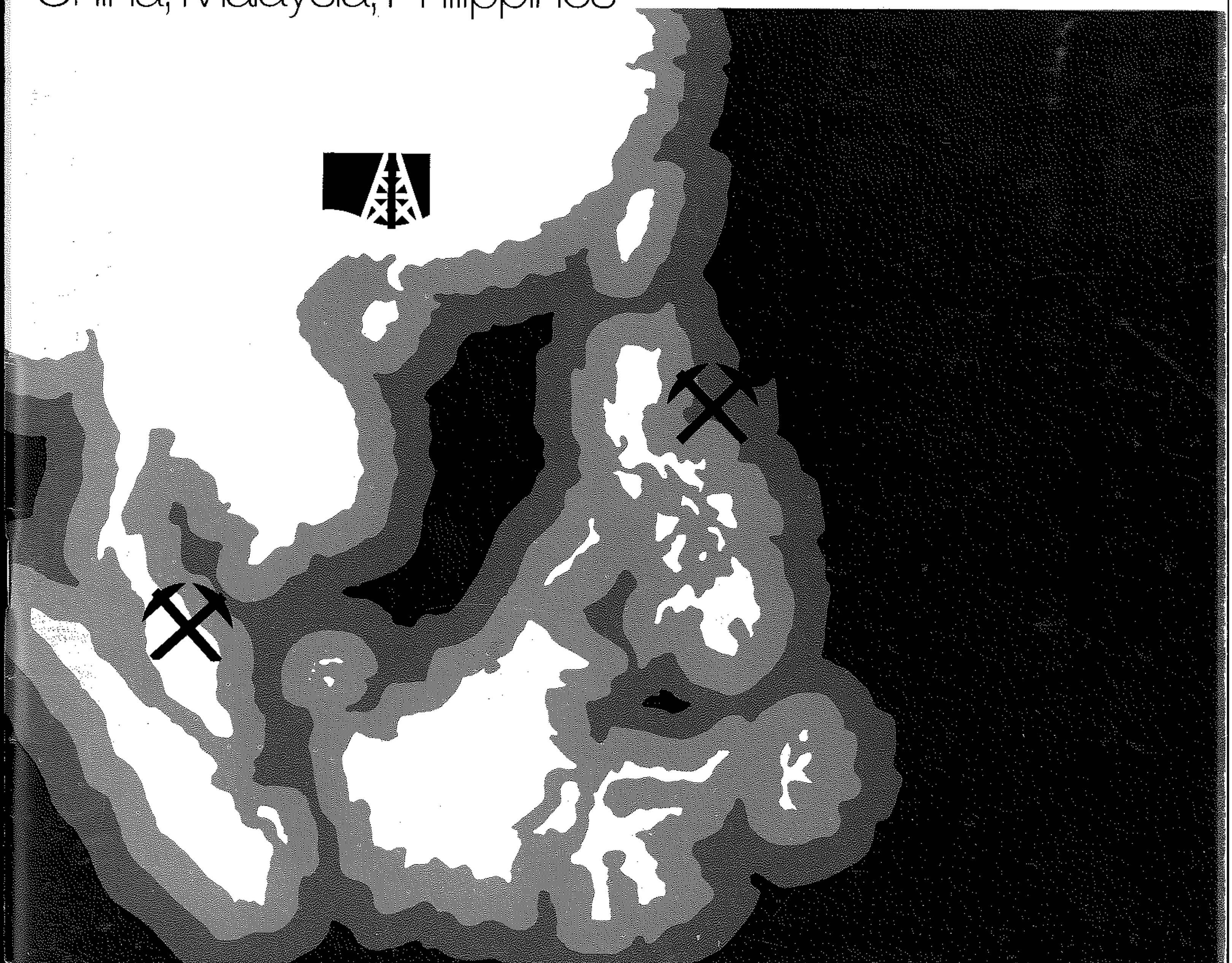
# mines magazine

april 1980

China, Malaysia, Philippines



Guggenheim Hall
Golden, CO 80401
(303) 279-0300, ext. 2293

## alumni events calendar

**April 8-10**—Cont. Ed. "Maintenance Management for the Mining Industry," Keystone, CO. For further information contact K. M. Barbour, CSMAA.

**April 11-12—E-Day**

**April 15**—Denver Section Meeting, Denver Athletic Club, 11:30 a.m., 12 noon luncheon.

**May 8-10—COMMENCEMENT PROGRAM**
8—Reunions for 1925, 30, 35, 40, 45, 50 & 55
9—Commencement Banquet, Green Center, 6:30 p.m.
**10—COMMENCEMENT**

**June 3-5**—Cont. Ed. "Maintenance Management Seminar for the Mining Industry," Keystone, CO. For further information contact K. M. Barbour, CSMAA.

**June 10**—AAPG Meeting, Denver, CO—CSM Alumni luncheon.

**July 29-31**—Cont. Ed. "Coal Industry Review", Denver, CO. For further information contact K. M. Barber, CSMAA.

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**volume 70** **april, 1980** **number 4**

## features



## departments



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## comments . . .

# Conversations With Nobel Laureates

by Sasha A. Cobb

Cobb

Recently, two Nobel Prize recipients, Dr. Rosalyn Yalow and Dr. Wassily Leontief, spoke at Colorado School of Mines on technological change and science in the service of man. Both have challenged dogma in their respective fields, both are explorers and problem solvers, and both believe in human innovation. But more importantly, both Dr. Yalow and Dr. Leontief have accepted the responsibility of presenting not only the basic elements of their work, but also the implications of their contributions and breakthroughs. Implications which are as controversial as they are important: nuclear power, radioactivity, responsibilities and ethics of scientists, planning, unemployment, and allocation of natural resources.

*Q. How can the United States avoid a nuclear war?*

**Dr. Yalow:** There is only one way: rely on energy from nuclear power. We are already rattling our nuclear arsenal in response to the situation in Iran. I am afraid that there will be a nuclear war unless we become independent of Middle East oil. I am surprised that President Carter with his background in nuclear physics does not encourage the development of nuclear energy.

*Q. Is coal a viable, temporary or otherwise, energy source?*

**Dr. Yalow:** I would much rather live next to a nuclear power plant than a coal-fired plant. Coal is dirty, coal power plants pollute and the pollution cannot be eliminated without prohibitive costs.

*Q. But are nuclear power plants safe?*

**Dr. Yalow:** Nuclear power plants can be run safely; as a matter of fact, people are exposed to more radiation during radiology treatment or during flying from New York to Denver, than at Three-Mile Island.

*Q. In your view, what is the solution to effective disposal of nuclear waste?*

**Dr. Yalow:** Use breeder reactors, which provide a continuous source of fuel. Plus, we have the technology to solidify nuclear waste and then effectively store it or to dispose of it.

*Q. I admire your commitment to speaking out on such controversial issues, why do not more scientists do so?*

**Dr. Yalow:** Most of us do not want to be tainted. I feel lucky that I have not yet been "smeared" as a result of my expressing my views.

*Q. Would you then blame the media for improper reporting?*

**Dr. Yalow:** The media looks for a good story, for sensational news, therefore, many events are exaggerated.

*Q. There seems to be a gulf in the communications between scientists and politicians, do you agree?*

**Dr. Yalow:** Yes, as I have said before, the scientists are much to blame for not actively seeking to work with the politicians to make technological advances properly understood.

*Q. Should scientists be "suprapolitical"?*

**Dr. Yalow:** As a scientist, I must be neutral with respect to political opinions, but not as a person.

*Q. Planning is a tool which can have significant application, how do you see planning with respect to your work?*

**Dr. Yalow:** Breakthroughs result from looking at the same problem differently, like Sol Berson and I did with respect to insulin, one makes new discoveries by working on various leads which cannot be planned.

Dr. Leontief, an economist and creator of input-output analysis, had quite a different view toward planning:

**Dr. Leontief:** It is absolutely necessary; with a plan it is simple to have reasonably full employment. We must plan for the consequences of policies and provide alternatives.

*Q. You mentioned unemployment, Dr. Leontief, can we really control unemployment?*

**Dr. Leontief:** In the less-developed countries, unemployment is inevitable, but in the more-developed countries, we can control it with a shorter work week, higher wages—i.e. a direct transfer of labor to capital.

*Q. How long do you think it will be before input-output analysis will be used in the United States?*

**Dr. Leontief:** One hundred years.

*Q. How do we encourage the use of input-output analysis?*

**Dr. Leontief:** If we want others to use a particular methodology, we draw them in, to be a part of its organization and creation.

*Q. Is allocation of natural resources possible on an international scale?*

**Dr. Leontief:** We already have an input-output model for the world. It is a difficult problem, but it can be solved.

In addition to optimism, Dr. Yalow and Dr. Leontief have presented some of the harsh realities of economic planning and nuclear power. The challenge now rests with the populace.

*Sasha Cobb is a senior in Mining Engineering at CSM. She interviewed Dr. Yalow February 26 and Dr. Leontief on January 30.*

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# China's Petroleum Industry— Geology, Reserves, Technology, and Policies

by A. A. Meyerhoff

The People's Republic of China is the world's most populous nation (official estimate of 975.2 million in 1978) and the third largest in size (9,457,385 sq km), after the USSR and Canada. Three main energy sources fuel the nation—coal (68%), petroleum (30%), and hydroelectric power (2%; Table 1). Although China possesses some experience with nuclear power and uranium resources are available, it seems unlikely that nuclear energy will play a major role in China before the year 2000.

Petroleum is assuming a steadily greater role within the energy mix, and production reached 2,080,000 bbl per day during 1978 and 2,120,000 bbl per day during 1979. Because production is greater than refining capacity and because China needs hard currency for foreign purchases, approximately 240,000 bbl per day was exported in 1979. This amount will increase during the next few years, but will not reach the large volumes predicted for the mid-1980's. China's offshore geology is far more complex than originally believed, and the offshore potential is relatively small—perhaps only 25-30% of China's ultimate production. The largest undeveloped petroleum potential in China today is onshore, particularly in the northern and northwestern basins. A final reason is that China needs the petroleum for itself—provided that sufficient refining capacity can be constructed.

To develop its petroleum resources China will need large amounts of foreign technology. Much of this technology will be of United States design, although individual units may be of non-U.S. manufacture. China does not intend to become reliant on another foreign power for technology, as happened with the USSR during the period of 1949-1960. China also intends to do most of the actual exploration and production, although foreign contractors may be allowed to participate during the initial stages.

There are several reasons for the shift toward a more petroleum-oriented economy. First, in many parts of the country, particularly in the northeast, east, and southeast, petroleum is a cheaper energy source. Second, transportation always has been a major bottleneck in China, and new discoveries in the northeast, closer to industrial centers, simplify the supply situation. Third, the modernization of industry, agriculture and transport requires liquid fuels in increasing quantities.

Much of what is forecast here depends on the survival of the nation's

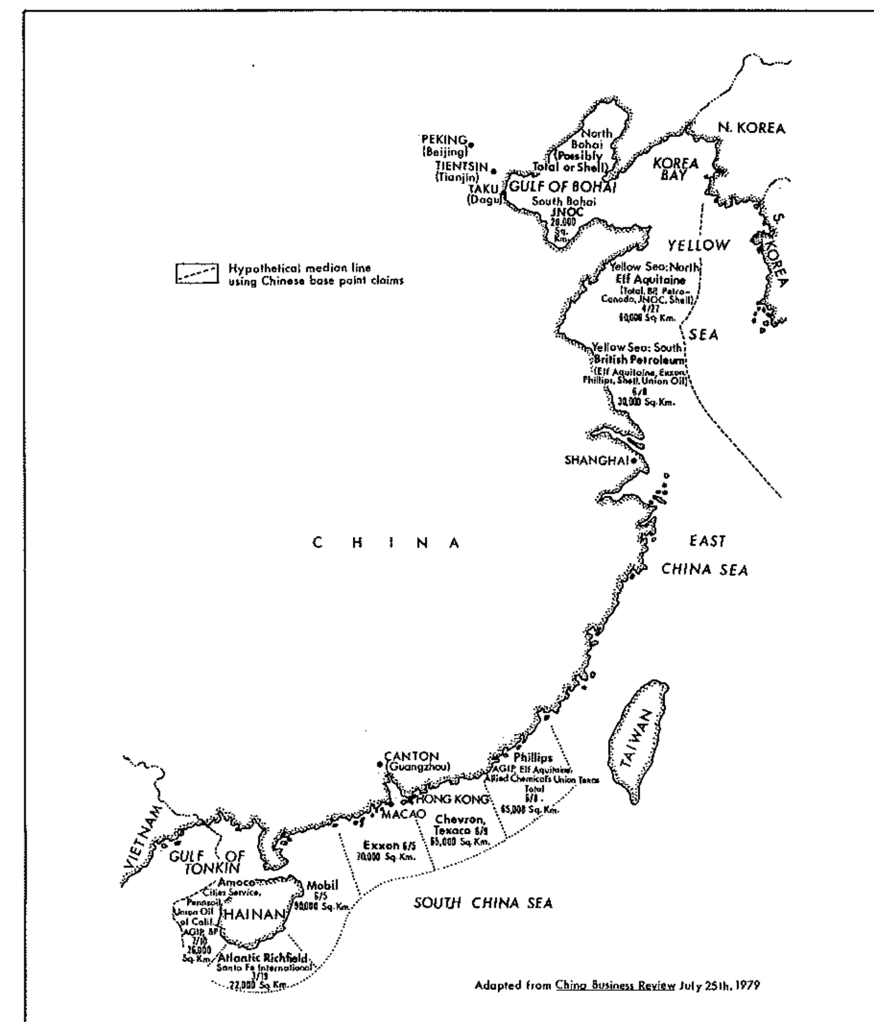


Figure 1.—Map showing approximate location and area size where foreign oil companies have signed contracts with China to conduct seismic surveys in offshore areas. Exact locations have not been announced at the request of China. The date listed is the 1979 date of contract signing. Operators for each block are shown in large type. Companies listed below are "original participants." Companies in parentheses had been invited to participate as of July 1, 1979, but had not given a final decision. Adapted from "The China Business Review," July-August 1979, p. 62.

present "outward-looking" policies and programs. Because of (1) the slow development of both offshore and onshore petroleum resources, (2) the limited supplies of foreign exchange, and (3) the very large amounts of coal which are available and are being mined, coal will continue to be a major energy source—if not *the* major energy source—during the foreseeable future.

## History

Coal has been an important source of fuel in China since the beginning of recorded history. Gas and oil* became energy sources in some areas during the period 211 B.C. - 1949 A.D. Shale oil has been used for energy for many decades, and became the principal source of oil within China during the Japanese occupation of 1937-1945. Shale-oil production declined as an important oil source after 1949, when exploration for production of natural petroleum commenced, with help from the Soviet Union.

China's petroleum industry probably is the world's oldest, with records of petroleum usage dating to 3,000 B.C. or before. Confucius, about 600 B.C., mentioned the deliberate drilling of wells for salt in the Szechwan basin. Gas deposits were found in that basin during the drilling for salt. In 211 B.C., a bamboo well—with a primitive percussion bit—was drilled deliberately for gas in Upper Triassic limestone on the Chiliu-ching anticline, west of modern Chungking. The gas was flared and used to dry the dissolved rock salt interbedded with the Triassic limestones. The method proved to be cheaper and much less time-consuming than the previous method of using salt-evaporating pans in the sunlight. Eventually wells were drilled to depths of 1,000 meters or more. More than 1,100 wells had been drilled on this one structure by 1900.

Oil seeps have been known since recorded history in nearly every sedimentary basin in China. By the 900's, oil and gas were exploited by bamboo drilling and by the digging of pits and shafts in the Ordos, coastal Yellow Sea, Pre-Nan Shan, Tarim, and Dzungaria basins.

The first commercial field discovered by modern drilling methods was with a cable-tool rig in 1897. The Tu-shan-tze oil field was discovered by Russian and Chinese drillers in the southwestern part of the Dzungaria basin. By 1945, eleven oil and gas fields had been discovered by modern methods, but only an estimated 20.3 million bbls of oil and 1.0 trillion cu ft of gas had been produced in the entire country by 1949.

A major hindrance to the development of a petroleum industry in China was the widespread belief by Western and Japanese geologists that oil and gas were generated only in marine strata. After the revolutionary regime was firmly established in 1949, Chinese and Soviet geologists began a systematic study of all onshore Chinese basins, both marine and nonmarine, and soon found numerous commercial oil and gas pools in reservoirs associated with source beds of nonmarine, continental origin (environments similar to that of the modern Great Salt Lake). By 1978, a total of 148 discoveries had been made, 85 of which produce today. Some are noncommercial; a few are now depleted; others are shut in because they are in remote areas far from highways, railroads, rivers, and/or pipelines. (Of 148 discovered, 41 were commercial discoveries by 1960, when Soviet technicians left China.) Of the 2,120,000 bbl per day produced during 1979, 93% came from nonmarine strata.

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| | | 1950[3] | 1960[3] | 1970[3] | 1977[4] |
|---|---|---|---|---|---|
| COAL | | | | | |
| | Annual production of raw coal (million metric tons) | 43 | 280 | 300 | 410 |
| | Coal equivalent (CE) (million mt) | 34 | 204 | 240 | 328 |
| | % share in total energy supply | 99 | 95 | 81 | 68 |
| OIL | | | | | |
| | Crude used for domestic energy production[1] (million mt) | 0.2 | 5.1 | 26 | 72 |
| | Coal equivalent[2] | 0.3 | 6.7 | 33.8 | 93.6 |
| | % share in total energy supply | 1 | 3.2 | 11.5 | 19.4 |
| GAS | | | | | |
| | Annual production (billion cu m) | nil | 2.0 | 16 | 43 |
| | Coal equivalent[2] | — | 2.7 | 21.3 | 57.4 |
| | % share in total energy supply | — | 1.3 | 7.2 | 11.9 |
| HYDROELECTRICITY | | | | | |
| | Annual production (billion kwh) | 0.7 | 9 | 12 | 34 |
| | Coal equivalent[2] | 0.1 | 1.1 | 1.5 | 4.3 |
| | % share in total energy supply | 1 | 1 | 1 | 1 |
| TOTAL ENERGY CONSUMPTION (Million mt OF COAL EQUIVALENTS) | | 34.4 | 214.5 | 296.6 | 463.3 |

[1] This figure takes into account the quantities exported, as well as crude oil used for petrochemcial purposes with no fraction available for energy purposes in the petrochemical industry.

[2] Conversion factors: CE/raw coal = 0.8
CE/crude oil = 1.3
CE/1,000 cu m natural gas = 1.33
CE/1,000 Kwh of hydro = 0.125

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## Geology and Geologic Conditions

Thirty basins and/or basin complexes are known from the onshore and offshore regions of the People's Republic of China. The total number of known basins will increase as offshore and onshore exploration is carried out. Not less than 148 petroleum fields have been discovered in these basins. Of these, at least 85 are producing today.

The geology of the onshore basins is quite well known, although large areas within the western and northwestern basins are unknown. The geology of the offshore basins is almost unknown, and knowledge of the offshore comes mainly from geophysical data, except in those few areas where some drilling had been done. The basins of China can be divided into two broad types, both characterized by fault-bounded margins. A third type also is known from some areas.

## Basins with Central Uplifts

The first type includes almost all basins west of the (Gulf of) Po Hai basin, the Sungliao basin, and the basins of the southeastern coastal region. These are large intermontane zones, generally of post-Early Permian or post-Early Triassic age, bounded on all sides by strongly folded, metamorphosed, and uplifted blocks of Paleozoic and older strata. Characteristically they are associated with east-west-striking fault systems on their western and eastern margins. In the middle of each of these basins is an uplifted central stable massif, and at the margins are deep sediment-filled depressions with thick sections of Permian and younger sedimentary rocks. Production to date is concentrated around the basin margins.

Examples of such basins are the Dzungaria, Turfan, Tarim, Tsaidam, Pre-Nan Shan, Ordos, and Szechwan. Of these, the Tsaidam and Szechwan contain large volumes of gas. The gas in the Tsaidam is of early Pliocene age and is continental. The gas in the Szechwan basin is much older—Triassic, Permian, and Sinian—and is marine. The Tsaidam gas is shut in for lack of pipelines and a market. In the Szechwan basin, up to 70% of the industrial energy is estimated to come from the giant gas fields south of Chungking.

Oil and gas pipelines within these basins are few. Oil pipelines connect some fields with refineries in the Dzungaria basin, but the oil is taken from the refineries by rail to the more central Langchow refinery. In the Tsaidam basin, an 1,100-kilometer pipeline is being completed to Lhasa—clearly for military use. This one line alone represent 19% of China's total *oil* pipeline kilometerage, and 16% of its total oil and gas pipelines.

## Basins with Central Depressions

These are the coastal and offshore basins of China, and include the late Jurassic-Cretaceous Sungliao basin of northeastern China (Heilung-kiang and Kirin Provinces; this is China's main producing basin), Po Hai, other northeastern China basins, and all offshore to coastal basins of Korea Bay, the Yellow Sea, East China Sea, South China Sea, and the Gulf of Tonkin. Faults also bound the margins of these basins, but instead of having a central uplift, these basins have a central down-faulted depression. Production, instead of being concentrated on the basin flanks, is mainly in the basin centers.

Production is from nonmarine strata—from the Cretaceous of the Sungliao basin, where the giant Taching (Daqing) oil field is located; and from the Tertiary in the Po Hai, coastal Yellow Sea, San Shui, and Tonkin basins. Faults within the Tertiary depresson of Po Hai are numerous. Some are active, and one was the site of the disastrous 1976 earthquake which struck this part of China. Some of the fractured Paleozoic and Proterozoic wells in the Po Hai are among the best producing zones discovered in China, with initial flows of 7,000 to 12,000 bbl of oil per day. An unusual occurrence is oil at Renqui, just south of Tientsin, where production is in fractured Proterozoic rocks.

This second basin type produces most of China's oil: 56.4% from the Sungliao basin, and 30.2% from the Po Hai basin. The San Shui basin may become more important during the next few years, as indicated by the fact that the Chinese have sent samples of San Shui oil to Japan for chemical analysis.

Whether offshore oil and gas will be mainly of marine or nonmarine origin is uncertain. The fact that geophysical data show most of the offshore area to be an extension of the nonmarine continental geology suggests that most future offshore production will be from nonmarine strata.

There are eight small gas fields and two small oil fields in western Taiwan, or just offshore from Taiwan. These fields produce from lower Pliocene and Miocene continental to deltaic sediments with marine interbeds. It is possible that the outer shelf edge of China, from near Japan and Korea on the north, to near Vietnam on the south, will be underlain by important volumes of marine sedimentary strata. To date, the offshore area appears to be a gas province, but oil—discovered in Tonkin, at San Shui, offshore near Taiwan, and onshore southeast of Shanghai—may be more important than gas as offshore exploration proceeds.

## Other Basins

Four areas of oil discovery in late Paleozoic and early Mesozoic include the Kwangsi-Kweichow syncline, the Tung T'ing basin, the Hsiangfan basin, and a possible complex of basins in Tibet (Xizang). The Tung T'ing basin produces 5.3% of China's oil. This basin is underlain by compressional foreland-type folds. The basins are not fault bounded. The structural trends within each basin parallel the mountain structures close by. Such basins do not seem to have a great future potential because of the small sizes and complicated character of the productive structures.

## Production and Reserves

The rise in oil and gas production has been steady in China, but has decreased during recent years because of difficulties in distribution, restricted refining capacity, and lower discovery rates. In addition, the country must still formulate a policy on exports. To date, the volume of exports has been limited by internal political debates, the need for hard currency abroad, and other considerations. Exploration success since the discovery of Taching has been modest, and no field the size of Taching has been discovered for more than 20 years. Taching—with an ultimate recovery of more than 8 billion bbl—is China's largest discovery. To supply future internal needs of this century, China must find at least 8-10 more Tachings within the next 5-10 years.

Undoubtedly several thousand fields remain to be discovered in all of China, but most of these will have ultimate oil recoveries in the 1- to 20-million-bbl range. Development of the offshore in areas close to major population centers has become extremely important, therefore, to China to make energy available close to major population and industrial centers. The huge and scarcely explored interior basins will have to be drilled intensively. Of particular promise are the huge Dzungaria and Tarim basins (Fig. 1). A major discovery was reported during 1978 along the northwestern margin of the Tarim basin, but its size has yet to be established. The Tarim basin along has an area of 500,000 square kilometers, so that development costs will be large.

Predicted onshore reserves of 42 billion bbl are based on good geologic present "outward-looking" policies and programs. Because of (1) the slow development of both offshore and onshore petroleum resources, (2) the limited supplies of foreign exchange, and (3) the very large amounts of coal which are available and are being mined, coal will continue to be a major energy source—if not *the* major energy source—during the foreseeable future.

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There are eight small gas fields and two small oil fields in western Taiwan, or just offshore from Taiwan. These fields produce from lower Pliocene and Miocene continental to deltaic sediments with marine interbeds. It is possible that the outer shelf edge of China, from near Japan and Korea on the north, to near Vietnam on the south, will be underlain by important volumes of marine sedimentary strata. To date, the offshore area appears to be a gas province, but oil—discovered in Tonkin, at San Shui, offshore near Taiwan, and onshore southeast of Shanghai—may be more important than gas as offshore exploration proceeds.

### Other Basins

Four areas of oil discovery in late Paleozoic and early Mesozoic include the Kwangsi-Kweichow syncline, the Tung T'ing basin, the Hsiangfan basin, and a possible complex of basins in Tibet (Xizang). The Tung T'ing basin produces 5.3% of China's oil. This basin is underlain by compressional foreland-type folds. The basins are not fault bounded. The structural trends within each basin parallel the mountain structures close by. Such basins do not seem to have a great future potential because of the small sizes and complicated character of the productive structures.

### Production and Reserves

The rise in oil and gas production has been steady in China, but has decreased during recent years because of difficulties in distribution, restricted refining capacity, and lower discovery rates. In addition, the country must still formulate a policy on exports. To date, the volume of exports has been limited by internal political debates, the need for hard currency abroad, and other considerations. Exploration success since the discovery of Taching has been modest, and no field the size of Taching has been discovered for more than 20 years. Taching—with an ultimate recovery of more than 8 billion bbl—is China's largest discovery. To supply future internal needs of this century, China must find at least 8-10 more Tachings within the next 5-10 years.

Undoubtedly several thousand fields remain to be discovered in all of China, but most of these will have ultimate oil recoveries in the 1- to 20-million-bbl range. Development of the offshore in areas close to major population centers has become extremely important, therefore, to China to make energy available close to major population and industrial centers. The huge and scarcely explored interior basins will have to be drilled intensively. Of particular promise are the huge Dzungaria and Tarim basins (Fig. 1). A major discovery was reported during 1978 along the northwestern margin of the Tarim basin, but its size has yet to be established. The Tarim basin along has an area of 500,000 square kilometers, so that development costs will be large.

Predicted onshore reserves of 42 billion bbl are based on good geologic information, and were calculated from the number of known drilled and undrilled surface structures. Because large areas of the north and northwest are covered by sand and therefore surface structures are buried, the 42-billion-bbl figure is conservative. Of this amount, more than 5 billion bbl has been produced, and production has passed the 774-million-bbl per year mark. Only about 11 billion bbl of proved plus probable reserves remains. The difference—26 billion bbl—is potential or speculative. Estimates of onshore gas reserves are uncertain, but 200 Tcf is a realistic figure.

Estimates of offshore reserves are based on the computer model described by Willums (1975)—30 billion bbl of oil and possibly 100 Tcf of gas. the gas estimate is likely to be conservative. Predictions for reserves "as great or greater than those of the Middle East" are press speculations that have no basis in geology or geophysics.

## Domestic Demand and Exports

Domestic demand currently is about 1,880,000 bbl per day, and exports are about 240,000 bbl per day, mainly to Japan. Only recently has refinery capacity caught up with domestic demand.

The presently exported oil goes principally to Japan, with smaller amounts to North Korea, the Philippines, Hong Kong, and Thailand. Some Chinese crude will be sold to other circum-Pacific countries, including the United States. The volume of exported oil, however, will not be great.

Some writers have predicted that China will be a major oil exporter—1,000,000 to 2,000,000 bbl per day—by 1985. Production for the mid-1980's has been predicted at 6,000,000 bbl per day, but a 4,000,000 bbl per day figure seems more realistic in view of the low discovery rate and the increasing delays in developing the offshore. It is unlikely that China will export much more than 1,000,000 bbl per day by 1985. China has the geologic potential to develop 6,000,000-7,000,000 bbl per day of production by the late 1980's, but the present slow progress offshore, the remoteness of the huge interior basins, and the huge capital expenditures that will be required to finance both offshore and interior-basin operations place such production (6-7 million bbl per day) beyond the reach of China's financial and technical capabilities.

A more serious problem concerns China's future political policies. The Maoist "looking inward" group still is a powerful force in Chinese politics. This group wishes to develop China slowly and to keep most of its oil for domestic purposes. The present "looking outward" group wants to develop China rapidly, and to this end desires to export larger volumes of oil and other materials for hard-currency acquisition. Much of China's future depends on the future direction of Chinese political policies—both internal and external. At present, however, even with the "looking outward" group in power, the prospects for significant exports by 1985 are dim.

## Role of Foreigners in Chinese Petroleum Development

China cannot develop its petroleum resources to the degree that it wishes without large influxes of foreign capital and high technology. To this end, several Western and Japanese companies will do extensive offshore geophysical studies in the hope of obtaining a role in the exploration for and exploitation of China's offshore reserves. Large-scale development of the remote interior basins will also require technology assistance. The question of how much foreign participation will be permitted is still very much "up in the air." China's long-term policy is to be self-sufficient in both exploration and exploitation. All mineral resources are the property of the state, and this policy will not change significantly in the foreseeable future.

China has purchased or copied more than 15 offshore rigs, and has replaced most 1960 and older Soviet onshore technology (turbodrills and seismic equipment) with Western technology. In the last decade, most rotary rigs have been imported from France, or copied from French designs, and China's dependence on Eastern European and Soviet technology has dwindled significantly.

Yet China still cannot manufacture sufficient exploration, exploitation, and downstream-operations equipment for its own needs. Pipe for pipelines is a particularly noteworthy example. Chinese-built pipe has little strength and is of small diameter. Large-diameter pipe presently is purchased from Japan. Japan and Western countries have been helping China to develop its refining industry. Despite foreign purchases to date, and the manufacture in China of some foreign-designed technology, China's technological development lags seriously behind its actual needs. Regardless of ambitious plans, self-sufficiency is decades away. In 1979, China had to scale down its ambitious industrial expansion programs, because of a lack of sufficient exports to acquire hard currencies. In fact, China revealed for the first time in more than two decades its overall foreign-trade position and its sizable budget deficits. These economic problems make it likely that China will become increasingly receptive to joint-production contracts as a means of payment for its foreign high-technology acquisitions. To become more receptive, China will have to gain experience in such joint ventures, and build a renewed confidence in foreigners, with whom China's past history has been bad—from ancient times through 1960.

## Political and Economic Role of Petroleum in China's Future

It should be clear that China's future courses of action in the petroleum industry depend entirely on whether China's present "outward looking" leadership policies prevail, or whether the nation reverts to the "inward looking" policies of the Mao era. The petroleum geology of China, although very different from that of most of the world, is favorable for the discovery of large reserves. The use of these reserves and the rate of their development—including the participation of foreigners and the purchase of foreign high technology—depend on China's future political trends. On the basis of past history, China has alternately welcomed foreign help and reacted strongly against it. The present political situation in China suggest that alternate "love" and "hate" cycles with foreigners will play a major role in China's development for the next several decades. In the long run, China's course of action will depend on how seriously this huge country wishes to modernize its present backward society and to participate in the affairs of the modern world.

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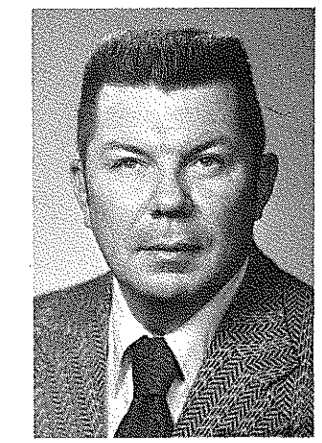


*Arthur A. Meyerhoff has attained worldwide recognition for his extensive and thorough geological exploration and the publication of the findings of that exploration. He has been associated with a number of companies, the USGS and was professor of geology at Oklahoma State University for some years. He is currently a partner in Meyerhoff and Cox, Inc., in Tulsa. He is a member of a number of professional societies and a fellow of AAAS, GSA and the Geological Society of London.*


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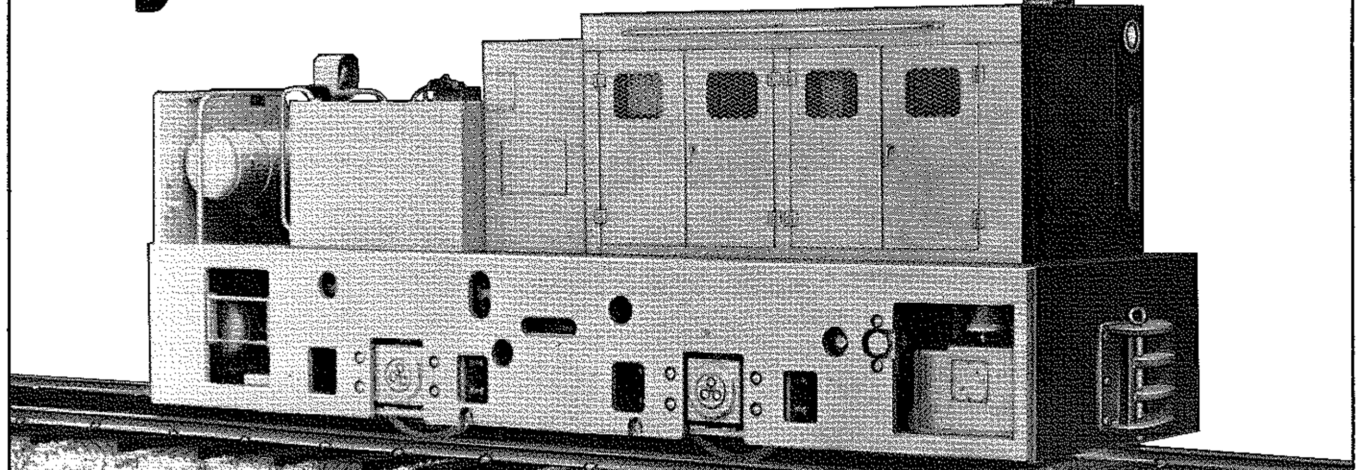
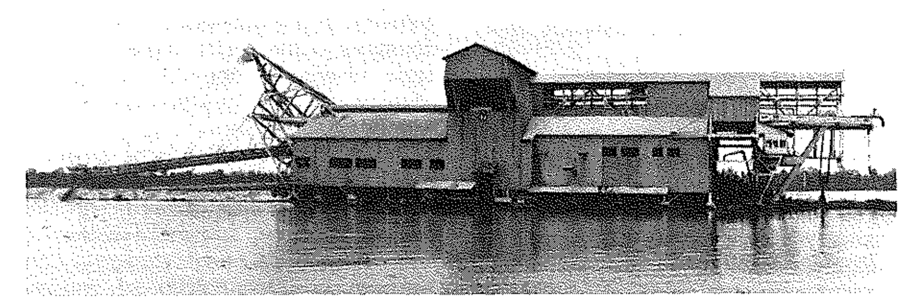


# Alluvial Tin Deposits in S.E. Asia

by Michael D. Russell, '53

Production of tin (in concentrates) from the countries of the free world is estimated to have been approximately 198,000 metric tonnes during 1979. There are some differences of opinion concerning comparison between supply and demand of tin metal (which has to take into account the factors of stocks and speculative trading) but consumption of primary tin metal is estimated to have been slightly lower than production for last year.



*A bucket line dredge mining offshore in Malaysia.*

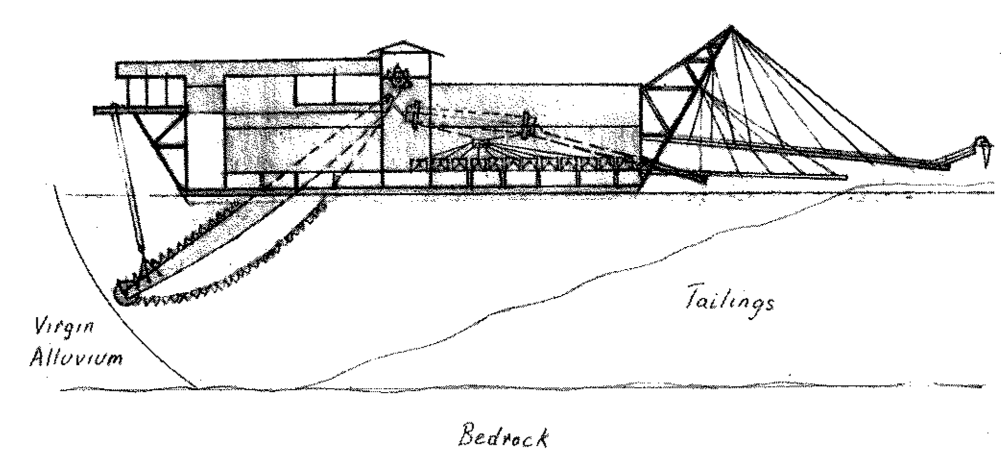
A breakdown of production figures from non-Communist countries for the year 1979 is not available yet, but percentages of this production are likely to be in the following pattern, judging from the preliminary half-yearly figures.

| | |
|---|---|
| **Malaysia** | 32% |
| **Thailand** | 16% |
| **Indonesia** | 14% |
| **Bolivia** | 14% |
| **Australia** | 6% |
| **Zaire** | 2% |
| **Nigeria** | 1% |
| **Other countries combined** | 15% |
| | 100% |

The importance of Southeast Asia as a source of tin, with 62% of the free world's primary production, can be seen.

Tin is one of the few commodities that is covered by an agreement, the International Tin Agreement negotiated under UNCTAD, designed to stabilise the supply and price in relation to the demand. The fifth I.T.A. is currently in force, with each Agreement lasting five years. The Agreement is generally recognized as being the most successful of all commodity agreements.

Malaysia Mining Corporation is a holding company with controlling interest in a number of publicly quoted tin mining companies in Malaysia and Thailand. Its sister company, Pernas Charter Management is responsible for the overall management of these mining companies. The group controls and manages a total 41 dredges, four of them offshore, and one open-pit mine, which together produce approximately 12% of the free world's output of tin.




*Schematic drawing of bucket-line dredge.*

### Occurrence and Exploration

In S.E. Asia tin occurs almost exclusively in its oxide form, cassiterite. The most common associated minerals are ilmenite, monazite and zircon. The first two are recovered and sold as by-products, whereas there is a little commercial demand for the quality of zircon occurring. Gold is found only in a few localities, as is struverite.

Hardrock mining for tin is not carried out on a significant scale in the region since the deposits occur predominantly in alluvial form, and many are considered eluvial in nature. Primary mineralization, from which the alluvial deposits were later derived, is considered to have occurred when the granitic magma, which now forms the main range of the Malaya Peninsula, intruded marine deposited limestone and shales during the late Mesozoic era.

Subsequent erosion and weathering has created alluvial deposition in what are now both onshore and offshore loose sedimentary strata. These mostly overlie either as weathered granitic bedrock, or the older limestones, or schists that were metamorphosed. The thickness of known mineralized deposits can range from a few feet up to over 300 feet, although current alluvial mining technology places an economic limit at around 200 feet. Offshore, a significant proportion of this depth may be sea water.

Exploration methods include the geophysical location of anomalities, favourable geological features, and contact zones, particularly for offshore areas. Onshore, geochemical prospecting and scout boring in geologically favourable areas are most widely used.

Evaluation of a potential deposit on land is carried out by Bangka churn drilling, either mechanically or manually operated depending on accessibility with the heavier components. Offshore evaluation is done from a boring barge and utilizing a Vibracore for deposits up to 20 feet thick which are not too compact, or mechanized Bangka drilling for the thicker and more compact sediments.

If scout boring indicates encouraging results, infilling is carried out. A grid of 8 x 8 chains is sufficient to prove a deposit of evenly distributed grades, whereas a 4 x 4 chain grid or less is necessary for erratic values. Values are traditionally stated in decimal parts of a local unit weight (a kati) per cubic yard of ore bearing ground. Cut-off grade in Malaysia can at present be as low as the equivalent of 0.08 lbs. per cu. yd., dependent upon operating costs of the particular mine.

### Mining Methods

Large corporate institutions with considerable financial resources generally mine with a bucket line dredge, provided the reserves they have located and obtained title to are sufficient to justify the capital cost involved. There are, however, numerous small operators, usually on a family or partnership basis among local citizens, who utilize a system of gravel pump mining.

Offshore, the larger mining corporations again use the bucket line dredges, specifically designed for offshore conditions. Suction cutter dredges have generally not been found to be efficient in recovery of heavy minerals, but various designs of submerged bucket-wheels are currently under investigation by the tin mining industry. In the offshore areas of some countries in the region there are small scale miners who operate, usually illegally, by using various suction devices with or without divers.

The principal evolution in the design of bucket line dredges over the past two decades has been towards greater digging capacity, and more extensive and efficient treatment capacity. This has reduced costs per cu. yd. and improved recovery, particularly of fine cassiterite, and has put into the economic category deposits that were previously considered submarginal.

A typical new dredge being designed and constructed presently would have a pontoon hull 320 feet long by 90 feet wide with a 9 foot draft. The digging ladder with its chain of buckets would be designed to reach only to bedrock of the intended area; maximum digging depth is limited to about 180 feet below the paddock water surface, due to the size and weight of components, but increased depth can often be obtained onshore by reducing the paddock level and dry-stripping ahead of the dredge. Close-connected buckets of 24 cu. ft. capacity would dig at a typical rate of 26 buckets per minute, achieving a throughput of 1200 cu. yds. per hour at 87% digging efficiency.

A bucket dredge excavates in a series of benches underwater so as to maintain a stable face of advance. The dredge works a face of approximately 1200 foot width, in three sections, moored by a long headline holding the digging buckets into the face, and traversing from side to side as it digs each bench by winching itself on a side bow and stern line on each side. The advance of each bench is typically 15 feet and excavation of a bench is carried out by lowering the ladder ½ to 1 foot with each traverse of the 400 foot section of the face being worked.

As each bucket in the chain, or band, reaches the driving upper tumbler it tips over to discharge its spoil into a dropchute, high up in the treatment plant on board. When stripping barren ground, a scuttle is opened in the dropchute to enable all material to by-pass the treatment plant and be discharged astern of the dredge via a stripping chute. When the dredge is treating however, all ore falls through a simple splitter to twin parallel trommels. Each trommel of our new dredge is 9 feet in diameter with 3/8 inch perforations over a typical length of 50 feet, and has high pressure jets delivered from a sparge pipe running up the centre of the trommel. Oversize is discharged immediately over the stern of the dredge, while undersize is collected into a hopper and fed evenly by gravity through a distribution splitter to the primary jigs.

If the ground to be worked as assessed to average 20% trommel oversize, this new dredge would have 48 primary 4-cell jigs of modified Yuba design. Tailings from the primary jigs are immediately disposed of far enough astern, via tailings chutes, so that their natural underwater slope does not cause re-digging and recirculation.

Hutch products from the primary jigs are then elevated by pumping the slurry to feed secondary jigs, and the product of these is again treated on tertiary jigs. The dredge concentrate as derived from the tertiary jigs runs at approximately 10% cassiterite by weight and constitutes the feed to be transported by locked mobile bins to the mill.

A dredge of this size will need both low and high pressure water pumps on board capable of delivering a total of about 40,000 g.p.m. derived from the paddock in which the dredge floats. The paddock water must also be kept relatively free of the suspended silt and slime fractions that are constantly being created. This is achieved by a 'slime pump' unit on a small separate pontoon, which extracts the suspended solids and disposes of them into settlement dams created on tailings behind the dredge.

Tin dredges have for many years been electrically powered, by a floating cable fed from an industrial power supply in the case of a land-based dredge, and by diesel driven generating units located on board in the case of an offshore dredge. The modern dredge being described would need about 4400 installed horsepower, although not all this would be in use at any one time.

The dredges operate 24 hours a day on three shifts. Regular maintenance is carried out as far as possible while operating and during two 'stopday' periods of approximately 6 hours each twice a week. Major repairs or modifications which require an extended shutdown are planned ahead as and when necessary, and are then also carried out on a 24 hour a day basis.

A typical new dredge will cost over $10 million to design and construct, excluding other necessary mine facilities and infrastructure. Pernas Charter Management will cost estimate and design such a dredge, producing final detailed drawings of every structure and component on this unit of over 7000 tons displacement, order all materials and equipment involved, and supervise the contracted construction. The pontoon hull is constructed initially on a slip-away, and then launched into a dock; fabrication and erection of the superstructure and installation of equipment and components subsequently takes place on the floating hull. The time required to design and complete the construction of a new dredge is 2 years.

### Milling

The mill is traditionally termed the 'tin-shed'. With the bulk of the feed from the dredges running between 30 and 200 mesh B.S.S., no initial comminution is necessary. Hydroclassification is the usual start of the flowsheet.

Dredge concentrates from many locations contain a high proportion of ilminite, one of the by-products, and in these circumstances wet magnetic separation is carried out early in the flowsheet to extract the bulk of this mineral. Next stages are normally wet gravity separation procedures using hydraulic up-surge washers, shaking tables and sluice-plate separators; these pre-concentrate most of the cassiterite in their head products. Extraction of the remaining cassiterite and ilmenite, and separation of the other principal by-products, monazite and zircon, are then carried out by dry treatment involving magnetic and electrostatic separation. Final concentration of tin concentrates to a smelter's grade of about 99% cassiterite is achieved by a traditional method of manual dressing in sluices.

### Smelting and Marketing

Many of the larger corporate mining companies, and practically all the smaller miners sell their tin concentrates direct to one of several smelters located in S.E. Asia, available to world markets.

My own group of mining companies have extended their operations further downstream, and sell the concentrates to a marketing organization within the group. The concentrates are then toll-smelted for this marketing company, which trades tin metal on all the prominent metal exchanges of the world.

My organization is currently designing and assessing the merits of constructing our own smelter also.

### Management

The management of the Malaysia Mining Corporation group of companies is the responsibility of Pernas Charter Management. Continuous operating management is the main role of P.C.M. and staff is provided for this both at mine location and at the supporting and head offices. In addition the company is responsible for all aspects of engineering design and construction, exploration, and feasibility studies for these companies. Services provided include mining, mineral processing, mechanical, and electrical engineering, geological and prospecting expertise, purchasing facilities, secretarial and accounting control, share registration, personnel management, security control, and computer services.

In addition to its regular management functions P.C.M. undertakes specific assignments in all aspects of alluvial mining both for companies within the group and at request from other clients.

*Michael D. Russell, E.M. '53, is an Executive Director of Pernas Charter Management, an organization which operates the world's largest group of publicly quoted tin mining companies. After graduation he started work as a Shift Engineer in Malaysia, where his family also has other business interests, with Anglo-Oriental which was a forerunner of P.C.M. Over the intervening years he progressed from Area Mining Engineer, Mine Manager, Area Manager, and Operations Director to become Chairman of Anglo-Oriental. That company merged in 1978 with Associated Mines, also based in Malaysia, to form the enlarged Pernas Charter Management organization.*





# Metal Marketing Views

by Henry A. Brimo
& Lawrence E. Smith

Metal marketing is an aggregate of functions; transferring title, moving metal from producer to consumer, buying, selling, storing, transporting, standardizing, financing, risk bearing and supplying market information.

Prospectors, geologists, miners and metallurgists have carried on the search for mineral deposits and have exploited them to supply metals for the urgent needs of mankind. The following is from an American Mining Congress publication: "Without minerals, we could not till our soil, build our machines, supply our energy, transport our goods or maintain any society beyond the most primitive."

The fossil resin, amber, was the precursor of precious trade mediums such as gold and silver. Extensive amber deposits were mined along the shores of the Baltic Sea. Flint, amber and salt—found in quantity at Salzburg, Austria, were the major commodities of commerce 3,000—2,000 years B.C. This trade surely became the forerunner of marketing functions, probably by barter—"I'll trade my flint point spear for your amber necklace and six hands full of salt".

An early silver bonanza was mined in Laurium, Greece around 480 B.C. and for centuries these state owned mines enriched the treasury of Athens. One of the earth's major group of silver mines played an important role in preserving Greek civilization against numerous threats from waves of attacking Persians. Not only were Persian Oriental traditions repulsed, but Athens long held a silver monopoly in the Mediterranean world.

This early treasure gave Athens a sustained economic clout that historians call Greece's *Golden Age of Commerce and Culture*. Here was an ancient development of metal marketing where trade by barter of commodities began to be replaced by establishing a silver standard of value.

A generous distribution of silver in a great many of the world's ore deposits has been a catalyst in developing an industrial demand far exceeding its primary production. This at long last has culminated in causing silver to crash through the $5.00 per ounce barrier in the third and fourth quarters of 1978, skyrocketing to over $22 per ounce for a one day high in late 1979.

*(Ed. Note: As of this writing, the price is $19.75)*

An October, 1979 shipment of a Pacific Basin producer of a silver bearing copper concentrate brought a London Metal Exchange (LME) settlement of $15 per troy ounce. 90% of the silver content was paid. It carried a $0.20 refining charge and a $0.15 miscellaneous charge deducted from the $15 base settlement. These miscellaneous charges are variable and dependent upon mutual agreement between seller and buyer. The silver was part of the residue, including gold, other noble metals and minor amounts of various metals below copper in the electromotive series, that dropped as anode sludge (slimes) in the tanks during the electrolytic refining stage of copper from (blister) anode to cathode. A $50.00 treatment charge per dry metric ton of concentrate, including ocean freight and handling of the material from shipper's loading port to the Smelter's unloading port and all risk marine insurance amounting to 0.2025% of estimated value of the shipment, was deducted from net metal payments. Since the concentrate contents were settled on LME monthly averages of refined, marketable metal, all refining costs for each metal were deducted in the computation presented in the provisional invoice settlement. 90% immediate provisional drawing is customary with the final invoice and balance of payment coming some 90 days later.

The pertinent figures of the provisional invoice are set forth below.

**PROVISIONAL INVOICE NO. 1073**
**SOLD TO: A New York Ore Buyer**

**COPPER CONCENTRATES**
**SHIPMENT #375**
**Produced at the Minesite**

COPPER CONCENTRATES (In Bulk) loaded and trimmed shipped per M/S "Ocean Wave No. 2" on October 30, 1979.

Quantity: Shipped Weights—5,250.00 Wet Metric Tons (Moisture 8.35%) or 4,811.500 Dry Metric Tons

Value: Dry basis; subject to final liquidation:

| | |
|---|---|
| Copper: | 24.10% (final assay was 25.10% Cu minus 1.00% per Smelter schedule) 24.10% x 4,811.500 = 1,159.5715 DMT or (2,556,414.52 lbs.) 1,159,571.50 Kgs. @ $0.7948/Lb. [0.8800/Lb. (Average October 1979 LME copper wire/bar price) x 99.75% (seller/buyer agreement] = $0.8778/Lb. − $0.0830/Lb. (refining charge from anode to cathode to wirebar) $2,031,838.26 |
| Plus: | Premium on Copper (share to seller on buyer's spot sales) 2,556,414.52 Lbs. @ 0.0075 Lb. 19,173.11 |
| | $2,051,011.37 |
| Silver: | 1.600 oz/DMT x 90% (smelter schedule) = 1.440 oz. x 4,811.500 DMT = 6,928.560 ozs. (215,502.47 gms) @ $14.65/oz. ($15.00 LME monthly average [less ($0.20 refining + $0.15 seller-buyer contract)] $ 101,503.40 |
| | $2,152,514.77 |
| Less: | Treatment charges (Smelting Ocean freight and marine insurance) @ $50.00/DMT x 4,811.500 $ 240,575.00 |
| | Amount Due $1,911,939.77 |
| | 90% Provisional Drawing $1,720,745.79 |

**Gold, the eternal treasure.** The largest gold nugget ever found weighed 83 kilograms (183 pounds). Its fine gold content in December, 1979 would have been worth in excess of $1-million but the rarity of a large nugget would bring many times its metal value as a museum piece or as part of a mineral display.

The Philippines in the mid-1930s became the forerunner of 41 operating gold mining companies by 1941—the impetus here was the U.S. gold price rise to $35 per ounce in 1932. Even with the frantic urgency to participate in the current gold bonanza, there seem to be few new strikes. There are numerous minor areas of activity throughout the world but the major effort is in extending the reserves of existing or old gold operations on the assumption that the current high price of above $350 per ounce is for keeps—we can recall a Cousin Jack miner stating in 1933 that the $35 figure was only political and not related to supply and demand!

With faith in high gold price stability, a Pacific Basin producer of copper, gold and silver in concentrate is looking into a 50 million ton fringe mineralization carrying a recoverable metal value of less than $10.00 per ton only. A low cost bulk mining method is applicable and fortunately, existing development and production headings penetrate the zone. A 10,000-15,000 metric tons per day supplement to the present concentrator feed will extend the life of the mine by another 6 years.

Looking at the gold settlement sheet of recent shipment, the potential is obvious:

**PROVISIONAL INVOICE NO. 1072**

**SOLD TO: New York Ore Buying Company**

**COPPER CONCENTRATE**
**SHIPMENT #375**
**Produced at the Minesite**

COPPER CONCENTRATES (in bulk, loaded and trimmed) shipped per MS "Ocean Wave No. 2" on October 30, 1979.

Quantity: Shipped Weights—5,250.000 Wet Metric Tons (Moisture 8.35%) or 4,811.500 Dry Metric Tons

Value: Dry basis subject to final liquidation

Gold: 1.305 ozs/DMT x 98% (Smelter schedule) = 1.279 ozs/DMT x 4,811.500 = (6,153.909 ozs) 191,408.11 grams @ $386.025/oz.

$390.00/oz x 99.75% (contract agreement between seller and buyer) = $389.025/oz − $3.00/oz (refining charge) = $2,375,562.72 90% Provisional Drawing = $2,138,006.45

The foregoing settlement figure became a 'technical adjustment' after reaching $438 per ounce on the Zurich metal market a few weeks before. 33 days after this $390/oz on the LME, it was back at $424/oz. and it sold on the world bullion markets at $524/oz. December 31, 1979, up from $226/oz. one year earlier.

Consolidated Gold Fields (South Africa) review, "Gold 79", reported: "It is certain that the acquisition and use of bullion will prove a constant feature of prudent asset management both in private portfolios and offical reserves. This reassertation of gold's traditional role as a store of wealth owes much to the attractive supply and demand picture that has emerged over recent years."

**Copper—Mid-1979.** Markets late in June ended their six-month decline with Comex cathodes dropping below $0.80 per lb. and cash wirebars below 900 per MT.

The period 1983-1985 is predicted to show a copper producer price of $2.00 per lb. in 1985, triple the 1978 average of 66 cents per lb. from a study released by Chase Econometrics.

We detail here a twenty-one year history of copper marketing of Pacific Basin producer showing with striking effect the wide range of copper prices and sometimes very narrow fluctuations.

**1958.** Our property is a low grade disseminated ore body with gold and silver by-product. Considering the sharp decline in the price of copper during the past twelve months to its lowest level since 1949, we realized our operations would not be much better than marginal.

**1959.** The price of copper was of prime concern to us. Presently, prices after refining charge are satisfactory, $0.64/kg. ($0.29/lb.), and have justified our decision made over a year ago to construct a mill when it appeared the bottom was about to drop out of the market.

**1960.** As early as March 1961, we were selling our copper at $0.595/kg. ($0.27/lb), compared to an average for the first semester of 1960 at $0.681/kg. ($0.309/lb.). The current depressed copper price was the result of surplus stocks due to world overproduction.

**1961.** The world market for copper appears fairly well established at what must be considered, in the light of recent history a reasonably satisfactory level, $0.613/kg ($0.278/lb).

**1962.** Our copper production during each of the past four years (1959 to 1962) was sold at $0.644/kg. ($0.2924/lb), $0.655/kg. ($0.2971/lb), $0.616/kg. ($0.2794/ lb.) and $0.629/kg. ($0.2855/lb.). These figures show the relatively narrow range of copper prices during the four years. This is an unprecedented situation for so volatile a commodity.

**1963.** Average copper price for the year was $0.626/kg. ($0.2841/lb.), adding to the remarkably long period of narrow range fluctuation. The current outlook is favorable, with a narrowing gap between consumption and production.

**1964.** Average copper price for the year was $0.685/kg. ($0.3106/lb). Currently selling prices were running well ahead of the 1964 level and we confidently looked forward to a higher average for 1965.



**COMMENCEMENT**
**May 8, 9, 10, 1980**

**Reunion Classes**
**1925, '30, '35, '40, '45, '50, '55**

**BANQUET**
**MAY 9**



**1965-1970.** Price volatility became the feature of this six year period attributed to a series of circumstances; increase in consumption, higher costs of operation, marketing problems caused by political difficulties in Zambia and Rhodesia, labor problems in Chile and particularly the 1967-1968 U.S. copper strike.

**1971-1972.** Price averages for the two years were $1.0255/kg. ($0.4653) and $0.9813/kg. ($0.44525/lb) respectively, continuing for many months in the doldrums until a steady rise began the last month of 1972.

**1973-1974.** The company's output was sold at an average $1.668/kg. ($0.757/lb) and $1.991/kg. ($0.904/lb) respectively for the two years. All sales represented sharp gains over previous levels but in the second semester of 1974, an economic slowdown of increasing severity ensued, triggered by the four or five fold increase in petroleum prices. 1975 will surely be a challenging year with a depressed copper market and continuing rising costs.

**1975-1976.** Copper concentrate markets were in some instances cut back—in our case 15% in 1975 and subsequently extended through 1976. Average prices for the two years were respectively, $1.162/kg. ($0.5273/lb) and $1.404/kg. ($0.637/lb). The problem of marketing our accumulated concentrates was resolved through shipments to a new market—The People's Republic of China, totalling 25,300 WMT of concentrates by the end of 1976.

**1977-1978.** Average prices received were respectively, $1.296/kg. ($0.588/lb), $1.349/kg. and $1.349/kg. ($0.612/lb). Despite the current extremely low copper price there is a recently developed demand for copper concentrate due to closure of a number of producing mines in several areas of the world. As of this writing the forecast of higher prices for 1979 appears to have been justified.

Arthur J. Wilson in the recent book, "The Pick and the Pen", Mining Journal Books, Ltd., discussed the pricing of metals with particular emphasis on copper—a summary is stated as follows:

- One of the main benefits of the metal exchanges such as LME (London Metal Exchange) and Comex (New York Commodity Exchange) is the establishment of common prices which provide highly positive terminal markets for some of the world's major metals.
- Most of the newly refined copper is sold either at prices which are fixed exclusively by producers or at prices which are related to quotations on one of the commodity exchanges.
- There has recently been some confusion with the crumbling of the producer system in the USA following adoption of Comex as a reference price for some of the major transactions.
- In addition, renewed attempts are being made by the governments of copper mining countries in the developing world to evolve a new formula aimed at bringing some stability into what has historically been a highly fluctuating market.
- As with the marketing of any other commodity, the law of supply and demand must be the root of all metal trading. The exchanges should reflect this balance at any one time, but they do so only in relationship to the tonnage which is sold on any particular Exchange. In the case of copper, this is a very small proportion of world primary production.
- The producer price system for copper tends to establish a price which is not strictly determined by supply and demand but rather an assessment of the balance between production and consumption.
- Each system is often roughly in line

with the other under normal conditions but copper is seldom normal.

- Costs of production by those who supply the market have a vast spread. Low cost producers make lots of money when prices are up, while high cost producers barely get by or face closure when the price slumps. (Prices existing in fourth quarter 1979 were a bonanza for almost any mine in operation at that time).
- Alvin Knoerr, **E/MJ** Editor from 1955-1969, once said of their *"Metal & Mineral Markets" (Now, "Metals Week"),* "We get nothing out of metal pricing except responsibility of doing an accurate job—one we are proud to have."

A mistake of a half cent a pound in copper on even a small shipment would mean someone was getting several thousand dollars more or less than he was really entitled to. Some years ago there was a copper slump and the true market price was at $0.77/kg. ($0.35/lb.). Chile was demanding $1.10/kg. ($0.50/lb) and temporarily was not selling any. Should their price be included in the compilation? Because of immediate past averages and future projections, the Chilean price was thrown out and corrected listed price was not distorted. This was a courageous decision considering the potential clout of a major copper producing nation.

### Backwardation and Premiums

During recent years, there have been major changes in both pricing and marketing copper concentrate and metals. Forward and backpricing have become common in both cases. Producer's prices, once so stable and precise, have succumbed to rather disjointed and erratic behavior. These primary producers who once disdained the volatility of quotations from so-called terminal markets (LME and Comex), now closely follow these markets.

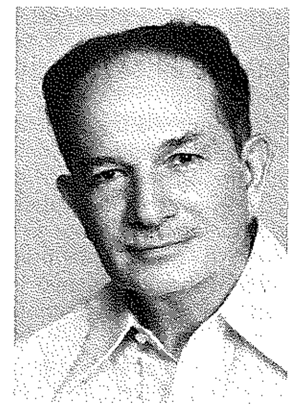
Most primary copper concentrate producers sell their output outside the United States based on LME average prices for current and some specific future month. Sales in the U.S., on the other hand, are dependent on whether concentrate or metallic copper is the product, and these closely follow Comex prices. In either case, back or forward pricing are accepted within certain limits.

In the past, copper was usually priced without reference to quality, provided accepted standards were met. During the past two years, more attention has been paid to the quality of copper concentrate and the copper metal and, as a result, premiums are being paid in many instances for the higher quality product.

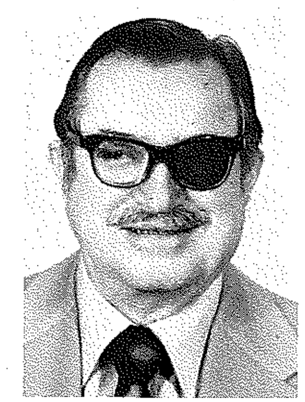
Students of copper markets should read the October 5, 1979 issue of Copper Studies, an affiliation of the Commodities Research Unit, Ltd. This issue thoroughly covered the major changes that are affecting pricing and marketing.

Metal marketing is a challenging and exciting activity for today's producers. It also brings great satisfaction in terms of the knowledge of *your* product's effects on the world's needs.

'"What Mining Means to Americans: American Mining Congress.



*Henry A. Brimo, president and founder of Philex Mining Corporation, has been active in mineral development in the Philippines for four decades. He has been involved in every level of the industry, and contributed greatly to both the mining and petroleum advances in his country. He has served as president or chief officer of a number of organizations having to do with export and trading on a general basis as well as the mineral/petroleum business. He is currently a member of the Philippine Export Council and chairman of the CityTrust Banking Corporation and president of the Philippine Overseas Drilling & Oil Development Corporation.*



*Larry Smith Met. E. 1931, is vice president for operations of Philex Mining Corporation, a major copper and gold producer in the Philippines. He has been involved in gold mining in Mindanao, iron ore mining in Luzon, and copper mining in the Visayas and northern Luzon. He was responsible for the opening of the Ralston Creek Uranium Mine (Swartzwalder), in Colorado, in the mid-1950's.*

**—mm—**

# World Politics and The Engineer Today

by Ralph Buultjens

Almost a century ago, the Victorian poet Matthew Arnold spoke of a poignant condition:

***Wandering between two worlds***
***One dying and the other powerless to be born.***

We live in that description today, at the crossroads of history, between the past that is fading under the assault of the present and a future that is uncertain. This is a moment in which the possibilities for destruction and creativity have expanded almost beyond human comprehension.

In the 20th century, we have transformed patterns which had remained relatively unchanged for most of human experience. The natural flow of events and circumstance have been radically altered and at a pace never before recorded. Consider five configurations which demarcate our era:

- In 1900, only 15 percent of the world's population lived in or near cities; by the year 2000, approximately 60 percent will live in urban situations.
- In 1900, only about 5 percent of humankind was literate; by the year 2000, around 60 percent will be able to read and write.
- In 1900, the average global life expectancy of an individual at birth was 35 years, by the year 2000, it will be close to 70.
- In 1900, work was the dominating experience of human existence, with the sixty-five hour work week in the United States considered relatively progressive; by the year 2000, work will be far less significant and the amount of individual disposable time will be higher than ever before.
- In 1900, the global population was one and one-half billion people; by the year 2000, it will be around seven billion—the largest and most resource demanding it has ever been, yet the smallest it will probably be for a long time thereafter.

Each of these circumstances will be unique in history. Never before has there been a predominantly urbanized and literate global civilization with so much time available to so many long-lived people. In less than one century, the pathways of culture which have been constant for thousands of years have been destabilized. The political, social and economic consequences of this convulsion have yet to be observed—and there are no precedents with which to create a response.

## II

The political context of the 20th century has accelerated these changes. The world of 1900 was a world of certainty. There was little indication that venerable institutions and approaches would essentially disappear in a few decades. Empires, colonialism, monarchy, laissez-faire government and other elements of the political past have been replaced by new nations, innovative ideologies, changed forms of government and radically different instruments of power.

Great political struggles have persisted, but their proponents, components and scope have changed. The limited battles of World War I killed twenty million people and destroyed the age-old notions of the glory of war. World War II annihilated fifty million people and destroyed the idea that a major modern conflict could be geographically contained. Cold wars replaced hot wars as the ideological struggles of the East-West conflict followed on World War II. These, in turn, drifted from the active confrontations of the 1950's and early 1960's to coexistence and, more recently to selective cooperation interspersed with occasional low scale vibrations. And the North-South confrontations between industrially rich nations and traditionally poor countries have begun to replace the residual tensions of the Cold War—a trend suggesting that economics has moved to the center stage of international politics.

Overarching these political shadows is a struggle considered vital by a major portion of the world—the struggle between traditional and modern visions of society. This is a conflict much more profound than ideological and primarily economic disputes. Its eventual impacts will resonate with greater consequences for the global community as a whole. Events in the oil producing nations, especially Iran, in Afghanistan, China, Cambodia and other countries appear to foreshadow convulsions in the future. The clash between modernization and tradition is as much psychological as it is physical. Since the modern-traditional conflict is likely to be the vortex of tension in much of the world, perhaps the basic requirement for understanding international affairs today is a set of socio-cultural tools with which to construct rational new political, economic and diplomatic policies.

The themes of world politics today suggest that we are at an intersection of two concurrent and overlapping revolutions. These are revolutions in the manner in which nations and peoples perceive and relate to themselves and others and thus are probably more far-reaching in their consequences. The first of these is a *vertical revolution*, a change in the ways in which people look from the present to the future. It involves attitudes to modernization, environment and ecology, population and resources and a variety of other things. The second revolution is *horizontal revolution*—an emerging redistribution of economic and political power in the world. Petrodollars, the consolidation of economic blocs in Western Europe (ECM) and Southeast Asia (ASEAN), the economic rise of Japan and the political rise of China, and the resource producers unions of the Third World are indicators of major rearrangements in the balance between states. And, for the first time in about five centuries, the scales do not tilt toward Western nations.

## III

This panorama of political and socio-economic change requires individuals concerned with the future of their professions to re-examine entrenched ways of doing things and to evaluate anew the elements which determine success and failure. The role of the engineer acquires a different definition as he or she must relate occupational competence to the larger concerns of science, society and world politics. To pursue this exploration requires three brief excursions:

- Into the relationship between the scientist and the engineer, and the lessons to be learned from the recent history of these professions.
- Into the circumstances which change roles and create new possibilities for the engineer today.
- Into the adjustments which the technical mind can expect to make if the opportunities of a changed role are to be developed.

In many ways, the charter event of the contemporary era was World War II. As with any seminal historical happening, the war had many dimensions and consequences. It was also an outstanding example of how science and engineering combined, coexisted comfortably and made major joint contributions to the Allied victory.

After World War II, for a variety of public relations and political reasons, the *know-why* of science began to receive more public support, to rank higher in esteem and to procure more funding than the *know-how* of engineering. This trend escalated after Sputnik went into orbit in October 1957. The Soviets hailed their achievement as a triumph of both science *and* engineering; the United States public and politicians perceived it as primarily a scientific accomplishment. The American scientist was transformed into a policy-adviser, if not a policy-maker. The romance of science captured the public imagination and the technology of engineering was relegated to a less attractive status—a process encouraged by scientists, the media, and the financial establishment of this country. The activities of the National Science Foundation in the first dozen years after its founding in 1950, clearly suggests support for this thrust. To a significant extent, engineers, more concerned with professional competence than with professional organization, contributed to their own disadvantage.

The era of the romance with science lasted almost twenty years. By the mid-1970's, conditions began to shift and the enchantment began to recede as public confidence in the nostrums of science began to erode. Five important features contributed to this change:

- Sustained resource shortages became a reality. Conservation and cost-cutting took on a new urgency. Industry has become more interested in making things work better than in making things.
- Economic pressures have increased in the Western industrial world. Productivity has become a weapon with which to fight inflation and competition. Financial managers have come to realize the vital role of engineering to the success of their investments.
- Competitive industrial economies, especially Japan and West Germany, have placed greater reliance on engineering and realized the benefits of this policy. This connection between engineering and industrial success has not been lost on the rest of the world.
- Science is increasingly costly and, as economic difficulties intensify, can only be afforded if society creates the wealth to pay for it. The creation of this wealth comes more from the application of technology than from pure scientific research.
- Perceiving science as a form of culture was fashionable in more affluent times, particularly in the 1960's and early 1970's. In a less comfortable circumstance, artists and poets and historians are less expensive types of culture to support. Society *now* pays more for science because it expects a practical return. And most practical returns involve the engineer.

The crises of World War II enhanced the professional and societal recognition of scientists and engineers. The tensions of the Cold War projected the scientist ahead of the engineer and of most other occupations. The confluence of the challenges of the 1980's and the global economic and political situation of the late 1970's, suggest that the value of the engineer and engineering has now taken a new significance. From energy to ecology, from economy to employment, from inflation to insulation, the engineer stands closer to and in higher regard of the policy-maker than at any time in the past two decades.

Thus, the capacity to influence policy, a relatively new opportunity, is now increasing. In a world with a long agenda of problems, the competencies and creativity of the engineer can make a vital contribution to society and its survival. The successful and enduring realization of these opportunities demands cultivation of a wide sense of public responsibility—the price of advancing the profession is that it "go public". Translating these challenges into reality also requires the engineering mind to explore and accommodate many dimensions of a non-technical nature. Six of these are of particular significance:

- First: How, in the socio-political environment, to expand the traditional role of the engineer-as-hired-specialist to include a new public role (a transition which the scientist accomplished thirty years ago) and how to organize the profession and education for this purpose.
- Second: How to restore civic faith in the social judgement of the engineer. Perhaps an effective starting point would be a willingness to accept more responsibility for the public consequences of professional actions and advice. The implications of public accountability are sobering for the professional associated with technology.
- Third: What ethical and moral considerations attach to the greater responsibilities of the professional as policy-maker? Reconciling and balancing civic and private interests is one such consideration. Developing a more holistic appreciation of socio-technic-political cause and effect is another.
- Fourth: When, in the international environment, to recognize the importance of context; when and how to supplement functional expertise with necessary political and socio-cultural awareness. Given the rapid internationalization of engineering, acquisition of this information becomes a necessity.
- Fifth: How to confront the awesome choice between patriotism and professionalism, a choice now thrust upon the engineer for the first time in recent history.
- Sixth: Where to stand in the conflict between modern and traditional visions of society. The engineer is purveyor of technology, but that may provoke a hostility which impedes physical access to his field of action.

There are no clear-cut and glib responses to these concerns. Their growing relevance for the engineer indicates that the path to enhancement of the profession and leadership within it lies as much in understanding elliptical influences and in acquiring new intellectual and organizational tools as it does in advancing conventional skills. Excellence will always depend on capabilities and talent, but functional competence is increasingly the outgrowth of linkage between professional resources and larger visions.

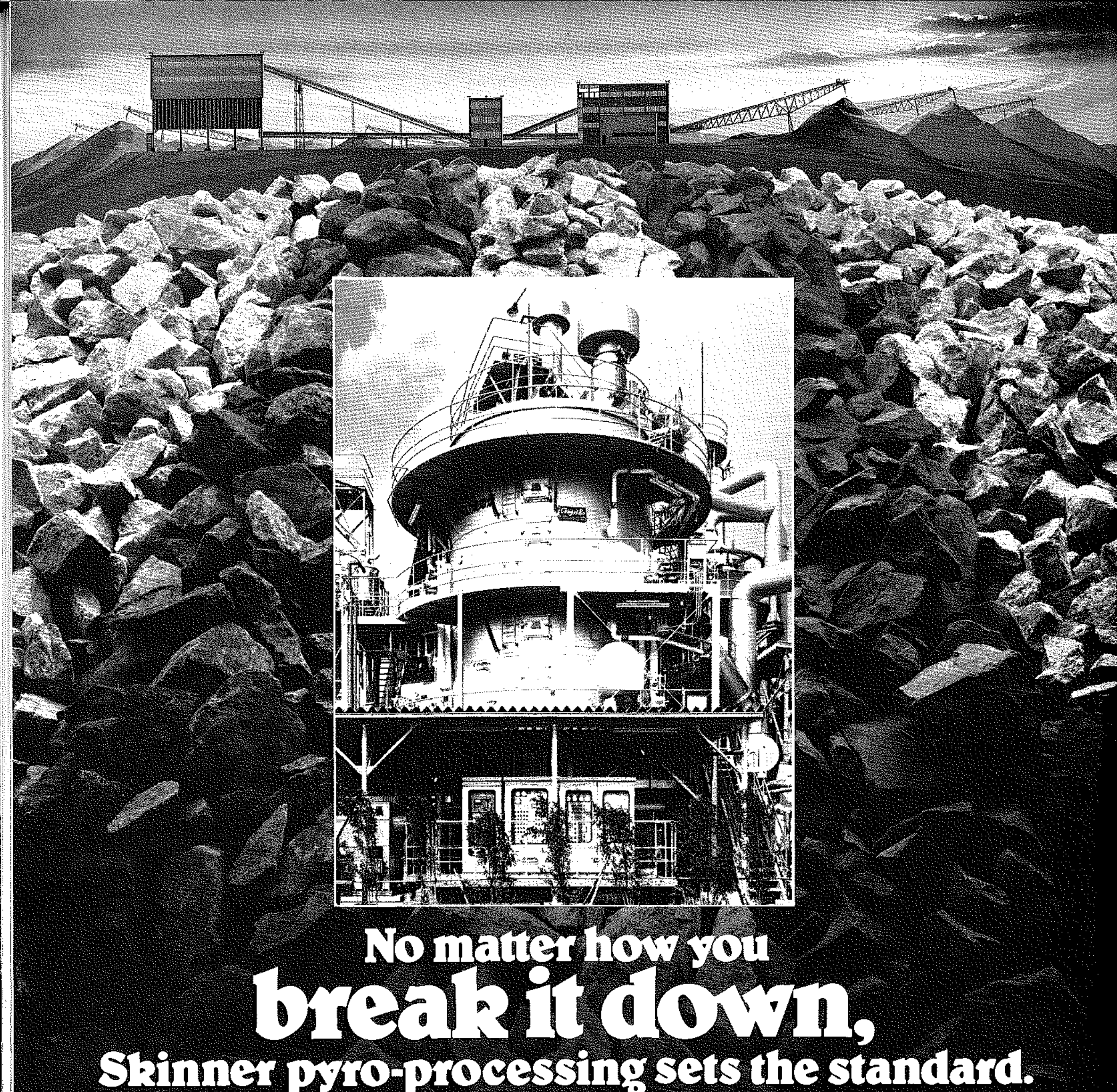
Twenty-five centuries ago, the father of Greek tragic drama cried:

***Some men see things that are and say: Why?***
***I see thing which never were and say: Why Not?***

Aeschylus' question—why not?—is perhaps the most appropriate motif for engineers as they reflect on personal and professional roles in today's political world.

—mm—

*Dr. Buultjens is AMAX Presidential Professor at CSM for the 1979-1980 academic year.*





# letters

Dear Ms. Petty:

This letter is in response to Robert L. Kessler's article in your January issue entitled "Coal Transport—Problem Area."

We at Burlington Northern certainly agree with Mr. Kessler's statement that adequate rail transportation is essential to the efficient operation of power plants. We do not agree with his assessment of rail freight rates and service.

Coal producers and their utility customers enjoy lower rail freight rates from the Powder River Basin than from other regions of the nation. Burlington Northern's coal rates average about 1.1 cents per ton-mile. By comparison, the national average for bituminous coal transportation by railroad is 1.9 cents; for grain 2.8 cents; for iron ore 3.1 cents, and for all commodities 3.3 cents.

Powder River Basin coal users are getting a transportation bargain on shipments which include some of the longest overland bulk commodity hauls in the world. They do so in spite of the fact that in a time of runaway inflation, massive rail reconstruction has been necessary to permit the handling of the required numbers of these very heavy coal trains.

Mr. Kessler's assessment of the current Powder River Basin rail service situation also is invalid. Since BN completed its 116-mile Gillette-Orin line connecting two main lines through the Powder River Basin in November, we have been able to shave from one to two days off most cycle times. In January and February, we would have been able to move over one million more tons each month if the mines and the utilities had called for it. As of March 1, BN had 30 unit train sets in storage. These cars, about 3,300 in number, represent idle annual coal transportation capacity of over 15 million tons.

The availability of equipment now makes it obvious that present rail capacity is more than adequate to handle today's demand. For the future, continuing track capacity expansions have been planned to meet realistic projections of demand. This task is eased by the fact that new utility plants require six to eight years lead time before they can begin operations.

In short, coal transportation capacity in the Powder River Basin is now ample to meet present demands, and we expect it will remain abreast of future needs.

Sincerely,

Michael M. Donahue
Vice President, Coal
Burlington Northern

Dear Pat:

I have been reading with a great deal of interest your pertinent and to-the-point articles and editorials in MINES Magazine and want to congratulate you warmly on your timely efforts. Those articles are worthy of nation-wide propagation.

On another subject, I would like to call the attention of all alumni who may read this to a cause of deep common interest to all Mines men and women. This is not a complaint nor a gripe; on the contrary, it deals with a pleasant subject, for it has to do with our magnificent 'M' on the top eastern slope of Mount Zion; the symbolic emblem of the Miner.

The Blue Key organization at Mines, which is dedicated to selfless service to the School and to the student body, has been for decades the honored "Keeper of the M." These young folk, girls and boys alike, sacrifice time, effort, and yes, money within their meager student means to accomplish the services they perform. Were you (whoever reads this) to attend Blue Key meetings, as I have been privileged to do for a number of years, you would come away with a warm glow and feeling of reassurance as to the type and quality of students attending Mines.

At our last Blue Key meeting it came out that all the devoted care, baling wire, scotch tape, sweat and saliva that has kept our illuminated 'M' within an inch from blackout, cannot do miracles any more. Some renovation is needed now: new sockets, wiring, bulbs, etc. These thoroughbred youngsters are looking at a cost of close to $2,000 and are desperate; they want to fulfill their responsibility to all Mines men and keep our symbolic 'M' aglowing. But, what with tuition, lab fees, books, food, lodging, clothes . . . hell, they can't cut it without help.

Conclusion: It's our 'M', the symbol of *all* Miners, and I, as one, am contributing $100 to the 'M' renovation fund. Please join me in this singular and very special Miner's project by sending your contributions to the Blue Key, Colorado School of Mines, Golden, Colorado 80401.

Bless you all and you, too, Pat.

Sincerely,

S. M. del Rio



# 1980 Colorado School of Mines Commencement Events

**May 8-10, 1980 (Thursday thru Saturday)**

Name ______________________ Year ________

Address ______________________

☐ YES, I am planning to attend the 1980 COMMENCEMENT Events! **Please send a detailed schedule of events.**

☐ My spouse and guests listed will accompany me: ______________________

☐ YES, I'd like to reserve tickets for the Alumni Cocktail Party and Banquet.
(__________ tickets @ $11.00 each)

☐ YES, we would also like to sponsor ________ 1980 graduates for the Cocktail Party and Banquet.
(__________ @ $11.00 each) **Cash Bar**

☐ YES, I plan to participate in the Faculty-Alumni Golf Tournament, Friday, May 9th.

I need ________ tickets for the audio coverage of the Commencement ceremony, Saturday morning. (Enclose your check and the completed form above—MAIL TODAY!

All other events are being arranged by the various reunion classes, 1925, 1930 (50th anniversary class), 1935, 1940, 1945, 1950 and 1955. Members of these classes will be contacted by their committees.

**CSM ALUMNI ASSOCIATION—GOLDEN, COLORADO 80401 (303) 279-0300 X 2293**

# alumni update

**'27 Edward C. Borrego E.M., Hon. Mem. 1969, Medalist 1972,** was one of thirteen SPE members honored by the AIME Executive Committee as Legion of Honor 50-year members. The newly qualified members of the legion may display the insignia of the legion as earnest of their distinction.

**'29 Eugene E. "Buz" Davis,** Associate and Life member, who is a faithful friend to the Alumni Association, was in town for the Founder's Day dinner and to attend the Alumni Day College. Buz is retired from the telephone company, but keeps extremely active in other ways—he does volunteer work for the Crime Prevention Unit of the Cheyenne Police Department, and has received five citations for bravery from that unit.

**'36 Carl L. Morris, E.M.,** has been elected Chairman of the Board of the Golden, Colorado Savings and Loan. Morris retired earlier this year as assistant chief engineer for Western Operations, Climax Molybdenum Co.

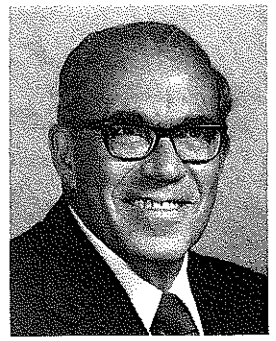
**'40 Herbert D. Thornton P.E.,** is Chairman of the Board, Paris Petroleum, Inc. He makes his home in Bellaire, TX. Among those attending the AIME convention in Las Vegas was **Douglas V. Watrous E.M.** Doug is head of his own consulting firm in Idaho Springs, CO.

**Jim Thompson, E.M.,** has retired from Kaiser Engineers, Inc., after 23 years with the firm. Jim will be active in the consulting field, with an emphasis on mineral engineering and economics. An interesting sidelight on Jim—he has been a member of CSM Alumni Association constantly since graduation, except for three years spent in a Japanese prison camp during WW II.

**'41 Martin Heggland, P.E.,** is a current member of the Board of Directors for the national Society of Petroleum Engineeers of AIME.







**James E. Lawver**

**'43 Robert Greider, Geol. E.,** is now President of Geothermal Resources International, Inc., in Marina Del Rey, California. Bob was formerly associated with Intercontinental Energy Corp. **James E. Lawver Met. E. and DSC. '53,** has been named recipient of the 1980 Robert H. Richards Award by the AIME. The award was established in 1947 to recognize achievement in mineral benefication. Dr. Lawver's primary work has been with phosphate, potash and iron ores, and he holds numerous patents and has written 41 publications on this subject. Dr. Lawver received his award at the annual AIME banquet in Las Vegas recently.

**'47 W. A. Colburn E.M., MSc. Met. 1951 and DSc. Met. 1954,** is now President of Magnesep Corporation, Denver.

**'48 William G. Cutler, P.E.,** is currently Manager, drilling operations, for Northwest Exploration Company, based in Denver.

**'49 B. E. Coles, P.R.E.,** is now senior engineer for the Sedco Energy Corporation, Dallas, TX. He was formerly with H. J. Garry and Associates.

**'50 Niles E. Grosvenor, E.M. and MSc. Min. 1952,** has been designated Senior Vice President of Gates Engineering Company, consultants. The main office of the firm is located in Beckley, W.VA., and Niles is in the Denver office.

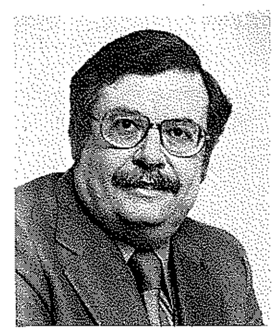




**'52 George A. Carlisle, Met.E.,** is attending Western State University College of Law, in California, with the intent of completing a Juris Doctor degree.

**'53** New Staff Director, Petroleum Engineering for the Natural Resources Group of Phillips Petroleum Company is **James E. Curzon, P.E. Raymond F. Peluso Met.E.,** is now technical director of Hydelco, Newbury Park, CA.

**'54 Ed Cutrell, Met. E.,** is now owner/broker for Cutrell Properties, in Arvada, CO.



**Nathan J. Hoffman**

**'55 Nathan J. Hoffman, Met. E.,** has been named a Rockwell International Engineer for the Year, as part of that company's program to honor its scientific and engineering community. Hoffman, who has been with Rockwell since 1955, is a project engineer for Energy Systems group in Canoga Park, California. The award is given each year "in recognition of demonstrated technical excellence in engineering or scientific activities relevant to the company's business," according to Rockwell International President Donald R. Beall. **Glen R. Graves, Geol.E.,** is the owner/director of Tornos Automaticos Taca C.A., based in Caracas, Venezuela.







**'58 William C. Bagby BSc. Pet.,** is now president, Texas Vanguard Oil Co., based in Houston. Bagby was formerly with GCO Minerals Company. **Ethan H. Gilman, Geop.E.,** has been elected vice president of engineering for Colorado Interstate Gas Co., wholesale supplier for the Public Service Company of Colorado.

**'59 Harold M. Knudsen, MSc. P.R.E.,** is back in the U.S. after a project in Saudia Arabia. He is now senior process engineer with Procon Pacific Operations, in Los Angeles. **C. Ogden Smith, Geop.,** has been promoted to general manager, exploration, for the Houston division of Ladd Petroleum Corp.

**'60 Hassan Alief, Geol. E.,** has been transferred to Khartoum, Sudan, by Chevron Resources Company, a subsidiary of Standard Oil of California. Mr. Alief will be in charge of exploration for the Chevron Exploration Corp. of Sudan. This is a new venture for the company and he will be setting up the entire operation.

**'61 George S. Dennison, E.M.,** who is a sales engineer for the Nash Engineering Company in Denver, was one of the attendees at the Alumni Day College, held in conjunction with Founder's Day in February. Dr. R.E.D. Woolsey was in charge of the one-day course. **William W. Walker, Geol. E.,** formerly a consulting geologist, has accepted the vice-presidency of Canyon Resources Corp., of Golden, CO.

**'63 Harlan W. Erker, Geol. E.,** and his partner in the firm of Zorich-Erker, Ted Zorich, attended the CSMAA Day College. **Martin C. Kuhn, Met. E., MSc. Met. '67 and PhD. Met. '69,** is vice president and general manager of Minerals Separation Corporation, of Tucson, AZ.

**'65 John J. Schocke, E.M.,** has been named president of Brown Badgett Inc., a Natomas coal mining subsidiary. He will be responsible for the operation of Brown Badgett's four surface and one underground mine in Western Kentucky. **Orlie A. Gallegos, E.M.,** is currently senior mining engineer with Pittsburgh and Midway Coal Co. Prior to this position, Orlie was with Gulf Mineral Resources.

**'66 Bradford P. Boisen, E.M.,** vice president of Terrametrics, is teaching a course, utilizing his wide experience in earth mechanics, in the CSM Mining Department. The course is titled, "Underground Construction and Applied Geotechnical Instrumentation." **Ahmet Coskun, Met.E.,** has written from Istanbul, where he is project and expansion manager of Rabak A.S., to renew his ties with the CSMAA. Rabak produces electrolytic copper, brass, bronze, aluminum and steel products. Coskun remembers with pleasure his classmates and professors during the period 1962-1966 and sent warm regards to them. Another "lost" Miner has reappeared—**Robert K Towner, E.M.,** was recently on campus interviewing prospective employees from the graduating students for his company, AMAX, Inc. Towner makes his home in Climax.

**'67 Terence P. McNulty DSc. Met.,** has joined Kerr-McGee Chemical Corp. in Oklahoma City as vice president, technical operations. McNulty will initiate technical studies, provide technology assessments and oversee development and application of new or improved technologies in the chemical mining and processing, mineral beneficiation, electrochemistry, and pigment-finishing operations of the company.

**'69 Gunter B. Moldzio MSc. Min.,** is president of Energy Data Services, in Englewood, CO.

**'71 Steven J. Heller BSc. Geol.,** is employed as mine foreman at the Henderson mine of AMAX Inc. **Charles S. McNeil BSc. Min.,** formerly director of engineering for Perma Resources Corporation in Colorado Springs, CO, has been named executive vice president of the firm.

**'72** The J. R. Simplot Co. of Pocatello, Idaho, has announced the appointment of **Oral D. Staman, BSc. Geol. E. and BSc. Min. '77,** to the position of director of technical services at the J. R. Simplot Conda Mine, Conda, Idaho. **Sam C. Prutch BSc. CPR,** has accepted a position as reservoir engineer with Kansas Nebraska Natural Gas. He was with Public Service of Colorado prior to this.

**'73** New project geologist at Power Resources Corp., Casper, WY, is **E. Thomas Cavanaugh BSc. Geol. and MSc. Geol. '76.** One of the alumni attending the annual Alumni Day College was **Thomas W. Haycraft BSc. CPR,** who is an engineer with Drake Engineering and Construction Co., Winter Park, CO.

**'74 Fred Steinberg BSc. Geol. E.,** has recently joined the staff of Strata Energy, Inc., oil and gas exploration division of Armco Inc. He will be an exploration geologist for the firm. Mormac Oil and Gas Co. has added **Gary L. Nydegger BSc. Geol.** to its exploration group as exploration manager and consultant.

**'75 James C. Waugaman BSc. Math,** who was systems analyst with Cities Service Co. in Alaska, is now a geophysicist with Union Oil of CA, based in Lafayette, LA. **Michael G. Leidich BSc. Mn.** is now mines manager for the Robinson Brick and Tile Co. in Dever. He was formerly with Geokinetics Inc.

**'76 James F. Walsh BSc. Min.,** is a product engineer with The Robbins Company, based in Seattle. Jim was recently on campus accompanying two Peruvian engineers who were surveying various mining techniques in the U.S. **Danny W. Hagood MSc. Min.** has taken over the responsibility of ventilation engineer for Jim Walter Resources, Inc. He makes his home in Brookwood, AL.

**'77 David J. Kelly BSc. Met.,** is now metallurgical engineer A, employed by Kennecott Minerals Company, Silver City, NM. **Stewart L. Sampson BSc. Geop.** is a geophysicist with Mesa Petroleum Co., in Midland, TX.

**'78 Robert S. Thurston BSc. Met.,** is currently employed at a metallurgical engineer, quality control, with CF&I, Pueblo, CO.

**'79** Agrico Chemical Company, Mining Division, has added **Lori Stute BSc. Met.,** to its staff in Mulberry, FL. **Ricky W. Sledge BSc. Pet.,** is a newly employed engineer with the engineering office of Amoco Production Company in its Farmington District Office.

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# China After Mao— Death of a Revolution?

by Ralph Buultjens, with a foreword by Indira Gandhi

**International Study and Research Institute, New York, 1979, 79 pp., including indices, comparative tables, and selected readings.**

Dr. Buultjens terms this small volume an essay; in her forward, Mrs. Gandhi characterizes it as a monograph. By whichever term one chooses for it, it is a surprisingly enlightening collection of information, which, as the author says he intends, present a balance between general information and specialized interpretation. Again, according to its author, it derives from several lectures given to both academic and civic groups. Its origins are cleverly concealed, for there is a unity to the presentation that does not reflect in any way that it represents several different discussions held at various times.

The central theme of the discussion is that China is still, for all of the apparent opening up of the recent times, an enigma poorly understood by the rest of the world. To strengthen this thesis, Buultjens reaches back into the incredible past of the country to the accomplishments of the early Chinese. Such things as a writing system and bronze technology were in existence in China 1700 years before the birth of Christ—when the rest of the world was far behind. Buultjens states that this early progress at once gives present-day China an impetus and serves as a negative force on the present advancement of the nation.

China is challenging history—for if it succeeds in the restoration of power and strength held for many centuries, it will be the first of the ancient civilizations to have accomplished this feat. The difficulties of this are great, considering that China has only recently become reasonably united, but consideration of the huge numbers of people involved, about 1 billion, the large amount of land to be governed, make it appear to be an all-but impossible endeavor.

Dr. Buultjens, in tracing the evolution of modern China, brings together the history of Mao Tse-tung, and the tremendous influence this one man had had on the development of the present structure of the nation. He points out that Mao was responsible for at least a dozen happenings of major importance in the nation, over a period of almost 60 years. Beginning with the establishment of the Chinese Communist Party in 1921, the Long March, collectivization of agriculture, the Sino-Soviet links and then break, and, finally the rapprochement with the United States in the 1970's, Mao led the country as no other leader in history has ever succeeded in doing. Buultjens characterizes him as one of the greatest statesmen the world has ever known—and questions whether the policies and aims of this man will continue to influence the development of his country.

It is important to remember, the author says, that Mao never held absolute power—he governed only with the consent and cooperation of others— a feat which enhances his stature. It is easier to be a despot, such as Stalin, than to gain the confidence of a sufficiently large number of people who will accede to a single policy.

Mao took the views of Lenin, whom he admired, and expanded the narrow revolutionary line of Lenin into a broad, encompassing movement. He espoused Lenin's theme that competent men must be isolated to rule the masses, but took it far beyond the meaning expressed by Lenin. He managed to find thousands of men who were both dedicated to his revolutionary principles and competent to administer them, thus insuring that his control would be the most powerful force in the country.

He aimed this control at the largest, most oppressed segment of Chinese society, the peasant class. It was here that he built his strongest base, and here that this base was maintained. He is still regarded as a great idol by the class that he brought into the mainstream of Chinese politics.

The task of the present government, to bring the idealism and force of Mao into a manageable entity in the world, is complicated by the great love and the more than 50 years of labor the peasant class spent in the service of Mao and his philosophy. Dr. Buultjens questions whether the current leadership, desperately struggling to advance modernization in the country, can utilize the Maoist influence for good, and at the same time, wean the people of China away from the principles considered old-fashioned and out of date by the present leadership.

As Mrs. Gandhi states in her excellent foreword, "Yesterday's allies can become today's adversaries and tomorrow's friends." The quote can be applied to the relationship between today's leadership in China and Chairman Mao, and it can also be applied to the developing relationships between China and the rest of the world. Dr. Buultjens sounds a warning for all the world, a warning which clearly states that all nations must learn more, consider more, and be exceedingly wary of the 1 billion people now struggling to reestablish their historical imperative of world preeminence.

—Patricia Curtis Petty

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# Press, Politicians & Petroleum

by Brodie Farquhar

"Idiotic", fumed United States Senator William Armstrong, (R-Colo.), referring to the proposed federal windfall profits tax on oil companies. The comment took place at a panel discussion on energy, at the Colorado Press Association convention in the Brown Palace, February 23.

"Even advocates of the bill admit that it would damage domestic production, at a time when we are highly dependent on foreign oil. To a degree, I have to blame part of this mess on the oil companies, thanks to their gutless, poor public relations," he said.

Other panelists from the energy companies agreed with Armstrong. Tom Dougherty, vice-president of Petroleum Information, called the windfall profits tax an obscene perversion of the free enterprise system.

Said A. B. Slaybaugh, vice-president of Continental Oil Company, "If we can keep that money, we'll find more domestic oil and develop oil shale. This use of private money, in private hands, is far more efficient than any government program."

Yet the windfall profit tax had some defense at the panel seminar, composed of members of the press, oil companies and heads of government agencies. "There are good arguments on both sides of the fence," argued Dr. Charles F. Metzger, director of the United States Department of Energy, Region VIII. "We can use it to help balance our national budget and develop alternative energy resources, or we can ask the public to carry that double burden with higher taxes and prices," he said.

The panel was then asked, if oil companies could internalize all of their profits, could oil companies turn around the national decline in oil production?

"If we can eliminate rigid land use barriers—the answer is Yes!" said Ed Cahill, economic consultant to Standard Oil of California.

Cahill noted that the United States has a vast amount of energy resources available to it—oil, gas, coal, oil shale, geothermal, nuclear, bio-mass and solar.

"The only problem is the long time-lag we face on development of these resources, plus the high costs of that development," he noted. Cahill noted that the combination of price controls, high taxes, lack of environmental balance and rigid land use was preventing the U.S. from making effective use of coal.

"Another problem is the adversary relationship that often exists between government and industry. The end result seems to be a hostile citizenry," he exclaimed.

Cahill then urged the press in the audience to concentrate on informing the public as their foremost duty, rather than shooting for flashy headlines. "Back your stories with solid facts and figures. Develop sources in government, the academic community—get as many views as you can. Above all, help educate the public about economics," wryly noted the Standard Oil economist.

Although a representative from Mobil Oil wasn't present at the seminar, that company did come under press criticism for its recent purchase of the Montgomery Ward chain of stores.

U.S. Senator William Armstrong (D-Colo.) came to Mobil's defense, noting that with current obstacles (price controls, high taxes and talk about nationalization), "We seem to be encouraging people to get out of the energy business. Increasingly, investment in energy development is producing lower and lower returns. A stable, outside investment like the purchase of Montgomery Ward, would look pretty good these days," he declared.

Cahill concurred, "The oil industry invests heavily in energy development, with only 5 percent invested outside energy areas. For example, Standard has invested more money in energy development this year, than our entire profit from the U.S. market," he said.

Several panelists from the energy companies claimed that the government was not helping, but was actually hindering the search for new energy resources. Said Blaine Miller, president of the Rio Blanco Oil Shale Company, "If it were not for federal price controls, we could have commercial oil shale plants in operation right now. A lot is going on, but much more would happen if the government got completely out of the picture."

A. B. Slaybaugh agreed. "You can find lots of horror stories in the field of synthetic fuels development—price controls, vague environmental regulations, etc. Under current conditions, imposed by the government, my company would have to tie up $1 billion for four years, to start up a commercial oil shale plant. That is a lot of money," he noted.

"The key question is," said Senator Armstrong, "do we have industry or the government do it? If the Energy Mobilization Board is approved by Congress, government and industry can come into Colorado and develop oil shale on a crash basis, with untold damage done to our state. I'm afraid that Congress believes that we must do "something," even if it is wrong, when we are in an environment of crisis."

A lot of questions were left unasked or answered, or partially so, including the title of the seminar: "Who is doing what for the public in this energy crisis?"

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**COMMENCEMENT**
**MAY 8, 9, 10, 1980**
**Reunion Classes**
**1925, '30, '35, '40, '45, '50, '55**
***BANQUET MAY 9***

# in memoriam

**JOHN D. STRASSER**

John D. (Red) Strasser P.E. 1941, died in Montebello, California January 23, 1980, after a lengthy struggle with cancer.

Strasser was born and reared in Denver, and attended Regis High School before entering Mines. While completing his college education he was a member of ATO, on the track team, participated in intramural sports and sang in the Glee Club.

Immediately following his graduation, he was commissioned as a 2nd Lt. in the Corps of Engineers. Assigned to the 46th Engineers, he served in Queensland and New Guinea. He was wounded and later hospitalized in Melbourne, then spent a tour of duty in Sydney. After a period of time in Washington, D.C., he returned to civilian life with a captain's rank.

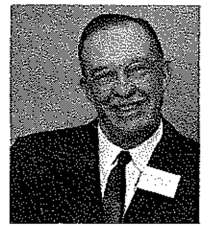
Most of Red Strasser's life was spent as a process engineer and manager in the petroleum and chemical industries. He worked for Shell Oil, Bechtel, C. F. Braun, Ralph M. Parsons and Best Fertilizer Company. The last 13 years of his career were with Fluor Corporation, and he was a project manager for that firm until his death.

John is survived by his wife, the former Yvonne Moloney, whom he met and married while stationed in Australia, and an aunt, Rebecca Strasser of Denver. Mrs. Yvonne Strasser makes her home at 16361 Colegio Drive, Hacienda Heights, CA.

The following comment by a good friend and fellow alumnus best describes the way Red Strasser's friends felt about him, "John was my idea of a typical Miner—full of humor and common sense, courageous and hard working. We will all miss him."

—*Robert L. Wilson, Geol.E. 1941*

Ed. note: We are indebted to Mr. Wilson for the information on Mr. Strasser's career and the words to describe his friend. Thank you.



**JOHN D. MARR**

John D. Marr MSc. Geology 1931 and DSc. Geology 1932, died November 8, 1979 in Houston, where he made his home for a number of years. At the time of his death, Dr. Marr was a consulting engineer in petroleum geology, which career he had followed after his retirement from Ray Geophysical Division of Mandrell Industries, in 1966.

Marr's career ranged over a wide spectrum of interests in geophysics, and he was well-known for both many major oil and gas discoveries and his numerous publications. He began in 1933 with Independent Exploration Co., moved to Tidewater Oil Company, then to Seismic Explorations, Inc. When SEI merged with Mandrell Industries, he became a vice-president of the Ray Division.

He was a member of various professional societies, including AAPG and SExG. He was a long-time member of the CSM Alumni Association.

Dr. Marr is survived by his wife, Kathryn S. Marr, Houston, and a sister, Mrs. Francis Conant, Medford, N.J.

**WALTER C. SPENCE**

Walter "Chris" Spence E. Met. 1952, died September 14, 1979 Vancouver, B.C, where he had made his home since 1975. A native of England, Mr. Spence was 52 at the time of his death.

Spence attended school in England, and worked for several years before coming to the United States in 1949 to enter Mines. His early training in his native country was all in metallurgy and he entered this option with an excellent background.

Upon graduation, he accepted employment with the Andes Copper Mining Company in Chile, later returning to the United States. Other positions included a period of time with the CSM Research Institute, New Jersey Zinc Company, a stint in Tasmania, Australia, and work in Canada. When he died, he was employed by H. A. Simons International Ltd., consulting engineers. He had been with this firm since 1975, in the capacity of senior metallurgical engineer.

He is survived by his wife and three children.

**JOHN V. SELVIDGE**

John Vivian Selvidge E.M. 1923, died in late 1978 in Kansas City, Missouri.

Mr. Selvidge had been out of touch with CSM for many years, and there is no knowledge of his work, family or survivors.

**DORSEY E. MAYHUGH**

Dorsey E. Mayhugh E.M. 1921, died in early 1977, according to information recently received in the Alumni Association office.

It is believed that he is survived by a daughter, Mrs. Mary Ann Sample, of Colorado Springs, Colorado.

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**EDWIN D. BIEBER**

Edwin D. Bieber E.M. 1947, died January 29, 1980 in Tucson, Arizona. He had been employed as precipitation plant engineer for the Phelps Dodge Corporation just prior to his death. A native of Colorado, Bieber was 59 years old.

Bieber worked with the U.S. Bureau of Reclamation before WW II. He entered the service and served in North Africa and Italy, attaining the rank of captain. Following his discharge from the U.S. Army Engineers, he entered Mines and graduated in 1947. While at the School, he was a member of Kappa Sigma, Theta Tau and the AIME Jr. chapter.

Employed by ASARCO in 1947, he worked at that company's Santa Barbara, Chihuahua, Mexico unit for seven years. He was then an engineer for Climax Uranium Company, leaving to work for American Gilsonite. He returned to Climax, then left that firm in 1969 to move to Arizona for Phelps Dodge, his last employer.

A member of the CSM Alumni Association, Bieber was in frequent correspondence with the Alumni Office, and a long-time supporter of the organization.

Survivors include his wife, Marguerite, two daughters, Mary B. Kurtz and Marguerite B. Darst, two sons, Edwin C. and Michael R., a sister, and five grandchildren.

**MORGAN J. DAVIS**

Morgan J. Davis Honorary Doctor of Engineering, 1964, died December 31, 1979. Mr. Davis, a petroleum geologist of world-wide fame, graduated from the University of Texas in 1925 and received a degree from Harvard Business School, Advance Management Program.

His distinguished career in the petroleum industry culminated with his appointment, in 1956, as President of Exxon Company, USA. He later became Chairman of the Board and C.E.O. of that company, and held that title until his retirement in 1963. At the time of his death, he was still active in his field, heading his own consulting firm, Morgan J. Davis Associates. He was a member of a number of professional societies, had received numerous awards for his contributions to the petroleum industry, and wide recognition for his social and philanthropic work in many areas.

Mr. Davis is survived by his wife, Veta Moore Davis, two sons, Morgan J. Davis, Jr. and James Harrison Davis, a sister and a brother and seven grandchildren.

**TIMOTHY GERARD ASHE**

Timothy Gerard Ashe, BSc. Min. Eng., 1978, was fatally injured in a coal mine accident on February 13, 1980 near Albers, Illinois, and died the next day. At the time of his death he was employed by Monterey Coal Company, a subsidiary of Exxon Corporation. He was born June 3, 1955 in Pensacola, Florida.

Mr. Ashe began his education at Tulane University, and transferred to MINES in the fall of 1974. While at MINES, he attained an outstanding academic record, being placed on the Honor Roll or Dean's List every semester. He was a recipient of the Hill Foundation Scholarship, the James Adami Scholarship, the Murchison Award, and was a member of Tau Beta Pi. Upon graduation, he received the Old Timers' Award, which is given every year to the outstanding mining graduate to be employed by the coal industry.

As a member of Beta Theta Pi fraternity, Mr. Ashe was admired and respected for his leadership and personable nature. He held the offices of Intramural Chairman, Scholarship Chairman, and President. Brothers who attended MINES with him have set up a scholarship in his name, and tax deductible contributions can be sent directly to the CSM Foundation, Inc., Golden, CO 80401.

Mr. Ashe is survived by his father, Herbert J. Ashe, E.M. '49, his mother, Gloria, two brothers, Herbert J., Jr. and Michael, and a sister, Mary. An uncle, Donald G. Ashe, Met. '50, also graduated from MINES.

**HARVEY G. THOMPSON**

Harvey G. Thompson BSc. Math 1972, was killed in a one-car accident in Florida late in 1978. The news of his death was not received in our offices until just recently.

Following graduation, Thompson was employed in the computer science field, and worked in Garland, Texas for E-Systems as a senior programmer.

He is survived by his parents, in Rifle, Colorado.

## Mine Health and Safety Institute

The Colorado School of Mines has announced the permanent establishment of the Institute of Mines Health and Safety on its campus.

Assisting mine operators in complying with Mine Safety and Health Administration (MSHA) regulations and providing academic expertise to government regulatory agencies are the two general objectives of the Institute, according to Prof. Robert T. Reeder. Reeder, a veteran member of the school's Mining Engineering Department, has been appointed director of the newly-created entity.

Making affordable consultation available directly to the mining industry is to be the thrust of the organization. The non-profit institute will be engaged in research projects in mine health and safety. Technical support will be given to the school and to state agencies whose functions relate to the mining industry.

The institute is the outgrowth of five health and safety conferences held annually at the Colorado School of Mines. An annual conference will remain the focal point for the Institute with the Sixth Institute on Mine Health and Safety slated for November 12, 13, and 14, 1980.

Reeder and his staff are presently identifying specific services that can be immediately provided to industry. A list of research projects will be compiled. Funding is actively being sought with which to make services and information readily available.

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## *Yalow: First Lady of American Science*

As part of the Distinguished Lecture Series at the Colorado School of Mines, funded by the AMAX Foundation, Inc., Dr. Rosalyn S. Yalow, Nobel Prize Winner in Medicine lectured February 26 at Green Center.

Called "the first lady of American science", Dr. Yalow lectured on "Science in the Service of Man." The lecture was attended by students, professors and several political figures, including Lt. Governor Nancy Dick of Colorado.

While much of her talk focused on the history of her own research, it was interspersed with pithy comments on feminism, multi-disciplinary research, peer review and scientific breakthroughs:

•On feminism: "I've been asked th change the title of my talk to 'Science in the Service of People'. I won't do that. Playing games with a dictionary is diversionary to the real challenges that face women in the professional world."

•On research: "Multi-disciplinary research works when you really care about the other fellow's field—that's why Sol Berson (her partner for many years) and I had a great partnership. You've got to realize that college or graduate school is only the beginning, that you will be moving from field to field."

•On peer review: "It is very easy to publish a me-too paper. Great discoveries take longer. That's why peer review on research grants, combined with cut-throat competition, is hurting scientific enterprise . . . Very few people create science, . . . but many are there to develop it. Oddly enough, breakthroughs are often made not by the most knowledgeable—sometimes, if you know everything, you don't work so hard anymore."

The developer of the radioimmunoassay, Dr. Yalow called it "a powerful tool for measurement." Radioimmunoassay is a uniquely sensitive and specific technique now widely used for measuring the concentrations of hundreds of biologically active substances.

With this tool, Yalow noted that physicians have a clearer understanding of diabetes; eliminated the threat of hepatitis in blood transfusions; detected hormonal or thyroid imbalances that cause stunted growth or mental retardation—and prevented same.

Yet, as Dr. Yalow warned, the benefits of nuclear medicine could all end—over the controversy of what to do with radioactive wastes. No dump sites or disposal methods means no nuclear medicine.

"I strongly suspect that the federal government is stalling on determining which of many solutions they'll adopt. Why? Simply because there is a good chance that many wastes can be reused, and the federal government wants access to those wastes a little longer," said Yalow.

She was severely critical of federal radiation standards, stating that the level of hospital radioactivity is not a significant threat to the public. "The federal regulators are making no distinction between the natural background radioactivity and that from man-made radioactivity," stated the doctor.

She went on to note that many people outside the nuclear industry are constantly exposed to background radioactivity that often exceeds federal safety guidelines, yet suffer no ill effects.

Dr. Yalow closed her talk by emphasizing the need to develop more nuclear energy, or face the threat of nuclear war, in defense of Middle East oil.

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# Indoor Track Results

The Colorado School of Mines cindermen took second place at the Air Force Academy junior varsity track meet. The Air Force Falcons took first at 84, while Mines scored 40 points, followed by Colby Colege at 34, and Metro State with 6.

Mines' Larry Keller took first place in the shot put, with an effort of 51'3". Fellow Oredigger Drew Detamore placed third.

Oredigger sophomore Roger Flahive was Mines' leading point earner. Flahive took first place in the long jump at 22'8.5", first in the 60 yard high hurdles at 7.7 seconds, placed second in the high jump and third place in the triple jump.

Senior Dan Scrivner took first place in the mile run, with a time of 4:28.9, while Mines' Tres Tipton was fourth at 4:38.5. Scrivner presently holds the Mines record in the mile run, at 4:19.9. Scrivner also took second place in the 880 yard run with a time of 2:01.2.

## *Faculty Gifts at $300,000*

Bob Weimer, chairman of the Faculty Gifts Committees of The Resource Fund, has announced that individual commitments to the development campaign now total $300,000—up from $250,000 a year ago. Bob said most of the increase can be traced to what he calls "donor initiative"—faculty who were already committed to The Resource Fund who increased their original pledge.

## Wrestling Season Over

The Colorado School of Mines grapplers finished their 1979-80 wrestling season at the 18th NCAA II Tournament, held this past weekend in Omaha, Nebraska.

While six of the Orediggers qualified for the tourney two weeks ago, none advanced beyond the first round of competition, with the exception of senior Tom Young. He won his first match against Rick Babbits of Southern Connecticut in a 12-6 decision, in the 142 pound division.

Young went on to meet the top-seeded Steve Spangenberg of North Michigan, who beat Young with a pin at 2:45. Spangenberg went on to win the 142 pound championship.

"It was a very tough tournament," said Oredigger Coach Jack Hancock. "All of our opening matches were against top seeded wrestlers, except at the 142 pound weight. Many of the people who beat us wound up as place winners."





## Stars Bound for Championships

Final results of the Intermountain Swimming League (IMSL) championships have yet to be released, but one thing is clear for the Colorado School of Mines Orediggers—two of them are bound for the NCAA II National Swimming Championships in Youngstown, Ohio.

Stephen Lowe (senior) and Rick Williamson (junior) will represent the Orediggers in their respective specialties—swimming and diving. Both All-Americans, the two have competed nationally before—this is the fourth trip for Lowe and the third for Williamson.

At Las Cruces, New Mexico, Lowe won two races, placed sixth in another and anchored three relay teams, according to swim coach Bob McCandless.

Lowe took first place in the 50 yard freestyle with a time of 21.88 seconds. He also took first place in the 100 yard freestyle with an IMSL record time of 47.53. According to McCandless, it also established a pool record time and qualified Lowe for the NCAA championships.

Lowe also took sixth place in the 200 yard freestyle with a time of 1:48.18. In the three relay races of the meet, Lowe anchored all three, giving the 400 yard medley and 800 yard freestyle teams a third place finish. Lowe anchored the 400 yard freestyle relay team, which took fourth place.

According to McCandless, Williamson took second place in both the one and three meter dive events. "Rick missed winning the one meter event by a mere 1.10 points," said the swimming and diving coach.

# Coal Symposium

A symposium on the geology of Rocky Mountain coal will be held April 27-May 1. Meetings will be held at the Green Center, CSM Monday and Tuesday, April 28 and 29, and a follow-up field trip to the Raton Mesa coal region. Two nights will be spent in Raton, with a return to Denver on May 1st.

The conference is sponsored by the Energy Minerals Division, American Association of Petroleum Geologists, Colorado Geological Survey, United States Geological Survey, Colorado School of Mines Research Institute and Colorado School of Mines.

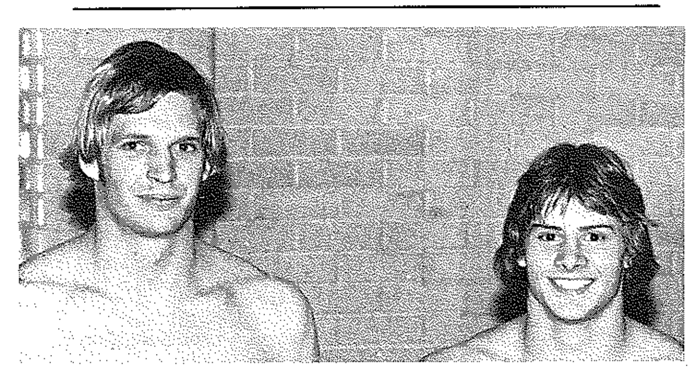
For information on the conference, contact Keith Murray, CSM Research Institute, Golden.

## *Essay Contest Winner*

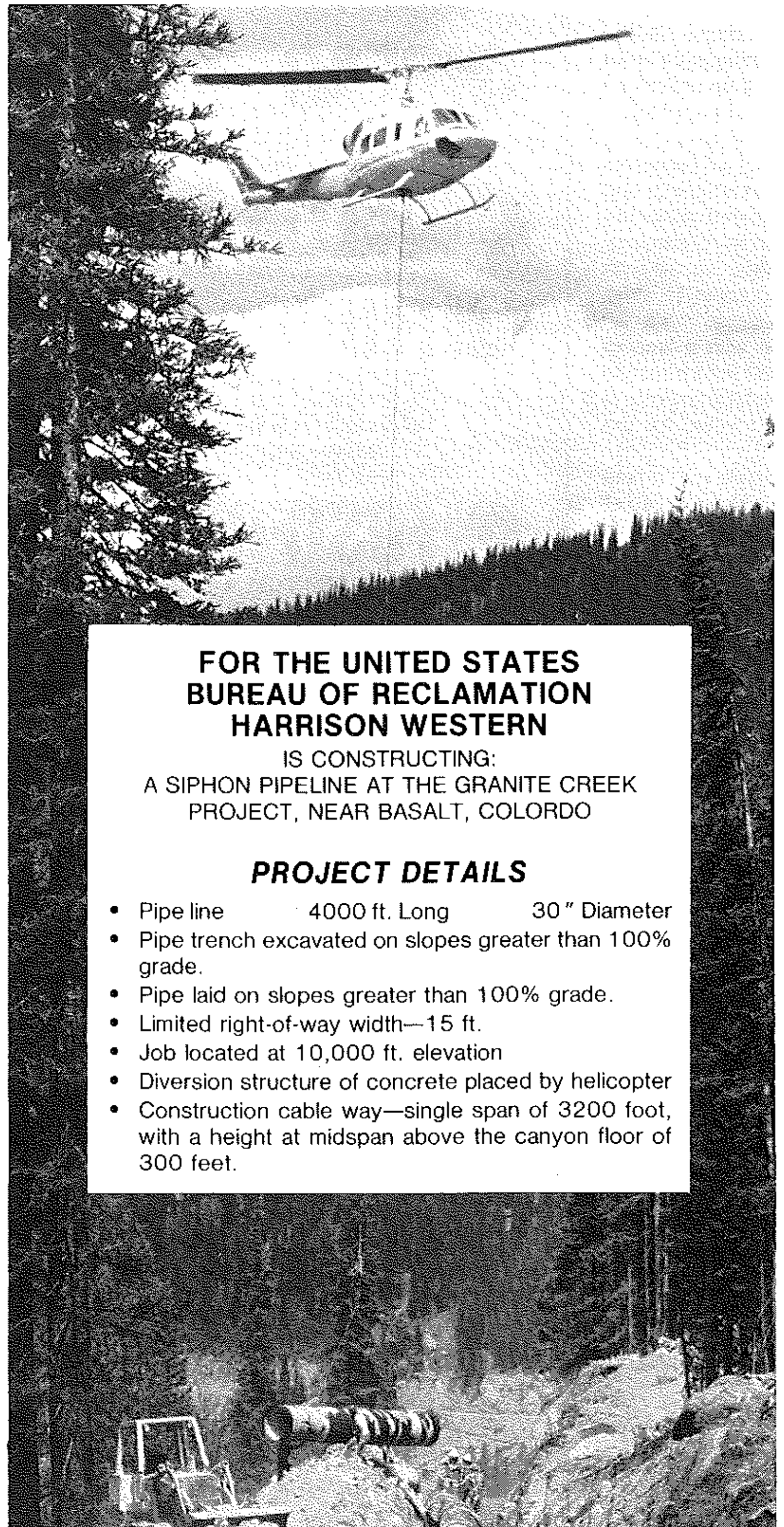
Mark Thomas Strever, a senior at the Colorado School of Mines studying mining engineering, won the national essay contest of the Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

The contest prize was $250 and a trip to the AIME national conference in Las Vegas, Nevada, Feb. 26-28. Title of the winning entry is "Methane Drainage Plan Using Horizontal Holes at the Hawk's Nest Mine."

Strever is the son of Don and Margaret Strever, 1919 Winston Road, Colorado Springs.



*Left, Stephen Lowe, Sr., swimmer; Rick Williamson, Jr., diver; All Americans in NCAA II National swimming championships in Youngstown, Ohio, March 12-16th.*





## Librarian Named

Joanne V. Akeroyd has been appointed acquisitions librarian in the Boettcher Reading and Reference Center of Energy, Environment, and Public Policy of the Arthur Lakes Library. A graduate of Penn State, she holds a master's in library science from the State University of New York at Albany. Prior to joining the library staff at CSM, she was catalog librarian at the American University Law Library in Washington, D.C. She has also served on the library staffs at the University of Connecticut and Rensselaer Polytechnic Institute.

## Chinese on Rocks

Colorado School of Mines Press has just been informed that "Principles of Rock Drilling," by George Clark, has been translated into Chinese by the Changsha Institute of Mining Research in Hunan Province, People's Republic of China.

Professor Clark's paper was published this summer in the CSM Quarterly, Vol. 74, No. 2. Engineers at the Changsha Institute report that they are particularly interested in studies on drilling and blasting of rocks.





# sections

### Houston

The Houston section, which meets the first Thursday of each month at the downtown Holiday Inn for luncheon, observed Founder's Day with a showing of 1958 football films. The 35 assembled Miners also listened to an informative lecture on income tax procedures.

### New York

The January meeting of the New York group, held on the 30th of that month, was one of the most dynamic meetings of the year, according to Newell Orr, correspondent for that section.

James Wilson, president of the Rocky Mountain Energy Company, a subsidiary of Union Pacific, was the speaker. Mr. Wilson is a member of the Board of Trustees, CSM and president of the CSM Foundation. In his remarks he gave the section members a thorough update on the status of the Resource Fund and the current developments at the School and in the Foundation.

A major area of the remarks covered the Future Graduate profile study now in progress at CSM. He stressed the importance of putting the emphasis in the profile implementation on changing attitudes, *not* changing curriculum requirements. The long-term goals of the profile, to better fit the Mines graduates for the more complex governmental and social environments, were deemed exceedingly important by Wilson. He gave examples of the complications faced by his own firm in dealing with the many requirements in these areas, and of the trained response necessary to cope with such requirements.

Citing the fact that there has been some resistance to changing the traditional concept of the Mines graduate as an extremely competent engineer, without political orientation, Wilson stated that the high salaries now enjoyed by new graduates *does* reflect the industry view of the Mines engineer, but that, increasingly, industry is beginning to look for larger human skills. He gave examples of the growing need in industry for technicians who can shape regulations, cope with politicians, influence legislation, and bring factual information to the public.

Wilson's report on the Resource Fund stressed the progress and accomplishments of that effort. He sketched briefly the activities of the Foundation in working toward the successful completion of the goals set for the various grants and gifts received, and how those activities will be amplified as time goes on. The Resource Fund, he stated, has been to date, an excellent effort, with a great deal of visible accomplishment. It has, however, a long way to go in fulfilling its stated aim of allowing the Colorado School of Mines to function more effectively in the realm of mineral education. The ultimate design, to up grade the whole School, in both physical and teaching facilities, will require a long period of planning and execution, with the support of many diverse groups.

Wilson's comments evoked a number of questions and led to some lively discussion about the School and its future.

Other guests attending the meeting were Bill Dinsmore, Texasgulf, and Bud Leeds, CSM Foundation.

—mm—

Charles Rogers E.M. 1915, sent me a list of 21 titles from which to choose a caption for this back-page column. I chuckled at some of them, am considering others. Many other people have been supplying suggestions, also, and I thank you all for your participation—even for those that are obviously tongue-in-cheek ideas!

Titles of columns and magazine sections are in themselves a form of communication—and communication is much on my mind this month. One must immediately perceive the theme of communication in the interviews with noted visitors which appear in this month's MINES Magazine. On March 6, another form of communication experience was available at CSM when Charles Kittrell, who has become famous for his advocacy of the petroleum industry, spoke to a good crowd of Mines students, faculty, administration and guests from outside our academic community. Mr. Kittrell, a dynamic showman with very persuasive ways, discussed the role of the engineer in working with the public media.

It is his contention, and that of some few other prominent industry advocates, that engineers, on whatever level, *must* be prepared to meet the media without qualms, to answer questions, to pose questions, and to tell the story of their own company and the industry as a whole. His firm, Phillips Petroleum, has chosen to place top-level management in the somewhat threatening (to many) position of responding directly to hostile media, and even to actively seek an interchange of information with such media.

In principle, I agree with this concept—with one important reservation. Last spring, recruiters for the petroleum companies would have hired almost 300 graduates—and there were less than 200 available from the three top petroleum departments of three engineering schools. Can we afford to use these engineers, a scarce commodity, as public relations people? The answer, sadly, is that we must indeed limit the effectiveness of these engineers in pursuing technical solutions to the difficult problems confronting the energy industry by siphoning off part of their time for public communication.

My reservation addresses that problem—and also the fact that the petroleum industry, the mining industry, the energy development industry must train other levels of personnel to *also* serve as spokespersons for all of us. General audiences can be presented with basic materials about the crisis in regulations, shortages, bad press, etc. by industry people with basic training and good public relations skills. Use our engineers where necessary, yes, but also, let's use our other employees and friends!

Communication—once considered an art—has now become a science, with teachers and practitioners everywhere one looks. It has become a means of survival in an increasingly verbal and vocal world. We grapple with its intricacies every day in inter-office memos as well as in company pronouncements. One-to-one or one-to-many, we all, engineers as well as others, *must* communicate.

Patricia Curtis Petty





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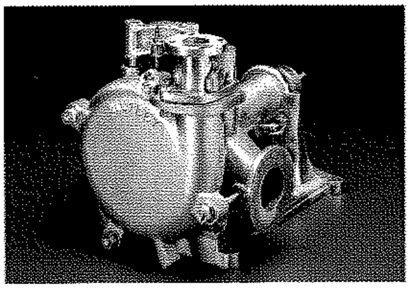

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