



1970 CSM Commencement



New Plant Guidelines

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THE MINES MAGAZINE

Col. Wendell W. Fertig
Publisher

Carter Kaanta
Editor

William V. Burger
Advertising Manager

Betty Decker
Circulation Mgr.

Calendar

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South African Tunnelling Conference, University of Witwatersrand, Johannesburg, July 21-24.

6th Annual Intermountain Mineral Conference, sponsored by Intermountain Section of AIME, Vail Colo., July 30-Aug. 1.

Short Course on Rock Mechanics, New Mexico Institute of Mining and Technology, Socorro, N. M., Aug. 2-5.

Symposium on Nuclear Power, United Nations Headquarters, New York, N. Y., Aug. 10-14.

2nd Inter-American Conference on Materials Technology, Mexico City, Aug. 24-27.

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1970 Mining Convention, sponsored by American Mining Congress, Hilton Hotel and Brown Palace, Denver, Colo., Sept. 27-30.

52nd ASM Materials Engineering Congress and Exposition, Cleveland, Ohio, Oct. 19-22.

SME Fall Meeting and AIME World Lead Zinc Symposium, Kiel Auditorium, St. Louis, Mo., Oct. 21-23.

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Volume 60

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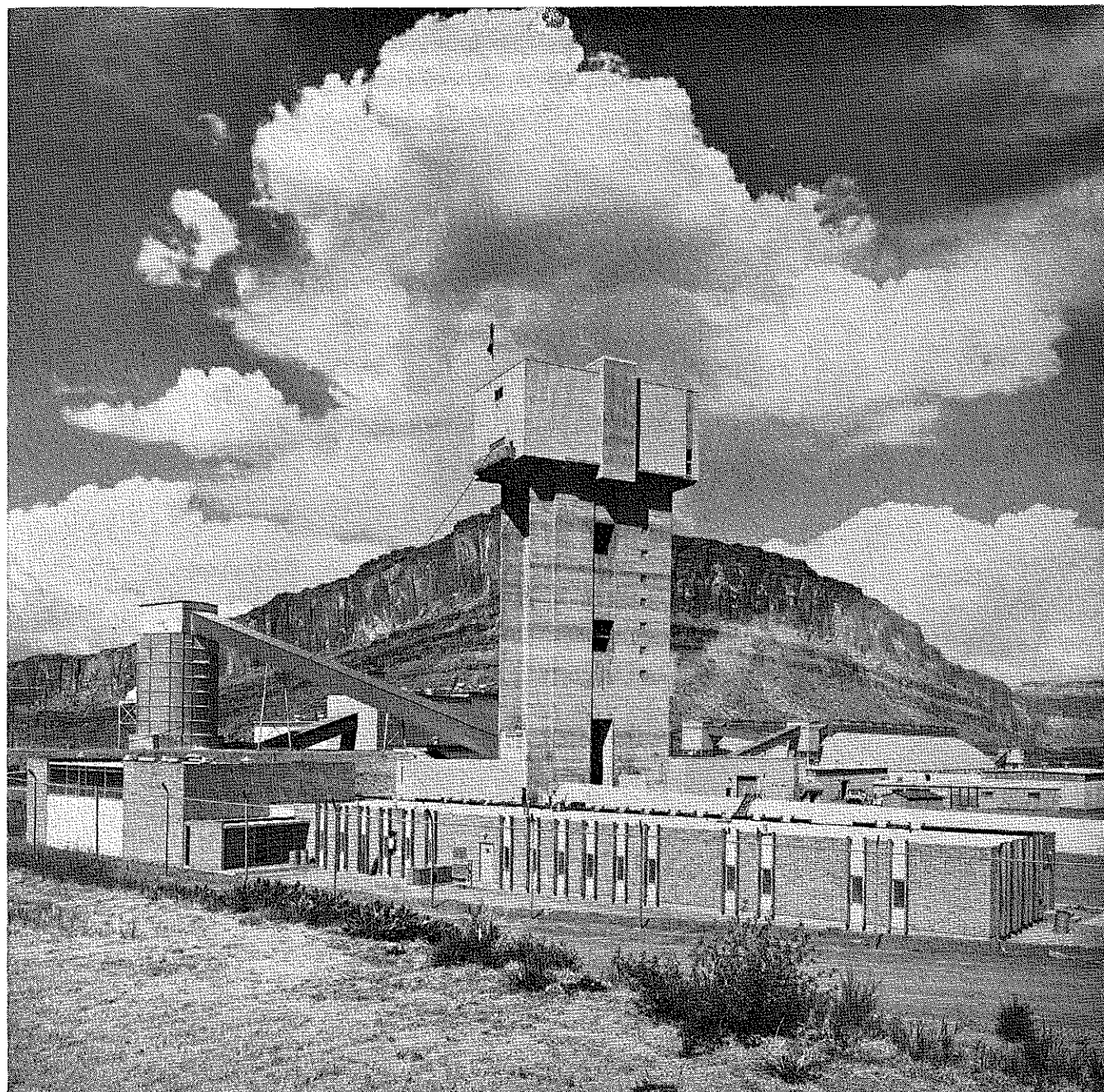
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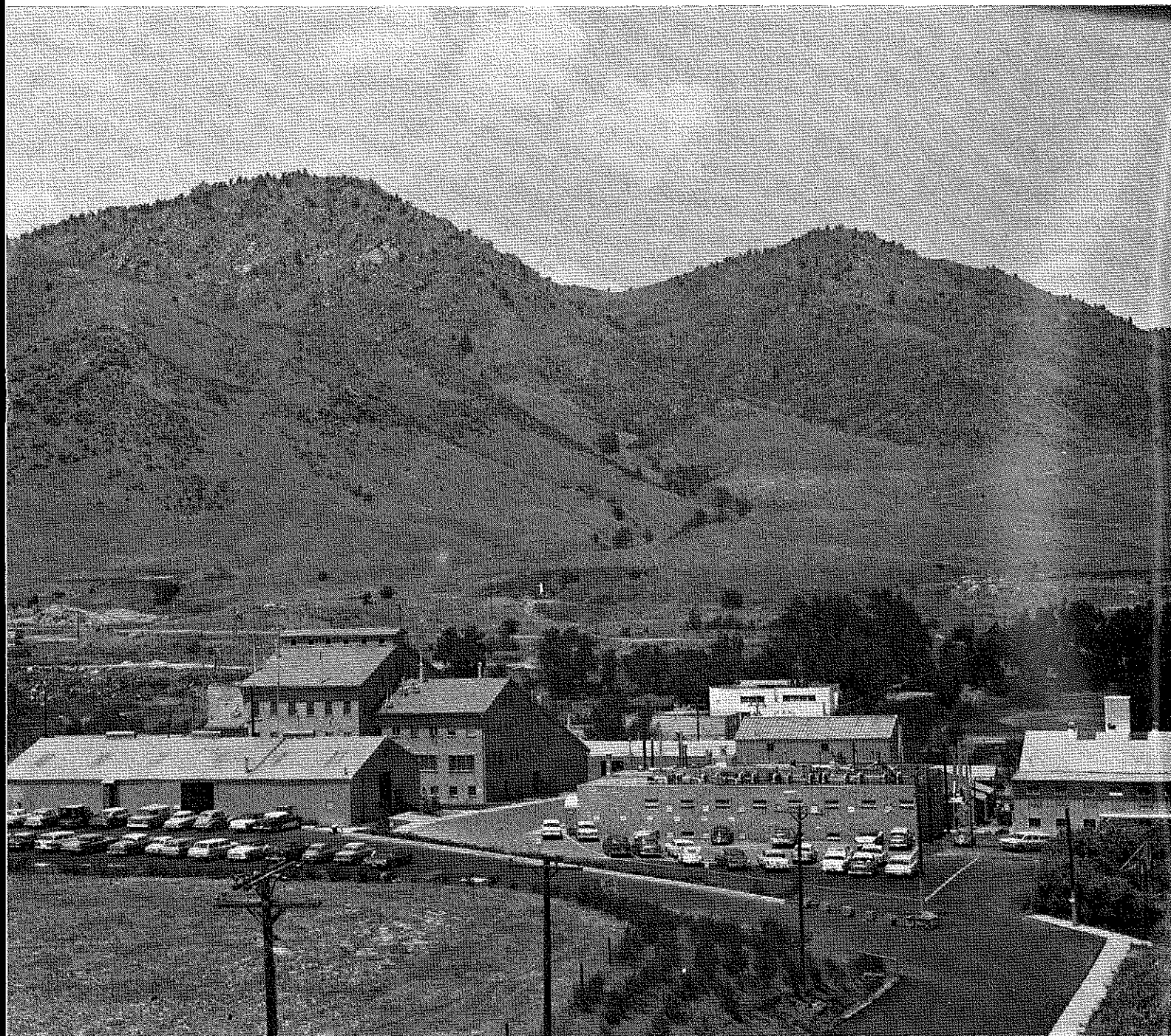
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 Headquarters at Golden, Colorado



Serving the Mining and Mineral Industries Since 1949



GRADUATE STUDENTS, SENIORS, FACULTY, AND DISTINGUISHED ALUMNI are shown as they proceed from Guggenheim Hall to Steinhauser Field House for the 1970 Colorado School of Mines Commencement on May 29th.

96th Commencement at Mines

THE Colorado School of Mines awarded diplomas to 207 seniors and graduate students Friday, May 29, in its 96th annual commencement. There were 57 undergraduate degrees and 22 graduate degrees presented on Jan. 15. There will be 30 degrees awarded later this summer upon completion of work.

Receiving Mines' coveted sterling silver diplomas were seven Doctorate candidates, 23 Master of Science degree candidates, five Master of Engineering degree candidates and 58 Professional Engineer degree candidates which are awarded to seniors for having completed the four and one-half year program and to all graduate students. Also 114 Bachelor of Science degrees were conferred.

Ceremonies set for 9:30 in the Steinhauser Field House on campus recognized all students completing work for graduation this year, including those who finished in January and those who will complete work later this summer.

An honorary Doctor of Engineering degree was awarded to the Commencement speaker, Dr. William T. Pecora, director of U. S. Geological Survey, Dept. of the Interior, since 1965. His topic was "Resources and Environment—Quest for Balance."

Graduating with highest scholastic honors was **Lloyd Thomas Winger, III** of Arvada, Colo. Graduating with high

scholastic honors was **Robert Richard Rostad**, from Arvada, Colo.; **James David Klein**, **William Leon Server**, and **Gregory Robert Siebers** from Colorado Springs, Colo.; **Carl Arthur Preyer**, from Denver; **Lee Alan Turner**, from Englewood; **David Duane Duston** and **J. William Fishback**, from Golden; **Charles William Bloomquist** and **Richard John Lorenzen**, from Littleton; **Gary Lee Andes**, from Brooklyn, Iowa; **Douglas John Guion**, from Indianapolis, Ind.; **Leo Andrew Holt, Jr.**, from Wareham, Mass.; **Larry Arthur Cramer**, from St. Joseph, Mo.; **Michael Thomas Hagan**, from El Paso, Tex.; **Donald Walter Douglas Rakowski**, from St. Albans, Vt.; **John Lowell Stalder**, from Linch, Wyo.

The graduates were as follows:

CLASS OF 1970 May 29, 1970

BACHELOR OF SCIENCE (Mining Engineering)

†Joseph Philip Aiello, Coleman, Alberta, Canada; Terry Duane Bauer, Prescott, Ariz.; Timothy J. Haddon, Salisbury, Rhodesia; Alan Conrad Noble, Fountain, Colo.; Robert Thomas Roberts, Aurora, Colo.; Paul Joseph Schiller, Arvada, Colo.

ENGINEER OF MINES

David Robert Allison, Arvada, Colo.; Terry Clark Barnes, Golden, Colo.; Robert Peter Billis, Golden, Colo.; Anton William Bosch, Leeuwarden, Holland; †Monty Lee Christo, Denver, Colo.; †Gary Joseph Colaizzi, Denver, Colo.; †John Joseph Falis, Jr., Burbank, Calif.; †Richard Jeffrey Fox, Warren, Mich.; Walter B. Freeman, Cave Junction, Ore.; Steve Peter Gauss, Colorado Springs, Colo.; †Phillip Randolph Hammond, Jr., Diablo, Calif.; Bartlett Jay Hanford, Bakersfield, Calif.; Thomas Curtis Johnson, Canby, Ore.; †Robert E. Killaly, Tabernash, Colo.; Terry James Laverty,

Denver, Colo.; †Douglas Keith Meriwether, Denver, Colo.; †David Edward Miall, Ottawa, Ontario, Canada; Phillip Louis Mosconi, Denver, Colo.; †Stephen Anthony Onorofski, Englewood, Colo.; †Dale Allan Pierce, Livonia, Mich.; Frederick Eugene Price, Jr., Boise, Idaho; †John Kenneth Robson, Unadilla, N. Y.; †Mark Gordon Sanders, Farmington, N. M.; Robert Charles Scharp, Lakewood, Colo.; †Henry Joseph Schmidt, Walton, Ky.; David H. Scriven, Casper, Wyo.; Abel Bruno Spiritelli, San Francisco, Calif.; Bruce Thomas Stanley, Lakewood, Colo.; Danny Adreon West, Estes Park, Colo.; Alan Turner Wheeler, Denver, Colo.; Carl Wayne Winters, Durango, Colo.

BACHELOR OF SCIENCE (Metallurgical Engineering)

*Gary Lee Andes, Brooklyn, Iowa; John Bradley Benton, Evergreen, Colo.; Dale Eugene Bingham, Lakewood, Colo.; Bartholomew Paul Caruso, Hagerstown, Md.; Bruce Donald Craig, Denver, Colo.; †Larry Arthur Cramer, St. Joseph, Mo.; Charles Dudley Crew, Golden, Colo.; Robert John Dearing, Northglenn, Colo.; Bruce Arthur Fry, Summit, N. J.; William Harold Gumma, Pueblo, Colo.; †Leo Andrew Holt, Jr., Wareham, Mass.; Robert Dennis Karsten, Denver, Colo.; Roy Stephen Koogle, Wheat Ridge, Colo.; Kenneth Loren Manning, Littleton, Colo.; Patrick William McKinley, Littleton, Colo.; Bruce Edward McQuarrie, Pueblo, Colo.; William Joseph Morris, Denver, Colo.; Henry A. Mullen, Gallipolis, Ohio; Richard Eugene Ott, Brush, Colo.; Howard Cooper Parker II, Davenport, Iowa; †Donald Walter Douglas Rakowski, St. Albans, Vt.; John Edward Reid, Englewood, Colo.; Garrett Conover Schanck, Edison, N. J.; †William Leon Server, Colorado Springs, Colo.; Charles James Slezewski, Sterling, Colo.; Gary Robert Steele, Westminster, Colo.; Richard Joseph Tullie, Providence, R. I.

METALLURGICAL ENGINEER

Nathan Isaac Banker, Denver, Colo.; †David Gardner Bellamy, St. David's, Pa.; †Richard Julian Carlson, Colorado Springs, Colo.; Leroy Wiley Cooper, Jr., Aurora, Colo.; †James Speed Herb, St. Louis, Mo.; Gary George Hoffmann, Aurora, Colo.; Rick Neil Johnson, Greeley, Colo.; †Carter Welling Kaanta, Golden, Colo.; Jerry Lee Kelly, Limon, Colo.; Robert Douglas Knecht, Lakewood, Colo.; †Steven Andrew McGhee, Lordsburg, N. M.; †Thomas Leonard Rising, Westminster, Colo.; Lee Edward Swartling, Olympia, Wash.; †Loren Gilbert Thompson, Halstad, Minn.; †Allan F. Tittes, Denver, Colo.; Roy Del Whiteaker, Colorado Springs, Colo.

BACHELOR OF SCIENCE
(Geological Engineering)

Wing-on Chu, Hong Kong; Larry Ozro Dean, Ontario, Calif.; Richard John Kehmeier, Cedar-Edge, Colo.; James Allen Kohn, Windsor, Conn.; Norman F. Lewis, Jr., Golden, Colo.; Allan V. Moran, Los Angeles, Calif.; James Elliott New-comer, South Bend, Ind.; Stephen Douglas Schwachow, Clyde, Ohio; Daniel R. Stewart, Leadville, Colo.; Sandra Ann Wilson, Medford, Ore.

GEOLOGICAL ENGINEER

Dennis Lyle Bettenhausen, Montrose, Colo.; William Clark Block, Cedar Rapids, Iowa; Cor-dell C. Chapman, Paonia, Colo.; Allen Robert Cockle, Ouray, Colo.; Patrick Costin, Den-ver, Colo.; Warren LeRoy Cummings, Newton, N. J.; Bernard William Distel, Olathe, Colo.; Peter Allen Macfarlane, Lake Forest, Ill.; John Robert May, Monrovia, Calif.; Gary Dean Mil-ler, Englewood, Colo.; Lee Moore, Jr., Douglas, Wyo.; Howard Wayne Musgrove, Hyattsville, Md.; Steven Edwin Plant, Colorado Springs, Colo.; Nicholas John Skorski, Capitola, Calif.; Charles Emmett Smith, Martinez, Calif.; Jess Wayne Smith IV, Denver, Colo.; Joseph Edward Smith, Jr., Bayville, N. J.; Andrew Charles Weinzapfel, Denver, Colo.; Michael Wedell West, Colorado Springs, Colo.; Paul Moyer Westbrook, Voorheesville, N. Y.

BACHELOR OF SCIENCE
(Petroleum Engineering)

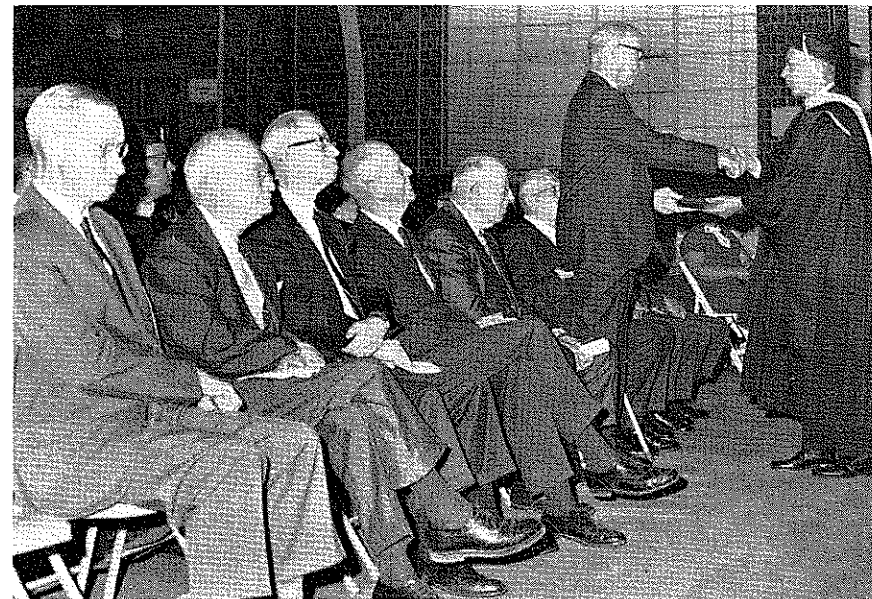
James Todd Duncan, Pittsburgh, Pa.; Raymond Warren Hagen, Jr., Denver, Colo.; H. Michael Hartmann, Salem, Ore.; Walton Randolph Hicks, Tampa, Fla.; Robert Paul Hofmann, Iliff, Colo.; Craig Warren Horner, Littleton, Colo.; John Fredrick McCune, Carbondale, Colo.; William Howard Myers, Denver, Colo.; Eugene Victor Prinz, Sterling, Colo.; John Lowell Stalder, Linch, Wyo.; George Clark Strother, Casper, Wyo.

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CLASS OF 1920 RECEIVING SILVER CERTIFICATES for 50 years of loyalty and devotion to Mines. Left to right: Karl W. Reynolds, Dr. William S. Levings, Frederick A. Lichtenheld, Herbert K. Linn, Steve Fullaway '16 (guest), Ethelbert Dowden (receiving certificate from Dean Francis E. Smiley) and H. W. C. Prommell.

Burson, Walsh, Colo.; Michael William Daly, Compton, Calif.; Robert A. Davis, Acton, Mass.; Charles Robert Grigg, London, Ontario, Canada; Melvyn Ray Millet, Grand Junction, Colo.; James Russell O'Hmans, II, La Habra, Calif.

BACHELOR OF SCIENCE
(Mineral-Engineering Chemistry)

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MINERAL ENGINEER—CHEMISTRY

Jim F. Lemons, Denver, Colo.

BACHELOR OF SCIENCE
(Mineral-Engineering Mathematics)

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Richard John Gardner, Denver, Colo.; James Michael Love, Denver, Colo.; Lee Alan Turner, Englewood, Colo.

July 18, 1970

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Craig Lee Garrett, Haxtun, Colo.; Henry Wal-quist Kaanta, Denver, Colo.; Richard A. Kesler, Los Angeles, Calif.; David Michael Korrey, Ster-ling, Colo.; Robert Bruce Moffett, Golden, Colo.; Ralph Richard Newman, Aurora, Colo.; Donald Erik Spiller, Des Moines, Iowa.

METALLURGICAL ENGINEER

John Randolph Roper, Northglenn, Colo.

BACHELOR OF SCIENCE
(Geological Engineering)

James Andrew Miller, Phoenix, Ariz.

BACHELOR OF SCIENCE
(Petroleum Engineering)

Michael Anthony Acosta, Pueblo, Colo.; Charles William Bloomquist, Littleton, Colo.; Mark Victor Patton, Tulsa, Okla.; Douglas Jay Ruckel, Wheat Ridge, Colo.

PETROLEUM ENGINEER

James Dale Harmon, Pueblo, Colo.; Ronald Jo-seph Jamison, Colorado Springs, Colo.

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BACHELOR OF SCIENCE
(Mineral-Engineering Chemistry)

Richard Case Norton, Lubbock, Texas.

BACHELOR OF SCIENCE
(Mineral-Engineering Mathematics)

Roger Van Dok, Lakewood, Colo.

August 8, 1970

BACHELOR OF SCIENCE
(Mining Engineering)

Peter Vernon Cawfield, Kalama, Wash.

BACHELOR OF SCIENCE
(Metallurgical Engineering)

Lewis Lynn DeLong, Golden, Colo.; Gary Herbert Garlough, Colton, N. Y.; Charles Ray Miller, Denver, Colo.; Guy William Schlink, Pueblo, Colo.

METALLURGICAL ENGINEER

Robert K. Nichols, Westminster, Colo.

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BACHELOR OF SCIENCE
(Petroleum Engineering)

Nagmeddin A. Arif, Tripoli, Libya.

BACHELOR OF SCIENCE
(Mineral-Engineering Mathematics)

Peter Julian Ryser, Kirkwood, Mo.

MINERAL ENGINEER—PHYSICS

James Alan Hodson, Aurora, Colo.

CLASS OF 1970

MASTER OF ENGINEERING —
MASTER OF SCIENCE

Department of Mining Engineering

Master of Engineering (Engineer of Mines)
Celso Augusto Bandeira, Belo Horizonte, Brazil.

Master of Science (Mining Engineering)
James B. Blackburn, Buenos Aires, Argentina;
Richard Edward Hague, Ft. Myers, Fla.; Jose
Alberto Lampaya Valdes, Madrid, Spain; Ken-
neth Ray Pohle, Lakewood, Colo.; Norman Alex-
ander Ross, Fort St. John, B. C., Canada.

Department of Metallurgical Engineering

Master of Engineering (Metallurgical Engineer)
Sushil Kumar Bhambri, Kanna, Punjab, India.

Master of Science (Metallurgy)
Ronald Robert Borisch, Portland, Ore.; Paul
J. Marcantonio, Salt Lake City, Utah; Stephen
Alfred Wilner, Arvada, Colo.

Master of Science (Metallurgical Engineering)
Emory Joe Beck, Golden, Colo.; Brent J.
Beer, Arvada, Colo.; Charles Edgar Brooks III
Denver, Colo.; Italo J. Caparachin, Lima, Peru;
Dennis R. Floyd, Wheat Ridge, Colo.; Richard
Wayne Harper, Inglewood, Calif.; Darrel D.
Lemon, Golden, Colo.; Lawrence William Loebel,
Denver, Colo.; Kjell Lovold, Oslo, Norway; Del-
mar Vance Miley, Denver, Colo.; Adrian A.
Vasquez G., Lima, Peru.

Department of Geology

Master of Science (Geology)
Aderbal Caetano Correa, Belem-Para, Brazil;
James M. Cronoble, Bartlesville, Okla.; Charles
Bruce Snow, Golden, Colo.; Peter Martin van der
Spuy, Stellenbosch, South Africa.

Master of Science (Geological Engineering)
Richard M. Nolting III, Richmond, Va.; Louis
R. Reimer, Uniondale, N. Y.

Department of Petroleum Engineering

Master of Engineering (Petroleum Engineer)
Royce Haddon Elliott, Wray, Colo.

Master of Science (Petroleum Engineering)
Ronald Johnston Cooper, Lakewood, Colo.;
Frederick E. Kastner, Denver, Colo.; Gabriel M.
Nounzert, Golden, Colo.

Department of Chemical and Petroleum Refining Engineering

Master of Engineering (Chemical and
Petroleum Refining Engineer)
Bruce Gaylord Frenzel, Colorado Springs, Colo.;
Robert John Gosik, Arvada, Colo.; Jorge Or-
donez Reyes, San Gil, Santander Sur, Colombia.

Master of Science (Chemical and Petroleum-
Refining Engineering)
Anthony Onu Ukanwa, Owerri, E. Nigeria;
Thomas Anthony Sladek, Traverse City, Mich.;
Yavuz Yorulmaz, Bolu, Turkey.

Department of Geophysics

Master of Science (Geophysics)
Mark Anthony Mathews, Golden, Colo.

Master of Science (Geophysical Engineering)
Yasar Tekiner, Istanbul, Turkey.

Department of Chemistry

Master of Science (Chemistry)
William Frank McKenzie, Boulder, Colo.; Ro-
man Z. Pyrih, Golden, Colo.

Department of Mathematics

Master of Science (Mathematics)
Maurice G.F. de St. Jorre, London, England.

INTERDISCIPLINARY MASTERS PROGRAMS

Departments of Mathematics and Geophysics
Master of Science (Mathematics-Geophysical
Engineering)
Hamid Jawad Al-Hakeem, Baghdad, Iraq.

DOCTOR OF PHILOSOPHY—DOCTOR OF SCIENCE

Department of Metallurgical Engineering

Doctor of Philosophy (Metallurgical Engineering)
Stanley Beitscher, Arvada, Colo.; Robert Bruce
Hill, Butte, Mont.; John Harry Jones, Denver,
Colo.; Josef Rene Roos, Aalst, Belgium; David
James Spottiswood, Melbourne, Australia.

Department of Geology

Doctor of Science (Geological Engineering)
Lynn A. Brown, Lafayette, Ind.

Department of Chemical and Petroleum Refining Engineering

Doctor of Philosophy (Chemical and Petroleum-
Refining Engineering)
Karl Alexander McKinstry, Kalamazoo, Mich.

Doctor of Science (Chemical and Petroleum-
Refining Engineering)
Fred Toshio Okimoto, Sacramento, Calif.

Department of Geophysics

Doctor of Philosophy (Geophysics)
Tsu Ko Chao, Taichung, Taiwan; Richard
George Geyer, Lansing, Mich.; Fred John Hil-
terman, Denver, Colo.

Doctor of Science (Geophysical Engineering)
John B. Thuren, Miami, Fla.

Completed work January 15, 1970
*With High Scholastic Honors
*With Highest Scholastic Honors
Completed work September 13, 1969

PRIZES

A Brunton transit for meritorious work in min-
ing engineering, provided by the late Hon. D. W.
Brunton, to Timothy J. Haddon.

The William D. Waltman Award, a cash prize,
to the graduating senior "whose conduct and
scholarship have been most nearly perfect and
who has most nearly approached the recognized
characteristics of an American gentleman,"
awarded by the late Mr. William D. Waltman,
D. Waltman, '99, to Gregory Robert Siebers.

A cash prize to the senior in petroleum refining
engineering who has demonstrated by scholarship,
personality, and integrity of character, the gen-
eral potentialities for a successful industrial ca-
reer, awarded by Mr. Harrison L. Hayes, '31, to
David Duane Duston.

A Brunton transit to be awarded to a senior in
mining engineering who "in completing the
course in mining engineering has made the
most progress in his school work during the

entire period for which the course is given,"
provided by the late Charles N. Bell, '06, to Paul
Joseph Schiller.

A membership in the American Chemical So-
ciety for meritorious work in chemistry, presented
by Robert A. Baxter, Professor Emeritus, to
Robert Richard Rostad.

Clark B. Carpenter Award, a cash prize, to
a graduating senior in the metallurgy or mining
option of the Colorado School of Mines, who in
the opinion of the seniors in the metallurgy and
mining options and the professors in charge of
the respective departments, is the most deserving
of the award, to Terry Duane Bauer.

A cash prize to the senior athlete at the Colo-
rado School of Mines who has contributed the
most to athletics, presented by Mr. and Mrs.
John C. Burt, to Charles Dudley Crew.

PRIZES

Cecil H. Green Award, "A gold medal to the
graduating senior student in geophysical engineer-
ing who, in the opinion of the Department of Geo-
physics and the Administration, has attained the
highest rating in the combination of scholastic
attainment, personality, and integrity," to Dou-
glas John Guion.

An award by the Rocky Mountain Association of
Geologists for outstanding scholastic achievement
and exemplary conduct in Geological Engineer-
ing, to Wing-on Chu.

Robert F. Aldredge Memorial Prize, a cash
award, to the graduating senior in geophysics
who has attained the highest scholastic average
in geophysical courses, to Douglas John Guion.

The Charles and Mary Cavanaugh Award, a
cash prize, for the outstanding graduating senior
in metallurgy, determined by his scholarship, pro-
fessional activity, and participation in school
activities, to Larry Arthur Cramer.

A plaque awarded to the outstanding graduating
senior in each degree-granting department,
Terry Duane Bauer in Mining Engineering
Donald Walter Douglas Rakowski in Metallurgical
Engineering
Stephen Douglas Schwachow in Geology
Charles William Bloomquist in Petroleum Engi-
neering
Lloyd Thomas Winger III in Chemical and Pe-
troleum Refining
Clinton Roger Hoagland in Geophysics
Robert Richard Rostad in Chemistry
Daniel Lee Everett in Mathematics
James Edward Gooman in Physics

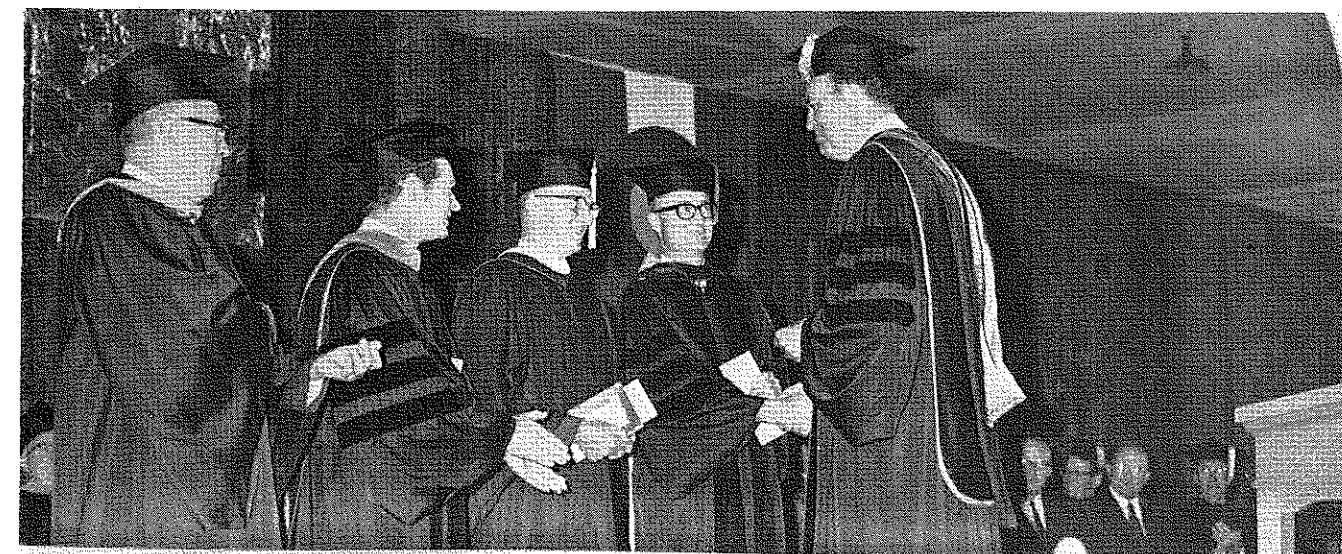
A plaque awarded to the senior athlete with
the highest academic standing, to Donald Walter
Douglas Rakowski.

Wyoming Geological Assn. Symposium Sept. 21-23

The Wyoming Geological Association is holding its annual symposium and field trip in Casper Sept. 21-23. Due to the unprecedented success of both oil and uranium explorationists in this state, the symposium will center on the important economic significance of Wyoming's sandstones. Of great importance, of course, is the Cretaceous "Muddy" sand where hundreds of millions of barrels of oil have been discovered in the past two years.

Problems pertaining to ground wa-
ter, including the subsurface disposal
of waste products will be discussed
also. Other topics will include trace
elements and geochemistry of Eocene
sands and titaniferous placer sand de-
posits.

Among the notable speakers will be
Edwin McKee, U.S.G.S. world re-
nowned authority on sedimentations,
and William Curry, newly elected
president of the American Association
of Petroleum Geologists.



DESIGNATION OF EMERITUS STATUS AND PRESENTATION OF THREE OUTSTANDING TEACHER AWARDS of \$1,000 each were made at Commencement by Dr. Orlo E. Childs. Left to right, E. H. Crabtree, who retired as director of the CSM Research Institute; and award winners Dr. Frank S. Mathews, Physics; Prof. Robert B. Osborn, Mathematics, who also retired; and Dr. John T. Williams, Chemistry. The awards were presented in recognition of outstanding teaching ability, research, and interest in students. Funds for the awards are provided by a grant from Standard Oil of Indiana Foundation, Inc. Crabtree served Mines since 1955, while Osborn taught mathematics starting in 1946.

Resources and Environment — Quest for Balance

By W. T. Pecora

ANCIENT man lived in harmony with nature. His existence was precarious but he accepted the good and the bad as qualities beyond his control and he stood in awe at natural phenomena he could not understand. From this humble beginning evolved our present society which now indicts man for all environmental ills and assumes that nature can be shaped to meet his every need. The ability to maintain an acceptable environment can be hindered by failure to recognize basic earth processes and quality patterns beyond our control.

With the intellectual development now achieved by man, it is inexcusable that we should fail to predict

responses of nature consequent to our own development. Environmental degradation is a natural process on earth. Man, however, is beginning to contribute to that degradation in large measure in certain areas. Man has begun to develop an awareness that better housekeeping of the earth must be practiced as he continues to take from the earth the things he needs and uses.

PLANET EARTH IS MAN'S ABODE

For some five billion years the planet Earth has revolved about the sun, and there is good reason to believe its journey will extend beyond another five billion years. Throughout this period the earth has undergone constant change — mountains have risen where oceans formerly existed; animal and planet species have flourished and become extinct; earthquakes and volcanoes have always been with us; rivers and plains have appeared and reappeared; and glaciers have covered large segments of the planet many times. Although on Earth but a few million years at the most, man has in the past 200 years unraveled a great deal of early history and learned how to use the planet to meet his growing needs for survival.

As earthbound residents, we look constantly, nevertheless, to other planets. One, the moon, satellite of the earth, has already been visited and found to be totally hostile to man. The surface of Venus is too hot for us, and Mars offers little, if any hope. The other planets are simply out of the question. Man, indeed, is earthbound and we must learn to accept this inescapable circumstance.

Of the billions of galaxies that exist in the universe, perhaps there is at least one other solar system like ours with a planet in the same solar position. Wherever that may be, it is beyond our reach, however great our expectation. We must learn to live on this planet throughout our full existence as one species.

CIVILIZATION MOVES FORWARD

Man has achieved phenomenal advance over 10,000 years in the face of a world population increase from a few million then to three and one-half billion today. The complex development of society over this period was accomplished because man has an intellect that could innovate, plan, acquire information, store it, pass it along to succeeding generations, and increase the level of its systemic intellect through research and development. What has often been called intellectual curiosity, as directed toward our total environment, is really a necessity by society if it is to avert disaster.

Man now truly inhabits the entire planet. He has crossed mountains and oceans, explored the poles, and burrowed deeply underground. The simple but astute primitive observer of nature and natural processes has developed into the creative scientist who serves man's mind in seeking to feed the technologic engines of modern society. Those unique quinquereimes of ancient times have developed into jet aircraft; simple mathematical devices that were developed separately in different civilizations have grown into complex modern computer systems; signal drums have

blossomed into telecommunications systems that link hemispheres. Real time for man now has real meaning, and you are part of all of this. You cannot ignore nor escape your role. Your generation will do deeds only dreamed of by mine, just as my generation made a giant step from my father's. The status quo may have meaning for other species on earth; but for man there is no status quo because of his intellectual capability.

PROJECTED RESOURCE NEEDS

Let's take a look at the resource needs of the society that makes up the United States of America. We are at the apex of civilization, and yet within the life span of 200 million people now living in the United States, this nation will consume from the earth:

- 6½ quadrillion gallons of water
- 7½ billion tons of iron ore
- 1½ billion tons of aluminum ore
- 1 billion tons of phosphate rock
- 100 million tons of copper
- and so forth . . .

In 40 years, our population will double. Just think of the added requirements of the next generation!

Water usage will triple by the year 2,000.

Energy requirements will triple by the year 2,000.

By the year 2,000 we will have to construct as many houses and other facilities as now exist in the United States.

This staggering amount of natural mineral resources upon which the sustenance of the Nation depends imposes a tremendous task of new discovery, and new development. How can we do this without changing the character of our environment; for society must also provide against excessive noise, excessive pollution, excessive degradation of the landscape, water-scape, and sea-scape. We do want the best of all worlds!

If this be the situation for the United States, certainly resource needs for the rest of the world command even greater attention. Developing nations seek fulfillment in health and economic betterment. The crust of the earth is worldwide and knowledge gained in one country can be used to good advantage by scientists and engineers in others. The crust of the earth has full potential to provide for man's needs if we have the motivation to procure and develop.

The problem for mankind is universal — planetary — not national. Certainly international competition cannot go on forever; wars must cease and man's society must be planetized if the species, Homo sapiens, shall persist on this earth.

If we must, therefore, take from the earth to provide for ourselves, we must employ value judgment and trade-off concepts in deciding how much to take from our environment, where to take it, and how to leave it



Dr. William T. Pecora, eighth director of the U. S. Geological Survey, Department of the Interior, was born and raised in New Jersey and received his baccalaureate degree from Princeton University in 1933 with honors in geology. His graduate work was at Harvard University and he received his Ph.D in Geology in 1940.

Dr. Pecora entered public service in 1939 with the U. S. Geological Survey, and has remained with this organization throughout his professional career. With the advice and consent of the Senate, he was appointed the eighth director of the U.S.G.S. by the President in 1965 and his reappointment was confirmed in 1969.

For his research work in geological sciences he was elected to the National Academy of Sciences, American Academy of Arts and Sciences, and the Brazilian Academy of Sciences. He has published more than 50 papers in his field of study.

Recent distinguished honors which he has received are the Distinguished Service Award from the U. S. Department of the Interior in December of 1968, and one of the seven winners of the Rockefeller Public Service Awards for 1969.

In his earlier years, he also achieved distinction as an outstanding athlete when winning the 1933 Intercollegiate Fencing Championship and serving as a member of the 1936 U. S. Olympic Team.

Dr. Pecora received an Honorary Doctor of Engineering Degree following his speech at the Colorado School of Mines. He has received one other Honorary Degree, a Doctor of Science from Franklin and Marshall College in Lancaster, Pennsylvania, in September of 1969.

in the taking and using. Take and use we must or we cannot survive as a species on earth.

NEED FOR RESEARCH

If the earth shall provide the materials for the survival of man's society, then a prudent society must provide for an intimate understanding of the earth, inquiry into geologic processes that have operated over the span of earth history, and operate today, continuing inventory of current and potential resources, and con-

tinuing effort to develop new techniques for information-gathering systems. Research and technologic development are costly investments; but they pay off handsomely in long-term benefits. Too often a society thinks only of "now." The cumulative benefits of early endeavors, on hindsight, are superb demonstration that today's long term is tomorrow's short term. Time, for man, is a long continuum.

The best example of this is the basic mapping systems that have been developed in the past. These include base topographic maps, geologic maps, hydrologic maps, geophysical maps, geochemical maps, and thematic, environmental, special subject maps. All of these are the products of intensive research effort. I am concerned that the pace of doing this kind of work has slowed down in recent years and I predict that our society will suffer for it. Our priorities will have to be reordered because of increasing needs of a World society that has a divine right under God to utilize our planet's total resources and to better the lot of man on earth.

NATIONAL RESOURCES GOALS

The United States, from its very inception, has been accused of placing too much emphasis upon the accumulation of wealth and too much effort in raising, through industry, its so-called standard of living. This view was first stated unequivocally in 1831 by Alexis de Tocqueville, a French Nobleman who visited this country when it had 24 states and 13 million people. Similar views are being stated today, as we have grown to 50 states and 200 million people.

The American democracy and its free enterprise system is a great and successful experiment, the first of its kind in the history of civilization. I, personally, see nothing wrong with dedication of individuals, or groups, toward amassment of wealth through honest industry. But in the process of achieving these goals our society unwittingly, or knowingly, has permitted deterioration of other values, not measurable in dollars or numbers, and which affect the quality of individual life in many ways. The growth of science and technology is discovery and utilization of our basic resources has failed in some ways and in many places to retain or fortify man's natural environment.

ENVIRONMENT MYTHS

It is believed by many people in this country that man alone is degrading and polluting his environment because of our modern industrial society. Some myths, however, need to be destroyed. Let me cite a few natural earth processes to demonstrate that natural processes are by far the principal agents in modifying our environment. This is not to excuse or put aside what man does, but rather to put man's actions in proper natural

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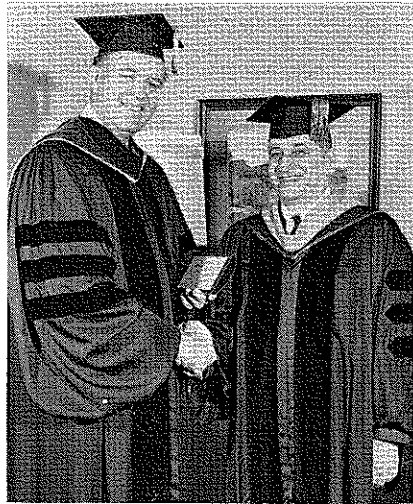
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perspective. Those individuals who speak about restoring our inherited environment of pure air, pure rain, pure water, pure lakes, and pure coastlines ignore the inevitability of nature.

It has been calculated that more than 100 million tons of fixed nitrogen in the form of ammonia and nitrates is annually transferred from the atmosphere to the surface of the earth as part of a natural precipitation process. In the United States alone there falls upon the face of our land annually more than four million tons of table salt, two and one-half million tons of sodium sulphate, and 36 million tons of calcium compounds—all in rain water.

Particulate matter and natural gases dispersed from the volcanoes is a continuing phenomenon. From three eruptions alone, the Krakatau eruption in Java (1883), the Mount Katmai eruption in Alaska (1912), and the Hekla eruption in Iceland (1947) more particulate matter in the form of dust and ash and more combined



DR. WILLIAM T. PECORA, USGS director and 1970 CSM Commencement speaker, receives a Doctor of Engineering degree from CSM President Orlo E. Childs.

gases were ejected into the atmosphere than from all of mankind's activity. Add to current volcanic processes the normal action of winds, forest fires, and evaporation from the sea, and we can readily conclude that man is an insignificant agent in the total picture, although he is becoming an important agent in extremely local context.

We have long been led to believe that water issuing from natural springs is pure and beneficial to health because of its purity. The springs issuing into the Arkansas and Red Rivers carry 17 tons of salt per minute. In the Lower Colorado River salt springs carry 1,500 tons of salt per day. The Lemonade Springs in New Mexico carry 900 pounds of sulphuric acid per million pounds of water, which is ten times the acid concentration of most acid mine streams in the country.

Hot Springs in Yellowstone Park is likewise many times more acidic than the typical acid stream in a coal-mining district. The Azure Yampah spring in Colorado contains eight times the radium that the Public Health Service sets as a safe limit. These are but a few examples of the kind of pollution that goes on continually from natural springs.

The lakes and ponds throughout

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geologic history have gone through a life cycle of birth, maturity, old age, and disappearance. No lake is truly permanent. Some of our inland lakes during their mature stage become more salty than the ocean itself. The Great Salt Lake is nearing its dying stages. Once 20,000 square miles in area (Lake Bonneville) it is now only 950 square miles in area. Many thousands of years ago it was essentially a fresh-water lake, fed during the pluvial period of the Great Ice Age, and now it is about ten times as salty as sea water.

We frequently hear that Lake Erie is dead. This is pure rubbish. Lake Erie is the shallowest of the Great Lakes, was created about 20,000 years ago and, barring another Ice Age, has several thousands of years yet to go before senility. The western part of the lake is extremely shallow and receives a large amount of natural organic material transported from the surrounding terrain. Here is where the algae growth has always been present. Lake Erie has continually produced about 50 per cent of the fish catch of the entire Great Lakes system, consistently over the past 100 years. This is not a mark of a dead lake. Green Bay, Michigan, so named by the first settlers because of the green color of the algae so prevalent in the Bay is, like the western shallow part of Lake Erie, the source of a great amount of organic matter. The food supply for aquatic life is high in these environments. The oxygen supply, unfortunately, diminishes as algae growth increases, as this portion of the lake becomes more and more shallow and as organic material is swept into the water, whether from natural or human sources. Every lake or pond, whether natural or man-made, faces a similar life history. Man can certainly better or worsen a natural situation like this.

The rivers of our nation are being called dirty because of the works of man. We must understand that the river systems of the land are the natural transport systems for sediment

washed downhill by the rains that fall upon the land. It is estimated that the Mississippi River carries into the Gulf a load of more than two million tons of sediment per day. This is equivalent to the load of 40,000 freight cars.

The Colorado River carries into Lake Mead about 40,000 tons per day. The Paria River in Arizona is probably the dirtiest river in the world. It carries 500 times as much sediment as the Mississippi River per unit volume of water. This is a continuing condition year after year. Chemicals are also transported by streams in phenomenal amounts. The Brazos River of Texas, for example, transports 25,000 tons of dissolved salt per day. Peace Creek in Florida carries twice the concentration of fluoride that is harmful to teeth. Many rivers and streams throughout the nation have natural qualities that do not meet the public health standards for drinking water.

The ocean has been the natural waste sink for the large-scale, natural pollution process of the earth. The character of the ocean itself has changed slowly throughout geologic time, while it has continually supported abundant life of all varieties.

MAN AS A GEOLOGIC AGENT

It must be quite evident that, although natural earth processes dwarf the actions of man in a total context, man can become a major geologic agent in a specific or local context. This inter reaction of man with nature is without question a most important issue of future years. In a society that has reached maturity in the industrial sense, the issue of environmental alteration becomes more and more acute. It is within this framework that certain actions 100 or 200 years ago are now considered sinful.

The philosophy of engineering project costs is being modified to allow for certain actions which in the past were not factored into our cost analyses. A mineral resource, for example, should not be developed unless it is rich enough to support proper restoration or reutilization of the land. A major pipeline traversing Alaska some 800 miles should not be constructed without added safeguards to protect the natural environment. Off-shore drilling for petroleum should not be endorsed without the added cost of providing maximum safeguards against pollution. Cities and industries should not use the water available from natural sources without factoring in the cost of returning the water to a usable state. The smokestacks of our refineries and energy plants must not treat materials that put unwanted matter into our air.

Reservoirs are constructed and rivers are diverted. These problems and others like them are familiar to all

of you. The science and technology which has made possible the great advance of mankind can surely pay attention to these matters and resolve them.

Who will bear the cost, however? Who will make the policy decisions? We know that government agencies have been urged by the people to regulate these matters, but who will pay the cost, I ask, for what I am convinced science and technology can do to ameliorate the situation. It must be the people.

Whether through their tax participation or whether it be in the higher cost of a product, the people must pay the cost both in dollars and in landscape changes for taking from the environment what mankind needs. We, who represent science and technology, can show how resources can be utilized with minimal alteration or degradation of the environment. We can do this, however, only by making a complete inventory of cause and effect—in other words—spelling out our costs and trade offs in more than just dollars. President Nixon and Secretary Hickel have spoken of this on many occasions.

GREATER ROLE FOR ENGINEERING

Throughout history engineering accomplishment has been a magnificent measure of human achievement, particularly where new challenges were posed. Daring projects, planned on basic natural laws, carefully monitored in the design and construction stages, became on hindsight well-conceived operations. For those times the ancient irrigation system of Mesopotamia, the Roman aqueduct, the pyramids were utterly fantastic operations. The hot water supply at Bath, England, still functions perfectly almost 2,000 years after its construction. Today the Hoover Dam, the Open Pit at Bingham, Utah, the Golden Gate Bridge or the Hudson River Tunnel mark great ventures of our own era.

Although the engineering profession today is recognized as one which gets things done, it is also recognized as one that is essentially pragmatic in acquiring maximum integrity of structure and function at minimum cost. A new ethic for engineering is evolving. More and more concern is being directed to areas of social impact arising from waste products disposal and environmental degradation.

In the 1969 Christmas Pageant of Peace in Washington, D. C., pine trees marked a path for the States of the Union—each tree for a state. These trees had been supplied by a private company in the Midwest and grown on restored lands where ugly coal strip mines had disrupted the landscape. The mining venture here was but an incident in a time plan. How proud I was to see this; but so few people know of it and other cases like

it. So many are angry over chemical wastes dumped into lakes and rivers and gaseous products from smelters and coal-burning smoke stacks emitted to the air. And their numbers are increasing!

The value of the extractive mineral resources in the United States is currently in the order of \$30 billion annually. This includes both the energy and hard mineral resources. The impact of that part of the engineering profession responsible for this mineral production, and its subsequent use in the economy, is profound on the maintenance of our way of life.

American industry is in trouble, however, because of past abuses to the environment which admittedly have been magnified or distorted by some critics. Profit has become an ugly word and the concept of service to mankind derived from engineering practice is being ridiculed in many places. We are in the midst of a conflict between the need to develop our resources and the need to preserve our environment—both for the benefit of mankind. In your chosen profession of engineering you will be very much involved—you will be subject to pressures from both sides and you must be responsive. Do not be silent under attack.

OBLIGATION OF LEADERSHIP

You young graduates will one day be leaders in your profession. The principal obligation of leadership is to be alert to the issues, to make tough value judgments, to be forthright in your expressions to management and to the community, to seek facts but, in the absence of total facts, to have the courage to make gut decisions with a constant edge toward people and people's problems. This is your quest—a quest for balance.

You may have read the words expressed by H. L. Keenleyside of Canada before a United Nations Scientific Conference. They came from a poem of James Russell Lowell in his tribute to Cromwell. More than anything else they represent the philosophic view I am presenting to you today. Let me give those words to you now.

"New times demand new measures and new men;
The World advances, and in time outgrows

The laws that in our father's day were best;
And, doubtless, after us some better scheme
Will be shaped out by wiser men than we,
Made wiser by the steady growth of truth."

God be with you in your life's endeavor. Never, never, shade the truth.

"How's the soup, sir?" asked the waiter.

"To tell the truth," the diner replied, "I'm kind of sorry I stirred it."

Top Students Honored at Mines

MORE than 50 students of the Colorado School of Mines won special recognition at the Annual Honors Convocation in Guggenheim Auditorium, Wednesday, May 20, 1970.

The yearly convocation recognizes students who have won special scholarships, awards and prizes.

By geographic location, the honorees are:

COLORADO

ARVADA: Robert R. Rostad, son of Mr. and Mrs. Ora H. Rostad, 6007 Dudley Court, winner of the Robert A. Baxter Award for meritorious work in Chemistry. Presented to Rostad by Professor Robert A. Baxter. Also the winner of the Outstanding Graduating Senior Award in the Chemistry Department. Presented to Rostad by Professor R. E. Bisque.

Paul J. Schiller, son of Mr. and Mrs. Joe Schiller, 6300 Johnson Way, winner of the Charles N. Bell Award for a graduate in mining engineer-

ing who "in completing the course in mining engineering has made the most progress in his school work during the entire period for which the course is given." Presented to Schiller by Professor A. M. Keenan.

Lloyd T. Winger, III, son of Mr. and Mrs. Lloyd T. Winger, Jr., 6135 Carr Street, winner of the Outstanding Graduating Senior Award in the Chemical and Petroleum Refining Department. Presented to Winger by Professor J. H. Gary. Also the winner of the Max I. Silber Award for Highest Scholastic Achievement for a 1969 junior and 1970 senior. Presented to Winger by President Orlo E. Childs.

AURORA: David L. Scott, son of Mr. and Mrs. Leslie G. Scott, 2249 Fulton Street, winner of the Alcoa Foundation Scholarship for 1970-71 academic year. Awarded to a junior student in Metallurgical or Mining Engineering.

BROOMFIELD: Randall J. Scott, son of Mr. and Mrs. Stanley R. Scott, 965 West 6th Ave., winner of the International Nickel Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in the Metallurgical Department.

COLORADO SPRINGS: James E. Goosman, son of Mr. and Mrs. Michael J. Goosman, 1707 West Bijou, winner of the Outstanding Graduating Senior Award in the Physics Department. Presented to Goosman by Professor R. B. Bowersox.

Gregory R. Siebers, son of Mr. and Mrs. Perry Siebers, 215 East Caramillo, winner of the William D. Wallman Award, an annual cash prize to a graduating senior whose conduct and scholarship have been most nearly perfect and who has most nearly approached the recognized characteristics of an American gentleman during his entire collegiate career. Presented to Siebers by Dr. A. W. Schlechten.

DENVER: Donald F. Geesaman, son of Mr. and Mrs. Frank Geesaman, 952 South Union B.v.d., winner of the John E. Lee Scholarship for the 1970-71 academic year. Awarded to a student in any year or in any option.

Clinton R. Hoagland, son of Mr. and Mrs. William R. Hoagland, 3191 South Parker Road; winner of the Outstanding Graduating Senior Award in the Geophysical Engineering Department. Presented to Hoagland by Professor J. C. Hollister.

William L. Karlin, son of Mr. and Mrs. L. W. Karlin, 6131 East Eastman, winner of a Universal Oil Products Foundation Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Chemical and Petroleum Refining Engineering.

DENVER: John L. Larson, son of Mr. and Mrs. John L. Larson, 5091 Perry Street, winner of a Universal Oil Products Foundation Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Chemical and Petroleum Refining Engineering.

Scott G. Munich, son of Mr. and Mrs. W. F. Munich, 10385 Verna Lane, winner of a Union Oil Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Chemical and Petroleum Refining, Geological or Geophysical Engineering.

Steven D. Steffens, son of Mr. and Mrs. Armon E. Steffens, 2029 Quitman, winner of a Cleveland-Cliffs Iron Company Scholarship for the 1970-71 academic year. Awarded to a sophomore in the Mining or Metallurgy Department.

William E. Westbrook, son of Mr. and Mrs. Elmer Westbrook, 855 South Corona, winner of the Max I. Silber Award for Highest Scholastic Achievement for a 1969 sophomore. Presented to Westbrook by President O. E. Childs.

ESTES PARK: Charles S. McNiel, son of Mr. and Mrs. Waldo S. McNiel, P.O. Box 1194, winner of the Edward C. Horne Scholarship for the 1970-71 academic year. Awarded to a junior or senior in the Mining Department.

FLORENCE: John C. Darrow, son of Mr. and Mrs. John Darrow, Route 1, Box 183A, winner of a Mathematics Prize Examination Award. Presented to Darrow by Professor J. R. Lee.

GOLDEN: Charles D. Crew, son of Mr. and Mrs. Wynn D. Crew, 12900 West 16th Drive, winner of the Mr. and Mrs. J. C. Burt Award. This is a cash prize available to the senior athlete who has contributed the most to athletics. Presented to Crew by Professor F. S. Brennecke.

David D. Duston, son of Mr. and Mrs. H. Duane Duston, 15200 West 32nd Ave., winner of the Harrison L. Hays cash prize for a student in Chemical and Petroleum Refining Engineering best demonstrating scholarship, personality, and integrity "the general potentialities of a successful business career." Presented to Duston by Mr. Harrison L. Hays.

John N. Pollard, son of Mr. and Mrs. John C. Pollard, 301 Lily Lane, winner of a ROTC Scholarship for the 1970-71 academic year.

LAKEWOOD: Randall L. Brocher, son of Mr. and Mrs. Lawrence Brocher, 80 South Cody St., winner of the Monsanto Company Scholarship for the 1970-71 academic year. Awarded to students in the Chemical, Petroleum and Refining Department.

Byron A. Palmer, son of Mr. and Mrs. Archie Palmer, 7330 West 10th Ave., winner of a Mathematics Prize Examination Award. Presented to Palmer by Professor J. R. Lee.

LITTLETON: Ronald H. Bissett, son of Mr. and Mrs. Robert J. Bissett, 5115 South Washington, winner of a Universal Oil Products Foundation Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Chemical and Petroleum Refining Engineering.

LITTLETON: Charles W. Bloomquist, son of Mr. and Mrs. Charles W. Bloomquist, 6577 South Gallup, winner of the Outstanding Graduating Senior Award in the Petroleum Engineering Department. Presented to Bloomquist by Professor G. R. Pickett.

Michael S. Kirchner, son of Mr. and Mrs. Stanley W. Kirchner, 2254 West Costilla Ave., winner of the Max I. Silber Award for Highest Scholastic Achievement for a 1969 freshman. Presented to Kirchner by President O. E. Childs. Also a winner of the Standard Oil Company of California Scholarship for the 1970-71 academic year. Awarded to a student in any year in Geophysical, Geological or Petroleum Engineering.

PUEBLO: John S. Belcher, son of Mr. and Mrs. Robert L. Belcher, 401 La Vista, winner of the Chevron Oil Company-California Division Scholarship for the 1970-71 academic year. Awarded to a senior student in Geophysical Engineering.

SALIDA: Daniel L. Everett, son of Mr. and Mrs. Daniel L. Everett, R.R. 1, Box 340, winner of the Outstanding Graduating Senior Award in the Mathematics Department. Presented to Everett by Professor J. R. Lee.

STERLING: Danny J. Krebs, son of Mr. and Mrs. Joseph E. Krebs, P.O. Box 105, winner of a ROTC Scholarship for the 1970-71 academic year.

OUT OF STATE

ARIZONA: Terry D. Bauer, son of Mrs. Robert Bauer, 326 Grove Street, Prescott, winner of the Clark B. Carpenter Award available to a graduating senior in Metallurgical or Mining Engineering and most deserving in the view of the stu-

dents and faculty members in the department. Also winner of the Outstanding Graduating Senior Award in the Mining Engineering Department. Both awards presented to Bauer by Professor A. M. Keenan.

CALIFORNIA: Steven L. Schuhart, son of Mr. and Mrs. T. V. Schuhart, 300 Anza Street, Davis, winner of a Cleveland-Cliffs Iron Company Scholarship for the 1970-71 academic year. Awarded to a sophomore in the Mining or Metallurgy Department.

Walter F. Malone, son of Mr. and Mrs. Walter Malone, 228 North 10th Street, Montebello, winner of a New Jersey Zinc Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Mining, Metallurgy or Geophysical Engineering.

CONNECTICUT: John I. Brockardt, son of Mr. and Mrs. John W. Brockardt, 4 colony Road, Darien, winner of an American Smelting and Refining Company Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Mining or Metallurgical Engineering.

ILLINOIS: Alan N. Pike, son of Mr. and Mrs. Kenneth N. Pike, 5809 Franklin Ave., La Grange, winner of the Dow Chemical Company Scholarship for the 1970-71 academic year. Awarded to a junior student in Metallurgical Engineering.

ILLINOIS: Cy Jordan, son of Mr. and Mrs. Calvin A. Jordan, 5570 Dorchester Drive, Rockford, winner of an American Smelting and Refining Company Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Mining or Metallurgical Engineering.

George K. McFall, son of Mr. and Mrs. George McFall, 4711 Forest Hills Road, Rockford, winner of an Alcoa Foundation Scholarship for the 1970-71 academic year. Awarded to a junior student in Metallurgical or Mining Engineering.

INDIANA: Douglas J. Guion, son of Mr. and Mrs. John A. Guion, 5153 Caroline, Indianapolis, winner of the Robert F. Aldredge Memorial Prize, a cash award, presented each year to the graduating senior in Geophysics who has the highest scholastic average in Geophysics courses. Also winner of the Cecil H. Green Award given to the student who has the highest attainment in the combination of scholastic achievement, personality and integrity in Geophysics. Both awards presented to Guion by Professor J. D. Hollister.

IOWA: David G. Sioffa, son of Mr. and Mrs. Anton J. Sioffa, 2022 Highland Ave., Davenport, winner of the J. Weldon Wilson Scholarship for the 1970-71 academic year. Awarded to a junior student in any option.

MARYLAND: Robert K. Spangler, son of Mr. and Mrs. Robert K. Spangler, 1323 Brixton Road, Baltimore, winner of an Alcoa Foundation Scholarship for the 1970-71 academic year. Awarded to a junior student in Metallurgical or Mining Engineering.

MARYLAND: John C. Vanko, son of Mr. and Mrs. John J. Vanko, 120 Springside Drive, Timonium, winner of a New Jersey Zinc Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Mining, Metallurgy or Geophysical Engineering.

MASSACHUSETTS: James J. Gusek, son of Mrs. Josephine R. Gusek, 28 Linden Ave., Westfield, winner of a Cleveland-Cliffs Iron Company Scholarship for the 1970-71 academic year. Awarded to a sophomore in the Mining or Metallurgy Departments.

MISSOURI: Larry A. Cramer, son of Mr. and Mrs. Rolf W. Cramer, 2319 Goff Ave., St. Joseph, winner of the Charles and Mary Cavanaugh Award in memory of a young Colorado School of Mines Alumnus and his wife. Presented to Cramer by Professor P. G. Herold.

NEW HAMPSHIRE: Robert G. Pepler, Jr., son of Mrs. Ruth Pepler, Hill Road, Franklin, winner of a Union Oil Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Chemical and Petroleum Refining, Geological or Geophysical Engineering.

NEW JERSEY: Richard J. Hurt, son of Mr. and Mrs. Jack S. Hurt, 119 Wm. Penn Ave., Pennsville, winner of an Alcoa Foundation Scholarship for the 1970-71 academic year. Awarded to a junior student in Metallurgical or Mining Engineering.

NEW YORK: Robert A. Crewdson, son of Mr. and Mrs. Ernest Crewdson, 124 Parkmere Road, Rochester, winner of a Union Oil Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Chemical and Petroleum Refining, Geological or Geophysical Engineering.

OHIO: Stephen D. Schwochow, son of Mr. and Mrs. Norman Schwochow, 241 East Cherry, Clyde, winner of the Outstanding Graduating Senior Award in the Geological Engineering Department. Presented to Schwochow by Professor H. C. Kent.

OREGON: Paul D. Blumenstein, Jr., son of Mr. and Mrs. Paul D. Blumenstein, Sr., 2825 Floral Hill Drive, Eugene, winner of the George W. Harris Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Mining Engineering.

PENNSYLVANIA: Wesley P. Nason, son of Mr. and Mrs. E. Paul Nason, 950 Highland Road, Sharon, winner of the New Jersey Zinc Company Scholarship for the 1970-71 academic year. Awarded to a student in any year in Mining,

Metallurgy or Geophysical Engineering.

TEXAS: William L. Fischer, son of Mr. and Mrs. G. L. Fischer, 907 Duncan Lane, Austin, winner of an American Smelting and Refining Company Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Mining or Metallurgical Engineering.

VERMONT: Donald W. D. Rakowski, son of Mr. and Mrs. Stanley Rakowski, 116 Messenger Street, St. Albans, winner of the Outstanding Graduating Senior Award in the Metallurgical Engineering Department. Presented to Rakowski by Professor P. G. Herold. Also the winner of the President's Award Senior Scholar Athlete. Presented to Rakowski by President O. E. Childs.

VIRGINIA: Clifford R. Pollock, son of Colonel and Mrs. C. R. Pollock, 123 Tanglewood Drive, Hampton, winner of a ROTC Scholarship for the 1970-71 academic year.

WYOMING: James B. Page, son of Mr. and Mrs. LeGrande T. Page, 107 12th Street, Wheatland, winner of the Kennecott Copper Corporation Scholarship for the 1970-71 academic year. Awarded to a junior or senior in Metallurgy or Mining.

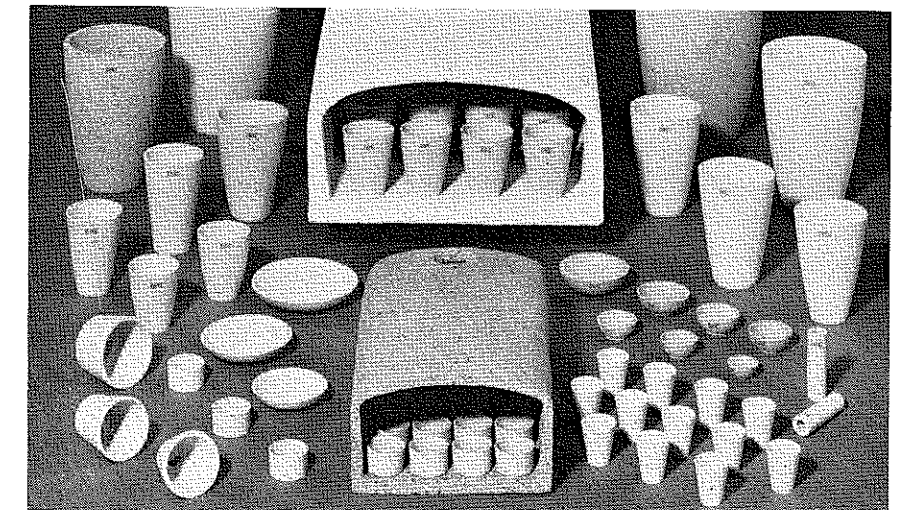
CANADA: David W. Philip, son of Mrs. Barbara I. Philip, 304-233 East 14th Street, Vancouver, B.C., winner of the Viola Vestal Coulter Scholarship for the 1970-71 academic year. Awarded to a junior or senior student in Mining or Metallurgical Engineering.

ENGLAND: Timothy J. Haddon, son of Mr. and Mrs. Michael P. Haddon, % 108 Queensgate, London S.W., winner of the Brunton Award. This Brunton Transit is made available by the late Hon. D. W. Brunton for meritorious work in Mining Engineering.

HONG KONG: Wing-On Chu, son of Mr. and Mrs. Chun Man Chu, 3F1, 8M1 Butler Road, winner of the Rocky Mountain Association of Geologists Award for achievement in all phases of Geology. Presented to Chu by Professor H. C. Kent.

PERU: Michael P. Juilland, son of Mr. and Mrs. Paul G. Juilland, 887 L. P. Villaran, Lima, winner of the Charles J. Adams Scholarship for the 1970-71 academic year. Awarded to a junior student in Mining Engineering.

The sign on the entrance to the Internal Revenue Service building read: "Watch your step." The sign on the exit read: "Watch your language."



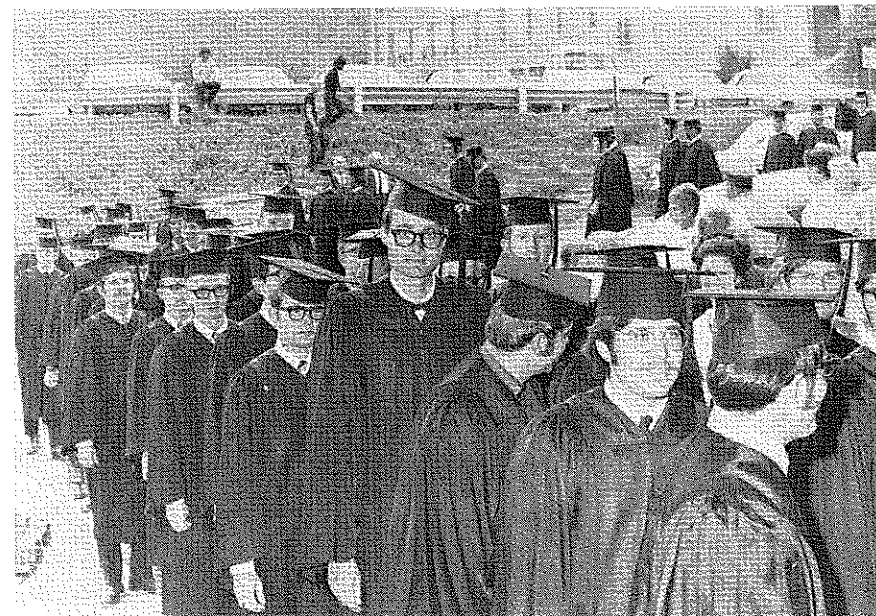
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DFC Ceramics, Inc.



HERE IS A CLOSE-UP OF THE 1970 COMMENCEMENT PROCESSIONAL from Guggenheim Hall to Steinhauer Field House.

Good Luck, Miners

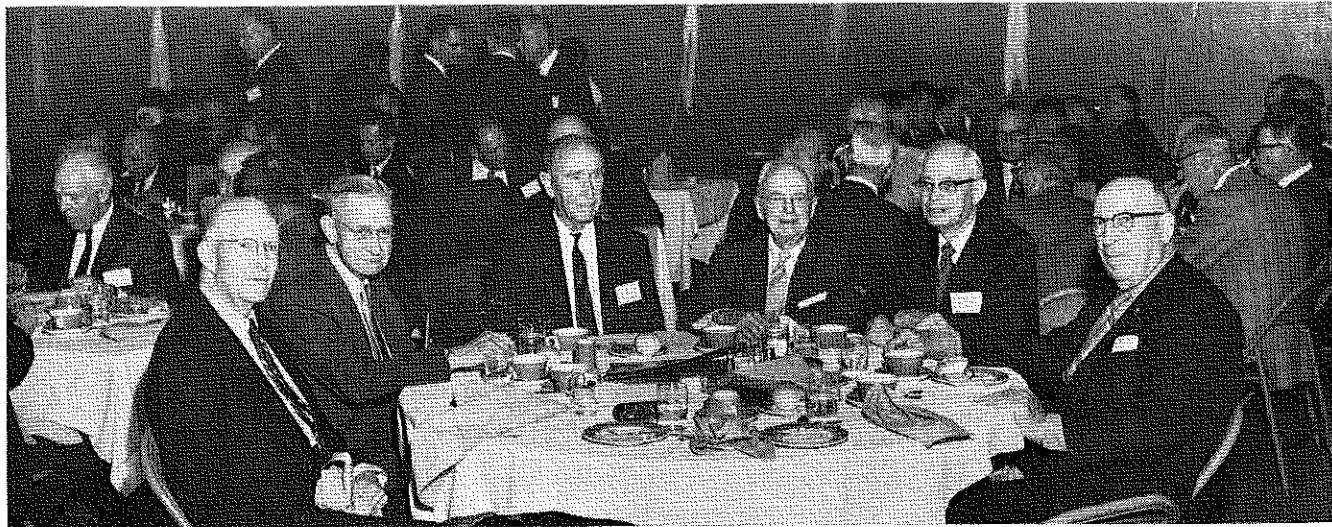
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Golden Anniversary Graduates Karl W. Reynolds '20 (beginning second from left), Ethelbert Dowden Jr. '20, W. S. Levings '20, Fred Lichtenheld '20. Also shown are F. E. Heatley '15 and Steve Fullaway '16.

Annual CSM Alumni Banquet

Celebrating the 96th Commencement

Denver Athletic Club, Denver, Colo.

May 28, 1970, 6:30 P.M.

MORE than 250 Mines men, CSM faculty and administration, and guests attended the Annual Alumni Banquet held May 28, 1970 at the Denver Athletic Club.

After relaxing cocktails and a gourmet dinner, CSM Alumni President Hal Addington made the following introductions and comments:

"I am Hal Addington, Class of 1943, president of the Alumni Organization and also consulting petroleum engineer, here in Denver.

"Harrison Hays, 1931, is the vice president of the Alumni and is direc-

tor of Project Development, Stearns-Roger Corp., Denver.

"Neal Harr, 1954, is the secretary of the Organization and a geologist with King Resources, Denver.

"Robert Magnie, 1947, is the treasurer, and was well chosen, because he is a member of the staff at the Denver U. S. National Bank. This is his second year.

"Dick Vincent, 1933, was elected in 1968 and is now serving his third year on the Board. Dick is director of Metallurgical Research for American Metal Climax.

"Donald A. Craig, 1948, was elected a director last year, and is also vice president of Metal Treating and Research Co., Denver. Don's son, Bruce, is a member of the 1970 graduating class.

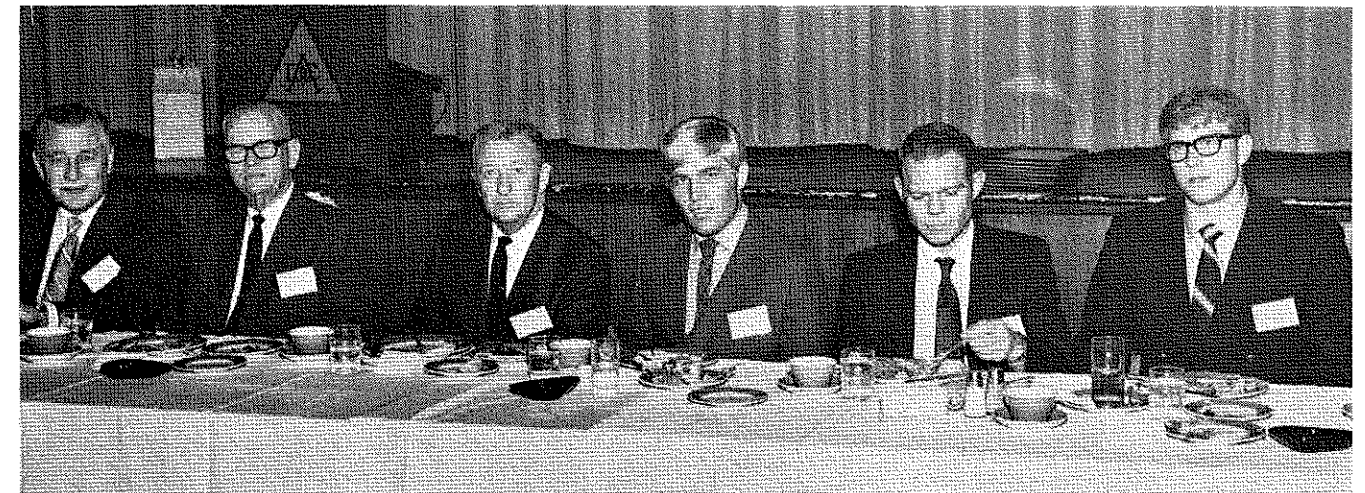
"David S. Squibb, 1934, is serving his first year as a director. He is with Stearns-Roger Corp.

"I am sure that most of you know Dr. Orlo E. Childs, president of the Colorado School of Mines, and I would like to ask him to present the members of his staff and faculty that may be present.

"The Board of Trustees of the Colorado School of Mines consists of Mr. Ted Stockmar, president, and Board members Ed Eisenach, Russell Volk, William Alexander and Leo Bradley.

"We are always pleased to have Representative George Fentress, 1949, with us.

"Both the President of the Student Body, Charlie McNeil, and the President of the Senior Class, Charles Crew, are with us this evening. We are proud to have these fine representatives of the students of the Colorado School of Mines with us at this time.



Seated at the Head Table are D. H. Squibb '34, H. L. Hays '31, H. W. Addington '43, Charlie McNeil '71, Neal J. Harr '54, and Charles Crew '70.

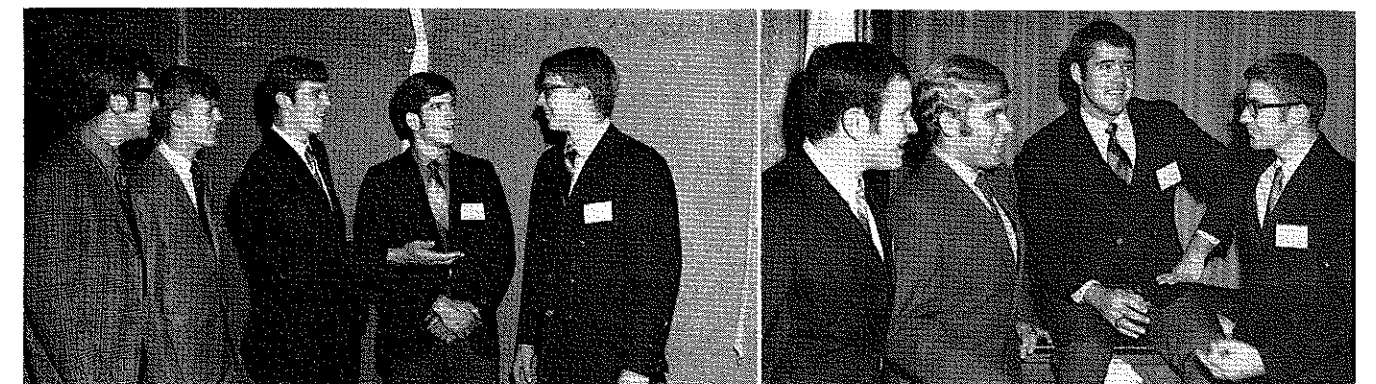
"Mr. Neil Harr will present the Class Agents for 1970 in the absence of Dr. Pegis who is unable to attend. The young men are Richard J. Kehmeier (Geology); Douglas J. Guion (Geophysics); Charles D. Crew (Metallurgy); Robert T. Roberts (Mining); Charles W. Bloomquist (Petroleum); Gregory R. Siebers (Petroleum Refining); Robert E. Deister (Chemistry); Edward C. Karg, Jr. (Mathematics); Lee A. Turner (Physics).

"Steve Fullaway, 1916, will present the annual Fullaway Award to the Outstanding Track Man, George Brett Bristol, a Junior, who holds the School record as a high jumper. He has lettered three years in track.

"The Pi Warren Annual Award is being given to Mike Collodi, a Sophomore, as the Outstanding Baseball Player on the Mines squad. Last year he received this award, and it was the first time it was ever given to a Freshman. He has had an outstanding season again this year. Mike also received conference recognition in both 1968 and 1969 for his performance in football as a brilliant receiver and flanker. He is one of the four athletes who has been chosen by the Outstanding College Athletes of



Ralph Foster '43, I. Ivan Gilbert '41, Walter L. Crow '41, Martin Hugglund '41, Ted P. Stockmar '43, and John J. Wanner '48.



Henry Kaanta '70, Mike Hagen '70, Mike Collodi ('72), Brett Bristol ('71), and Charles Crew '70. Also shown (right) Paul Schiller '70, Charles McNeil ('71), Bob Bills '70, and Carl Winters '70.

U.S.G.S. Geologic References

Do you still look for USGS geologic references by place names? The quick, accurate way is by latitude and longitude. Our **Geologic Index** is an easy-to-use reference finder kept current by Monthly Supplements, \$15.00 per year, Quarterly, \$9.00, or Yearly, \$3.00. See *Mines Magazine* "Book Review" August, 1969 or write us for particulars. Each book sold is delivered to you completely up-to-date with supplements. Price \$25.00. Used extensively in U.S. and Canada.

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Risser

America and will be honored in the 1970 Volume of their publication.

"The Colorado School of Mines has, for the past 27 years, recognized its outstanding graduates by conferring the Distinguished Achievement Medal at the Annual Commencement. The award represents the highest honor the School of Mines bestows on its own graduates.

"Selection of the Medalists is made by the Board of Trustees of Mines, who have carefully evaluated, screened, and chosen those most eligible from among our distinguished graduates. The Distinguished Achievement Award is represented by a Silver Medallion encased in Lucite, set on a walnut base. The record of accomplishments of each medallist is permanently inscribed in a journal; a bound copy of this inscription is presented to each of the honored graduates. Since the achievement of each is reported in full at Commencement, we will only introduce each one this evening with a statement of his current position. They are:

"Aziz A. Alwattari, Petroleum Refining Engineer, Class of 1952, who resides in Barnes, London, England. He is presently a member of the Board of Directors of the Sahara Insurance Co., Tripoli, and is doing graduate work in economics at the School of Oriental and African Studies, University of London. Although he was unable to attend the banquet this evening, he has sent a letter expressing regret.

"Claude L. Barker, Engineer of Mines, Class of 1931, lives here in Denver. He is now an independent consulting mineral investment engineer after a successful career spanning almost four decades in Colorado with E. I. DuPont Co.

"Willam S. Cole, Jr., Engineer of Mines, Class of 1935 from St. Ann, Jamaica, West Indies. Mr. Cole is vice president and general manager, Reynolds Jamaica Mines Ltd., director and vice president and general manager, Lydford Enterprises Limited in Lydford, St. Ann, Jamaica.

"Frank R. Fisher, Petroleum Engineer, Class of 1940, from Richard-

son, Texas. Mr. Fisher is assistant manager, Research and Development, North American Producing Division of Atlantic Richfield Co., in Plano, Texas. His publications include several articles in MINES Magazine and other technical publications. In addition, he holds three United States Patents.

"J. Harlan Johnson, Master of Science, Class of 1923, Crawley, Texas. In 1925 he became associate professor of Geology at Mines and in 1936 received the Doctor of Philosophy degree from the University of Colorado. He was professor of Geology at Mines from 1947 until 1967 when he retired as Professor Emeritus. Dr. Johnson is the author of over 170 publications, largely on organic limestones and fossil algae, and is the author of a book, 'Limestone-Building Algae and Algal Limestones.'

"Hubert E. Risser, Engineer of Mines, Class of 1937, from Urbana, Ill., is unable to attend the banquet. Since 1960, Dr. Risser has been professor of Mineral Economics, University of Illinois and principal mineral economist and assistant chief of the Illinois Geological Survey. In January 1970 he became a visiting professor in the Department of Mineral Economics at the Colorado School of Mines. He is the author of more

than 30 publications on many aspects of the mineral industries.

"Our Commencement Speaker Dr. William Pecora, will receive an Honorary Degree, Doctor of Engineering. He has been the director of the United States Geological Survey, Department of the Interior, since 1965. For his research work in geologic science Dr. Pecora was elected to the National Academy of Sciences, American Academy of Arts and Sciences, and the Brazilian Academy of Sciences. He has published more than 50 papers in his field. In his earlier years, Dr. Pecora also achieved distinction as an outstanding athlete. He was Intercollegiate Fencing Champion in 1933 and in 1936 a member of the United States Olympic Team.

"The Colorado School of Mines Alumni Foundation elects a number of individuals each year as Honorary Members. The requirement for this designation is that they are "a friend of the institution and have contributed in some way to its well being." This year five Honorary Members have been recommended by the membership and approved by the Board of Directors of Colorado School of Mines Foundation. These men are:

"Dr. Orlo E. Childs, who is retiring as President of the Colorado School of Mines. The changes on the campus



T. T. Humphreys, Tom Roberts '70, S. Power Warren '13, Carl A. Blaurock '16, Frank E. Briber '16, John B. Carman '10, Kenneth H. Mateson '11, and Robert W. Humphreys '70.

and within the curriculum mark the effort made by him during his six years as president.

"Dr. Wm. J. Pecora, director, U. S. Geological Survey, for his outstanding work in Geology and continued support given by him to the Colorado School of Mines.

"Dr. Robert H. Carpenter, Dept. of Geology, for his contribution not only in his official position with the department but for his intense and continued interest in the welfare of the foreign students on the campus by sponsoring the International Club. Dr. Carpenter should share this honor with Mrs. Carpenter, for she has also played a great part in this endeavor.

"Prof. Robert D. Osborn for his dedication as a teacher of mathematics. Professor Osborn is retiring as of the end of this school year.

"Mr. Nils Swenson, for his expression of support to the Colorado School of Mines Foundation by donating a substantial gift which expressed his faith in the students, faculty and the administration of the Colorado School of Mines in maintaining their "cool" during these most trying times.

"In the interest of brevity we will not introduce the individual members of the classes who are here for their reunions. However, I thought that you might be interested in some statistics. The Silver Anniversary Class of 1945 was much smaller than usual as the number of graduates had been drastically curtailed by the demands of World War II. There were 44 graduates in the Class, of whom 40 are living and 2 are expected to return for their 25th reunion.

"The Class of 1940 (30th Year) was one of the larger pre-war classes, with 148 graduating and 130 of whom



Fathers and Sons Table—Greg Chlumsky '70, Frank J. Chlumsky, Lloyd Winger III '70, Lloyd Winger, Jr., Fred Staible '70, E. W. Staible, O. H. Rostad, and Robert Rostad '70.

are still living. We expect to have 16 here for the reunion.

"The Class of 1935 (35th Year) has 93 graduates, 74 of whom are still living and 15 of whom are expected at reunion. A letter from George Argall—on his way to the 6th International Mining Congress in Madrid — expresses best wishes to members of the Class of 1935.

"The Class of 1930 (40th Year) contained 68 graduates of whom 49 are still living and nine are expected to be here. This is the first class before the spectacular crash of the 1929s. Shortly after graduation they met the crisis of October 1929 and for the next few years it was largely a case of 'root hog, or die.'

"The Class of 1925 had 79 members of whom 48 are living and eight will

be in attendance at the annual reunion.

"The Golden Anniversary Class of 1920 (50th Year) was also curtailed in number by World War I. Only 40 men graduated in that class, of whom 21 are living and six are in attendance at this reunion. Since this is their Golden Anniversary Reunion I think it is proper to make an exception here and introduce the six who are present: Mr. Ethelbert Dowden, DeBary, Fla.; Dr. Wm. S. Levings, Golden, Colo.; Mr. Frederick A. Lichtenheld, Oklahoma City, Okla.; Mr. Herbert K. Linn, Lakewood, Colo.; Mr. H. W. C. Prommel, Denver, Colo.; Mr. Karl W. Reynolds, Tulsa, Okla.

"K. H. (Scotty) Matheson represents the Class of 1911 (59th Year).



Jack Haley '48, Dick Veghto '54, and Ralph Foster '48 (left). W. W. Fertig '51, Jim Colasanti '51, and Albert M. Keenan '35 (right).



W. W. Fertig '51, Jim Colasanti '51, and Albert M. Keenan '35 (right).

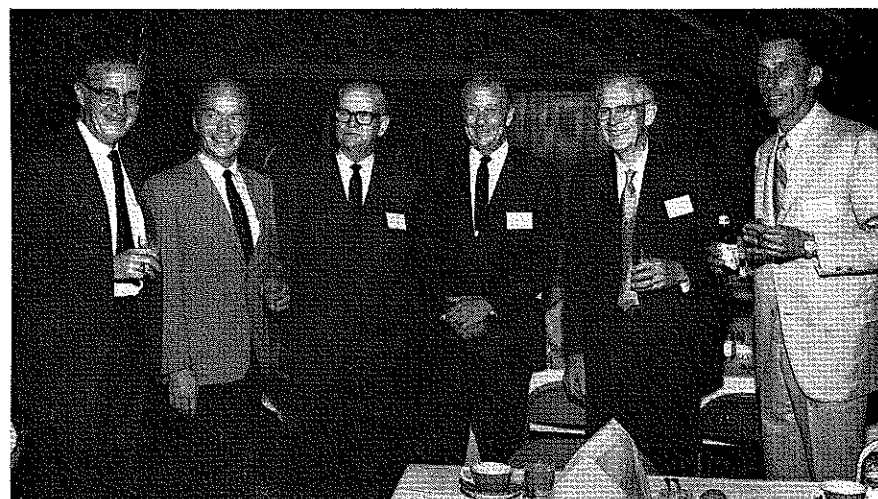


D. H. Squibb '34, Edward Matsen '34, T. G. Manhart '30, and Lindy Barker '31 (left). Brett Bristol '71, Ken Nickerson '48, Dan Carroll '70, and Mike Collodi '72 (right).

"John B. Carmen represents the Class of 1910 (60th Year).

"Warren Prosser from the Class of 1907 is here and will have completed 63 years since graduation. Mr. Prosser said that 'as a member of the Class of 1907 I sincerely hope that many of you of the Class of 1970 will return to celebrate your Golden Anniversary in 2020 A.D.'

"The end of the program is near, and it is time to salute the man who runs the Alumni Association, Col. Wendell W. Fertig, and his efficient staff: Mrs. Betty Becker, Mrs. Charlotte McKnight, Mrs. Jackie Simpson, Mrs. Shirley Ashlock, and Dean William Burger, who has been most successful as advertising manager of MINES Magazine. MINES Magazine Editor Carter Kaanta also is here tonight with his son, Henry, who graduates from Mines this summer. Another son, Carter W., now with IBM in Vermont, graduated from Mines in January with a Metallurgical Engineering degree. The boys' maternal and paternal grandfathers were also Mines' graduates: C. W. Badgley '06 and Henry W. Kaanta '15.



Jack Chelius '42, E. J. Mayhew '41, Harrison L. Hays '31, H. W. Addington '43, Dr. John W. Vanderwilt, and Dr. Ramon Bisque.

"This is it—let's ask the fathers of sons in the Class of 1970 to stand. Now, will members of the Class of 1970 stand and be accepted in the ranks of one of the world's most exclusive clubs. Let's salute these fine

young men who will carry on the tradition of the Colorado School of Mines long after we are gone!"

Mines men, faculty and guest attending the 1970 Alumni Banquet were:

Class of 1907

Warren Prosser.

Class of 1910

John Carman.

Class of 1911

Kenneth H. Matheson.

Class of 1913

Harvey Mathews and Pi Warren.

Class of 1914

Neil MacNeill.

Class of 1915

F. E. Heatley and Ben Essig.

Class of 1916

Carl Bluarock, Frank Briber, R. M. "Steve" Fullaway.

Class of 1920

W. S. Levings, Fred Lichtenheld, E. Dowden, Karl W. Reynolds.



Members of the Class of 1935.



Alumni partake of a sumptuous dinner served buffet style. Some of the members of the CSM Alumni staff: Mrs. Jackie Simpson, Mrs. Shirley Ashlock, Col. W. W. Fertig '51, and Mrs. Betty Decker.

Class of 1921

Joseph P. Ruth.

Class of 1922

Malcolm Collier and A. L. Pierce.

Class of 1923

E. J. Brook and Charles O. Parker.

Class of 1924

Harry L. McNeill.

Class of 1925

Homer A. Goddard, William L. Jude, Ivan Salnikov, Frank J. Laverty.

Class of 1926

Melford H. Salsbury, Ruth Volk, G. C. Weaver, Arch Sproul.

Class of 1927

Bob McGlone, Claude Fertig, A. L. Ladner.

Class of 1928

S. M. Del Rio.

Class of 1929

Neil S. Whitmore and Bob Williams.

Class of 1930

W. P. Morris, Robert N. Hastings, Bernard M. Bench, T. A. Manhart, George Fancher.

Class of 1931

R. L. Stark, Harrison L. Hays, Col. William K. (Mutt) Wood, Earl C. Phillips, A. J. Hintze, Lloyd H. Donnelly, C. L. Barker, William C. Klein.

Class of 1932

V. N. Burnhart, Ralph Jensen, Walter H. Zwicky, William P. Morris.

Class of 1933

Dick Vincent.

Class of 1934

David Squibbs and Edward Matsen.

Class of 1935

Philip A. Pelton, Max E. Coats, W. A. Van Hook, Robert F. Barney, George D. Volk, Merrill S. Rosengren, R. W. Price.

Class of 1936

Carl Morris, Earl L. Durbin, Al Brookes, Kirk Forcade.

Class of 1937

Gene Meyer.

Class of 1938

William R. Parks.

Class of 1939

Edwin J. Eisenach, Hubert E. Risser, Phil H. Garrison, V. A. (Bud) Vassen, J. F. Dieckman, L. J. Brewer.

Class of 1940

Howard Schmuck, John J. Kelley, Col. David Roberts, Douglas J. Watrous, Fred A. Nagel, M. S. Patton.

Class of 1941

Howard C. Parker, Walter L. Crow, J. Ivan Gilbert, R. P. Comstock, Martin Hegglund, Leo J. Goldsmith, Fred Hynes, E. J. Mayhew.

Class of 1942

John R. McMinn, Lee Scott, J. L. Fusselman, Bob Simpson, Neil Becker, Jack Chelius.

Class of 1943

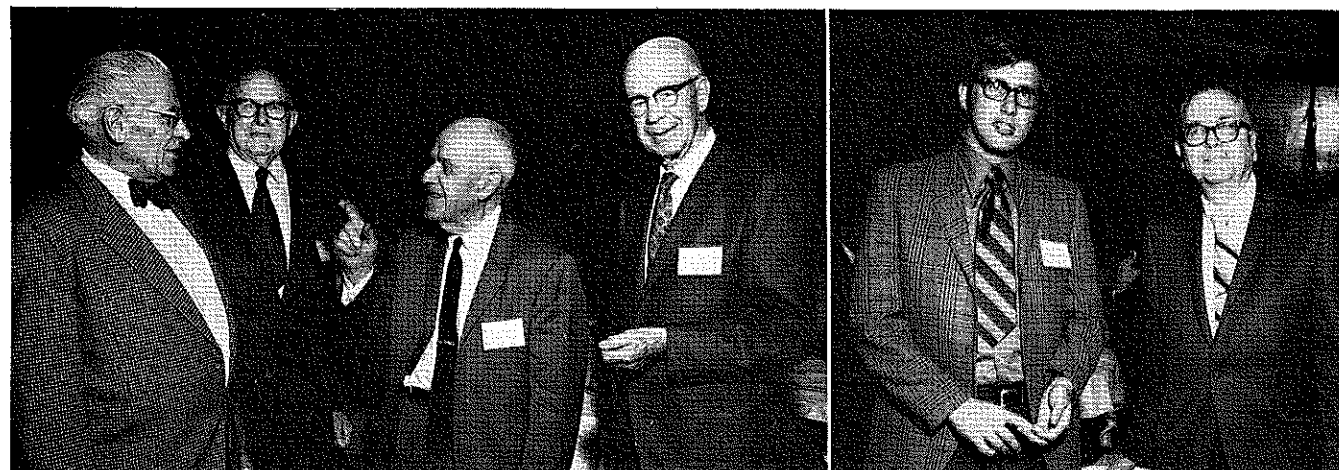
Robert E. Lintner, H. W. Addington, Ted Stockmar.

Class of 1945

Clyde V. Johnson.

Class of 1947

Albert Musgrove, M. John Berstein, Bob Magnie, Harry Hopp, Chuck Einarsen.



Joe Ruth '21, Pi Warren '13, Harvey Mathews '13, and Warren Prosser '07 (left). Graduating Senior Henry Kaanta II and his father, L. Carter Kaanta (right).



Overall view of 1970 CSM Alumni Banquet May 28 at the Denver Athletic Club.

Class of 1948

Donald A. Craig, Ken Nickerson, Arthur Lankenau, Jack Haley, Anthony Corbetta, John J. Wanner.

Class of 1949

Ben H. Parker, Jr., Leo Bradley, Den Galbraith, Bob Torpey, George Fentress, Don Siljstrom, Robert Coleman.

Class of 1951

John W. Carey, Wendell W. Fertig, Dave Johnson.

Class of 1952

Thomas M. McLaren and Robert Johnson.

Class of 1953

Richard C. Huston, George Minick, H. J. Smith, Carlos Carroll.

Class of 1954

Fred Fox, Neal Harr, Al McGlone, Edward Rozada, Dick Veghte.

Class of 1955

Dean Laudeman and Harold Kellogg.

Class of 1957

Ronald E. Evenson.

Class of 1960

L. Douglas Patton, F. Sparks Laughner, Jr., Tom Carroll.

Class of 1961

Frank Hadsell, Gordon Van Sickle, Art Biddle.

Class of 1962

Terry Walker and John Vanderwilt (Hon.).

Class of 1963

Daniel McFadden and William G. Ross.

Class of 1964

Don L. Bingham.



Nils Swenson and R. H. Volk, '26. Last year Mr. Swenson gave \$50,000 to Mines because he likes the way students handled the ROTC protest. (For details: p. 12, June 1969 MINES Magazine.)

Class of 1965

Fabiano S. Lobato and Jerry Jergensen.

Class of 1966

Henry Babcock.

Class of 1967

A. H. Patton (Hon.), Edmund Finch, Warren Harrison.

Class of 1968

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Guests

Nils Swenson (Hon.) '70, Robert Newell, Telfer E. Norman, Chester Miller, Frank Pool, Robert Hudson, Brett Bristol, Bill Stein, Frank Van Dok, Charles McNeil, Mike Collodi, Clem Hoffman, Raymond Mullen, Jay Turner, Loran Noble, Jack Hemp, Chas. Crew, L. Carter Kaanta, Bill Steen (photographer).

Faculty and Administration

Fritz Brennecke, Dr. Albert W. Schlechten, Marv Kay '63, Warren Mason '43, Fran Smiley '40, DeJoseph R. Lee, Col. William Leckie '49, Jim Johnstone '48, Jack Hancock, Grunett Steinhauer, Chuck Morris, Charles Kohlhaas '56, Frank Utter, Dr. Orlo Childs (Hon. '70), Dr. William J. Pecora (commencement speaker), Dr. Robert Carpenter (Hon. '70), William J. Chaptis, Dr. Truman Kuhn (Hon. '69), Dr. James Gary, Justin B. Pierce, Dr. Ramon Bisque, Martin Lemke.

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CLASS OF 1920 GOLDEN ANNIVERSARY REUNION BREAKFAST. Front row, left to right: H. W. C. Prommel, Mrs. Robert K. Stone (daughter of Mr. Prommel), Mrs. Karl W. Reynolds, Karl W. Reynolds, Mrs. William S. Levings, Dr. William S. Levings. Back row, left to right: Steve Fullaway '16 (guest), Ethelbert Dowden, Dr. Orlo E. Childs, Frederick A. Lichtenheld, Col. Wendell W. Fertig.

Mining Engineering Graduation Breakfast

By Charles O. Frush

APPROXIMATELY 140 people attended the annual "Mining Engineering Department 'Graduation Breakfast'" on May 29. This occasion is an old tradition in the Department, having been initiated many years ago by Professor Parkinson to honor the Department's graduating Seniors. It was held in the newly renamed "Ben H. Parker Student Center." The attendance of students, families, and friends this year was the largest ever.

Terry Bauer was awarded the "Old Timer's Watch." This fine timepiece is given each year by the "Old Timer's Club" to a newly elected "Watchman" from the Colorado School of Mines. Other similar watches are given to selected top students in other mining schools who have chosen to go into the coal industry. There is the additional benefit that the recipient need never fear being out of work — the "Old Timer's Club," through the individual members, will always help a "Watchman" get a new job in case of need. At the present time, of course, and for as far into the future as anyone can now see, this is no problem, but in earlier days this has been one of the most attractive aspects of the award.

This year's breakfast marked the beginning of what is very much hoped will be a new tradition. The Mine Safety Appliance Co., through the courtesy of Jack Leech, Denver area representative, gave each graduating mining engineer a new "Skullgard" hard hat and a miner's belt. Robert Anderson, district manager of the Company in Salt Lake City, says that the Company hopes in this way to help attract the attention of other students to the excellent career opportunities within the mining industry. Whether or not this succeeds, the fact remains that this year's recipients were delighted with the gifts and are very much aware of this company's role in helping to improve the safety of mining and metallurgical operations. Graduates in other options have expressed envy, and our Junior mining engineering students have been much interested in whether the practice is likely to be continued.

The Mining Engineering Department Graduation Breakfast is always held on the morning of Graduation Day. Alumni of the Department are particularly welcome.

CSM to Conduct Statewide Colorado Land Use and Natural Resource Inventory

THE Colorado School of Mines has received a \$117,000 grant from the State Department of Natural Resources to conduct a Colorado Land Use and Natural Resource Inventory (CLARI).

Project CLARI, the first of its kind in Colorado and the second in the Nation, will be conducted through CSM's Basic Engineering Department, under Dr. Arthur J. McNair, visiting professor from Cornell University. The first similar inventory survey was conducted by the state of New York from 1966 to 1969 by Cornell University. Presently the New York inventory is being expanded due to the demands upon the existing inventory data.

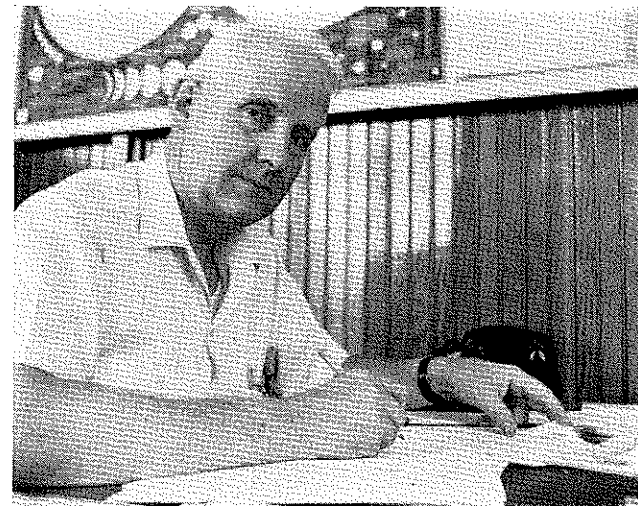
Under project CLARI the state's 106,000 square miles will be divided into 2,837 "cells," each cell being 10 kilometers (approximately six miles) on a side. Each of the individual cells will be evaluated for over 150 land use and natural resource items under five primary headings recognized by agencies such as NASA, Department of Interior, Department of Agriculture, Department of Commerce and National Academy of Sciences. The five major headings are: cartography; geology and mineral resources; hydrology and water resources; agriculture and forestry; and geography and cultural resources. These items in turn will be transferred to computer magnetic tape and stored for random reconstruction of the cells as a map with any of the specific items requested being placed to scale on the computer readout map display.

By utilization of electronic computers, photogrammetry, photo interpretation, and remote sensing the inventory will become a dynamic planning tool, providing planners statewide the opportunities of projecting future land uses.

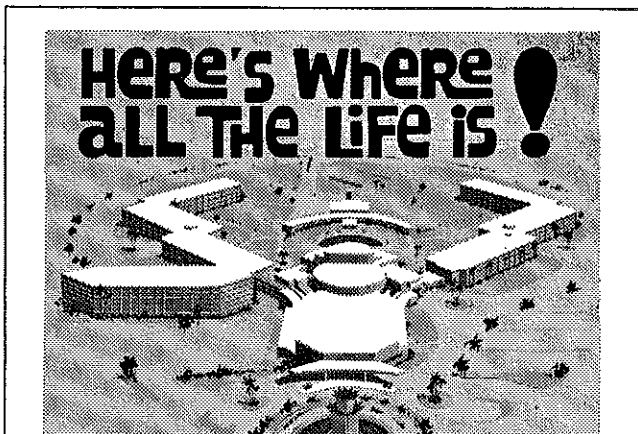
Information for compiling the inventory will be gathered from aerial photographs, topographic maps, geological and soil conservation maps, highway department maps, reports of recreation, biologic, water resources and other agencies, various state departments, local county and municipal governments, mapping organizations, public utility companies, and from other bulletins, folios and maps.

All information contained in air photos or obtained from supplementary maps and reports will be outlined by the air photo-interpreter and transferred to a 1:250,000 scale map, (approximately four miles to the inch). Once the air photo interpreter and other staff members have gathered all useful information the data will be summarized by each specific cell. The grid cell, 10 kilometers square, becomes the key to all data handling, processing, storage, analysis and display.

The final computer output will be either tabular print-out form or map display form. The map display will be produced on 112 sheets which will comprise the entire state. Analysis of particular areas such as of individual countries or water sheds, can be performed on the individual 112 sheets. That is, it is not necessary to study the entire state at one time. The analysis provided by computer flexibility permits not only present studies to be made, but allows a planner or engineer to predict future land uses incorporating features such as popula-



Dr. Arthur J. McNair



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tion growth, development of water supplies, water pollution, air pollution, transportation systems, development of new resources, and literally dozens of other factors. This method has been proven to be the most economical manner of analyzing and forecasting land data for the future.

The inventory of the state may be updated at anytime due to the digitized storage of the data, completed by a simple operation of re-examining photographs of the areas where changes have taken place. Additional information from sources other than maps or air photographs can be filed in the data bank as soon as the geographic position of the secondary data is known.

Expansion of the Colorado inventory in the future would be composed of updated developments in specific areas and the expansion of the existing computer stored data over larger scaled maps composed of "cells" only one to five kilometers square. This type of larger scale would be used in areas of high density population, structures, or development. The advantage being that present data would be adequate as it exists on computer storage with only new data necessary to update the existing inventory.

Presently there is only one complete topographic map of Colorado that is at 1:250,000 scale (approximately one inch to four miles) which is compiled on 16 sheets made from 1954-1968. Approximately two-thirds of Colorado is mapped at larger scales, but approximately half of these maps are obsolete. In addition, topographic maps customarily show only a limited number of features. Many

of the features not present on existing maps are land use, geologic, agricultural and water resources.

As with any intelligence-gathering project using air photographs, it will be necessary for field checks and identification to be performed so as to provide greater accuracy of the data. This travel throughout the state will be coupled with visits to officials and individuals in the local areas who are knowledgeable about the natural resources and land uses in those areas.

Staff members of project CLARI will contact each county's commissioners, and the mayor, city engineers, zoning commissions, or other public officials of each municipality in the state. They will describe the project, application of the project to their respective county or municipality, and the value of the program for both the state and their local areas.

Staff members from CSM who will be involved in the project are from the basic engineering department, mathematics department, chemistry department, and geology department. Additional staff members will be joining the CSM staff from Colorado State University, and the University of Colorado. The "photo-interpreters" are either undergraduate or graduate students with various interests in the state and competence in any of the five specific areas of natural resource inventory. The students' majors cover areas such as: geology, geophysics, mathematics, civil engineering, biology, archaeology and fine arts.

Completion of project CLARI is scheduled for Mar. 31, 1971.

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Dr. T. H. Kuhn Named Interim Chief at Mines

DR. TRUMAN H. KUHN, a faculty member and administrator since 1942, was named on June 2 as Interim Chief Executive Officer of the Colorado School of Mines by Ted P. Stockmar, president of the Board of Trustees.

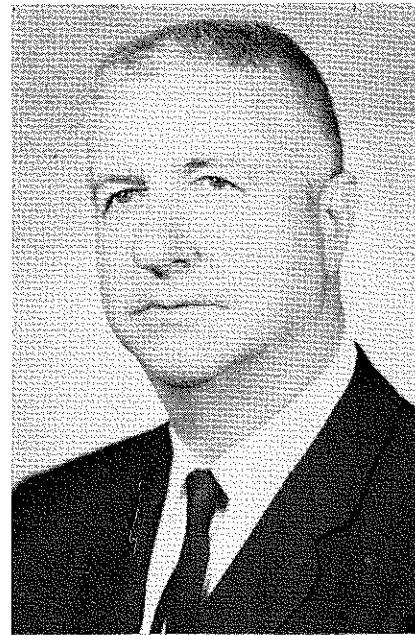
Stockmar said that Dr. Kuhn, who is vice president for Administrative Affairs at Mines, will serve until the Board selects a successor to Dr. Orlo E. Childs, who has announced his resignation effective at the end of the current academic year. Dr. Childs is leaving mines to become vice president for Research at Texas Tech University.

Dr. Kuhn assumed his position on June 11. He will continue his duties as vice president for Administrative Affairs.

A native of Glendora, Calif., he received his undergraduate degree from the California Institute of Technology in 1930, and in 1940 earned his Ph.D. degree at the University of Arizona.

Dr. Kuhn spent 11 years as an engineering and mining geologist in California and Arizona before coming to Mines.

He joined the faculty in 1942 as an assistant professor of geology, became associate professor in 1947, and full



Dr. Kuhn

professor in 1952. He served as dean of the Graduate School from 1953 to 1956.

In 1956 he was named dean of Faculty and in 1968 was appointed to the vice-presidency for administrative affairs.

A Fellow of the Geological Society of America, Dr. Kuhn has served as a consultant and has done research resulting in professional publications in mining geology. He directed the U.S. State Department-sponsored project in which Mines helped strengthen a mineral engineering program at Istanbul Technical University in Turkey.

In 1960 he received a Medallion of Merit given by the University of Arizona for his outstanding record as a geologist and educator.

In 1969 he was awarded the Tasker H. Bliss Medal of the Society of American Military Engineers in recognition of his support of the Reserve Officers

Training Corps (ROTC) and his participation in its programs.

Dr. Kuhn is a member of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) and served as chairman of the Colorado Section in 1958. He has held other leadership positions in AIME, including chairman of the Education Committee, Society of Mining Engineers, in 1959-61, and chairman of the AIME Council of Education in 1963-64.

In 1961-62 he was chairman of the Mineral Engineering Division, American Society for Engineering Education.

In the American Institute of Professional Geologists, Dr. Kuhn was chairman of the Committee on Professional and Scientific Standards from 1966 to 1969, and this year is secretary and treasurer of the national group. He also is a director of the Engineers' Council for Professional Development.

Dr. Kuhn is a Registered Professional Engineer in Colorado and is vice-chairman of the Colorado State Board of Registration for Professional Engineers. He also is a member of the Society of Economic Geologists, Society of Sigma Xi, and the Teknikn Club.

A leader in community activities, Dr. Kuhn has served as president of the Kiwanis Club of Golden, president for two terms of the Golden Recreation Association, and as a member of the Board of Directors of the Golden Chamber of Commerce.

Dr. Kuhn and his wife, Edith, have twin sons: Dr. Martin C. Kuhn, research metallurgist with the Anaconda Co. in Tucson, Ariz., and Dr. David T. Kuhn, assistant professor of genetics at Creighton University, Omaha, Nebr.

The Kuhns live at 2223 Table Drive in Golden.

Social Responsibility vs. Social Awareness

By Dr. E. D. Woolsey*

RECENTLY, when I was interviewed by the Colorado School of Mines student newspaper, I was asked the following question: "It has often been asserted that engineering students as a group show little social awareness or social responsibility; what do you think?"

My reply was: "I think that the rigor of engineering studies does, due to demands on time and concentration, postpone development of social awareness for a time. However, in that same period, the acquisition of such a socially responsible profession as engineering builds a firm base of logic and training for the development of later social awareness. After all, an engineer is, by definition, a builder; and it is noteworthy that engineers and scientists rarely appear among the ranks of those who would destroy the present social structure . . ."

In the face of increasing demand for more careful stewardship of our environment we are confronted with a startling decrease in enrollment in schools of engineering. Does this mean that the average student "concerned" about the rape of our environment is unwilling to take on the rigor of study necessary to become an engineer and therefore acquire some skills to do something about the problem?

Dr. E. D. Woolsey, Prof. Dept. of Mathematics, Colorado School of Mines.

The pollution of our environment is usually described as a "social" problem, but this ignores the fact that the technology to solve it must be developed and implemented by the engineering profession. There is no question that the social sciences contribute greatly to sounding the alarm and helping to mobilize an aroused public conscience to demand that something be done. But somewhere the buck has to stop, somewhere somebody has to do it, and that somebody is the engineering profession.

For the student who would rather carry a sign than study, it is certainly easier to go to a liberal arts institution, be socially aware for four years, emerge with a degree in social awareness, and be not better equipped to solve the problem than before. The only difference between schools that allow this sort of thing and a mental institution, is that in order to get out of a mental institution you must show improvement.

The more difficult and more socially responsible course is to take up a course of study wherein, upon graduation, you are equipped to get to work on the problem.

In the words of Cyrano: "I issue one universal challenge to you all . . ." if you are really concerned, join us, start studying and learn to do something.

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Engineers Must Consider Both Production and Preservation

"We can't be content with being producers; we must also act as preservers," John C. Kinnear, Jr., president of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) told members of the Upper Peninsula Section of AIME.

Mr. Kinnear, who is vice president-Operations, Metal Mining Division, Kennecott Copper Corp., was Upper Peninsula Section's dinner speaker on Wednesday, April 29, 7 p.m., at the Douglas Hotel. Mr. Kinnear told his audience that while many of the problems we wrestle with today did not come about because of evil intentions, from now on "we are going to have to do a good deal more of hard thinking before we act."

"Clearly," he said, "we do not have to clean up this mess, but we have to adopt the policy of fully scrutinizing all future activities for their potential technological fall-out and balancing the benefits against the risks. We can't go on recklessly tinkering with the biosphere. Until we are quite certain what the total results of any proposed action will be, we should probably reverse the old adage and say, 'Don't just do something, stand there.'"

The AIME President also called for more effective control of the present rate of population increase and said that his view was not based on emotions, but hard professional judgments. "We are brought together today by a common professional concern for developing the resources to meet the rising material needs of the global community.

"Minerals form the very bedrock of civilization and the prosperity of a society is directly proportional to its use of metals and fuels. If the poor nations of the world are going to advance in sufficient measure to assure the well-being of their people, and if our country is to continue its broad economic progress, then we shall have to make tremendous strides in developing our mineral resources throughout the planet. This will be an arduous and sophisticated undertaking, and I am convinced it will require a greater influx of young engineers and technologists into the extractive industries than we have enjoyed in recent years."

In line with this, Mr. Kinnear stressed the urgent need for engineering manpower in the future. "It

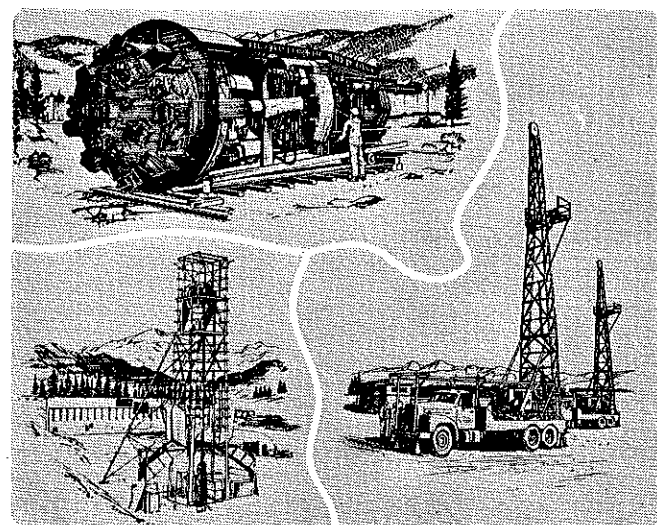
becomes clear, therefore, that our industry needs a vast infusion of people who are more than expert technologists and environmental idealist. They must be people of broad vision who can communicate and work effectively with professionals in other enterprises and with people in government and the academic community."

Mr. Kinnear offered several possibilities for attracting such people. He said that the industry first must improve its image, take a serious and searching look at how adequately it recompenses its employees, and give expanded opportunities for young engineers to grow professionally in their jobs.

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Three Mines Alumni Honored

THREE graduates of the Colorado School of Mines have been selected for inclusion in the 1970 edition of "Outstanding Young Men of America."

They are Vincent G. Gioia, 804 Linda Lane, Pittsburgh, Pa.; William A. Preston, 1230 Hamilton Ave., Palo Alto, Calif.; and Robert H. Waterman, Jr., 198 Warren Road, San Mateo, Calif.

"Outstanding Young Men of America" is sponsored by the non-profit Outstanding Americans Foundation. Men chosen are between the ages of 21 and 35 and, according to John Putnam, president of the Foundation, "are working toward excellence in their careers and community service."

Gioia, a 1956 Colorado School of Mines graduate in metallurgical engineering, is manager of patents for Allegheny Ludlum Steel Corp. in Pittsburgh; Preston, who received a degree in geological engineering in 1958, is president of Icore Electric Plastics Inc., Santa Clara, Calif.; and Waterman, a 1958 graduate in geophysical engineering, is an executive with McKinsey and Company, Inc., a San Francisco marketing and management consulting firm.

Gioia also has a juris doctor degree from George Washington University. He is a member of the patent committees of the American Bar Assn., American Patent Law Assn., and Pittsburgh Patent Law Assn.; a member of the Federal Bar Assn., the Bar of the District of Columbia, and the Allegheny County (Pennsylvania) Bar Assn. Gioia is president of the Pittsburgh Rose Society and is affiliated with several U.S. and foreign rose societies as an officer, member, and a judge. He is active in the YMCA and the Pittsburgh Press Club, and is president of the Pennsylvania-Ohio

Section, Colorado School of Mines Alumni Assn.

After graduation at Mines, Preston went on to gain a master's degree in business administration at Stanford University. He joined Icore Electro Plastics in April of 1969 and was elected president in December. He previously was general manager of the powder metal products division of Fansteel Inc. and served as a member of that firm's corporate planning staff. While an engineer with Lockheed Missile and Space Co. in 1960, he organized, wrote, and published the final report on the Polaris missile test series. He is active in the YMCA, Republican Party activities in his community, and Little League baseball.

Waterman graduated with honors at Colorado Mines and secured a master's degree in business administration at Stanford University. He returned to Colorado to serve with the industrial economics division of the University of Denver Research Institute. During this time he participated in a major study for the National Aeronautics and Space Administration (NASA). Since joining McKinsey and Company, Inc., he has been involved with many of the nation's top companies in problem-solving in marketing, data processing, management, and planning. In 1968 he was elected president of the San Francisco Chapter, Stanford Business School Alumni Assn. and a member of that group's board of directors. He has authored several business magazine articles, and is active in public speaking for financial and marketing associations.

"Outstanding Young Men of America" is an annual biographical compilation of the accomplishments of approximately 5,000 young men from throughout the country. Nominations are made by chapters of the Junior Chamber of Commerce, colleges and universities, and business leaders.



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With the Manufacturers

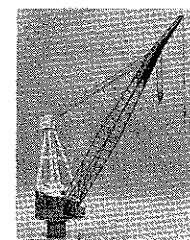


Gravity Concentrator (542)

The new unique Bartles-Mozley "Orbital" gravity concentrator, unlike conventional gravity-type concentrators, is capable of economically recovering extremely fine fractions of valuable heavy minerals from previously low yielding or untreatable mine tailing, slime or pulp. It has been particularly effective where the mineral particle size ranges from 50 to 10 microns and lower. To date it has been successfully run on cassiterite, scheelite and wolframite with particle recovery range down to 5 microns and with excellent recovery yields. It is applicable to any heavy metal or ore normally recoverable by gravity. (C. Tennant, Sons & Co., 100 Park Ave., New York, N. Y. 10017) Circle 542 on Reader Service Card.

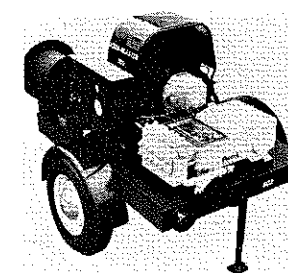
Cap With Shield (545)

A new protective face shield is now an optional feature of the Jackson Bump Cap, made by Jackson Products of Warren, Mich. The visor is of sturdy transparent plastic (crystal clear or tinted green), and swings easily up and down at the touch of a hand. It is attached to the cap with snaps, to permit easy removal or replacement. Circle 545 on Reader Service Card.



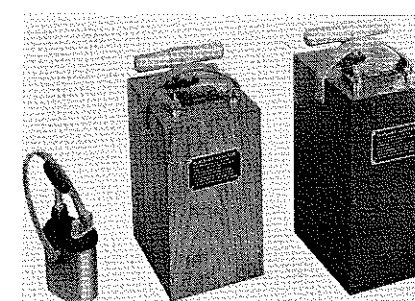
Marine Cranes (552)

Bucyrus-Erie Co. is introducing a line of completely hydraulic cranes to the marine industry for uses in offshore drilling operations, dockside or shipboard cargo handling and for marine construction purposes. Due to their new design and detailed engineering features, they are also easily adaptable to practically any other type of marine application. Circle 552 on Reader Service Card.



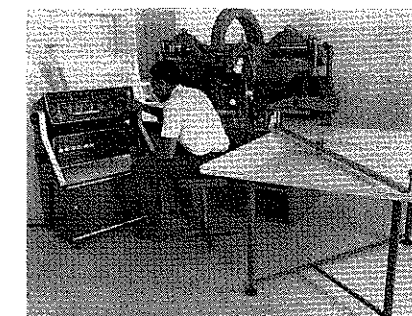
Cleaning Unit (548)

Partek's new "500" Series water blast cleaning unit is especially effective in removing softer materials, such as paint, from all types of surfaces. Three models offer a broad range of pressure and volume combinations, powered by either an electric motor or a Volkswagen industrial engine. The model "500" shown is equipped with the VW engine. (Partek Corp., P. O. Box 18312, Houston, Tex. 77023). Circle 548 on Reader Service Card.



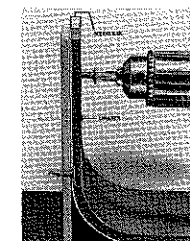
Blasting Machine (550)

A highly dependable, compact pocket-size 10-Cap blasting machine has been developed by Fidelity Electric Co., Lancaster, Pa. 17603, for operations where a maximum of ten caps are to be fired simultaneously in a series circuit. Manually operated, the twist-handle DC generator has been designed to release a high energy output of sufficient duration to fire electric blasting caps and other explosive initiators. Circle 550 on Reader Service Card.



Quantizer-Scaler (544)

A technician at California Aero-Topo Inc. digitizes a topo-graphic map with a three-axes version of H. Dell Foster Co.'s new graphic quantizer and accessory electronic scaler. As the map at right is traced on the plotting table, the electronic scaler converts distances to map ratios. The scaled distances are counted and "quantized" in the H. Dell Foster unit. With the aid of the large stereo plotter at rear, distances and volumes along three-dimensional planes can be traced, and totalled by the quantizer. (Texas Instruments Inc., Dallas, Tex. 75222). Circle 544 on Reader Service Card.



Mealbak System (554)

Linatex Corporation of America announces the availability of a new Linatex Product known as "Metalbak." This is a new abrasion resistant lining system pioneered by its Anti-Abrasion Laboratories. The "Metalbak" system is a combination of world-renowned Linatex abrasion resistant rubber permanently bonded to a special formable mild steel. The "Metalbak" system is simply installed by special self-drilling fasteners. Since no adhesives are required, equipment protected with "Metalbak" can be put into service immediately. Circle 554 on Reader Service Card.

WANT MORE INFORMATION?

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Catalogs and Trade Publications

AIR COMPRESSOR PLANT (631)

A 4-color, 8-page brochure. Form 3355, illustrates Ingersoll-Rand's new generation of air compressors. The booklet completely describes this air compressor which has broken with tradition to offer benefits never before available in reciprocating compressors. Known as the "Air Cube," it is an exceptionally compact, cross-head type, water-cooled packaged plant with built-in intercooler and aftercooler, integral flange mounted motor with motor starter and optional solid-state environmental control system. The air cube is a major advance in compressor design that offers a new low total cost of air power, is so smooth running that no special foundation is required and is quiet running as reflected in decibel limits far below noise levels allowed by the Department of Labor. The booklet also gives physical and performance information and includes a standard specification describing all the equipment included on these packaged air power plants. They are available now in 75 and 100 horsepower sizes for delivery of 400 and 535 acfm at 100 psig. Circle 631 on Reader Service Card.

RATCHET PULLERS (632)

Beebe Bros., Seattle, Wash. 98134, announces a complete new line of ratchet pullers. Available in 6 models with capacities to 4000# and cable lengths to 15'. The new line of BEEBE ratchet pullers incorporates a combination of special features to make them the finest tool available anywhere at a low price for lifting, lowering and pulling loads. Light weight, the heaviest unit weighs only 9#. Write for Form RP-4. Circle 632 on Reader Service Card.

STEREO MICROSCOPE (634)

The new H/I Long Arm Stereo Microscopes (Hacker Instruments Inc., P.O. Box 646, West Caldwell, N.J. 07066) provide magnifications from 5x to 80x, anti-reflection optics and built-in illumination, as described and illustrated in a two-page leaflet. Circle 634 on Reader Service Card.

"EARTH MOLE" (635)

A new portable electronic instrument that determines the exact location of drill bits or cutting heads in horizontal earth boring operations has been introduced by the Goldak Co., Glendale, Calif. 91201. The new Model F-405 horizontal bore pipe locator, called the "Earth Mole," consists of a transmitter, receiver and accessories. The transistorized units use self-contained batteries. In use, the transmitter mounts behind the cutting head in line with the bore pipe. A hole through the center of the transmitter lets water, air or drilling mud pass through during the boring operation. On the surface, the operator uses the receiver to "sweep" the ground and follow the exact course of the mole. The operator can also determine depth of the cut and/or determine any deflection of the boring bit with a tolerance of more or less 1 inch at all times. Circle 635 on Reader Service Card.

GEOLOGICAL MAPS (636)

Geophoto Services, Inc., Denver, Colo. 80222, is now offering geological maps of Alaska's Bristol Bay region which reveal structural and stratigraphic information useful in petroleum exploration. Based on detailed photogeologic and photogeomorphic studies, the maps are drafted to base maps photographically screened from U.S. Geological Survey topographic sheets. The scale is one inch equals two miles. Standard materials furnished consist of uncolored prints on paper. Film reproduces and mosaic prints can be obtained for a nominal extra fee. Circle 636 on Reader Service Card.

MOLY-CONTAINING STEELS (637)

Climax Molybdenum Co., 1270 Ave. of the Americas, N.Y., N.Y. 10020, has just issued a reprint list entitled, "Literature on Molybdenum-Containing Steels, Irons and Nonferrous Alloys." The list describes 162 articles and brochures available from Climax in the subject categories: high-temperature and corrosion-resisting alloys, cast products and abrasion-resistant materials, high strength steels and other topics, and product specifications. Circle 637 on Reader Service Card.

ION EXCHANGE RESINS (638)

Descriptive and useful information on Ion Exchange Resins is available from J. T. Baker Chemical Co., Phillipsburg, N.J. 08865. A new company bulletin charts descriptions, specifications, operating conditions and prices of the "Baker Analyzed" line of laboratory, analytical and chromatographic grades of Ion Exchange Resins. Mixed bed, macroporous and microfine resins, special purpose inorganic ion exchangers and a full line of anion and cation resins are included. Circle 638 on Reader Service Card.

Send Us Your Bulletins

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

CENTRIFUGAL COMPRESSORS (639)

Allis-Chalmers single-stage centrifugal compressors for sulfuric acid applications are described in new literature (Bulletin 16B4215). Designed for long periods of trouble free operation and easy maintenance during "turn-arounds," the compressors are available in volumes from 5000 to 150,000 acfm and heads from 5000 to 23,000 ft. and above. Exclusive features include a forged alloy and stainless steel impeller that can be balanced in position within the compressor. Large clearances between it and the backplate prevent deposit build-up. Kingsbury-type thrust bearings and premium pivoted shoe journal bearings are standard components. Circle 639 on Reader Service Card.

METAL LOCATOR (640)

A new four-page bulletin on metal locators has been issued by Geophysical Instrument & Supply Co., Denver, Colo. 80203. Illustrated and described in the bulletin are a metal and treasurer locator which has a depth operating capacity to approximately 60 inches. The lightweight unit weighs only 3 lbs. and is battery operated. It can be handheld to locate buried pipes, coins, metal chests, tools, weapons, rings, metal containers, and almost any object whose conductivity is greater than the surrounding medium. A heavy duty model pipe and cable locator is also illustrated and described in the bulletin. Circle 640 on Reader Service Card.

AIR POLLUTION CONTROL (643)

A new, condensed catalog (10-WH) features Wheelabrator air pollution control equipment and methods for ventilating cupolas, electric furnaces, shakeout operations, sand handling, blast cleaning, grinding and providing make-up air filtration in foundries. Equipment installations described and illustrated include Wheelabrator Dustube fabric filters and Wheelabrator-Turbex wet collectors, as well as canopy, side draft and snorkel hooding and direct shell evacuation systems for electric furnaces. A Wheelabrator Ultra-Filtration system for foundry make-up air is also shown and described. Wheelabrator Div., The Wheelabrator Corp., 400 S. Byrkit St., Mishawaka, Ind. 46544. Circle 643 on Reader Service Card.

EPOXY-REPAIR GUIDE (644)

An epoxy-repair guide, specially prepared for fast reading by the busy plant-maintenance engineer, is now available from Sika Chemical. The new brochure, PM-70, provides how-to-do-it data on a series of epoxy repair systems for industrial-plant maintenance. The text describes procedures to follow and epoxy products to use. Brochure may be obtained by writing Sika Chemical, P.O. Box 297, Lyndhurst, N.J. 07071, or by checking off No. 644 on the enclosed Reader Service Card. VITON BELLOWS (645)

GORTIFLEX® bellows molded in Viton material (Bulletin UT-100) are now available in 36 standard sizes without tooling charges from A and A Manufacturing Co., 803 N. 109th St., Milwaukee, Wis. 53226. The bellows are made of 60 durometer .030 Viton or .045 Viton/Nylon for chemical and high heat resistance. The units are particularly applicable as exclusion seals on rods, screws, etc., or as flexible connection where vibration, movement or misalignment are involved. Circle 645 on Reader Service Card.

WANT MORE INFORMATION?

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MOISTURE TESTER (646)

A new bulletin on the Speedy Moisture Tester has been issued by Solltest, Inc. The "Speedy" Tester can be used to quickly and accurately determine the moisture content of a broad range of materials such as soils, sand aggregates, ores, ash, pastes, chemicals, mixes, ceramics and textiles. The non-electric instrument is direct reading. Included in the bulletin are instructions for operation and a complete description of the instrument. Copies of the four page bulletin are available on request from Solltest, Inc., 2205 Lee Street, Evanston, Ill. 60202, or Circle 646 on Reader Service Card.

HOF COMPRESSORS (647)

Pennsylvania Class HOF Compressors for industrial plant air and process applications are described in Bulletin 360A, available from Wallbridge Co., 803 Patterson Bldg., Denver, Colo. 80202. Design features are outlined and detailed through typical cross-section of 2-stage unit. Included also are photographs and description of cylinder, connecting rod, lubricator and frame oil pump, crosshead guide, crosshead, annular stainless steel valve discs, main frame, main bearings, and crankshaft. Circle 647 on Reader Service Card.

FLUORSPAR FLOWSHEETS (648)

"Fluorspar Metallurgy and Flowsheets" is the title of an informative 12-page bulletin just published by Denver Equipment Division, Joy Manufacturing Co. Bulletin No. G3-B148 discusses mineralogy, market specifications, milling methods of various grades of fluorspar, and presents 15 of the more typical flowsheets to show the variations possible and to what extent the fluorspar producers have gone in their efforts to obtain a maximum economic return from their ores. Plant layouts are also shown as an aid in mill design. Circle 648 on Reader Service Card.

MARCY GRINDING MILLS (649)

A new catalog from Mine and Smelter Supply Co. covers the company's Marcy Grinding Mills line. In clear and informative language, it explains the details of operation and unique capabilities of various types of ball, rod and pebble mills and accessory equipment. Included in the attractive 12-page catalog are four useful tables. These give a potential user information on mill capacities and horsepower requirements for the different size mills available. For a free copy of Catalog 101-C, write to Mine and Smelter Supply Co., 3800 Race St., P.O. Box 16067, Denver, Colo. 80216, or Circle 649 on Reader Service Card.

MULTI-PORT VALVES (650)

A revised bulletin from DeZURIK Corporation describes their line of 3-Way and 4-Way Valves. The 16-page, color bulletin includes complete descriptions and specifications of the line of 3"-16" valves which provide single valve transfer and shutoff. Drawings and photos show both 3-Way and 4-Way construction as well as details of the DeZURIK actuator line including Levers, Totally Enclosed Handwheels and Totally Enclosed Cylinders for on-off or throttling applications. Ordering information includes a list of available valve materials and accessories. Dimensional data for all valves and actuators is included. Free copies of DeZURIK 3-Way and 4-Way Valve Bulletin 20.00-1 are available on request from DeZURIK Corp., Sartell, Minn. 56377, or by Circling 650 on Reader Service Card.

ERIEZ PRODUCTS (651)

New All-Products Bulletin from Eriez Magnetics lists ways magnetic forces can be used for automation, materials movement, separation, beneficiation, reclamation or pollution control to solve processing problems in your plant. Bulletin B-90-1C describes Eriez' complete line of permanent and electromagnetic vibration, separation and magnamation equipment including vibratory feeders and bin vibrators, volumetric feeders, magnetic plates, grates, humps, pulleys, ferrous traps, demagnetizing coils, drum, roll and mechanical separators, magnetic flocculators, suspended magnets, road and floor sweepers, coolant cleaners, lifting and hold-down magnets, magna-rails and magna-rolls, can washers, and magnetic chip and parts conveyors. Write Eriez Magnetics, Asbury Road at Airport, Erie, Pa. 16512 or Circle 651 on Reader Service Card.

Plant News

IMC-Canada Mineral Exploration

International Minerals & Chemical Corp. (Canada) Limited and Barkroy Explorations, Limited have announced an agreement to form a joint venture company, SCAN Explorations, Ltd., to seek out minerals deposits, particularly metallic minerals, in Canada.

The new company, with principal offices in Toronto and Vancouver, will engage in prospecting and exploration activities and in "arrangements and transactions" including joint ventures, toward obtaining explorations rights, establishing mining claims and acquiring or leasing mineral properties.

National Lead will Expand Mining Operations in Norway

Plans for the expansion of ilmenite mining operations at Tellnes, Norway, by its affiliate, Titania A.S., to one million tons of concentrate annually have been announced by National Lead Co. Cost of the new facilities is approximately \$6 million.

Ilmenite ore is used in the production of titanium dioxide, a whitening agent used extensively by the paint, paper and other industries.

Demand for Norwegian ilmenite has been increasing steadily in recent years with the expansion of titanium dioxide production in Europe and in the growing interest in this particular type of ore.

One million tons of ilmenite concentrate is equivalent to the production of more than three million tons of basic ore. A by-product of the increased production will be 55,000 tons of magnetite.

Union Camp Corp. Announces Seismic Exploration Contract

Union Camp Corp. has announced that Pan American Petroleum Corp. of Tulsa, Okla., has been awarded a one-year contract for seismic exploration on 482,000 acres of Union Camp's land holdings in southeastern Georgia.

The contract with Pan American, a wholly owned subsidiary of Standard Oil Company (Indiana), provides for an option to lease up to 241,000 acres with rights to drill for oil and gas. The company is presently conducting reconnaissance seismic exploration in Georgia and upon completion of its contract with Union Camp, Pan American will have conducted the most extensive seismic exploration program for oil and gas ever undertaken in Georgia.

Swindell-Dressler Establishes Environmental Engineering Dept.

A department to deal directly with environmental pollution problems facing industry has been established by Swindell-Dressler Co., Pittsburgh, Pa.

Donald J. Morfee, executive vice president of the engineering and construction division of Pullman Incorporated, said the environmental engineering department staff will work towards defining specific problems encountered by industries his company serves.

"It will then apply itself to improving existing systems, as well as to developing new systems, to solve these problems," he added.

Aluminum Unit-Train Built for Detroit Edison

The largest single aluminum unit-train order in railway history is under construction in New Jersey. Nearly seven million pounds of aluminum will be required for 584 gondola cars, Aluminum Company of America reports.

The aluminum-bodied cars are being built for The Detroit Edison Co., to transport coal from West Virginia mines to the company's Monroe, Mich., power plant. The Fruehauf Railcar Division, Fruehauf Corp., N. J., is nearing completion on construction of the first of four unit trains. Two of the trains will be 152 cars each and two will be 140 cars each. Subsequent trains are scheduled for completion in Sept., 1970, April 1971, and April, 1972.

Tosco Announces Refinery Acquisition From Signal

The Oil Shale Corp. has completed acquisition of a 24,500-barrel-per-day petroleum refinery in Bakersfield, Calif. The acquisition, from Signal Oil and Gas Co., was announced by TOSCO's president, H. I. Koolsbergen.

"The refinery, which is the most modern in California's San Joaquin Valley, can supply proposed new gasoline to pollution-free engine systems as soon as they are ready," Koolsbergen said. The refinery is capable of converting up to 90 per cent of crude oil charge into gasoline. Other products include diesel fuel, stove oil, liquid petroleum gases, and coke.

"The Bakersfield refinery acquisition is the first major step in a continuing TOSCO program to provide substantial funds for its expanding oil shale activities from projects in closely related fields.

"Estimated cash availability to TOSCO from 1970 operations of the refinery is in excess of \$5 million. The Bakersfield refinery will also provide a base for integrated operation when commercial production of petroleum from oil shale begins."

Ingersoll-Rand Purchases British Pump Manufacturer

Ingersoll-Rand Co. has announced the purchase of the assets of Sigmund Pumps Ltd. of Gateshead, England, a leading British manufacturer of centrifugal pumps.

Ingersoll-Rand will operate the Gateshead Works under the name Ingersoll-Rand Pumps Ltd. The 250,000-square-foot plant, which employs 900 persons, formerly was a division of Sigmund Pulsometer Plenty, Ltd.

Gardner-Denver Facilities Expanded in South Africa

A \$1,500,000 addition to the manufacturing facilities of Gardner-Denver Co. in South Africa is under construction. The addition of 142,000 square feet of manufacturing area and 19,700 square feet of office space at Johannesburg will be ready for occupancy in the fall of 1970.

Products manufactured in Johannesburg for the mining and construction industries of Africa include pumps, paving breakers, drifter drills, Hi-Leed drill steel, sump pumps, line oilers and Air Trac rock drilling units.

Allis-Chalmers Receives Process Equipment Order

Allis-Chalmers Cement & Mining Systems Division has obtained contracts in excess of \$600,000 for processing equipment for St. Joe Minerals Corp.'s expanding operations at Brushy Creek, in southeast Missouri.

Included is an 11 by 16-ft. rod mill, a 13 by 14-ft. ball mill, two 6 by 10-ft. low-head feeders, a 42 by 48-in. A-1 jaw crusher, a 4 by 8-ft. Model SH Ripple-Flo screen, and a 1084 Hydrocone crusher. Shipment of the equipment is scheduled for later this year.

Philippine Law Imposing 10% Export Tax Is Signed

President Ferdinand Marcos of the Philippines has signed into law the bill passed by the Philippine Congress imposing a 10 per cent export tax on major export products including copper ore and concentrates. The tax will decline at the rate of two per cent a year and expire on June 30, 1974.


According to Jesus S. Cabarrus, Sr., chairman of the board and president of Marinduque Mining & Industrial Corp., the signing of the bill by President Marcos automatically abrogated Philippine Central Bank Circular No. 289 which, since February 1970, required exporters to turn in 80 per cent of their dollar receipts to the government at the former legal exchange rate of 3.90 to the dollar, while the remaining 20 per cent could be turned in at the floating (free) market rate which has been in excess of six pesos to the dollar.

Largest Diameter Vertical Mine Shaft Ever Drilled

Kerr-McGee Corp. has completed drilling and casing of a large diameter uranium mine shaft in the Ambrosia Lake area of northwest New Mexico, the largest diameter vertical mine shaft ever successfully drilled to completion by rotary rig drilling techniques on the North American continent. The 16½ foot diameter mine shaft hole was drilled to a depth of 784 feet. A steel liner, with external reinforcement members and an inside diameter of 14 feet, was lowered into the hole to a depth of 784 feet and cemented in place.

Drilling of the shaft began in September, 1969, and was completed in less than six months. A 16½ foot diameter hard rock drilling bit weighing nearly 40 tons was utilized on a unique twin-masted rig, designed by Kerr-McGee, to drill the shaft. Hole surveys indicate that shaft deviation from vertical is less than 6 inches at total depth.

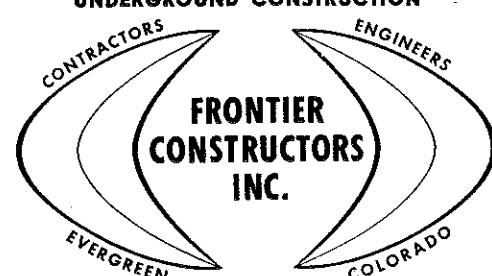
The company currently has seven operating uranium mines in the Ambrosia Lake area. Mining of ore from the eighth mine is scheduled to begin this year. Upon completion of the Section 19 mine, the company will have nine operating mines in the area.



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EXPLORATION STRUCTURES

Copper Range Given Top Safety Award

Copper Range Co.'s White Pine, Mich., mine has won the coveted Award of Honor, the highest possible recognition given industrial operations by the National Safety Council. This marks the seventh time in nine years that the White Pine Copper Co., which operates the mine, won one of the two top awards, and the third time it has won the top honor of the Safety Council.

Coal Mining Complex Near Centralia, Wash.

The Consulting Services Division, McDowell Wellman Engineering Co., is presently engaged in mining studies and engineering services for a strip mine that will feed more than 18,000 tons of raw coal per day to a 1,400-megawatt power plant under construction in Centralia, Wash. The complex is the first in a series of new steam generating stations to be built in the Pacific Northwest.

The mining project, which is scheduled to be in operation by the end of 1970, is a joint venture of the Pacific Power and Light Co., Portland, Ore., and the Washington Irrigation and Development Co.

Uranium Development

According to a survey conducted by the Atomic Energy Commission's office in Grand Junction, Colo., the domestic uranium industry is planning about 24,000,000 feet of surface exploration and development drilling during calendar year 1970. This compares with 30,000,000 feet actually drilled in 1969.

This survey information represents the combined estimates of drilling footage and associated costs for 52 companies. These companies project a total of about 78,000,000 feet of drilling during the four years 1970 through 1973 at a cost of \$120 million including technical and administrative costs, but excluding costs for acquisition of lands and exploration rights.

High Grade Copper Ore At FRC's Bonney Mine

Federal Resources Corp. has encountered a 15-foot wide vein of high grade (5%) copper ore during development work at the Bonney Mine near Lordsburg, N. M.

The ore was found on the 2,000 level, which is the deepest workings in the mine. The ore vein discovered is of better width and grade than anticipated and of a higher grade than current production from other areas in the mine, the report said. The length of the ore vein will be determined during mining operations, officials said. Present production from the property is at 85% of mill capacity and will be increased in the near future.

The company reported that the three-compartment production shaft has been completed at the Camp Bird silver-lead-zinc mine in Colorado. Equipment is being installed on the 700-foot level and work began in June on an access drift to the 85-72 ore body. Mining should begin soon thereafter.

Atlantic-Richfield "New Look" Program

Atlantic Richfield Co. has announced launching of a \$60-million "New Look" program, the largest in the history of the petroleum industry.

The company began June 8 to market two new and improved grades of gasoline under a single, coast-to-coast name—ARCO—and will introduce a third, lead-free, grade three months ahead of schedule in the Los Angeles basin.

Anti-Pollution Program

The nation's second largest prime producer of molybdenum, a metal used to harden steel, is spending almost \$250,000 annually to stop water pollution. Molybdenum Corporation of America officials say the company's Questa Mines Division has spent \$1.5 million toward developing a waste disposal system to eradicate pollution.

The disposal facility, high in the Sangre de Cristo mountains of northern New Mexico, has been expanded to give the firm a total of \$67 million investment in its mine and mill—an investment that was a bit more than \$30 million in 1965. The division now has 655 employees on its \$7 million annual payroll. Molybdenum is being used on manned space capsules because it is the only metal that can withstand heat on re-entry into the earth's atmosphere. The metal will also be used as a catalyst to free gasoline from lead and to help cut down on air pollution, since molybdenum can be used to remove carbon monoxide and other impurities from automobile exhaust.

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Technical Societies

Sea Horse Institute

Leading scientists and engineers interested in the behavior of materials in marine environments gathered for four days of discussion (June 1-4) at the 32nd meeting of the Sea Horse Institute in Wrightsville Beach, N. C.

The Sea Horse Institute participants represent such diverse fields as oceanography, medicine, metallurgy, chemistry, biology, and desalination. Two half-day sessions were devoted to metals and alloys. Two more sessions discussed special topics and one session was on coatings.

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Second Inter-American Materials Technology Conference Aug. 24-27

MORE than 100 papers in the fields of materials technology and materials education will be presented at the II Inter-American Conference on Materials Technology in Mexico City, Aug. 24-27.

The conference is expected to attract more than 800 scientists, engineers and educators from all countries of the western hemisphere. In addition to the sessions scheduled, an international exposition of equipment, publications and processes in the field of materials engineering is planned.

Sponsors of the conference are Southwest Research Institute of San Antonio, Texas, The Colegio de Ingenieros Mecanicos y Electricistas de Mexico, the Ford Foundation, the National Science Foundation, the Organization of American States, the Agency for International Development and The American Society of Mechanical Engineers.

Co-sponsors of the conference are American Society for Engineering Education; American Society for Metals; American Society for Nondestructive Testing; American Society for Quality Control/Mexico Section; American Society for Testing and Materials; American Welding Society; Asociacao Brasileira de Metais; Asociacao de Engenheiros do Sao Paulo; Asociacion de Ingenieros del Uruguay; Asociacion Salvadorena de Ingenieros y Arquitectos; Asociacion Venezolana de Ingenieros Electricos y Mecanicos; Canadian Aeronautics and Space Institute; Canadian Institute of Mining and Metallurgy; Centro Paraguayo de Ingenieros; Colegio de Ingenieros de Guatemala; Colegio Dominicano de Ingenieros, Arquitectos y Argrimensores; Engineering Institute of Canada; Federacao Brasileira de Associaoes de Engenheiros; Instituto Latinoamericano del Fierro y del Acero; The Metallurgical Society of the American Institute of Mining, Metallurgical and Petroleum Engineers; National Association of Corrosion Engineers; Sociedad Colombiana de Ingenieros; Sociedad de Engenharia do Rio Grande do Sul; Sociedad de Ingenieros del Peru; Sociedad de Ingenieros y Arquitectos del Guayas-

Ecuador; Society of Automotive Engineers; Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers; Union Mexicana de Asociaciones de Ingenieros and Union Panamericana de Asociaciones de Ingenieros.

Proceedings of the meeting will be available to participants at the time of registration in English and in Spanish.

Registration for the conference is \$50, which includes copies of the proceedings, a banquet, admission to all sessions, and transportation from headquarters hotels to the Unidad de Congresos del Centro Medico del I.M.S.S., site of the conference. All sessions will be held in English and Spanish. For more information, write to David L. Black, P. O. Drawer 28510, San Antonio, Tex. 78228.

AMC Supports Concept Of Pollution Control

The American Mining Congress, representing producers of the nation's metals, industrial and agricultural minerals, and solid fuels, has told Congress it supports as "still sound" the concept of air pollution control set forth in the 1967 Clean Air Act Amendments.

Speaking for the mining industry, Dave Swan, of New York, N. Y., vice president for technology, Kennecott Copper Corp., praised Congress for its success "in spurring a growing awareness of the problems of air pollution throughout the United States." He said the mining industry is in full accord with efforts of both the Administration and the Congress in controlling air pollution.

The mining industry, Swan said, endorses the proposal to require immediate designation of all 91 air quality control regions under the Clear Air Act. More than 70 per cent of the nation's population thus would be living in federally designated regions, leaving the remainder in smaller communities or rural areas.

"How do you manage to live within your income?" one man asked his friend.

"Heavens, I don't!" exclaimed the other. "It's all I can do to live within my credit!"

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Class Notes

1927

Dr. Arthur S. Adams, D.Sc. 1927 and Medalist 1949, was honored recently when the new eight-story residence tower of the New England Center for Continuing Education was named for him. Dr. Adams is a former president of the University of New Hampshire and is now a consultant to the Center.

1932

Harry F. McFarland is a professor of mining technology and coordinator of overseas programs at the Leadville campus of Colorado Mountain College. It was through his efforts that CMC recently invited four Micronesian students to enroll at Colorado's unique and innovative twin-campus community college on the top of the Continental Divide.

1949

L. B. Curtis, P.E. 1949, is president-elect of the Society of Petroleum Engineers of AIME. He will assume office as president in February, 1971. Mr. Curtis is manager of operations for the eastern hemisphere for Continental Oil Co. in New York. Soon after graduating from Mines in 1949, he began his career with Continental at Fort Worth.

1953

Richard D. Erdman, P.R.E. 1953, has been promoted to the position of manager of operations of Sequoia Refining Corp.'s Hercules Plant, Ponca City, Okla. His former title at the Hercules Refinery was superintendent of technical services. He has had 10 years of operating, supervisory and technical service experience with Universal Oil Products Company of Chicago.

Dr. Harry O. McLeod, P.E. 1953, is director of the information services department and assistant professor of petroleum engineering at the University of Tulsa. He was formerly with Dowell and still earlier with Jersey Production Research Co. in Tulsa. In addition to his degree from Mines, he holds a Ph.D. degree in petroleum engineering from the University of Oklahoma.

1968

Dr. Nilendu S. Mukherjee, D.Sc. 1968, is an exploration geologist with Congdon & Carey, Denver, Colo. He was formerly employed by the Indian Atomic Energy Commission.

Ralph B. Tacoma, E.M. 1968, formerly associated with Kennecott Copper Corp. at Ely, Nev., is now employed as a maintenance engineer with Wyandotte Chemicals Corp. in Michigan. Ralph's mailing address is P. O. Box 157, Wyandotte, Mich. 48192.

Address Changes

1920-1939

Frank Siermans, '28, 5037 Pine, Maywood, Calif. 90270.
Douglas M. Shaw, '28, P.O. Box 1283, Tubac, Ariz. 85640.
Henry T. Putz, '32, 241 N.E. Tusawilla Ave., Ocala, Fla. 32670.
Clyde E. Osborn, '33, 7215 E. Camino Valle Verde, Tucson, Ariz. 85715.
George D. Roberts, '34, 26 Alta Vista Way, San Rafael, Calif. 94901.
Hubert E. Risser, '37, Apt. #21, Mines Park, Golden, Colo. 80401.

1940-1959

Louis O. Storm, '40, 2122 Adobe, Hobbs, N.M. 88240.
Lt. Col. Rone B. Tempest, '42, USFK-ENJ, APO San Francisco 96301.
R. F. Miller, '43, 1834 North Main St., Liberty, Tex. 77575.
William G. Cutler, '48, 91 Sutton Pl., El Paso, Tex. 79912.
Glenn M. Pedderson, '49, Winston House, Dollis Park, Finchley Church End, London, N. 3, England.
Thomas O. May, '49, 99 Clarendon Rd., N.W., Calgary 48, Alberta, Canada.
Joseph C. DuBois, '50, 1030 Plaza Tower, 1001 Howard Ave., New Orleans, La. 70113.
Larry E. O'Brien, '51, 930 Midland Savings Bldg., Denver, Colo. 80202.
Guerton E. Jackson, '52, 5433 East Fort Lowell Rd., Tucson, Ariz. 85716.
Adolph Frisch, '53, 3909 Carnation St., Wichita, Kans. 67202.
Ronald W. Clark, '57, 15150 Goodhue St., Whittier, Calif. 90604.
Harvey P. O'Brien, '58, 1521 Grape St., Denver, Colo. 80220.
Richard L. Brustern, '59, 3832 West Prospect, Fort Collins, Colo. 80521.
Fred A. Kumpf, '59, % Phillips Petroleum Exploration U.K., Ltd., Stag Place, London, S.W.1, England.

1960-1969

David L. Watson, '60, % Cerro de Pasco Corp., Cerro de Pasco, Peru, S.A.
Mr. Paul Keith Hoffman, '62, 3602 Waterway Blvd., Isle of Palms, S.C. 29451.
Lawrence J. Graha, '64, P.O. Box 204, Eagle Mountain, Calif. 92241.
William Quentin Summer, '64, 6277 N.E. Radford Dr., Seattle, Wash. 98115.
Robert H. Writz, Jr., '64, 506 Devon Road, Morrestown, N.J. 08057.
Ralph L. Allen, Jr., '65, 51 Philadelphia Ave., Tokoma Park, Md. 20012.
Gary K. Gantner, '65, % W. A. Stone, 4200 Fisher, Middletown, Ohio 45042.
Calvin H. Bendixen, '66, % American Smelting & Refining Co., 495 E. 51st Ave., Denver, Colo. 80216.
Marvin A. Svaldi, '67, Star Route, Box 48, Morrison, Colo. 80465.
Ronald Ciarallo, '68, % Shell Chemical, P.O. Box 211, Torrance, Calif. 90510.
Wiliam John Gardiner, III, '68, 5 St. Josefaan, Blewazel Mol (Antw.), Belgium.
Mr. Alejandro Rodriguez-Gratacos, '68, 9th Street G-24, Jardines Fagot, Ponce, PR 00731.
Robert Earl Guttridge, '68, 1423 South Fifth, Ponca City, Okla. 74601.
Daniel M. Howard, '68, P.O. Box 652, Austinville, Va. 24312.
Robert E. Irelan, '68, 28 Vrain, Denver, Colo. 80219.
Danny R. Kirschman, '68, 2925 Dexter St., Butte, Mont. 59701.
Sp/4 Jack R. McClellan, '68, 524-64-6212, USASA Comm. Unit Europe, APO New York 09757.
H. Nelson Meeks, '68, P.O. Box 145, Chesapeake Beach, Md. 20732.
Toby Todd Peterson, '68, 9273 Nienan Road, Shawnee Mission, Kans. 66214.
William T. Reish, '68, 23928 Lyons Ave., Newhall, Calif. 91321.
Josef Rene' Roos, '68, 79 Pieter, Colckestr Aalst., Belgium.

Michael O. Russo, '68, 5709 Lyonsview Pike, Apt. 1103, Knoxville, Tenn. 37919.
David J. Starbuck, '68, 4851 W. 11th Avenue, Denver, Colo. 80204.
Jaime Arismendi, '69, Facultad Nacional de Minas, Medellin, Colombia, S.A.
Dr. Brian Thomas Brady, '69, 12745 W. 15th Pl., Lakewood, Colo. 80215.
Dr. David Lester Butler, '69, % Mr. Lewell C. Butler, P.O. Box 398, Mesilla Park, N.M. 88047.
Philip M. Cook, '69, 1910 Simpson St., Apt. #3, Madison, Wisc. 53701.
Abelardo A. Cruz, '69, Apartado 809, Caracas, Venezuela, S.A.
Mark J. Dominguez, '69, CSV APDO 809, Caracas, Venezuela.
Kenneth R. Donley, '69, 3825 Chase, Denver, Colo. 80212.

Peter George Garside, '69, 809 Oakridge, Royal Oak, Mich. 48067.
Howard M. Gollnick, '69, 3334 Cummlia Lane, #173, Houston, Tex. 77024.
David M. Hammond, '69, 1800 S. Penn., #35, Roswell, N.M. 88201.
Fredric J. Kerulis, '69, Southern Peru Copper Co., Toquepala, Peru, S.A.
Mohamed Jameel Hassan Konther, '69, P.O. Box 345, Jeddah, Saudi Arabia.
Mr. Karl Alexander McKinstry, '69, % Mr. Bryon H. McKinstry, 1997 Paddington Road, Kalamazoo, Mich. 49001.
Leslie S. McMillin, Jr., '69, 9282 Montview Blvd., Apt. 201, Aurora, Colo. 80010.
Gunter Bruno Moldzio, '69, 1100 Marion St., Denver, Colo. 80218.
Dr. David Allen Rice, '69, % St. Joseph Lead Co., P.O. Box A, Monaca, Pa. 15061.
James M. Riddle, '69, Croyden Apts. #17, Leadville, Colo. 80461.
Raymond F. Stewart, '69, 708 West Fourth St., Roswell, N.M. 88201.
Larry G. Thomas, '69, 926 West 27th, Pueblo, Colo. 81001.
William C. Tieman, '69, 505 East Platte Ave., Ft. Morgan, Colo. 80701.
Richard E. Voiles, '69, % Sunray-D.X., P.O. Box 2431, Corpus Christi, Tex. 78403.
Bill E. Watson, Jr., '69, P.O. Box 1558, Estes Park, Colo. 80517.
Frederick E. Welsh, Jr., '69, 1815 Pittsburgh St., Cheswick, Pa. 15024.
Dr. K. K. G. Lakdasa Wijetilke, '69, 23, De Zoysa Estate, Ratmalana, Ceylon.
John D. Wright, '69, 180 N. Ashwood, Ventura, Calif. 93003.
German Zambrana Zenteno, '69, 1401 Haven Rd., Apt. F-31, Hagerstown, Md. 21740.

Charles R. Johnson, '49

Mining Consultant
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and Evaluations

P. O. Box 88 Tel. 303-685-5737
Manitou Springs, Colo. 80829

Edward J. Johnson, '49

Petroleum Geology
Room 300

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

Edward P. Jucevic, '60

Consulting Mining and
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Albert C. Harding, '37

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Col. Fertig

New President of Colorado School of Mines

BY mid-June no decision had been made on the selection of the new president of the Colorado School of Mines but the Board of Trustees, recognizing the problem of operating without a Chief Executive, named Dr. Truman H. Kuhn, vice president, administration as Interim Chief Executive Officer of the Colorado School of Mines. This assignment is in addition to his other duties and will make him responsible for the operation of the institution during the time required to select a new president.

The Annual Banquet was an outstanding success when 347 attended the dinner at the Denver Athletic Club. The food was superb while the speeches and program were kept to a minimum.

In addition to the information presented in the report given by Hal Addington, president of the C.S.M. Alumni, there were two unusual occurrences. L. Carter Kaanta, editor of The Mines Magazine and son of Henry W. Kaanta E.M. 1915, had two sons graduate in the class of 1970. The elder, Carter W., graduated in January 1970 while Henry W. Kaanta II attended the banquet with his father. He graduates July 18th.

Bruce Craig, Met. E. 1970, son of Don A. Craig, Met. E. 1948, a director of the C.S.M. Alumni, marked the third generation of Craigs who had attended Mines.

Commencement Ceremonies

Commencement ceremonies were held in the field house and were undisturbed by any protest although it appeared that one student attempted to make his point wearing only his undershorts under his graduating gown.

Considering the progress being made on the Graduate Center this is quite possibly the last class that will graduate in the Field House although it may be that the Class of 1972 may be the first to graduate in the new facility.

The Hundreth Anniversary

1947 is the 100th Anniversary of the founding of the Colorado School of Mines, and the celebration of this event will extend over the entire year.

Alumni Headliners

Dr. Ralph Pray Elected Fellow of American Institute of Chemists

DR. RALPH E. PRAY, D.Sc. 1965, consulting engineer of Pasadena, Calif., has been elected a Fellow of The American Institute of Chemists. The AIC has more than 7,000 members in 26 chapters throughout the United States.

Dr. Pray received his B.S. in Metallurgy from the University of Alaska in 1961 and his D.Sc. from the Colorado School of Mines in 1965. He is president of Wilbur Foote Plastics and Clipper Mountain Exploration Co. He and his family live in Pasadena.

Charles Bruce Production Mgr. At M&T Chemicals Plant

CHARLES BRUCE, Geol.E. 1957, has been named production manager of the Matawan, N.J., plant for M&T Chemicals Inc., a subsidiary of American Can Co.

Mr. Bruce, prior to this appointment, served as plant engineer at the Matawan facility and as project engineer, manufacturing services for M&T. He also served as a mining geologist for M&T International operations in Bangkok, Thailand, and La Paz, Bolivia.

M&T is a leading manufacturer and supplier of plating systems, industrial chemicals, coatings and inks, ceramic chemicals, and recycles metallic resources.

Mr. Bruce holds a degree in geology from the Colorado School of Mines. He has served as director of the Geological Society of Bolivia and the Bolivian-North American Business Assn. He is also the author of a technical paper on "Gravitational Methods for Tin Exploration," and co-author of a paper on "The Ore Deposits of Bolivia . . . Their Origin and Problems."

Mr. Bruce is a member of the American Institute of Mining Engineers, American Institute of Professional Geologists, and the Lincroft (N.J.) Volunteer Fire Dept. He resides with his wife, Eileen, and son, Scott, at 24 Majestic Rd., Lincroft, N.J.

Dr. Kuhn is chairman of the Planning Committee, and it is hoped that the general scheme for the celebration can be completed by the fall of 1970 so that detail work can begin shortly thereafter. The extensive celebration envisions many important meetings in the new facilities on the campus, return of former graduates, and a forecast of events to take place at least in the first decade of the second 100 years of the Colorado School of Mines.



Kellogg

Dr. Kellogg Research Director For King Resources Company

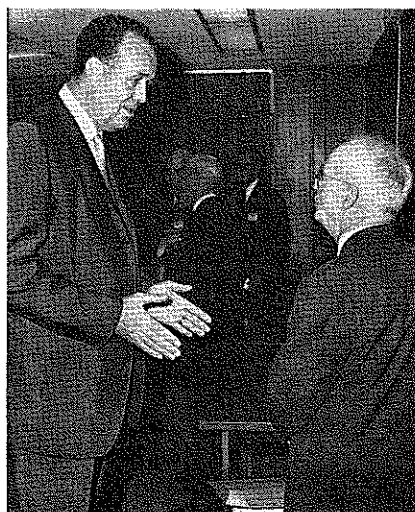
DR. HAROLD E. KELLOGG, Geol. E. 1955, King Resources Co. research administrator and manager of geological research, has been named director of research for the company.

Dr. Kellogg has been with King Resources Co. since August, 1968. He is a graduate of Arvada, Colo., High School, received a Geological Engineering degree from Colorado School of Mines in 1955 and a Doctor of Philosophy degree from Columbia University in 1959.

Dr. Kellogg joined American Overseas Petroleum, Ltd., a foreign subsidiary of Texaco, Inc., and Standard Oil of California, in 1959 and for seven years was engaged in exploration for oil and gas in Turkey, Norway, France, Nigeria and Libya.

In Libya he participated in the exploration effort that led to the discovery of the giant Nafoora oil field and was head of the North African Regional Studies Group for American Overseas Petroleum, Ltd. Subsequently he was on the exploration staff of Texaco, Inc., in Billings, Mont., for two and a half years.

Dr. Kellogg and his wife, Eva, have two children, Scott, 9, and Doris, 10.



CHATTING WITH DR. WILLIAM S. LEVINGS at the Class of 1920 Golden Anniversary Reunion Breakfast is Dr. Orlo E. Childs. Dr. Levings, professor of Geology at Regis College, was a member of the Mines Geology Department from 1936-1955.

LEON D. KELLER GRANTED PATENT ON IMPROVED UPFLOW HYDROSIZER

LEON D. KELLER, Met.E. 1943, has been granted U.S. Patent No. 3,485,365, covering an improved upflow hydrosizer. The new design reduces water consumption and effectively handles metallurgical and related pulps over a wide range of particle sizes. The patent has been assigned to Dorr-Oliver Incorporated, Stamford, Conn., with whom Mr. Keller is associated as resident manager, industrial equipment sales at Virginia, Minn.

The new upflow mechanism provides absolute scrubbing of the coarse particles, sharply controlled separation, high solids concentration and positive removal of the oversize fractions. As a result, subsequent dewatering of the oversize fraction is unnecessary. Subsequent filter operation is improved. The removal of finely divided silica slimes from an iron ore concentrate raises the quality of the final product.

The rake arms of the thickener mechanism operate in a plane close to any directly above the pressurized hydraulic water induction system in the bottom suspension zone.

The induction system uses a non-plugging nozzle arrangement to supply hydraulic water under moderate pressure against the discharge resistance of the nozzles and the hydraulic head of pulp in the tank. The rate of hydraulic water and rate of oversize withdrawn are controlled to maintain the desired critical separation between oversize and undersize, and/or removal of the slimes.

The rake structure sweeps over the induction system and positively moves the oversize solids through the intense hydraulic teeter area that surrounds each succeeding nozzle. In transit, the oversize solids are repeatedly agitated and scrubbed free of slimes and a clean separation of the fractions is attained, as well as high solids concentration of the underflow.

Due to the positive mechanical conveying action of the rake structure, water consumption is held to a minimum. The non-plugging check valve type nozzles used in the Dorr-Oliver HydroSizer minimize the need for

shutdown and overhaul, as compared with earlier orifice type teeter water distribution systems.

Mr. Keller has been associated with Dorr-Oliver since 1949, specializing in metallurgical process equipment sales for the iron ore industries throughout Minnesota and upper Michigan. He has made his headquarters in Virginia, Minn., since 1954, where he is resident sales manager, industrial process equipment.

A 1943 metallurgical engineering graduate of the Colorado School of Mines, he is a professional metallurgical engineer registered in Minnesota and an active member of the American Institute of Mining, Metallurgical and Petroleum Engineers. He was chairman of the society's Minnesota Minerals Beneficiation Group in 1959. Mr. Keller has authored several technical papers.

He resides in Virginia, Minn., with his wife, Marie.

Dr. Rowland Attends Seminar On Computerized Engineering

DR. DAVID A. ROWLAND, P.E. 1949, has recently returned from a seminar on "Computerized Reservoir Engineering" which he conducted in Leoben, Austria. This conference was attended by 27 German speaking petroleum engineers employed in Austria, Germany and Holland and was present at the Montanistischen Hochschule in Leoben. Professor Dr. Ing. Manfred Lorbach, head of Petroleum Engineering Department, was coordinator for the seminar.

The first week of meetings consisted of general reservoir engineering computer applications such as: contour mapping, material balance, and frontal drive computations. The second week was devoted to numerical models and reservoir simulation techniques.

Dr. Rowland is presently production manager for Mutual Oil of America, Inc., located in Santa Fe, N.M. Previously he has served as associate professor of petroleum engineering at both the University of Southwestern Louisiana and the New Mexico Institute of Mining and Technology. He received his P.E. degree from the Colorado School of Mines and his Ph.D. in Petroleum Engineering from Stanford University.

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John R. "Jack" McMinn, '42
Fred G. Van Matre, '56
Jeff J. Wood, '54
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Denver, Colo. 80202



Rowland



Wolfe

Wolfe and Schoenike Form Consulting Engineering Firm

JOHN A. WOLFE, Geol.E. 1947 and M.Sc. 1954, and H. G. Schoenike have formed a new consulting firm, Schoenike, Wolfe & Associates of Houston, Tex. The firm will offer world-wide service as geologists and mining engineers in exploring for and evaluating deposits of metals and industrial minerals. Mr. Schoenike stated, "With the increased realization that exploration for minerals is one of the most profitable enterprises, we believe that our organization will be able to guide and assist the growing interest of Gulf Coast firms in diversification into mining."

Mr. Schoenike is a graduate mining geologist of the University of Wisconsin where he also received his Master's degree. After several years as a corporate mining geologist, he established a consulting practice in Houston in 1957.

Mr. Wolfe, the other senior member of the firm, graduated from Colorado School of Mines in 1947 with degrees of Geological Engineer and Engineer of Mines, followed in 1954 by a Master of Science in Geology. Before establishing a consulting practice in 1965, Mr. Wolfe was primarily engaged in the evaluation of deposits of industrial minerals such as cement. He has lectured throughout the U. S. and the Orient on Mineral Economics. Much of his recent work has been on metallic deposits in the Orient and Latin America.

Howbert Now Assistant Manager AMAX Mine Evaluation Dept.

JOHN C. HOWBERT, E.M. 1948, has been named assistant manager of the Mine Evaluation Department of Amax Exploration, Inc.

Mr. Howbert was formerly attached to the Mine Evaluation group in New York and joined the Climax Division on May 15, 1967. He has been attached to the Henderson Mine Planning group in Colorado since that time.

In his new position, Mr. Howbert will remain in Colorado where he will be joined by some other members of the Mine Evaluation group in new quarters in Golden.

Lovett Named Corporate Director Of Exec. Staffing for Motorola

NORMAN V. LOVETT, P.E. 1942, of Arlington Heights, Ill., has been named corporate director of executive staffing for Motorola Inc.

He will work closely with corporate officials to identify their present and future managerial needs and will conduct searches for suitable candidates to fill these needs. Following the corporate policy of promotion from within whenever practical, he will seek out managers who are ready for promotional opportunities.

For the past three years Lovett served as manager of management consulting services for Ernst & Ernst, an international public accounting and consulting firm. Prior to that he held various personnel and industrial relations positions with several notable companies.

Lovett graduated from the Colorado School of Mines and attended Denver University for graduate work in business administration.

Einarsen's Viking Exploration Seeks Oil in Queensland

CHARLES A. EINARSON, P.E. 1947, president of Viking Exploration, said the agreement with Queensland calls for \$430,000 in exploratory work and drilling over the next four years. Einarsen said Viking will have an exploration office in Brisbane, the capital of Queensland, before the end of 1970.

Einarsen is a native of Denver and a graduate of Colorado School of Mines. Before establishing Viking Exploration a year ago, he was a consulting oil engineer and hydrodynamic consultant. He also put together geological prospects drilled in Colorado, Wyoming and Montana, and his work led to discovery of the big Cinder Buttes gas field in the San Juan Basin.

Einarsen said that just north of Viking's Australian concession is a vast oil shale deposit which is being core-drilled by Aquitaine Co. of Canada, Ltd. Just south of the concession, he said are properties of Santos, Ltd., and Delhi Australian Petroleum, Ltd., where several gas fields have been proven.

In November, Delhi-Santos began gas deliveries to Adelaide, South Australia, through a 486-mile, 22-inch pipeline. Commercial use of natural gas began in Australia eight months earlier with the opening of a pipeline from Roma to Brisbane. (Roma is about midway between Brisbane and Viking's concession.)

The port city that's most accessible to Viking is Townsville, major American embarkation point during World War II.



Fogarty



Boyd

Fogarty Commencement Speaker At College of Santa Fe

DR. CHARLES F. FOGARTY, E.M. 1942 and D.Sc. 1952, president of Texas Gulf Sulphur Co., presented the twenty-first commencement address of the College of Santa Fe on May 10 in the CSF gymnasium.

A native of Denver, Colo., Dr. Fogarty became an orphan at the age of 10 and was one of the first students at a school for underprivileged boys called the J. K. Mullen Home for Boys at Ft. Logan, Colo. Mullen was conducted by the Christian Brothers, the same teaching order as that at the College of Santa Fe. While at the school, the young Fogarty was a mathematics student of Brother Cyprian Luke, F.S.C., who is now president of CSF.

After his education at Mullen, Dr. Fogarty's opportunity for college came in the form of a scholarship from a Denver newspaper, which allowed the recipient to choose any college or university in Colorado.

"After a lot of deliberation, I decided the Colorado School of Mines was the best for me in my financial condition," Dr. Fogarty recalled. "The dean of the school helped me get a job and I earned room and board by waiting tables and washing dishes in a fraternity house." In his spare time and weekends, Dr. Fogarty could be found pounding a typewriter, typing term papers for fellow students at 10 cents a page. During his junior and senior year he also earned \$10 a month in ROTC.

Graduation in June 1942 found Dr. Fogarty with a mining engineering degree but the property of the Army Corps of Engineers. His ROTC training dictated the military assignment and he was sent to Fort Leonard Wood, Mo., as a second lieutenant. He spent the war years at Fort Wood and various other posts as an instructor for replacement engineers, rising to the rank of major. It was at the Missouri post that he met an Army nurse, Wilma M. Wells, who became his wife on Oct. 14, 1943.

From 1946 to 1950 he was a senior geologist with Socony Vacuum Oil Co. in South America. He then returned to the Colorado School of Mines.

In 1952 Dr. Fogarty joined Texas Gulf Sulphur and spent his early years on exploration assignments in Japan,

Dr. James Boyd Elected Chairman Copper Range Board of Directors

JAMES BOYD, MSc. 1932 and D.Sc. 1934, recently was elected chairman of the board of directors of Copper Range Co., New York City, the nation's fifth largest producer of primary copper, after serving 10 years as company president. Chester O. Ensign Jr., Copper Range's executive vice president, was elected a director and also elected to succeed Mr. Boyd as president.

Mr. Boyd climaxes a long and varied career in the minerals industries with his election as chairman. Until now, the chairman's position at Copper Range had been vacant. He joined Copper Range as president and director in 1960. Before that, Mr. Boyd served for nine years with Kennecott Copper Corp. as vice president of exploration. Prior to entering the business world, Copper Range's chairman was director of the U. S. Bureau of Mines from 1947 to 1951. He served during World War II as head of the Army and Munitions Board's metal branch, where he helped mobilize the mining industry for the war effort. He also aided in Germany's industrial recovery following the war, as director of the industrial division of military government.

Mr. Boyd's career as an educator began in 1929, when for several years, he was on the faculty of Colorado School of Mines, one of the nation's leading mining institutions. Following World War II, he returned to Colorado School of Mines as dean of faculty. Copper Range's new board chairman served as chairman of the National Science Foundation's advisory committee on mineral research from 1953 to 1956. He has received the Rand medal and the Jackling award from the A.I.M.E.

Mr. Boyd is a past president of the Mining & Metallurgical Society of America, the Copper Club and the A.I.M.E. He is a director of Felmont Oil Corp. as well as Detroit Edison Co. Born in Kanowna, Western Australia, Mr. Boyd was educated in England and the U. S. and was graduated from California Institute of Technology. He earned his master's degree and doctor of science degrees from Colorado School of Mines.

Canada, Mexico, the Gulf Coast of the U.S., the Middle East, and Africa.

He became manager of Exploration in 1954 and was elected vice president in 1957, senior vice president in 1961, director in 1962, executive vice president in 1964, and president in 1968.

Dr. Fogarty is past president of the Mining and Metallurgical Society of America and is a member of the Board of the Colorado School of Mines Research Foundation, a director of the Foreign Policy Association and a member of the Economic Club of New York.

Personnel Placement

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

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

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

Client's Code Number	Degree	Age	Marital Status	No. of Children	Preferred Fields of Work	Locality Preferred	Languages Spoken
MN 18	Mining	44	M	2	Mining-Metals Mill	Colorado	English
MN 19	Mining	34	M	2	Mining Engineer	Western U.S.	English
MN 29	Mining	51	M	0	Sales Management	U.S.A.	English
MN 30	Mining	26	S	0	Mine Exploration or Heavy Equipment	Alaska/Western U.S.A.	English
MN 34	Mining	39	M	1	Mining Geology	Western USA/Foreign	English/Spanish
MN 35	Mining	45	M	6	Mining Engineering	Open	English
MN 36	Mining	30	M	1	Open Pit or Underground	West, Northwest U.S.	English
MT 41	Metallurgy	29	M	2	Metallurgical Engineering Management	U. S.	English
MT 42	Metallurgy	25	S	0	Sales or Technical Representative	Open	English
MT 47	Metallurgy	33	M	3	Mill Operation	West. U. S.	English
MT 48	Metallurgy	35	M	2	Development, Project Management	Colorado	English/Spanish
MT 49	Metallurgy	24	M	2	Project Metallurgy—Production Metallurgy Sales Eng.	Rocky Mt. Region	English
MT 50	Metallurgy	24	M	2	Project or Process Engineering	Western USA Rocky Mtn.	English
MA 05	Mining—Math	26	M	3	Operations research, Systems analysis	Open	Thai, Spanish and English
GE 30	Professional Engineer	35	M	3	Engineering—Civil—Geology	Western U. S. A.	English
GE 31	Professional Degree	25	S		Geological Exploration Development, Management	Open	English
GE 34	Geol. Engr. Civil Eng.	39	M	3	Prefer Management	Open	English
GE 36	Geology	43	M	1	Production—Mining or Non-metallic Processes	Western U.S.	English
GE 37	Geol. Engr.	42	M	3	Geological Exploration	Western USA/Foreign	English
GE 38	Geology	35	M	2	Mineral Prop. Evaluation Mine Manag. & Planning	Western USA/Foreign	English
GP 15	Geophysics	49	M	3	Petroleum Expl.	Rocky Mountains Colorado	English
GP 17	Geophysics	34	M	1	Geophysics	Rky. Mtn.	English
GP 18	Geophysics	23	S	0	No Mgmt. Trainee	Southwest U. S. or South America	English
GP 19	Professional Engineer	24	M	0	Mineral Exploration	Rocky Mt. Area	English/French
GP 20	M.S. Geology & Geochemistry	28	M	0	Mineral Exploration	Rocky Mtn. Region	English
PE 15	Petroleum	24	S	0	Reservoir Engr.	Rocky Mtn., Canada or Alaska	English
PE 16	Pet. Eng.	27	M	2	Prod. Engr.	Open	English
PE 17	Pet. Eng.	34	M	4	Pet. Engr.	Rocky Mtn. Region	English
PH 02	Physics	23	S	0	Engineering Physics	Coastal except N.E.	English
PH 04	Engr. Physics	27	M	0	R. & D. Engr. Marine Engr.	U.S.A.	English
PR 11	Masters in P.R.E.	30	M	2	Management Systems	Open	English/French
PR 12	Chem./Ptrlm. Refining	22	S	0	Chemical-Petroleum Refining Industry	Open	English/French

In Memoriam



Cotterell

Charles H. Cotterell

CHARLES H. COTTERELL, Geop. E. 1959, geophysicist at Marathon Oil Co.'s Research Center in Littleton, Colo., died April 18 in an automobile accident near Ellis, Kans. Burial was in Chapel Hill Cemetery with full military honors. Those who wish may contribute to the CSM Alumni, Golden, Colo. 80401.

Born Sept. 3, 1937, in Denver, he graduated from Englewood High School in 1955 and from Colorado School of Mines in 1959 with a degree in geophysical engineering.

He worked at Marathon Oil Company in Littleton since 1960 as a geophysicist specializing in research.

At Marathon he gained recognition in his field by designing and developing a radiation device to measure core samples.

He was a member of several professional groups, including the Society of Professional Well Log Analysts, the Society of Exploration Geophysicists, the Denver Well Logging Society, the Scientific Research Society of America and the Colorado School of Mines Alumni Association.

He was also a captain in the U. S. Army Reserve Officer's School at Fitzsimons.

He was one of five Coloradoans to receive the Distinguished Shooter's Medal for Pistols and was a member of the Fifth Army Pistol Team for approximately six years.

Mr. Cotterell is survived by his father, Charles M. Cotterell of Denver; his mother, Mrs. John H. Gabriel of Englewood; three brothers, Gary L. Cotterell of Englewood, Tommy Cotterell and Donnie Cotterell, both of Denver; and three sisters, Anne Baty of Englewood, Patricia Rodriguez of Littleton and Sandra Hamilton of Denver.

Other survivors include his grandparents, Mrs. Hazel Cotterell of Bennett, Colo., Mrs. Augusta Biznett and Mr. and Mrs. A. M. Gabriel, all of Englewood.

Earl F. Foster

EARL F. FOSTER, E.M. 1924, died April 6 in St. Mary's Hospital while visiting in Tucson. He had been general superintendent for American Smelting & Refining Co. for 42 years prior to his retirement in Sun City, Ariz. in 1966. The last 27 years of his career had been spent in Mexico at AS&R's Taxco Unit.

Born in North Platte, Nebr. in 1902, Mr. Foster received his Mining Engineering degree from the Colorado School of Mines in 1924 and joined AS&R immediately after graduation.

Mr. Foster was a member of the American Institute of Mining and Metallurgical Engineers, the Colorado School of Mines Alumni Assn., the Sun City Country Club, Swim, Bridge, Men's and Cribbage clubs, all of Sun City.

Survivors include his wife, Charlotte, of Sun City; two sons, Thomas of Chicago, and Frank (E.M. 1958) of Campbell, Calif.; two sisters, and three grandchildren.

Clare L. French

CLARE L. FRENCH, E.M. 1913, died April 5 at his home in Phoenix, Ariz. (6818 West Wolf St.). His wife, Mary, writes: "We had the funeral in Colorado where his mother lived over 50 years and is buried."

Mr. French was born in Michigan on Feb. 17, 1890 and received his Mining Engineering degree in 1913 from the Colorado School of Mines. He was employed by Charles Pfizer and Co. in New York City for over 31 years. When he retired in 1959, Mr. and Mrs. French sold their home in Forest Hills, N. Y., and moved to Phoenix, Ariz. They also maintained a summer home near Highland Mills, N. Y.

Mr. French was a loyal member of the Colorado School of Mines Alumni Assn. and had served as secretary of the New York Section. In 1963 he returned to Golden to attend the 50th Anniversary of the Class of 1913.

Robert B. Ingalls

ROBERT B. INGALLS, Met. E. 1948, died April 16 in a Salt Lake City hospital. Burial was in Mt. Calvary Cemetery.

Born Feb. 23, 1920, in Salt Lake City, Mr. Ingalls attended the University of Utah and in 1948 received his Metallurgical Engineering degree from the Colorado School of Mines. During World War II he served in the army and was for years a sales engineer for the National Equipment Co. in Salt Lake City. He took an active part in his local CSM Alumni Section and had served as president of the Salt Lake City Section.

Surviving are his sons, Mark and Jeffery; one grandchild, his mother, Mrs. Mark Ingalls; and a brother, Dr. Boyd Ingalls, all of Salt Lake City.

Mrs. Merle Wood Riddle

MRS. MERLE WOOD RIDDLE, wife of Donald D. Riddle (E.M. 1918), died April 29 in Orlando, Fla. A native of Indiana, she came to Orlando in 1933 and was a member of the First Church of Christ Scientist, a charter member of the Women's Republican Club, and a founder of the Gray Ladies Assn. of Orlando.

Survivors include her husband, Donald Dana Riddle, Orlando; son, Donald Dines Riddle, Winter Park, Fla.; daughters: Mrs. Shirley Cucuel, Orlando, and Mrs. Mariel Sisson, Titusville, Fla.; 12 grandchildren and three great-grandchildren.

Letters

PROFESSIONAL ENGINEERS OF COLORADO

May 28, 1970

Dr. A. W. Schlechten
Vice-President, Academic Affairs
Colorado School of Mines
Golden, Colorado 80401

Dear Dr. Schlechten,

We know you share our concern for the actions of students in the matter of protests about environmental problems, the war in Viet Nam, and other national problems. At the Annual Meeting of our Society on May 23, 1970, there was much discussion of the present situation, and as a result, it is felt that you and your faculty and the engineering students should be commended for carrying on in a responsible manner during the past couple of weeks.

Accordingly, the PEC membership directed the following resolution be sent to you, and it is hoped that you will pass this information along to all concerned in your school and that it will serve as a means of maintaining our excellent relationship with you, your faculty, and your students:

"Resolved that Professional Engineers of Colorado, at its 22nd Annual Meeting, being aware that the engineering students of the engineering schools and colleges at Colorado University, Colorado State University, Denver University, and Colorado School of Mines are as concerned and as informed on the problems of pollution, environmental quality, and other national problems, and the need for improvement as other students, do hereby commend the engineering students on their decision to stay in class during recent demonstrations and to work to solve the problem in a responsible manner."

Professionally yours,
Mike H. Barrett, PE
President

MHB:ln
cc: Tom Tobin, PE

Box 294
3740 Yukon Court
Wheat Ridge, Colo. 80033
May 20, 1970

Dear Mr. Editor:

Several recent articles in Scientific American, Life, Science News, and Mines Magazine's article on Dr. Ramon Bisque's tangency theory—have developed what has become a fact, a new rationale for mineral exploration.

In an expanding universe, we should have an expanding world, this relates to Continental Drift (of which I have been a continuing student since 1938, when I was enabled to thoroughly analyze "Our Wandering Continents," by Du Toit), in this manner:

If the present land masses, continents, were the original total surface of the earth, some 4.3 billion years ago then the earth's sphere, with 57 million square miles of area, could have had a diameter of only 4,240 miles, or about half its present 8,000 miles; then as these separated and wandered across their regelated-lubricated surface (as a solid will melt and slide on supporting ice), and as these were altered from their high density nickel-iron, via atomic decomposition, into the lighter density present surface materials, we would be moving towards a present, still evolving geography of the earth as we know it.

The moon, plucked from the Western Pacific (Charles Darwin's theory) left a gap in the area.

With such knowledge, my observation of the Aracuara Pine, left a gap in the area. With such knowledge, my observation of the Australia-South America similar ecology, as the Aracuara (umbrella ribbed) Pine, common to these two countries, and other similarly common life, indicate that South America and Australia were joined, hence there was a much smaller world, for Eastern Australia to be close to the Chilean Coast, and (note this!), Australia fits into the Ross Set, and Southern Argentina fits into the Weddel Sea, of Antarctica, further indicating a spread of distances from the poles.

Among other things, this theory would have placed Arabia across the Equator during a long period, where its accumulation of petroleum, in the subsurface, would have been facilitated.

Further study, and comments to the writer, are welcomed, to help develop our world mineral resources, whose magnitude exceeds our wildest dreams. The problem is merely one of which to develop, not of whether there are enough, in the new World Game.

Respectfully
Francis N. Bosco, P.E.
1935 and M.Sc. 1941

Book Reviews

Report on Uranium In Southern U. S.

A report on "Uranium in the Southern United States" is being made available by the Atomic Energy Commission and the Southern Interstate Nuclear Board.

This 230-page compilation has numerous maps showing the location of the occurrences identified in preliminary reconnaissance examinations for uranium in the SINB region conducted by the AEC and the U. S. Geological Survey during the 1950-56 period. It includes new information on radioactive occurrences as well as an extensive bibliography of references pertaining to the geology and uranium potential of the 17 southern and southwestern states.

Those served by the SINB are Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

WASH-1128 may be purchased for \$2.25 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402.

Compression Packings Handbook by MPA

This Compression Packings Handbook, sponsored by the Compression Packings Division of the Mechanical Packing Association, Inc., has been prepared and published to answer the great need for an up-to-date treatise on the variety of these products, their selection and proper methods of application.

Compression packings are often referred to as soft packings or jam packings and are so called because they are packed into a stuffing box where their fit is regulated by compression from the gland or follower. They are used as sealing elements in such equipment as centrifugal pumps, reciprocating pumps, and in industrial bronze, iron and steel valves, faucet valves, autoclaves, expansion joints, defibrators, soot blowers, jordans, and many other types of mechanical equipment.

They find their major use in the process industries such as chemical, petroleum, petro-chemical, paper and steel mills, and in such services as utilities, marine water and sewage, nuclear, food, etc. They seal all types of fluids—for example, water, steam, acids, caustics, gases, beverages, oil and gasoline.

Price, \$2.50 each; order from Mechanical Packing Association, P. O. Box 98, Brielle, N. J. 08730.

Pictorial History Of American Mining

"A Pictorial History of American Mining" by Howard N. and Lucille L. Sloane is the only book that covers the full scope and sweep of mining in America and it is the only book with such a wealth of illustrations (there are nearly 1,000, many obtained from private sources and never before published).

For you as an industry member, it offers many benefits: entertaining reading because of its delightful text and photographs; educational value because it covers the full history from its earliest days, in all aspects, all over the nation; public relations value because it shows how this great industry has developed and contributed to the growth of this country.

The Sloanes start their book with a brief discussion of prehistoric mining in America. They show the earliest mining of the "Old Copper Culture" of the upper Great Lakes, the mound builders of Ohio and Illinois, the Pueblo and Hopi Indians, and the various minerals they mined.

Then they move on to pre-Colonial and Colonial days to view the operations of the Spanish and French and the settlers who founded our country. You'll see the mining of saltpeter, iron, gypsum, precious and base metals, mica, fluorine, feldspar, mercury, and how they contributed to the early economy.

Throughout the book there are threads of gold and silver. And it was remarkable for me as an outsider to see how the search for these metals influenced the development of mining and the course of history in this nation.

All of the familiar stories are here, of course, retold in exciting, vivid detail—the Sutter's Mill strike and the 49ers, the Comstock Lode, Cripple Creek, the Klondike. But here, too, are the stories of men largely forgotten by history who struggled and died in their flight to wrest a fortune from the earth. Some men made it big and retired as millionaires; some made it and lost it; others never made it at all.

Besides the men who dug into the ground there were many others — gamblers, thieves, gunmen, lawmen, saloonkeepers and prostitutes, speculators, rascals, politicians and statesmen, stagecoach drivers and railroad barons, and a host of others who poured into the mining towns to share the wealth — while it lasted. All of them played a role in the drama of a great and growing industry.

From the search for gold and silver came many other mining enterprises as men learned more about the wealth that lay beneath their feet. What started as a search for precious metals often turned into even greater wealth in other minerals.

You get an overview of all the min-

erals and their by-products extracted from the earth—copper, lead, cinnabar, oil, potash, coak, salt, sulfur, iron, building stone, tin, uranium, magnesium, zinc—to name but a few of the many covered.

This is a story of progress, both technical and corporate, from the pick and shovel of the prospector to today's giant machines and sophisticated mining and refining techniques. Hundreds of individual mines and companies, some long gone, others now huge corporations, are described and shown.

These are but a few of the highlights of this big book. It's so filled with stories of mining accomplishments and human interest that I can't begin to include it all here. It is so complete that it even speculates about the future and the possibilities of extra-terrestrial mining.

A PICTORIAL HISTORY OF AMERICAN MINING is available now, priced at \$12.50; Crown Publishers, Inc., Mail Service Department, 50-10 34th Street, Long Island City, N. Y. 11101.

Comprehensive Guide To Consulting Work

A comprehensive guide to consulting with helpful "how-to" suggestions. Covers a wide spectrum of subjects of interest to those desiring a career in consulting. Applicable to all specialties and fields, regardless of industry, endeavor or market chosen for practice.

Among the subjects treated are: credentials, designing a fee schedule, costs, client relations, building a clientele, what companies expect of a consultant, proposing and quoting, contract considerations, licenses, associates, and professional ethics. 31 pp, soft cover, \$2.50; published by SiSi, P. A. Box 42576, Los Angeles 90050.

Geological Literature On Alaska's North Slope

Geological Literature on the North Slope of Alaska by J. C. Maher and W. M. Trollman, U. S. Geological Survey.

This bibliography prepared by the U. S. Geological Survey in cooperation with the U. S. Navy, Office of Naval Petroleum and Oil Shale Reserves, is being published by the American Association of Petroleum Geologists. It contains approximately 1,300 references in the fields of areal, engineering, economic, and structural geology, geomorphology, geophysics, oceanography, hydrogeology, petrology, stratigraphy, and paleontology. These have a simple one-subject index and a complete serials list.

Mail orders at \$5.00 a copy (25 per cent discount to AAPG members) to The American Association of Petroleum Geologists, P. O. Box 979, Tulsa, Okla. 74101.

NBS Highlights

The status of the U. S. Metric Study, and a variety of consumer problems, are among leading topics in **NBS Technical Highlights: 1969**. This latest annual report of the National Bureau of Standards, U. S. Department of Commerce, covers the Bureau's activities from July 1, 1968, to June 30, 1969.

The metric study—a Congressionally mandated inquiry by NBS into the impact of increased world-wide usage of the metric system on the United States—is now passing the half-way mark and was well under way during the period reviewed in the *Highlights*; the book's introductory chapter summarizes the study's progress, reviews staff and organizational changes at NBS, and notes developments related to automotive safety and broader protection from flammable fabrics. This is followed by a feature on the rapidly expanding program of the Bureau's Center for Computer Sciences and Technology.

1969 TECHNICAL HIGHLIGHTS OF THE NATIONAL BUREAU OF STANDARDS, NBS Special Publication 325, issued March 1970, 243 pages; \$1.25. (Order from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, or local U. S. Department of Commerce Field Office as SD Catalog No. C13/10:325, or from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151 as NBS SP-325.

Study of the Brine Of Great Salt Lake

A recent study of the brine of the Great Salt Lake has been released by Utah Geological and Mineralogical Survey. Entitled *Great Salt Lake: Chemical and Physical Variations of the Brine, 1963-1966*, it is the work of D. C. Hahl and A. H. Handy of the U. S. Geological Survey.

Construction of the Southern Pacific Causeway, cutting off the north section of the lake, has in effect created two lakes with widely different physical and chemical properties. The south arm is about one foot higher than the north arm. Water in the south arm is green in color, and that in the north arm is pink. A crust of sodium chloride had precipitated out in the north arm. The difference in concentration is related to the fact that the south arm receives most of the inflow of fresh water. The level of the lake varied from 4191.3 feet above sea level in 1963, the lowest level since records were kept, to 4195.7 in 1966.

Water Resources Bulletin 12, *Great Salt Lake: Chemical and Physical Variations of the Brine, 1963-1966*, is available at the Utah Geological Survey Building, University of Utah, Room 103, Salt Lake City, 84112, for \$2.00.

Pre-Fab Units Developed By Israeli Engineers

A new type of pre-fabricated building element based on rigid foam has been developed by Israeli engineers, to meet the need for mobile housing. The units utilize polyurethane foam in a sandwich panel which is reported to have advantages in terms of insulation, maintenance, appearance, structural stability and economy. Each can be assembled from a few parts. The basic component of sheet metal facing with a core of rigid foam can be made in any metal fabrication plant. The advantages of speed and economy are also available with small scale production.

These pre-fabricated units can be erected without special equipment by untrained labor and are suited to the needs of developing countries as well as for field units in mining and drilling. In countries of advanced economy, they may be used in building vacation homes.

The panel's insulating qualities are said to provide a cooling element in hot climates and heat-retaining comfort in low temperatures.

The unit was developed by Israel Product Research Company Ltd., (ISPRA), a year-old firm of Israeli scientists and engineers, many of whom received their training in the United States and other western countries.

William Crowe Kellogg, '43

Kellogg Exploration Company
Geologists—Geophysicists

425 E. Las Flores Dr., Altadena, Calif.
Sycamore 4-1973

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GEORGE R. BROWN, '22

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HOUSTON, TEXAS 77002 CApitol 3-1346

Campus Headlines

57 Teachers Back In School at CSM

FIFTY-SEVEN higher elementary and secondary school teachers, counselors and administrators have started six-week courses at the Colorado School of Mines in "Resource Development in Oil and Gas" or "A Total Concept of the Mining Industry."

Each of the courses are again being offered through CSM for six semester hours credit which the educators may apply toward credits required for graduate education training, or renewal and reinstatement of earth science and administrative teaching certificates where courses are unspecified.

Thirty-four educators are enrolled in the mining sequence course which is co-sponsored by the Colorado Mining Association; and twenty-three educators are enrolled in the petroleum sequence course which is co-sponsored by the Colorado Petroleum Council.

All students are sponsored by scholarships awarded by a joint committee of educators and industrial executives. The petroleum sequence is now in its third year while the mining sequence is starting its second year.

Each of the courses are offered during the summer to help familiarize elementary and higher educational instructors to the potential in the mining and petroleum areas, and perti-



COLORADO ELEMENTARY AND SECONDARY TEACHERS, counselors, and administrators began orientation to special courses offered again through the Colorado School of Mines. Col. W. E. Leckie, assistant to the President, explains the purpose of the courses. One course, "Resource Development in Oil and Gas" is jointly sponsored by the Colorado Petroleum Council, and "A Total Concept of the Mining Industry" is jointly sponsored by the Colorado Mining Association.

Mines Receives NSF Grants

COLORADO School of Mines recently received three National Science Foundation grants totaling \$39,500.

The following departments have received grants: Basic Engineering \$15,000; Physics \$15,000 and Metallurgy \$9,500.

The Basic Engineering grant entitled "Structure of Scalar Fields Mixed by Turbulence for Arbitrary Schmidt Numbers" will deal with the construction of pipe water systems for the investigation of properties in turbulent velocity fields and scalar contaminants mixed by turbulence. Principal investigator will be Dr. Dragoljub M. Kesic. The project will continue through the 1970-1971 school year with additional funds allotted for research assistantships, including tuition.

The Physics Department grant entitled "Mossbauer Studies of Permalloy Alloys" will consist of two phases. In the first phase alloys of commercial chemistries will be fabricated and heat treated to achieve equilibrium

well-ordered states. Mossbauer spectra will be obtained and evaluated with respect to the spectrum of the perfectly ordered Ni₂Fe alloy. Conclusions will be made about the effects of excess nickel molybdenum and copper additives on the electronic state of the iron atoms and on local order.

The second phase of the study involves obtaining Mossbauer spectra of commercially available, high magnetic quality Permalloys and comparing these spectra to the equilibrium alloy spectra from the first phase. In this manner information about the microscopic differences in ordering and electron distribution between the equilibrium alloys of the first phase and the quasi-equilibrium commercial alloys will be obtained. The principal investigator is Dr. Joseph A. Moyzis.

The third grant to the Metallurgy Department will be used for the purpose of purchasing specialized engineering research equipment. Dr. Paul G. Herold, head of the Metallurgy Department, will be director of the grant.

16 Senior ROTC Cadets Commissioned Second Lieutenants at Mines

SIXTEEN senior ROTC cadets were commissioned Second Lieutenants in the U.S. Army Corps of Engineers at ceremonies conducted on the Colorado School of Mines campus. Colonel Cecil C. Baldwin, professor of Military Science at Mines, administered the Oath of Office to the new officers in the Presidents' Room of the College Union before an audience of parents and friends.

The new officers gained their commissions by successfully completing the four year ROTC program at the School of Mines and the requirements for their degree. Twenty-five other senior cadets from Mines will receive their commission at Ft. Riley, Kan., after they have completed a six-week ROTC summer camp this summer.

The 16 newly commissioned officers are:

David R. Allen, El Cajon, Calif.; Gail A. Batman, Pierce, Colo.; Eric A. Bayley, Aurora, Colo.; Robert P. Bills, Golden, Colo.; Dale E. Bingham, Lakewood, Colo.; Leroy W. Cooper, Jr., Aurora, Colo.; Bruce D. Craig, Denver, Colo.; John C. Gathje, Grand Junction, Colo.; Thomas C. Johnson, Canby, Ore.; Robert R. Rostad, Arvada, Colo.; Robert C. Sharp, Lakewood, Colo.; Joseph E. Smith, Jr., Bayville, N.J.; Danny A. West, Estes Park, Colo.; Michael W. West, Colorado Springs, Colo.; Alan T. Wheeler, Denver, Colo.; and Carl W. Winters, Durango, Colo.



Shown standing beside the dedicatory plaque honoring the late Dr. Ben H. Parker are Mrs. Parker Sr. and her son, Dr. Ben H. Parker Jr. The College Union building at 16th and Maple streets in Golden has been renamed the Ben H. Parker Student Center by action of the College Union Advisory Board, the Student Council, and the Board of Trustees.

STUDENT CENTER NAMED IN HONOR OF DR. PARKER

DEDICATION of the Ben H. Parker Student Center at the Colorado School of Mines was held Thursday, May 28, 1970, at the Center, 16th and Maple Streets.

Formerly the College Union, the student activity center was named in honor of the late Dr. Ben H. Parker of Golden, who was president of the Mines Board of Trustees at the time of his death, July 31, 1969. Friends of the Parker family and interested citizens of the community attended the dedication ceremonies.

Dr. Orlo E. Childs made introductory remarks prior to the dedication of the building by Ted P. Stockmar, president of the Board of Trustees.

Dr. Ben H. Parker, Jr., gave the response, and the dedicatory plaque was presented by Dr. Childs and Charles S. McNeil, president of the Associated Students of the Colorado School of Mines.

The dedication program concluded with the singing of the Mines "Alma Mater" by the Colorado School of Mines Chorus.

Elmer R. Wilfley, '14

Wilfley Centrifugal Pumps
Denver, Colorado

Following the death of Dr. Parker, the student body through the College Union Advisory Board and the Student Council recommended to the Board of Trustees that the building be dedicated in Dr. Parker's memory. The recommendation was adopted immediately.

Dr. Parker had a life-long interest in the School of Mines, and it is a tribute to him that the student activity center be named in his honor.

He graduated with an Engineer of Mines degree in 1924, and gained his Master of Science degree in 1932 and Doctor of Science in 1936. He received a Distinguished Achievement Medal in 1952.

Dr. Parker was instructor in geology from 1933 to 1935, assistant professor of geology from 1936 to 1939, and associate professor from 1940 to 1946.

In 1946 he was named president of the Colorado School of Mines, and served in that capacity until 1950.

He was appointed a member of the Board of Trustees in 1950, and in 1957 became president of the Board.

Dr. Parker was named a director of the Colorado School of Mines Research Institute in 1949 and served until his death.

The dedication was followed by the Faculty Women's reception for the graduating Class of 1970, their parents, and friends at the Ben H. Parker Student Center.

Baltimore Colts Train at Mines

THE Baltimore Colts pro football team will set up training camp at the Colorado School of Mines in Golden, Aug. 9-28.

Don Klosterman, general manager of the Colts, and Fritz Brennecke, director of athletics at Mines, said that details were complete for the three-week stay. Plans have been in the works for some time, but have now been finalized by the Colts.

Immediately after their exhibition game at Oakland on Aug. 8, the Baltimore squad will move into headquarters at Golden to begin preparations for exhibition games at Kansas City, Aug. 15; against the Denver Broncos at Denver, Aug. 22; and possibly a game at Miami, Aug. 29.

Approximately 75 people will be in the Colts' training camp at Mines, including players and team officials. Players will room in the Thomas Hall dormitory at Mines and have their meals in the Ben H. Parker Student Center.

Practice sessions will be twice daily at Brooks Field and at Mines' nearby intramural fields.

"The convenient location of Golden and the fine facilities at the School of Mines made our choice for the training camp an easy one," said Klosterman.

The Baltimore team finished second last year in the Coastal Division of the National Football League with an 8-5-1 record under coach Don Shula. Now Shula has departed for the head coaching post with the Miami Dolphins, and the Colts are headed by Don McCafferty, an 11-year assistant coach for Baltimore.

With the merger of the National and American football leagues, the Colts in 1970 will play in the Eastern Division of the American Conference of the NFL. They join New York Jets, Boston Patriots, Miami Dolphins, and the Buffalo Bills, all former AFL teams.

Heading the Colts' list of returning veterans is football's all-time quarterback, Johnny Unitas, entering his 15th season. Last year "Johnny U." completed 178 of 327 passes for 2,342 yards and 12 touchdowns. Right behind Unitas as back-up man is Earl Morrall, also facing his 15th pro campaign.

The Colts' strong corps of running backs is led by Tom Matte, who had his greatest season in 1969 with 909 yards and 11 touchdowns. Matte also starred as a receiver, pulling in 43 receptions for 513 yards and two touchdowns.

Other backs include three fullback-types, veteran Jerry Hill from Wyoming, third-year man Terry Cole, and number one draftee Norm Bulaich from TCU.

Willie Richardson is the team's

speedy, high-leaping flanker who tied Matte last year as the Colts' leading receiver.

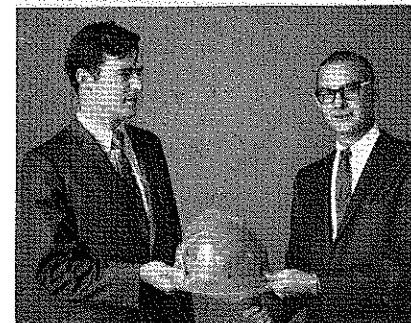
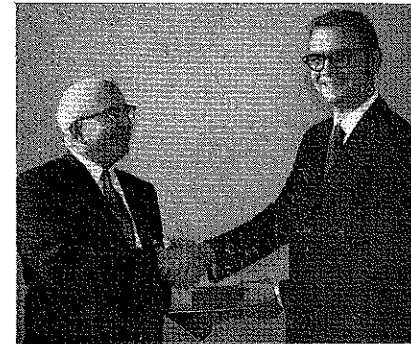
Defensively, leading the Baltimore rush are Bubba Smith, a 6'7" and 295-pound giant, and Roy Hilton. Veterans Billy Ray Smith and Fred Miller are consistent performers in the front four.

David Lee from Louisiana led the NFL in punting in 1969 with 45.3 yards per kick.

The Colts will bring to camp an impressive array of 26 rookies.

Heading the Colts' front office are Carroll Rosenbloom, President and owner, and Steve Rosenbloom, assistant to the president. The latter was in contact with Gurnett Steinhauer, Vice President for Business Affairs at Mines, in setting up arrangement for the Colts' Golden headquarters.

Baltimore's pre-season training site, except for the three-week Colorado visit, will be at Western Maryland College, Westminster, Md.



OLD TIMER'S WATCH is presented by Prof. Al Keenan to Terry Bauer (top picture); Walter Freeman receives hard hat from Jack Leech (bottom picture).

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Three High School Graduates Receive Tuition Awards

THREE high school graduates have accepted special tuition awards to attend the Colorado School of Mines in Golden.

George Puls III, of 992 South Charles St., in Lewisville, Texas, will enter CSM with a past history of outstanding abilities in academics and athletics. George lettered three years in football, two years in golf, and one year in track. In football he played at offensive and defensive tackle. He was elected team captain, and was All-District, through the Times Herald, during his junior and senior years. Academically, George ranked in the upper 25 per cent of his class, and was nominated by Rotary International as an "Outstanding Student." He was also active as a student council representative and served as Sophomore Class President. George is six feet and weighs 205 pounds.

Chad Reynolds King, of 2412 Santiago St., in Farmington, New Mexico, will attend the Colorado School of Mines. In high school, Chad graduated in the upper 20 per cent of his class and was a member of the National Honor Society. He also received recognition as an "Outstanding Student in Drafting" in 1968. In sports, Chad lettered two years in football playing at the position of offensive guard and defensive end. He received recognition his junior year winning the "Fighting Heart Award," and during his senior year was elected team captain, "Most Outstanding Lineman," and was a member of the All-State First Team as an offensive guard. He is 5 feet, 11 inches and weighs 195 pounds.

John Wesley Hart, of 1245 Ursula St., Aurora, Colorado, graduated from Aurora Hinkley High School in the upper 25 per cent of his class and was outstanding in both academics and athletics. John lettered three years in football as defensive and offensive back, and was recognized as team captain and received All-Conference Honorable Mention during his Junior and Senior years. John was also active in Key Club, DeMolay and the Varsity Club. He attended Boys State, and was a Key Club delegate to the international convention. John is six feet and weighs 180 pounds.

Eugene E. Dawson, '38

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Quips

Letter to a Congressman: "Please don't improve my lot in life any further. I can't afford it."

"Hey, I've just been made vice president of our firm!" a man exclaimed to his son.

"Big deal," snorted his offspring. "Veeps are a dime a dozen. The neighborhood supermarket has so many it even has one in charge of prunes."

The retort bothered him, so he called the market and asked for the vice president in charge of prunes. The voice at the other end inquired politely: "Packaged or bulk?"

Whether a fellow winds up with a nest egg or a goose egg depends a heap on the kind of chick he married.

The landlord figured that when it came to complaints, he'd heard them all. Then a tenant called to ask for more heat: "My apartment is so cold that every time I open the front door the light goes on!"

No matter how much you nurse a grudge it won't get better.

"Wow!" exclaimed the customer, looking at the price tag of a new model compact car.

"Well," shrugged the salesman, "if you want economy, you have to pay for it."

A parking meter is a device that enables you to do two hours shopping in one.

The doctor was having trouble diagnosing the patient's illness.

"Have you had this before?" he asked.

"Yes, twice."
"Ah-ah!" exclaimed the medic, taking off his stethoscope. "I hate to tell you this, but you've got it again."



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From the Local Sections

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

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
Alabama Birmingham			Wm. Haynes, '54	On call of the president.
Alaska Anchorage			Reginald S. Y. Lee, '67 628 E. 5th Ave., Anchorage 99501	
Arizona Arizona	William E. Saegart, '53	Robt. A. Metz, '55	James D. Sell, '55 2762 W. Holladay St. Tucson, Ariz. 85706	Annual Meeting, Dec. 7, 1970, Western Motel, Tucson.
California Bay Cities	Carl Foget, '61	Dave Strandburg, '61	Tom Aude, '62 54 Woodford Drive Moraga, Calif. 94556	Meetings held on call of the Secretary.
Santa Clara Valley Sacramento	Gail Penfield, '56		Stanley Y. Ogawa, '53	
San Joaquin Valley	R. A. Ganong, '47		F. B. Sweeney, '57 6619 Auburn Blvd., Citrus Heights	
Southern California	Dick Richards, '62		B. A. Ellison, '61	
Colorado Denver	A. E. "Ted" Seep, Jr., '68	Hal Kellogg, '55	Neal Schmale, '68, Sec. Jack Dressel, '50	Luncheon meeting held third Tuesday of each month, Denver Press Club, 1330 Glenarm Pl.
Grand Junction	Arch F. Boyd, '26	Robert H. Sayre, '34	Robert F. Barney, '35	
District of Columbia Washington	A. A. Wyner, '25	Louis DeGoes, '41	Charles T. Baroch, '23 2001 N. Daniel St. Arlington, Va.	Regular meeting at noon, second Tuesday of each month at the Shrine Temple, 1315 K St. N.W.
Illinois Great Lakes	C. R. Fitch, '49 7915 Exchange Ave. Chicago 17, Ill.			
Kansas Wichita	Francis Page, '39		James Daniels, '51 307 Schweitzer Bldg., Wichita, Kans. AM 5-0614.	Meetings called by secretary. Contact secretary for date of next meeting.
Louisiana New Orleans	Charles Tyler, '53	Joseph L. DuBois, '50	Monte Richard, '60 Pan American Petr. Corp. P.O. Box 50879 New Orleans, La. 70150	Regular luncheon meetings -- last Wednesday of the odd-numbered month except July.
Lafayette	John J. Wallace, '51	Edward J. Gibbon, '68	Stephen D. Chesebro, '64 P. O. Box 51345 Lafayette, La. 70501.	Regular luncheon meetings at Lafayette Petroleum Club on fourth Thursday of each month.
Minnesota Iron Ore Range	Paul Shanklin, '49			
Missouri St. Louis	H. A. Dumont, '29 227 Crane St. Edwardsville, Ill.			
Montana Butte	John M. Suttie, '42 Continental Dr. Butte			
Nevada Northern Nevada	Paul V. Fille, '40	H. R. Fitzpatrick, '38	James H. Bright, '52 1450 E. 2nd St. Reno, Nev. 89502	Meetings held four times per year at call of the Secretary.
New Mexico Carlsbad	John Magraw, '53			
Four Corners	Lou Amick, '50	Al Loleit, '50	N. E. Maxwell, Jr., '41 405 S. Church St. Aztec, N.M. 87410	Special meeting at the call of the president.
New York New York	Robt. B. Kennedy, '38	Board of Governors: Ralph Hennebach, '41 C. D. Michaelson, '32 C. Bellm, '34 R. B. Kennedy, '38	E. T. Benson, '33 1175 Broadway, New York, N. Y.	Meetings on call every month or six weeks from September to May, usually at Uptown Mining Club, 49th and Park Ave.
Ohio Central Ohio			Raymond M. Schatz, '35 Battelle Memorial Institute Columbus	
Cleveland	Bob Garrett, '45	Carl Nowak, '62	Richard Pitney, '60	Meetings held on call of president.
Oklahoma Bartlesville	G. T. McIntyre, '30	Bill Fredrick, '56	Charles Strong, '58 Box 336, Bartlesville, Okla.	Regular meetings held every Tuesday at noon, YWCA, 411 S. Johnston St. After September, group will meet every Friday.
Oklahoma City	Ed Johnson, '49 844 First Nat'l Bldg.		Jerry McLeod, '57 1708 East 60th Pl. Tulsa, Okla. 74105	Regular meeting held at call of the president.
Tulsa	Todd C. Storer, '47		Wendell Cloepfil, '62	Meetings held at call of the president.
Oregon Lower Columbia River Basin	Michael DiLembo, '58	D. H. Griswold, '30		On call of the president.
Pennsylvania Eastern Pennsylvania	Samuel Hochberger, '48	Arthur Most, Jr., '38 1345 Woodland Cr., Bethlehem	David P. Rihl, '58 Dravo Corp., Pittsburgh and Terrace Rd., Carnegie, Pa. 15106	Meetings held first Wednesday of each month (noon), Cafe "B," Golden Triangle YMCA, 4th and Wood Sts., Pittsburgh.
Pennsylvania-Ohio	Vincent G. Giola, '56		Irwin M. Glasser, '43 Humble Oil & Refining Co. Corpus Christi, Tex. 78401	Luncheon Meeting -- First Wednesday of each month at the Petroleum Club.
Texas Coastal Bend	Ray Gouett, '52	Charles R. Russell, '54	L. G. Truby, '48 4320 O'Keefe Dr. El Paso, Texas 79902	Meetings held on last Wednesdays of January, March and May. Special meetings on call.
El Paso	Peter A. DeSantis, '51	William F. Dukes, '50	James K. Applegate, '66 Marathon Oil Co. 2300 W. Loop, South	Luncheon meetings held at 12 noon on first Thursday of each month at White Horse Cellar, 1211 Fannin St.
Houston	Ronald E. Diederich, '57	Edward B. Reynolds, '66	Al Wynn, '65 4313 Princeton, Midland, Tex. 79701	Meetings held in Jan., Mar., May, Sept., and Dec.
Permian Basin	Hal Ballew, '51	Harry B. Hinkle, '59	Peter A. MacQueen, '50 P.O. Box 2050 Ft. Worth, Texas 76101	Meeting held on call of president.
Dallas-Ft. Worth	Harold E. Potter, '27	Dewey D. Bowling, '49		

Mexico City Alumni Enjoy Fiesta at Fernandez Home

On May 9th the Mexico City Section of the Colorado School of Mines Alumni had a fiesta in the home of Mario and Rebeca Fernandez. Those who attended were Mr. and Mrs. Ed Spalding, Mr. and Mrs. Andres Ramirez, Mr. and Mrs. Herb Ashe, Mr. and Mrs. William Schiele, Mr. and Mrs. Jim Wilson, Mr. Chuck McCoy, Mr. Francisco Vidaygaray, Mr. and Mrs. Luis del Castillo, Mr. and Mrs. Francisco Perez, Mr. and Mrs. Charles Campbell, Mr. George Ordonez and Mr. and Mrs. D. F. Coolbaugh.

Eddy Named District Sales Representative, Columbia Steel

CLINTON L. EDDY, Met.E. 1962, has been appointed district sales representative by Columbia Steel Casting Co., Portland, Ore., manufacturer of manganese steel. Mr. Eddy will serve Columbia customers in the Rocky Mountain region from district headquarters in Denver. Previously Eddy was sales engineer with Martin Metals Division of Martin Marietta Corp. Also, he was with Precision Castparts Corp., of Portland, Ore., and with Boeing Aircraft Corp. of Seattle. He is a graduate of the Colorado School of Mines with a degree in metallurgical engineering.

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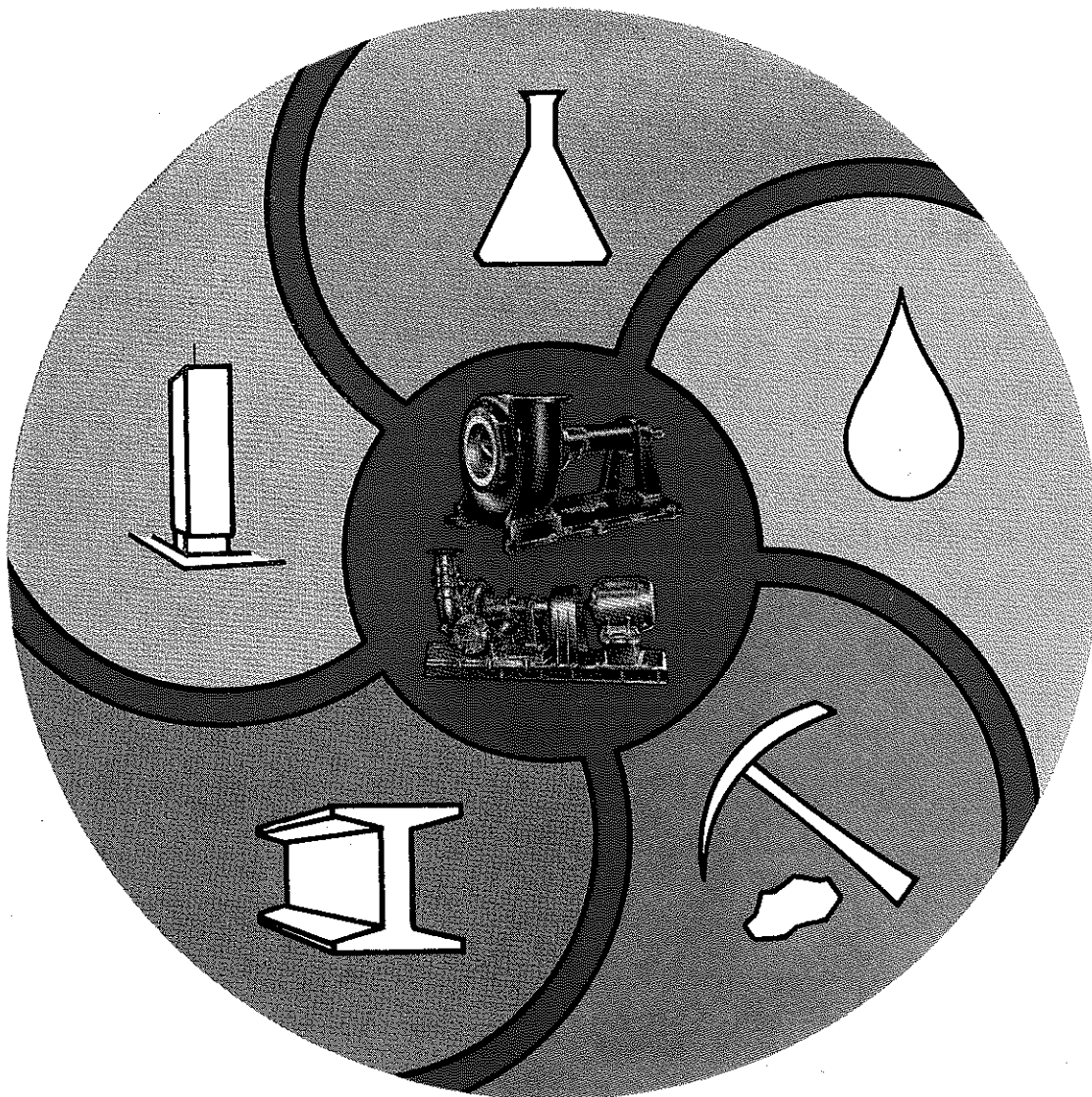
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Ben F. Zwick, '29

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
South Texas			William A. Conley, '19 1515 Haskins Rd. San Antonio	Meetings held at 7 p.m. on first Thursday of February, May August, November at Old Town Inn, 416 8th St., San Antonio.
Utah Four Corners	See N.M. for officers			
Salt Lake City	Allen D. Trujillo, '62	Wallace W. Agey, '48	Carl D. Broadbent, '64 5750 Glenbrook St. Salt Lake City, Utah 84121	Four meetings annually on dates set by officers.
Washington Pacific Northwest	Sidney B. Peyton, Jr., '54		Boyd Watkins, '64 10427 Aqua Way S. Seattle, Wash. 98168	
Eastern Washington			Arden Bement, '54	Meetings on call of president; annual August picnic.
Wyoming Central Wyoming			George S. Rogers, '59 3209 Aspen Drive Casper, Wyo. 82601	
Canada Calgary	Richard C. Siegfried, '50 Canadian Superior Oil Ltd. 703 6th Ave., Calgary Tel.: 267-4110 Local 429			Calgary Section meets for a noon luncheon on the 3rd Monday of Sept., Nov., Jan., Mar., May—at Calgary Petroleum Club. Visiting alumni invited to attend.
France	Resident or visiting alumni may contact Bernard Turpin, '60, 33 Rue de la Tourelle, 92-Boulogne, France.			
Libya	Haldon J. Smith, P.E.53, Corresponding Secretary, Derbasi-Geode Co., P. O. Box 529, Tripoli, Libya.			
Peru	Martin Obradovic, '53			Meetings first Friday of each month (April thru December), 12:30 p.m., Hotel Crillon. Other meetings on call
Philippines Baguio	Francisco Joaquin, '26			
Manila	J. R. Kuykendall, 41	Jesus Jalondoni, '40	M. E. Natividad, '40 c/o Northern Motors United Nations Ave., Manila	Meetings held at noon, second Tuesday of each month.
Puerto Rico	Resident or visiting alumni may contact L. L. Hagemann, '60, Apt. 17, El Monte Apartments, Avenida Munoz Rivera, Hato Rey, Puerto Rico.			
Turkey Ankara	Alumni visiting Turkey contact Ferhan Sanlav, '49, Turkiye Petrolleri A. O. Sakarya Caddesi 24, Ankara, Telephone 23144.			
Venezuela Caracas	Z. Sancevic, '57	Jean Pasquall, '60	Ian Achong, '58 Cla. Shell de Venezuela Aptdo. 809, Caracas	



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