UTAH GEOLOGICAL & MINERALOGICAL SURVEY

QUARTERLY REVIEW

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Environment Control and Mineral Use

Modified from "Environmental Quality Control and Minerals," by H. E. Risser, published in the Illinois State Geological Survey's Environmental Geology Notes, No. 49; Risser currently on assignment with the U. S. Geological Survey. Printed by permission.

During the past several years, an increasing concern for the quality of our national environment has arisen. Many of the patterns of activity and material consumption within the United States are being criticized and demands for their alteration, if not total abandonment, are being made.

Minerals have been criticized, perhaps for three reasons:

1. They are an integral part of the environment by virtue of their occurrence and chemical make-up. Therefore, to produce, move or utilize them without modification of the environment is unrealistic.

2. The quantities involved are so huge and mineral production and consumption activities so widespread geographically that the effects are observable to everyone. Between 3 and 4 billion tons of solid fuels and minerals, 5 billion barrels of liquid fuels and 22 trillion cubic feet of natural gas are consumed each year. Furthermore, the rate of use of some minerals has been doubling every 9 to 15 years.

3. Many durable mineral materials remain as scrap long

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View of the Salt Lake City, Utah, area, taken from aircraft at altitude of at least 50,000 feet. Great Salt Lake in upper left; Wasatch Mountains in right; Jordan River flowing from lower center northward; Interstate 15 parallels Jordan River; Salt Lake Airport west of city just below center (photo courtesy of USGS, Dept. of the Interior).

URBAN LAND USE

Changes in Salt Lake Area 'Photogenic'

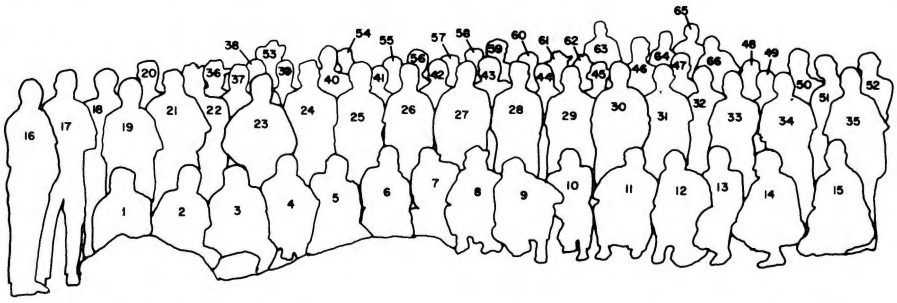
Salt Lake City is one of 23 cities being photographed as part of a cooperative study by the U. S. Geological Survey and NASA to test the feasibility of detecting urban changes from earth-orbiting satellites.

The project is linked to the Interior Department's EROS (Earth Resources Observation Systems) program administered by the USGS and is a prelude to developing remote sensing procedures to monitor urban land use changes and determine their environmental consequences from higher flying satellites.

By using different cameras trained on urban and surrounding areas—selected because of their patterns of growth, features and characteristics that make them comparable to other cities—changes in geographic features, transportation linkages, urban growth and functional changes can be identified. Ultimately maps of the entire nation will permit determination of the best land uses on a national scale.

STATE GEOLOGISTS MEET IN MOAB

(See Quarterly Review, May 1972, p.1)



1. L. Hough, La. Geol. Survey
2. G. Hanson, Geol. and Nat. History Survey, Univ. Wis.
3. J. Simon, Ill. State Geol. Survey
4. F. Foley, Kans. Geol. Survey*
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6. V. Dreeszen, Cons. and Survey Div., Univ. Nebr.
7. W. Fackler, Alaska, Div. Mines and Geol.
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9. R. Doyle, Maine Geol. Survey
10. L. Fellows, Mo. Div. Geol. Survey and Water Res.
11. P. La Moreaux, Ala. Geol. Survey
12. C. Steen, uranium operations, Moab, Utah
13. E. Noble, N. Dak. Geol. Survey
14. J. Patton, Dept. Nat. Resources, Bloomington, Ind.
15. R. E. Corcoran, Oreg., Dept. of Geol. and Min. Industries
16. S. Conrad, N. C., Div. of Min. Resources
17. R. Erwin, W. Va. Geol. Survey
18. C. G. Groat, Tex., Bur. of Econ. Geol.
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25. K. Weaver, Md. Geol. Survey
26. D. McGregor, S. Dak. Geol. Survey
27. A. Socolow, Pa. Geol. Survey
28. C. Mankin, Okla. Geol. Survey
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30. J. Davis, N. Y. State Museum and Sci. Service
31. H. G. Hershey, U. S. Dept. Int., Office Water Res. Research*
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34. J. Murray, Ga. State Div. Cons., Dept. Mines, Min. and Geol.
35. V. Scheid, Nev. Bur. Mines
36. J. Rold, Colo. Geol. Survey
37. D. Miller, Wyo. Geol. Survey
38. M. Biggs, Ind. Dept. Nat. Res.
39. R. Jordan, Del. Geol. Survey
40. J. Calver, Va. Div. Min. Res.
41. W. Howe, Mo. Div. Geol. Survey
42. S. Tuthill, Iowa Geol. Survey
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44. L. F. Heising, USBM, Denver, Colo.
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46. S. M. Pickering, Ga. State Div. Cons., Dept. Mines, Min. and Geol.
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48. R. H. Lyddan, USGS, Washington, D. C.
49. K. Silliman, State Rep., Green River, Utah
50. K. Widmer, N. J., Bur. Geol. and Topography
51. A. Slaughter, Mich. Dept. Nat. Resources
52. E. Callaghan, UGMS*
53. R. Vernon, Fla., Bur. Geol.
54. W. P. Hewitt, UGMS
55. M. Carlson, Cons. and Survey Div., Univ. Nebr.
56. M. E. Ostrom, Geol. and Nat. History Survey, Univ. Wis.
57. R. King, Mont. Bur. Mines and Geol.
58. P. Sims, Minn. Geol. Survey
59. L. Hoover, Am. Geol. Inst.,Washington, D. C.
60. O. Van Eck, Iowa Geol. Survey
61. A. Baker, III, Nev. Bur. Mines and Geol.
62. J. Smith, USBM, Denver, Colo.
63. C. W. Hendry, Jr., Fla., Dept. Nat. Resources, Bur. Geol.
64. H. R. Ritzma, UGMS
65. H. H. Doelling, UGMS
66. A. Zeizel, U. S. Dept. Housing and Urban Devel. (HUD), Washington, D. C.

*Honorary member

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after the product has served its useful purpose. Reclamation may not be economic, but the production of new materials is criticized because old materials are so obviously available.

The problem the mineral industry faces is finding ways to protect environmental quality and still provide the nation with the minerals it requires at an acceptable cost.

Any production of minerals will involve financial costs and will affect the environment. In some instances these effects may consist only of the void left by the removal of the minerals; in others, the effects may be detrimental, benign or even beneficial.

Although greater mineral output is accompanied by increased costs and overall environmental effects, the public differentiates between them. Production expenditures are equated with unit costs and the cost of each unit to the consumer may not change significantly as total quantity produced increases.

But seldom are the incremental environmental effects allocated to the additional units of material produced or energy consumed. Instead, within a given mining area, the total cumulative environmental effects are observed in their entirety rather than as a series of discrete units.

What can be done to reduce the undesirable or adverse effects?

An obvious way would be to decrease the amount of mineral materials consumed. Through such a reduction, both the total environmental effects and the total (not necessarily the unit) production expenditure would be reduced. But not only has the production of minerals expanded

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(increasing an average of 3 percent per year), the average per capita consumption also has increased.

Another way to reduce environmental effects is through increased expenditures resulting from changes made in production procedures to protect the environment, from restoring the environment after production has occurred, or from expenses related to actions such as installation of pollution-control devices.

That the general public fully recognizes the extent of the costs or that they ultimately must be borne by the consumer is doubtful.

As the effort toward environmental improvement progresses and the relative magnitudes of the costs and benefits become more apparent, it may be decided that, beyond a certain point, the incremental benefits do not justify the added costs.

Nonetheless, the public conviction that the quality of the environment must be protected from further deterioration is also reflected in the official government attitude. An effort to point out the magnitude of the costs involved in complying with new regulations is unlikely to receive much sympathetic attention today. Nor will an apparent impractical or infeasible proposed regulation or procedure necessarily mean that legislation requiring such procedure will not be enacted.

Another way to reduce some environmental effects is through improved technology in the production and use of minerals, which may or may not result in increased costs. But new technology requires time, concerted effort and increased investment.

Some of the impact of environmental regulations already is

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All that remains is a reputation built on the past . . . (photo courtesy of Salt Lake Chamber of Commerce).

GSL—Best Known, Least Cared For

Great Salt Lake has the potential of becoming one of the greatest tourist attractions in the United States. But poor facilities and dirty beaches degrade its reputation and disgust travellers.

Wendell Gile, senior vice president of Continental Bank and Trust Co. and chairman of the Great Salt Lake Committee, has outlined three main problems on the lake: the brine fly, lack of fresh water and lack of sewer facilities.

Preliminary attempts to control the brine fly fell short because of lack of funds. Meetings with private investors and the State Division of Parks and Recreation yielded a substantial portion of the money needed to continue the research, but the committee is still approximately one-third short of the necessary funding to complete the project.

Development of recreational sites has been left to private investors who have not had the capital outlay to construct or maintain adequate facilities. And the atrophy of Saltair attests to public indifference.

The Great Salt Lake is Utah's best known scenic attraction. To be apathetic towards it is to condemn it to neglect and deterioration.

Al, Cu, Zn Recovery Through Freezing

A refrigerant technique, cryogenics, that uses dry ice, liquid nitrogen and dry ice in methanol has proven successful in separating zinc from malleable aluminum and copper in a mixed metal concentrate and in removing insulation materials from copper wire.

According to K. C. Dean, scientist involved in the solid waste research program, U. S. Bureau of Mines, 100 percent of the zinc die cast and 3 percent of the copper from the minus fraction product can be recovered in this most recently developed process for recycling automobiles (see *Quarterly Review*, November 1970, p. 1, and August 1971, p. 3).

To isolate the zinc die cast, metal scraps containing 69 percent zinc, 21 percent aluminum and 10 percent copper are placed in the freezing chamber for 60 seconds at -72°C, run through a hammer mill

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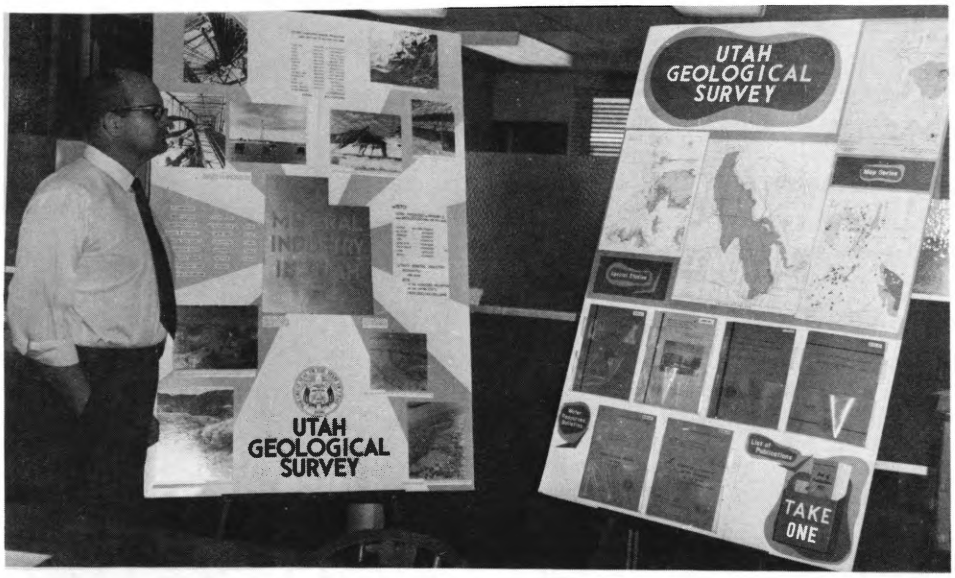

UGMS SERVES UTAH

Carlton Stowe, UGMS staff specialist, stands beside panels to inform the public of the work of the Survey and its role in the development of the State's mineral resources.

If we can show you the story of UGMS and the value of Utah's mineral industry, contact Carlton Stowe, UGMS, (801) 581-8557.

Right panel: latest publications of the Survey, sample maps and publications lists. *Left panel*: mineral industries in Utah.

UGMS RELEASES NEW STUDIES

The following publications were released for sale during the last quarter.

Bulletin 95, "Magnetic and Gravity Study of Desert Mountain, Juab County, Utah," by W. G. Calkins, $2.50. The geophysical study determines the extent and configuration of the granitic and monzonitic core of Desert Mountain. Calkins reports on 33 gravity stations and 279 magnetometer stations where density and magnetic susceptibility measurements were made. No previous studies of the area have been published prior to this investigation.

Bulletin 97,[1] "Stratigraphy of the Duchesne River Formation (Eocene-Oligocene?), Northern Uinta Basin, Northeastern Utah," by D.W. Andersen and M. D. Picard, $2.00. The stratigraphy of the Duchesne River Formation, the standard section of the latest Eocene Duchesnean stage, is described and a revision of previous informal nomenclature proposed. Study of the formation has been limited in the past by the lack of suitable stratigraphic subdivisions within the formation.

[1] Bulletin 96 in press.

Circular 54, "Energy and the Environment: A Potential Crisis in Resources Supply," by Carlton Stowe, $.50. This study deals with problems of a potential crisis in our resources supply. It focuses attention on aspects of demand and supply, environmental problems of power generation, factors in the present energy crisis, problems of fuel supply—natural gas, coal, oil, nuclear fuel and oil shale—all directly related to Utah's and the Intermountain area's needs. An important reference supply of statistical as well as narrative information.

The publications may be purchased in person or by mail from the Publications Office, 103 Utah Geological Survey Building, University of Utah, Salt Lake City, Utah 84112. Include 10 percent mailing charge if purchased by mail.

H. R. Ritzma, UGMS petroleum geologist, was appointed to the Tar Sands Subcommittee of the Interstate Oil Compact Commission.

The 23-member committee represents industry and several state and Federal agencies from twelve states, the District of Columbia and the Province of Alberta, Canada.

Tar-Sand Deposits To Be Cored

UGMS has received a $77,200 grant from the U. S. Bureau of Mines to conduct informational core drilling in five of Utah's tar-sand deposits.

Mapping, sampling and analytical work of the Survey indicate that *Utah's fifty tar-sand deposits contain between 20 and 25 billion barrels of oil in place,* about 90 to 95 percent of the U. S. reserve of oil contained in tar sands. About half of Utah's tar-sand resources are in the Uinta Basin; the oil in these deposits contains little sulfur, making them particularly attractive for development.

Drilling of twenty shallow core holes on known tar-sand deposits in Uintah County will be located to provide maximum data for scientific and economic evaluation of the deposits as petroleum sources to supplement the nation's dwindling reserves.

The program, supervised by H. R. Ritzma, Survey petroleum geologist, is expected to cost $81,250, with the Survey contributing the balance of the funds.

The field portion of the program is expected to be complete in late 1972 with final work scheduled by mid-1973.

UGMS Financial Statement

July 1, 1971—June 30, 1972

SOURCE OF FUNDS		
Appropriations and allotments		
Mineral leasing fund: fiscal income	$105,009	
Land grant maintenance fund	100,000	
General fund	90,000	
Health Education and Welfare grant	58,000	
		$353,009
Other		
Publications sales (restricted)	$ 23,519	
Services rendered (restricted)	26,828	
Miscellaneous income and reimbursement from state agency	8,776	
		$ 59,123
Carryover		
Operating funds (incl. encumbered)	$ 55,591	
Publications receipts	17,646	
Services rendered	555	
		$ 73,792
TOTAL FUNDS AVAILABLE	$485,924	$485,924
TOTAL FUNDS USED (detailed at right)		$389,481
FUNDS ENCUMBERED		$ 58,322
UNENCUMBERED BALANCE		$ 38,121
		$485,924

EXPENDITURES	
Administration	$ 25,655
Employment benefits	18,902
Services to public and state	43,741
Examinations	
County studies	2,797
Coal	36,249
Hydrocarbons	18,666
Mineral commodity studies	14,407
Great Salt Lake	56,087
Urban and engineering geology	11,752
Regional, structural and stratigraphic	12,782
Cooperative studies	
U. S. Geological Survey	
Topographic mapping	35,000
Water resources	26,000
Geologic mapping	3,000
U. S. Bureau of Mines	
Oil field brines (encumbered $1,500)	—
Mineral information	7,818
Publications (preparation)	73,413
Oil well sample library	2,343
Remodelling and furnishings	869
TOTAL FUNDS USED	$389,481

Gas Flows From Record Depth

Mountain Fuel Supply Co. has set a new depth record for production in the Rocky Mountain region. Completion of the No. 1 Butcher Knife Springs Unit, 6 miles south of the Church Buttes gas field in Uinta County, southwest Wyoming, surpasses by several hundred feet the depth record established by Mountain Fuel and Union Pacific in 1967 at Church Buttes field.

The new well was completed flowing 5.7 million cubic feet of gas and 300 barrels of condensate daily from the Pennsylvanian Morgan Formation perforated between 18,200 and 18,280 feet.

The discovery is a substantial success in Mountain Fuel's multimillion dollar exploration program to develop new gas reserves in its southwest Wyoming area of supply. The company is at present drilling a deep wildcat in the Church Buttes field and has announced location for another 18,300-foot exploratory venture 15 miles of Church Buttes.

The current annual *basic* mineral production in Utah has a value of more than $600 million; about 80 percent is spent in the State as payment for wages, taxes, goods and services. Manufacturing and processing contribute jobs, taxes and the need for service and supplies.

UGA FIELD TRIP

The Utah Geological Association will hold its second annual field trip, September 21-23 in central Utah, with emphasis on the transition area between the Basin and Range Province on the west and the Colorado Plateau Province on the east.

Participants will explore the complex geology along the central Utah hinge line.

Registration and orientation for the trip will be in Salt Lake City, September 21. For information write: Utah Geological Association Field Trip, P. O. Box 11334, Salt Lake City, Utah 84111.

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apparent, and the effect of others will be felt during the next few years. New regulations will be applied to production, transportation and utilization of mineral materials.

Some proposals would completely halt certain types of mineral production because of their effects on the environment. Already pits and quarries have been banned in some urban areas and strip-mining has been prohibited in certain regions.

The proposed banning of further offshore drilling would make more than 9 percent of the nation's known oil reserves and almost 13 percent of the known gas reserves inaccessible. In addition, it would remove from exploration large areas that offer some of the greatest potential for future discoveries. If extended to current production, the proposed ban on offshore drilling would eliminate a significant portion of the current oil and gas output.

The total prohibition of strip-mining would eliminate about one-third of the current U. S. output; approximately 200 million tons per year of strip coal would be lost. To produce the same amount of coal from underground mines would require 27,000 additional miners (21.5 percent increase of labor force) and, because underground mining recovers only about 50 percent of the coal in the ground, nearly twice as much coal resource would be exhausted in providing the same amount of output.

Transporting solid minerals has not, in general, resulted in environmental problems. Recent attention, however, has focused on the effects of oil spillage, primarily from water-borne shipments. As increased foreign shipments are transported in, problems of tanker spillage also are likely to increase.

A third type of environmental quality regulation affecting minerals is directed at the consumer.

One proposal prohibiting the use of tetraethyl lead in gasoline would reduce the market for lead by about 20 percent and create a drastic impact on the producers of lead and associated minerals.

Perhaps the most dramatic and far-reaching impact has resulted from recently proposed and already established sulfur dioxide emission standards for fuels. Coal currently being produced and most of the reserves throughout the country cannot meet them without the use of emission control devices on combustion units. Unfortunately, such control devices have not yet proved effective on a commercial basis. To comply with the new air quality standards, fuel consumers attempted to procure natural gas as a substitute for coal. As present supplies of gas cannot even meet the growth in established markets, the sudden additional demand for gas as a substitute fuel could not be met.

Hopefully, within the next few years, satisfactory devices and techniques to control sulfur dioxide emission will be available so that high-sulfur coal can be burned without violating air quality standards. In the future, coal also will be processed into sulfur-free synthetic pipeline gas to supplement the declining reserves of natural gas and into liquid fuel to supplement natural petroleum products.

Some of the resulting demands and regulations for environmental protection are beyond the present technology and capability of the nation. It is hoped that demands patently unreasonable or impossible to comply with will give way to a more rational approach.

Depth Record Set

A new drilling depth record has been set in Utah by Continental Oil at No. 22-1 Conoco-Federal in sec. 22, T. 9 S., R. 20 E., Uintah County. At a depth of 20,053 feet, drilling was halted by a "fish" in the hole which the operator was unable to retrieve or bypass.

At last report, Continental had run production liner to a shallower depth to test shows of gas encountered during the drilling operation.

Dinosaur Monument Map Available

The U. S. Geological Survey has published a new topographic map of Dinosaur National Monument; the text includes an account of the exploration of the region, descriptions of fossils and aerial and ground photos of the Monument.

"Dinosaur National Monument, Colorado-Utah," is available from: USGS Public Inquiries Office, Federal Building, Salt Lake City, Utah 84111; price, $1.50.

The mineral producers of the nation and the world, and the mineral consumers as well, are faced with a future in which mineral costs will increase as prices rise to cover the additional costs of environmental protection activities.

It behooves the industry to pass along the necessary costs to protect the environment and to identify these costs as such for the consuming public. But it is also extremely important that the minerals industry continue to produce and provide its products at the lowest possible cost.

Callaghan Retires From Survey Post

At the end of the academic year in June, Dr. Eugene Callaghan retired from his post as associate director of the Utah Geological Survey and as professor of geological and geophysical sciences in economic geology, University of Utah.

He was appointed to the Survey in 1965 to assist the director, W. P. Hewitt, in a variety of administrative duties; he also served the Department of Mineralogy as research professor.

In 1968, when the departments of mineralogy, geophysics and geology were combined, Callaghan was named the first chairman of the new department, a position he held until July 1970. He taught courses in mineralogy and economic geology and handled supervisory and organizational tasks.

Callaghan served the state community of earth scientists as president of the Utah Geological Society (1968) and as a member of the informal Geological Discussion Group. He served nationally as a member of the Council of the Society of Economic Geologists and was instrumental in inviting the Geological Society of America to hold its annual meeting in 1975 in Salt Lake City.

After obtaining his initial degree at the University of Oregon, Callaghan was trained in engineering geology, economic geology and petrology at Columbia University where he was awarded a Ph.D. in 1931. He served as field geologist for the Metals and Nonmetals Section of the U. S. Geological Survey in the western United States, Puerto Rico and Bolivia between 1930 and 1946. In 1946 he was appointed professor of economic geology at Indiana University and also worked with the Indiana Geological Survey. In 1949 he became director of the New Mexico Bureau of Mines and Mineral Resources where he initiated many programs and procedures making the Bureau one of the most productive of the state surveys.

In 1957 Callaghan turned to private industry. He made mineral deposit examinations in the U. S., Canada and Mexico as chief exploration geologist for Haile Mines. In the winter of 1957-58, as the geological member of an engineering team of De Leuw, Cather & Co., he reported on the feasibility of a route to connect the railroad systems of Turkey and Iran. From chief geologist for Hanna Mining Co. to explore for gold in Brazil and consultant for St. John d'el Rey Mining Co. at the Morro Velho deep gold mine, Callaghan was appointed senior resident geologist in Cyprus for Cyprus Mines Corp. During his two contracts with Cyprus, he directed an intensive exploration campaign in the copper pyrite deposits of Cyprus and made mineral deposit examinations in Greece, Israel, Saudi Arabia, Spain, Portugal and Morocco.

In addition to his career in administration and in private industry, Callaghan has authored or coauthored more than 50 publications. He is a fellow of the Geological Society of America, member of the Institution of Mining and Metallurgy (London) and member of the American Institute of Mining, Metallurgical and Petroleum Engineers, Society of Economic Geologists, and Utah Geological Association. He is an honorary member of the Association of American State Geologists, New Mexico Geological Society and Mineralogical Society of Utah.

Presently Callaghan is continuing research in engineering and economic geology and providing contracting and consultant services to the Utah Survey.

Memorial Fund for Mineral Display

Ray E. Marsell, professor emeritus of geology at the University of Utah, passed away on October 11, 1971.

Before he retired from the university in 1962, Professor Marsell gave his extensive mineral collection to Westminster College. Since then the collection has been in storage because the college has not had suitable cases to display the minerals.

Recently, the Ray E. Marsell Memorial Fund was established to purchase display cases. Contributions to the fund are tax deductible; those who contribute before December 31, 1972, will be listed in the memorial display case.

Send your contribution to Westminster College, 1840 South 1300 East, Salt Lake City, Utah 84105.

Ray E. Marsell Memorial Fund
Westminster College
1840 South 1300 East
Salt Lake City, Utah 84105

Donor _____
Amount enclosed _____
Send receipt to _____
_____
_____

No receipt requested _____

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and screened. Through this process, cold brittle zinc can be easily separated from the aluminum and copper.

In another cryogenic process, insulated copper wires, containing 75 percent metal and 25 percent nonmetal, are either dipped directly in liquid nitrogen or indirectly frozen with dry ice. The wire is then crushed in a roller and fed through the water elutriator which further separates the insulation material from the copper.

Mineral Industry Vital

The mineral industry directly employs about 11,600 people in Utah. But for each worker, an additional six to eight jobs are created elsewhere which provide services, supplies and other requirements.

It pays the highest wages of any major industry in the State, and as a group, its services and supply organizations are among the highest paid.

If the mineral industries in Utah were closed down with their related processing and manufacturing plants, the State could not support half its present population.

UTAH
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SALT LAKE CITY, UTAH 84112

Address correction requested

Massive Coal Project Nears Completion

The first in a new series will be released soon by the Utah Geological Survey. Monograph Series No. 1, "Southwestern Utah Coal Fields: Alton, Kaiparowits and Kolob-Harmony," by H. H. Doelling and R. L. Graham, marks the near-completion of a massive project begun three years ago to research records, compile data and complete mapping of Utah coal.

The volume is divided into coal fields, areas and quadrangles; geographical data, geology, mines and development, land ownership and control, coal quality and reserves are treated.

More than 40 multicolored maps alone outline coal seams; numerous other figures and tables illustrate the text.

Doelling spearheaded the project and supervised the field work, compilation of data and publication of the results.

Of the $206,500 supporting the survey, $131,500 were funded from the Office of Air Programs of the Environmental Protection Agency (formerly National Air Pollution Control Administration of the Department of Health, Education and Welfare), supplemented by $75,000 State money.

Two other volumes covering the central, eastern and northern regions of Utah and a summary of Utah's total coal picture also will be available this year.

Monograph Series No. 1 sells for $17.00, Nos. 2 and 3 for $20.00 each, or the set can be purchased for $50.00 at 103 Utah Geological Survey Building, University of Utah, Salt Lake City, Utah 84112. If ordered by mail, include 10 percent handling.

QUARTERLY REVIEW
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