

QUARTERLY REVIEW

ABANDONED AUTOS: URBAN ORE

The automobile—center of our society—is the basis of employment of nearly 14 million people in the United States. In 1968 there were more than 100 million registered vehicles in the country. Of our resources, 60 percent of all rubber, 20 percent of all steel, 10 percent of all aluminum, 7 percent of the copper, 13 percent of the nickel, 35 percent of the zinc and more than 50 percent of the lead are consumed in automotive use.

At the same time, as revealed at the National Conference on the Abandoned Automobile, sponsored by the Institute of Scrap Iron and Steel, Inc., in March of this year, about 7 million passenger cars and more than 1 million trucks and buses were scrapped last year. More than 2,500 cars are abandoned daily in this country. The total nationwide accumulation of junk automobiles is estimated to be about 20 million.

The U. S. Bureau of Mines is actively engaged in research on converting old automobiles to metals suitable for recycling to industry. In a test at its metallurgy research center in Salt Lake City, 17 scrap automobiles were dismantled, separated into their components and analyzed. From this test, it is estimated that an automobile weighing 3,600 pounds could be expected to yield approximately 2,500 pounds of steel, 500 of cast iron, 32 of copper, 54 of zinc, 51 of aluminum, and 20 of lead. The remaining 400 pounds consist of nonmetallic material.

These materials constitute a constantly expanding resource, a situation nearly unique in our experience with dwindling natural resources.

Thirteen years ago the abandoned auto, according to Karl C. Dean, who is project coordinator for the research on the problem being conducted at the Bureau of Mines installation in Salt Lake City, was not a major problem. The demand for scrap metal was high, and steel-making technology tolerated larger

amounts of scrap iron containing nonferrous metals than does the basic oxygen furnace in common use now.

Dean reports that the Bureau of Mines has developed two principal methods for resolving the auto disposal problem.

The first is shredding, the second is incineration and hand dismantling, followed by baling, baling and shearing, or shredding of the clean steel scrap.

Shredding consists of ripping apart cars whose radiators, batteries, engines, *(continued on page 2)*

New Department at Utah

The Department of Geological and Geophysical Sciences was established in the College of Mines and Mineral Industries at the University of Utah through merger of the former departments of geology, mineralogy and geophysics by the Board of Regents in July 1968. Eugene Callaghan, associate director of the Utah Geological Survey, was appointed the first chairman and served until June 1970. Stanley H. Ward, professor of engineering geophysics at the University of California, Berkeley, became chairman in July 1970.

In addition to Dr. Ward, new faculty appointments include the following assistant professors: R. C. Wilson, struc- *(continued on page 9)*



Disassembled parts from a 1961 Oldsmobile. (1) heavy steel, plus 1/8-inch thickness; (2) light steel, minus 1/8-inch thickness; (3) aluminum; (4) zinc (die cast); (5) lead (battery); fiberglass, noncombustible; (7) textiles and plastics, combustible; (8) molded paper and fiberboard, combustible; (9) light steel, minus 1/8-inch thickness, nickel-chromium-plated; (10) rubber, combustible; (11) spring steel; (12) heavy steel, plus 1/8-inch thickness, nickel-chromium-plated; (13) glass; (14) cast iron; (15) copper and brass; (16) hardened iron, and (17) cast steel. Photo courtesy U. S. Bureau of Mines.

Abandoned Autos—Urban Ore (continued from page 1)

gas tanks and seats have been removed. The fist-sized pieces are sorted with a magnet. The advantages of this method are (1) cars can be flattened for transportation to the shredder, reducing costs and (2) the size of the pieces is ideal for electric steel furnaces. The disadvantages are (1) shredders are extremely costly to build and operate, (2) the steel contains too much copper (0.2 percent) for most steel manufacture; this process wastes copper, (3) tonnage required for economical operation is too large for small urban or rural areas, specifically with fewer than 40,000 cars per year, and (4) a good deal of hand dismantling is required.

A car salvage company plans to have a shredder in operation in Salt Lake City in April of next year for processing the 24,000 cars abandoned annually in the area.

The second method encompasses incineration and hand dismantling. The Bureau of Mines conducted a time and motion study based on dismantling and analyses of the 17 cars described above. The three criteria to be met were (1) scrap containing less than 0.1 percent copper, (2) smokeless incineration, and (3) an operation which would be economically profitable.

The estimated cost of processing a complete car by incineration and hand dismantling is about \$51; value of marketable metal with high quality steel is about \$56. This provides an annual rate of return on investment of 19 percent.

Apparently recovery of nonferrous metals provides the difference between economic feasibility and failure. If partly stripped automobiles are processed, Bureau of Mines researchers find that it is not possible to operate at a profit.

Japan is the principal customer for scrap iron. The baled cars are shipped out of National City, California, for \$40 to \$50 per ton. The Japanese pay the freight; final cost per ton is \$65 to \$70.

Researchers are experimenting with methods for recovering copper from starters, generators and other high-copper automotive components by dipping in molten calcium chloride. The heat melts the copper which can be easily drained off. West German researchers are trying temperatures so low the ferrous metals become brittle and shatter under impact while the ductile metals do not.

If the tires discarded every year were strung out tread to tread, they would circle the earth twice at the equator. But of course they aren't strung out; they are piled in heaps of trash or junkyards or are burned in the open, adding their volatile contents to an already polluted atmosphere. Bureau of Mines researchers have been working on an idea originating with the Firestone Tire and Rubber Co., and are obtaining large quantities of valuable chemicals, oils, gas and tar from old tires by destructive distillation techniques.

As much as three barrels of oil and 1,500 cubic feet of gas comparable in heating value to natural gas have been recovered from one ton of tires.

Export demand for scrap has kept the scrap metal processors in business. Development of more economical and efficient methods for recycling the metals should stimulate a domestic market.

In most states the legalities of title and storage requirements of dealing with derelict cars make salvage economically impractical. The Institute of Scrap Iron and Steel suggests these tests to determine if a car is in fact abandoned:

- It has been left on public streets or private property for a designated time, somewhere between 48 to 72 hours.
- It has been extensively damaged.
- It is apparently inoperable.
- It has a market value of less than a designated price, for example, \$50.

A few cities and states have moved to streamline the process. In Chicago, police officers take a calculated risk and tow derelicts directly to a processing company for scrap without going through the time-consuming process of impounding. Ten thousand vehicles later, they have not had a single complaint. They classify a derelict automobile as any obviously abandoned vehicle that has component parts missing, is inoperable, and is worth less than \$100.

In Maryland, a uniform law on disposition of junked and abandoned vehicles, a \$200 fine for any person abandoning a car, fines for owners of wrecking yards if they keep a vehicle 18 months or longer, and a \$1 fee assessed for every title transaction, keep the scrap metal moving. The last item nets more than \$600,000 yearly; the money is called the bounty fund. This fund pays the scrap processor \$10 for every vehicle

EDUCATIONAL AID AT UGMS

Geologic hazards and scenes of environmental geology in Utah are depicted in a series of 100 35 mm color transparencies in preparation at UGMS. Bruce N. Kaliser, UGMS engineering geologist, is drawing upon his collection of slides which show these situations.

The series is meant to serve as a visual aid to classroom instruction and other presentations. Slides will portray mud flows, floods, landslides, distressed structures, dams and reservoirs, active faults, charts, diagrams and maps.

A questionnaire sent to geology department heads and earth science teachers in Utah and in neighboring states has brought the greatest response (85 percent) from colleges and universities. High schools and junior high schools throughout the state also are ordering the set.

Kaliser has shown a similar set of slides to many audiences in the state.

The series is to be available in November. The descriptive material and plastic pockets containing the slides will be bound in a book.

Institutions which have not returned a questionnaire but are interested in procuring this slide series should address requests to Kaliser at UGMS. Cost is \$24.00.

that he certifies he processed for scrap. This subsidy insures the processor some profit in event of a depressed scrap market.

In New York State, cleanup of abandoned cars was developed in connection with rodent control and partially subsidized by rodent control program funds.

Vermont related a comparable program with the Federal Highway Beautification Act of 1965.

Mining of this constantly renewed resource largely contained by 33,000 wrecking yards across the country by 1,800 scrap processors cleans up a source of serious land and air pollution, recycles resources we can ill afford to waste, and supports a thriving industry. From the national viewpoint, these vehicles are a major source of raw material, a resource out of place.

Moves Toward Passage MINERAL POLICY BILL

The House Interior Committee reported favorably S. 719, a Senate-passed bill to establish a national mining and minerals policy. Committee amendments restored fuels to the measure's coverage and would make the federal government responsible for fostering and encouraging private enterprise in the "study and development of methods for the disposal, control and reclamation of mineral waste products and the reclamation of mined land..."

The Association of American State Geologists supported the proposal with testimony at the Interior Committee hearing. The testimony consisted of a report adopted by a meeting of the Association in April 1970 at Rolla, Missouri. The chairman of the Association committee which prepared the report was James D. Forrester, recently retired director of the Arizona Bureau of Mines. W. P. Hewitt, State Geologist for Utah, was a committee member.

UTAH COAL STUDIED

The coal resources of Utah are receiving a close scrutiny by UGMS staff. Hellmut Doelling, economic geologist for UGMS, is supervising a survey which is financed jointly by U. S. Department of Health, Education and Welfare, National Air Pollution Control Administration and the State of Utah.

In the past six months Doelling and his crew have completed mapping in the Kaiparowits and Vernal coal fields and have written preliminary reports which are on open file in the UGMS office. Mapping is far advanced in several other areas.

Approximately 15 fields, varying widely in size and economic potential, are scattered over the state. Three fields, Alton (southwest Utah), Eastern Book Cliffs and Emery (both central Utah) probably will be the next to be finished. Succeeding reports will be on open file and available for examination in the UGMS office.

Each coal field will be mapped by quadrangle, to a scale of 1½ inch to the mile. The maps will show the geology and coal outcrops in detail.

The preliminary reports will ultimately be combined into an atlas. The project will take about 2½ more years.

Of the \$183,000 supporting this project, \$131,500 is provided by the federal government.

CITIZENS' COMMITTEE REPORTS

Excerpts from a report to the Utah Legislative Council by the Citizens' Planning and Organization Committee on Natural Resources:

"Mapping:

Accurate topographic maps form an indispensable framework for all phases of natural resource planning and management. About 65 percent of Utah's area is mapped, but much of this mapping does not meet modern standards of scale and accuracy and some is obsolete. All mapping of the state should be coordinated and expedited.

Priorities in Land Management:

Each area and parcel of land therein has an optimum use in man's continuing existence on earth. In rare instances, this is an exclusive use. In most instances, several uses must be made of the land, either simultaneously, sequentially, or in combination.

Before any exclusive or damaging use of any parcel of land is permitted, there should be an inventory and analysis of all resource values therein. Then appropriate decisions regarding priorities of development in *time* and *space* could rationally be assigned.

This could help prevent the permanent loss of choice recreation and agricultural lands caused by the encroachment of industrial, residential or transportation uses. It could help to insure stable watersheds, protect water quality, and preserve plant and animal life consistent with other needs for orderly development. It could help guard against the locking up of mineral stores. Decisions could then be made as to timing and method of mineral extraction considering all values.

It will take some of man's most inspired thought and greatest talent to put the land to its highest degree of use without waste and destruction.

Increasing population coupled with increasing per capita resource use throughout the world pose a certain threat of shortages of many energy sources and common raw materials indispensable to life as known today.

These resources are a vital factor in the nation's security and self-sufficiency. Development can be the basis of great wealth for Utah, its people, government, and schools."

The report is designed to guide lawmakers in future sessions of the legislature.

SALT CRUST MEASURED

Thickness of the salt crust in the bottom of the north arm of Great Salt Lake is being measured by UGMS in cooperation with the Hydrology Division of the U. S. Geological Survey. UGMS boats, crew and equipment under the supervision of Walter M. Katzenberger, chief of operation and maintenance, are taking 53 core samples of the salt crust.

"We will use the plastic hydrocorer except in places where the crust is too thick," stated Katzenberger. "In those places we will drill." The hydrocorer will make cores 12 to 14 inches long in the north arm.

The north arm of the lake is paved with precipitated salts in a layer so hard, according to Katzenberger, that Utah has what could be described as the largest cement-lined swimming pool in the world.

Concentration of brine in the north arm is increasing with corresponding dilution of the brine south of the causeway.

The sampling stations, all north of the Southern Pacific Railroad causeway and approximately two miles apart, will be carefully mapped so that changes in crust thickness can be recorded at intervals in time.

GROUNDWATER HELP GIVEN

The cities of Bountiful and Payson requested assistance this fall in finding potable groundwater at high elevation. UGMS engineering geologist Bruce N. Kaliser recommended the drilling of two test holes in each case. Both exploration programs are underway.

Bountiful started with the idea of a reservoir in a canyon east of the city. After considering evidence of foundation conditions from surface exposure and one core hole, Kaliser suggested the city instead turn to groundwater as a source. Hydrology of the canyon streams and groundwater was studied before drilling started. Artificial recharge is to be attempted at one site.

Wells at high elevations will avoid filtration, evaporation and land acquisition problems, pressure loss through pipe lines, significant power consumption requirements and some maintenance problems.

*Preliminary Figures***1969 MINERAL PRODUCTION IN UTAH**

Mineral-production value in Utah was \$539.1 million, a record high, according to the Bureau of Mines, U. S. Department of the Interior. This value was \$90.2 million (20 percent) more than the previous high recorded in 1966, and \$115.2 million more than the 1968 figure. Value of the metals group increased \$104.4 million and showed losses only in the values of lead, silver and uranium.

All commodities except natural gasoline in the mineral-fuels group showed increases in value. The group recorded an increase of \$7.8 million (8 percent) in value to a total of \$111.7 million.

Value of nonmetals decreased for 9 of the 14 commodities. Gains in the values of cement, sand and gravel, salt, lime, potassium salts, and stone increased the overall value by \$2.9 million.

Construction was started in July on an \$8 million acid plant located near the Garfield smelter of Utah Copper Division, Kennecott Copper Corp. The new plant, scheduled for completion in September 1970, will produce 500 tons of sulfuric acid per day from the sulfur dioxide recovered from smelter gas emissions. The new unit will increase the total capacity of all the units to 1,900 tons of acid per day.

Union Carbide Corp.'s new oxygen plant near the Garfield smelter of Utah Copper started delivery by pipeline of 250 tons of oxygen daily; oxygen enriched air is used in copper converters on a regular production basis. Company officials reported the result was an increased smelting rate with greater copper production per converter charge while the refractory wear remained constant.

The Office of Minerals Exploration granted Western States Minerals, Inc., a \$75,000 loan for work on the Crown Point and East Crown Point claims near Eureka. Projects planned include a 1,300-foot shaft, a 500-foot drift, and 4,000 feet of diamond drilling to locate copper-gold-silver ore.

In July, ore from Brush Beryllium Co. mine near Spor Mountain was stockpiled at the company's new \$10 million mill at Lynndyl. The processing facility was put on stream in September, and in November some concentrates were shipped to Elmore, Ohio, for further processing.

Officials of Topaz Beryllium Co., a subsidiary of the Anaconda Company, announced plans to build a beryllium

ore concentration plant in the Spor Mountain area. Exploration work continued on the company claims just south of Brush Beryllium's open pit mine.

The OK copper mine of Toledo Mining Co. and the Big Indian mine of Cliffs Copper Corp. were closed during the year. Some production was reported from the Big Indian mine but none from the OK mine.

Open pit operations were started at the Yellow Hammer tungsten-copper mine of Silver Star-Queen Mines, Inc. The ore was taken to a newly rehabilitated 40-ton-per-day mill at Gold Hill.

An investor group purchased the holdings of Tintic Lead Co. in Horn Silver Mines Co. The group plans to form a joint venture to explore and develop the old Horn Silver mine west of Milford. This mine was a prominent early day producer of lead-zinc ore.

Drilling operations for near-surface gold ore bodies in the Mercur district are being conducted by Newmont Mining Corp. Drilling was done near Eagle Hill and in the vicinity of the Brickyard and Geyser-Marion properties.

Work was started on two shafts, each 18 feet in diameter and more than ½ mile deep, at the Rio Algom Mines, Ltd., property south of Moab. Company officials reported the mine and mill complex would cost \$20 million.

Officials of the University of Utah signed a contract with the U. S. Department of the Interior to develop an intermediate coal hydrogenation process. The University will receive \$843,860 from the Office of Coal Research and \$176,340 from the state for the 5-year project.

More than 80,000 tons of coking coal were shipped from the Kaiser Steel Corp. Sunnyside mines to a Japanese steel plant for testing purposes. The plant is a potential consumer for large quantities of coking coal.

A contract was signed by Resources Co. and the Department of the Interior granting the company the right to take water from Lake Powell for a coal burning powerplant near the Kaiparowits Plateau. The company has the right to use 3,825 acre-feet of water in 1977 with additional water up to 102,000 acre-feet annually after 1989. The proposed plant would burn 14 million tons of coal annually at full generating capacity.

Officials of Rio Grande Railroad and

United States Steel Corp. have worked out a coal transport system, involving three separate coal mines, which will eventually use 230 cars to handle the same tonnage originally requiring 1,050 cars. The new system will deliver coal on a twice daily schedule to the Geneva steel plant near Provo.

The mine and mill of Stauffer Chemical Co. near Vernal started producing phosphate rock in July after being idle 14 months. The production rate was increased to 300,000 tons per year.

Production is scheduled for early 1971 from the Great Salt Lake Minerals and Chemicals Corp. solar evaporation ponds near Ogden. Canal systems, pumps, 20 square miles of ponds, and a \$420,000 administration building have been completed. Dow Chemical Co. has agreed to purchase a minimum of 100,000 tons of magnesium chloride annually in a 15-year contract.

A leasing and royalty agreement was reached between the state of Utah and National Lead Co. for operation of the proposed \$70 million magnesium recovery plant near Grantsville. Company officials report \$5 million have already been spent on development activities and production of the first magnesium metal is scheduled for 1971. National Lead Co. has acquired the holdings of Hogle-Kearns Corp. in Magnesium Project, making the Project a wholly owned subsidiary.

Officials of Intermountain Chemical Corp. report the completion of 2,150 acres of solar evaporation ponds near the railroad on the west side of Great Salt Lake. No production was reported because of a mechanical failure of the pumps; however, production of magnesium chloride is scheduled in 1970.

Crude petroleum production increased slightly but value was higher because of an increase in price of crude oil. The state received \$1.7 million from the federal government as its share of receipts from oil and gas leases on public domain for the first 6 months of 1969. Drilling activity for the first 10 months of the year was 119 wells, 10 less than for the same period of 1968, a decrease of 8 percent. A significant oil discovery was made by Mountain Fuel Supply Co. The well, Cedar Rim No. 2 in Duchesne County, tested 888 barrels of oil per day from perforations in the Wasatch Formation from 8,580 to 8,670 feet. Plans were announced for the expansion of the American Oil Co. refinery in Salt Lake City; capacity of the plant will be increased from 36,000 to 49,000 barrels of oil daily.

MOON ROCK WORK FIRST REFERENCE FOR LUNAR SCIENCE

"Proceedings of the Apollo 11 Lunar Science Conference," a three-volume set containing the only comprehensive review of the examination by scientists of the "moon rocks" brought back from the Sea of Tranquility by astronauts Aldrin, Armstrong and Collins, has been released by Pergamon Press, Inc., of Elmsford, New York 10523, publishers of scientific books and international journals.

The volumes feature more than 500 halftones and 16 color plates of the lunar samples, highlighting details of rock textures, glass spherules and soil samples found on the moon. The 150 investigators contributed 180 articles to the 2,491-page report published as Supplement 1 of *Geochimica et Cosmochimica Acta* (vol. 34), official journal of the Geochemical Society and the Meteoritical Society.

Natural magnetization in the crystalline rocks and the breccias indicates that the moon may have had a magnetic field with a strength of a few percent of the earth's field.

The lunar samples provided a sample of gases blown off the sun in the solar wind, leading to a better understanding of the evolution of the sun.

The three volumes of the set, edited by Prof. A. A. Levinson of the University of Calgary, Canada, are entitled "Mineralogy and Petrology," "Chemical and Isotope Analyses" and "Physical Properties." \$40.00 the set.

Gilson Mountains Thesis Subject

One of the dissertations completed at the University of Utah in 1970 is entitled "Geological and Geophysical Studies of the Gilson Mountains and Vicinity, Juab County, Utah," by Yun Fei Wang of Taiwan. UGMS was one of the organizations which helped Dr. Wang with field materials.

The Gilson Mountains, occupying an area 9 miles long in a northerly direction and 10 miles wide, are on the north side of the Leamington Canyon and Sevier River which separates them from the Canyon Range to the south. They are dominated by limestone of Mississippian age but, owing to complex structure, both older and younger rocks crop out.

In addition to the Gilson Mountains, the mapped area includes the Black Mountains which lie south of the West Tintic Mountains and the narrow (one mile wide) southern projection of the East Tintic Mountains. The Black Mountains, 6 square miles in area, expose beds of Cambrian to Devonian age; the East Tintic Mountains are dominated by Pennsylvanian and Permian rocks, though older rocks are brought up in thrust plates. The large intervening areas are covered by Quaternary and Tertiary sediments. Patches of Tertiary volcanic rock mainly of latite composition, are preserved in the East Tintic Mountains

and at the nearby east end of the Gilson Mountains.

No intrusive rocks are recorded and no metallic mineral occurrences noted, though sand and gravel, limestone and quartzite are abundant.

The study is mainly concerned with the stratigraphic sequence of 35,000 feet of sediments ranging from Late Precambrian to Tertiary and with the tectonics exhibited in the Gilson Mountains. Rocks of Triassic and Jurassic age are conspicuously absent and the conglomerate of Cretaceous age which is so prominent in the Canyon Mountains to the south is represented by one small outcrop in Leamington Canyon.

The Leamington Canyon fault along the north side of the canyon brings the Paleozoic rocks in contact with Precambrian quartzite and terminates the thrust plates within the Paleozoic. It has been interpreted as the strike-slip margin of a large regional thrust plate or as a fault having a role of less significance. The Champlin and Gilson thrust faults are interpreted as having been active in the Cretaceous orogeny tending to bring older rocks over younger.

A considerable part of the field effort was devoted to a gravity survey and magnetic profiles in areas of major structural interest. Anomalies were found but their interpretation added little in the way of definite contribution.



Aerial photo taken during inspection trip to San Juan County following Labor Day flooding. UGMS engineering geologist B.N. Kaliser accompanied Congressman Burton and Assistant Secretary of Interior Loesch on the aerial reconnaissance flight.

Ephemeral channels crossing the highway in the flood plain of the San Juan River are prominent in the photograph.

Oil Sandstone Mapping Continues

Mapping of oil-impregnated sandstone deposits in Utah is continuing through the 1970 field season. Mapping parties directed by Ron Blakey, recent University of Utah graduate, expect to cover areas not previously examined in the San Rafael Swell, Emery County, along Argyle and Minnie Maud creeks, Duchesne and Carbon counties, and in the Myton area, Duchesne and Uintah counties. Also to be examined in 1970 are small deposits known to exist in San Juan and Washington counties.

Preliminary San Rafael Swell mapping indicates that the Triassic formations of this uplift are similar to those of the Circle Cliffs Uplift to the south where extensive oil-impregnated Triassic sandstones were mapped in 1968 and 1969. Sedimentary features in the two areas also are similar. Oil appears to be in stratigraphic traps in shallow water marine sandstones, originally beaches and offshore bars in the Triassic seas.

Mapping and sampling crews at work during the summer on the oil-impregnated sandstone project included Sam Quigley and Dave Bernini, University of Utah students, and Ed Dalton, earth science instructor at Tooele High School.

NEW UGMS STAFF MEMBER

UGMS has a minerals information specialist. He is Carlton Stowe, formerly district manager of Petroleum Information Corporation.



Carlton Stowe

For the past two years, Stowe has been in charge of Petroleum Information's Salt Lake City operations. Before coming to Salt Lake he was manager of the Casper district. His past association with Petroleum Information brings to the Utah Geological Survey a wide range of experience. As a specialist in mineral statistics he will assume duties concerned with information in Utah. He will handle public relations for the Survey.

Stowe has been active in the Rocky Mountain Oil and Gas Association and Utah Petroleum Council functions. He is secretary of the Utah Association of Petroleum and Mining Landmen.

Sandalized Trilobites

HOAX OR HAPPENSTANCE?

Shades of Alley Oop and friends cast a shadow in the spring of 1968 when trilobites from Millard County, probably from the House Range, were reported by a Delta man. Finding of the trilobites, marine crustaceans which thrived in Paleozoic time, particularly early Paleozoic, came to the attention of UGMS staff.

This find was unique in that marks in the stratum containing the animals bore a resemblance to a sandalled footprint. Hellmut Doelling, economic geologist for UGMS, in a statement to the *Deseret News*, a Salt Lake City newspaper, stated that either the find was a hoax or the marks resembled a footprint by an accident of nature, and that by no stretch of geological evidence could these two animals, trilobite and man, exist in the same geologic age.

We hope the letters stop. The subject is getting to be old and tired.

ANNOUNCING A NEW JOURNAL

Beginning with 1970 the *Water Resources Bulletin of AWRA* became the *Journal of the American Water Resources Association*. It is now a bi-monthly publication and contains at least 1,000 pages per volume. The first four issues include the Proceedings of the Annual Water Resources Conferences. The last two issues contain as many additional papers as have been published in a volume in the past. In addition to these, each bulletin contains the *Water Resources Newsletter* and a section which continues to feature the Water Resources Library, Book Reviews, Publications List and Meetings of Interest.

Information regarding the new journal may be requested from:

Circulation Manager
AWRA
P.O. Box 434
Urbana, Illinois 61801

UGMS, University Representatives
JAPAN MEETING

UGMS was represented by two staff members at the joint meetings of the International Mineralogical Association and the International Association on the Genesis of Ore Deposits in Tokyo and Kyoto, Japan, August 23 to September 2. Eugene Callaghan represented the College of Mines and Mineral Industries and James Whelan, who is on military leave in Guam, was delegate from the Survey. M. L. Jensen of the Department of Geological and Geophysical Sciences attended, as did a number of government and company geologists who work in the Salt Lake area.

Highlight of the meetings was the field excursion to the complex massive sulfide deposits associated with Miocene volcanic rocks near the north end of Honshu, the main island of Japan. The deposits lie in irregularly shaped plates closely associated with shale in the volcanic sequence which is at least partly marine. Their origin was hotly debated by the syngeneticists and the epigeneticists both on the trip and during the sessions.

More than 40 countries were represented by 600 delegates. The Japanese provided excellent facilities and very warm hospitality. English was the language of the meetings.

UGMS Report on
UTAH GAS AND OIL

UGMS, in cooperation with the Utah Oil and Gas Conservation Commission and the U. S. Geological Survey Oil and Gas Conservation Division, is accumulating production statistics on oil and gas fields in Utah.

The report, which is being prepared by Carlton Stowe, staff specialist for UGMS, will include field outlines as defined by the State Nomenclature Committee and will show each oil, gas, water input, injection and drilling well, and dry holes within each field. A graph will show the oil, gas and water produced yearly since the field was discovered, and will show gas-oil ratio. Production data will be presented for each year starting with the discovery well of the field, and for any subsequent discoveries. An analysis of the production characteristics of each field will be made, recording statistics on gravity, pour point, sulfur content, gas-oil ratio, water salinity and other pertinent data.

Developments in the Utah oil and gas industry date back to the late 1890's and early 1900's. More than 850 wells produce 1.5 million barrels of oil each month. The report will present for the first time a comprehensive analysis of the industry under one cover.

STEAM STIMULATES OIL WELL

Analysis of crude oil produced by steam heating of the reservoir rock at Rozel Point oil field, Box Elder County, indicates that oil produced in this fashion has a lower sulfur content than that collected from seeps along the shores of Great Salt Lake near the field. The well sampled was flowing uncontaminated oil through casing to the surface from a depth of about 200 feet in November 1969.

Samples collected from the steam-stimulated well by the Division of Oil and Gas Conservation and the Survey work were analyzed by Dr. Ralph Wood, Fuels Engineering Department, University of Utah, and showed: specific gravity 1.043 and gravity API 4.2°; and percentages of N₂, 1.3, of C, 66.0, of H₂, 7.8, and of S, 5.47.

Sulfur content of oil collected from seeps has been 14.32 and 12.13 percent in two analyses, and the oil has been described as possibly having the highest percentage of organically combined sulfur of any oil known.

OPEN FILE - WASATCH FAULT

The report on a study of the north part of the Wasatch fault was received recently by UGMS. The study, undertaken by Woodward-Clyde and Associates, Oakland, California, and financed by UGMS, covered that part of the fault extending from near Draper to Brigham City.

The study locates exactly the most important single active fault in Utah, important because of its proximity to the most densely populated and industrialized area in the state. The purpose of the study is to describe and evaluate problems connected with urban and industrial development, present and future, on the Wasatch Front.

According to the report, written by Lloyd S. Cluff, vice president and chief engineering geologist of the company making the study, this zone has been associated with strong earthquake activity in the past, and major earthquakes are expected here in the future. The faulting, portrayed by low-sun angle photography, exhibits features typical of recently active faults.

Vertical deformation, if an earthquake occurs here, may uplift, depress or tilt the land surface for as much as several hundred feet to either side of the fault. Strong shaking or ground failure combined with unstable ground conditions would create havoc in a developed area. Landslides along the Wasatch Range coincide with the fault.

Land showing evidence of these activities should be studied carefully in the light of past activity and potential use before development is permitted. Comprehensive geological and engineering investigations should define the hazards and the consequences of urban or commercial use.

The report recommends establishment of an interdisciplinary Consulting Review Board, composed of geologists, soil engineers and structural engineers, an architect and a planner. These board members should represent private, academic and governmental employment. This Board should be charged with the responsibility of ascertaining "that the nature and severity of each particular type of problem has been reasonably evaluated, and the margins of safety provided are appropriate..." The Board should gather and make available data developed from specific projects under its jurisdiction, and should complement

functions of local building and planning agencies.

The report further recommends that a similar study be made of the south portion of the Wasatch fault.

Bruce Kaliser, UGMS staff engineering geologist, gathered information and assisted in the field studies.

Open-file copies of the report may be seen at the UGMS office at 103 Utah Geological Survey Bldg., University of Utah, Salt Lake City.

SIX NEW UGMS PUBLICATIONS

The following publications were released by UGMS in the last two months:

Special Studies 33, Sedimentology of Oil-impregnated Lacustrine and Fluvial Sandstone, P. R. Spring area, Uinta Basin, Utah, by M. Dane Picard and Lee R. High, Jr., \$2.00.

Water-resources Bulletin 13, Thermal Springs in Utah, by J. C. Mundorff, \$3.00.

Water-resources Bulletin 14, Effects of a Causeway on the Chemistry of the Brine in Great Salt Lake, Utah, by R. J. Madison, \$2.50.

Water-resources Bulletin 15, An Evaluation of Eddy Flux Techniques in Computing Evaporation from the Great Salt Lake, by Don R. Dickson and Alvin Ellsworth Rickers, \$1.00.

Water-resources bulletins 13 and 14 are the results of collaborative efforts with the U. S. Geological Survey.

Bulletin 85, Land and Mineral Resources of Sanpete County, Utah, by Alan R. Pratt and Eugene Callaghan, \$2.50.

Bulletin 86, Abstracts of Theses Concerning the Geology of Utah to 1966, \$4.00.

These publications may be purchased in person or by mail from Publications Office, 103 Utah Geological Survey Bldg., University of Utah, Salt Lake City, Utah 84112. If the copies are ordered by mail, the purchase price should be increased by 10 percent to cover handling and mailing.

How Sweet It Is

Ten little miners working in a mine,
One lit a short fuse, then there were nine.

Nine scrambling miners trying to escape
Shoved, tromped, stampeded—then
there were eight.

Eight careful miners, the debris and
mud to leaven,
Sheared an underground cable, then
there were seven.

Seven hungry miners, getting in their licks,
Drew lots among them, then there were six.

Six contented miners, glad to be alive,
Chanced on a well shaft,—well,
there were five.

Five disheartened miners, drenched to the core
Used a fellow for a ladder, then
there were four.

Four spunky miners beset with atrophy
Tried again to scale the sides, then
there were three.

Three ragged miners, pondering what to do
Felt blasting of the rescue team, then
there were two.

Two slightly buried miners looked up
to see the sun,
Shouted, caused a landslide, then
there was one.

One bedeviled miner not to be undone,
Hired out as dog catcher, was bitten—
there was none.

Ann-anonymous.

TRACE MINERALS DISCOVERED

A study of considerable scientific interest is being conducted on mineral deposits in Millard County by a graduate student in the department of geological and geophysical sciences at the University of Utah. Robert L. Sayre, a master's candidate, is studying mineralogy of a deposit originally reported by prospectors in the area. They reported anomalous occurrences of copper.

Sayre's thesis is tentatively titled "Study of trace elements distributed in a copper prospect." He reports the following minerals: alunite, azurite, beaverite, chalcocite, cerusite, chrysocolla, conichalcite, "copper pitch," covellite, gibbsite, hematite, halloysite, jarosite, malachite, mimerite and osarizawaite.

Beaverite and osarizawaite are rare minerals; the latter is reported in this country for the first time.

EARTHQUAKE EPICENTERS

General earthquake epicenters in or near Utah for May, June and July 1970, with dates of occurrence and approximate magnitude, are listed below. Unless otherwise indicated, localities are in Utah.

	Magnitude
May	
1 South Utah-Nevada border	3.0
2 South of Sunnyside	2.2
2 South of Sunnyside	2.0
2 South Utah-Nevada border	2.5
3 Rangely, Colorado	1.6
6 South of Sunnyside	2.0
7 South of Sunnyside	2.1
7 Near Ephraim	2.5
8 San Rafael Swell	2.7
9 Near Coalville	No mag
9 Near Teasdale	1.8
12 San Rafael Swell	No mag
12 Near Cedar City	3.6
13 Near Ephraim	2.5
14 Rangely, Colorado	1.5
14 Green River Desert	3.0
21 Pocatello, Idaho	2.9
21 Near Dragerton	2.4
22 South of Sunnyside	No mag
22 San Rafael Swell	2.6
23 Denver, Colorado	4.1
23 North of Panguitch (felt)	3.5
23 North of Panguitch (felt)	2.7
24 North of Panguitch (felt)	2.7
24 North of Panguitch	2.5
24 North of Panguitch	2.9
25 Near Scofield	3.0
28 Rangely, Colorado	3.0
30 South of Sunnyside	2.2
(Approximately 15 recognized rockbursts near Price, Utah that were of significant size to be recorded, and 10 significant Bingham blasts.)	
June	
1 Near Cedar City	2.1
4 South of Sunnyside	2.0
4 Green River Desert	3.5
5 Near Gunnison	2.5
5 Near Fillmore	2.6
6 Near Salt Lake City	No mag
9 East of Randolph in Wyoming	2.4
15 Near Scipio	2.5
16 Near Richfield	2.8
17 Near Mount Pleasant	2.5
17 South Utah-Nevada border	No mag
18 Near Gunnison	2.5
20 Near Moroni	1.9
20 San Rafael Swell	1.8
20 Utah-Idaho border near Lewiston	2.8
22 Utah-Idaho border near Lewiston	3.1
23 Near Ephraim	2.4
24 San Rafael Swell	3.1
26 Rangely, Colorado	1.6
26 South Utah-Nevada border west of Cedar City	2.7
27 Near Huntsville	2.6
30 Near Cedar City	No mag
30 Weber Canyon	

On Open File

The U. S. Geological Survey is releasing in open file the following report:

Seismic activity in the Sunnyside mining district, Carbon and Emery counties, Utah, during 1968, by C. Richard Dunrud, John O. Maberry, and Jerome Hernandez. 27 p. (including 14 tabular pages), 4 pl. (scale 1:24,000), 1 fig. Available for inspection at 1012 Federal Bldg., Denver, Colo. 80202; 8102 Federal Office Bldg., Salt Lake City, Utah 84111.

(Approximately 11 recognized rockbursts near Price, Utah that were of significant size to be recorded, and 15 significant Bingham blasts.)

July	
3 San Rafael Swell	2.1
8 Green River Desert	2.0
9 Near Randolph	2.5
10 North of Huntsville	3.0
10 San Rafael Swell	3.2
10 South of Sunnyside	2.7
13 Near Fish Lake	2.3
14 Near Milford	2.3
14 Near Fish Lake	2.2
15 Near Ephraim	1.6
15 Near Nephi	2.4
15 San Rafael Swell	2.4
16 Central Utah-Nevada border	3.0
21 Near Teasdale	3.1
23 Near Hanksville	No mag
23 Near Antimony	No mag
24 Central Utah-Nevada border	2.9
24 Near Salina	2.4
24 Near Salina	< 2.0
24 Near Salina	< 2.0
26 South Utah-Nevada border	3.2
26 South Utah-Nevada border	3.5
27 Near Fish Lake	No mag
27 Green River Desert	No mag
27 Near Fish Lake	2.0
27 Near Junction	< 2.0
27 Near Hanksville	< 2.0
27 Near Salina	2.4
28 Near Magna	2.5
29 Near Moroni	2.9
29 San Rafael Swell	2.4
30 Near Payson	2.0
30 Near Salina	2.2
31 San Rafael Swell	< 2.0
31 Near Emery	< 2.0
(Approximately 7 recognized rockbursts near Price, Utah that were of significant size to be recorded, and 12 significant Bingham blasts.)	

These earthquakes were recorded by the University of Utah seismograph stations under the direction of Kenneth L. Cook. All locations and magnitudes are preliminary determinations; the final determinations will be printed in the University of Utah Seismological Bulletin, issued quarterly.

NEW ASSOCIATION FORMED

Utah Geological Association is the name of the newly merged membership of the Intermountain Association of Geologists (IAG) and Utah Geological Society (UGS). Members of both groups overwhelmingly approved the merger. The name "Utah Geological Association" was selected by the memberships for the new organization. A slate of officers was chosen during October to serve for the next year.

UGS and IAG held their annual field conference "Late Cenozoic Geology of the western Grand Canyon region, Arizona and Utah," October 1-3. Headquarters were at the Coral Hills Motel in St. George. Registration was handled by Walter Buss, Weber State College, Ogden, assisted by Carlton Stowe, Utah Geological Survey. Boyles Brothers Drilling sponsored the hospitality hour. Approximately 90 individuals attended the field trip which included an overnight campout in the Vulcan's Throne area of the Grand Canyon National Monument.

Editors of the guidebook for the field trip are W. K. Hamblin and M. G. Best, Brigham Young University. The guidebook includes papers by Hamblin, Best and W. H. Brimhall, also of Brigham Young University.

The western Grand Canyon region encompasses 7,000 square miles in the northwest corner of Arizona and adjacent southwest Utah, north of the Colorado River. The guidebook presents a perspective of the tectonic-geomorphic segments of the western Grand Canyon area generally within the regional junction of the Basin and Range and Colorado Plateau provinces.

The guidebook may be ordered from UGMS for \$5.00.

SCANDIUM REPORTED

Scandium occurs in the Thomas Range of Utah, according to a paper by Clifford Frondel of Harvard in the May-June 1970 *American Mineralogist*.

The mineral occurs in the range of 0.1 to 0.7 percent by weight, in late-stage minerals—pseudobrookite, bixbyite, hematite, spessartite and beryl—in the lithophysae of rhyolite flows.

The little boy was out digging in his back yard. His mother saw him and said, "Are you adit it again? Now stope that!"

New Department at Utah

(continued from page 1)

tural geology; W. P. Nash, mineralogy and petrology; J. H. Goodwin, low temperature geochemistry; J. F. Miller, micropaleontology.

It is expected that in July 1971 the geological engineering faculty and curriculum of the present Department of Mining and Geological Engineering will be transferred to the Department of Geological and Geophysical Sciences and that W. T. Parry and M. P. Nackowski will become full-time faculty members.

Preliminary figures show that in 1969-1970 and 1970-1971, the number of graduate students has increased from 57 to 75 and undergraduates from 114 to 120.

New facilities in the mineralogy area are highlighted by the electron microprobe microanalysis laboratory instrumented by the ARL EMX-SM with three spectrometers. A Zeiss research microscope with photographic capability is added together with student microscopes and sample preparation equipment. The facilities of the paleontology area in the Natural History Museum building have been greatly improved and a darkroom, acid preparation laboratory, rocksaws and airbrasive unit added.

The Utah seismograph network has been expanded by a new station at Cedar City and by taking over operation of the Uinta Basin Seismological Observatory near Vernal and the Flaming Gorge seismograph station at Dutch John. Equipment has been added to the Granite Mountain Records Vault in Little Cottonwood Canyon to record strain accumulation and tilt with facilities for telemetering to recorders in the Mines Building. A high resolution-high gain seismograph system has been added and programs for computer graphics have been developed in the Computer Center. Instrumentation for a paleomagnetic laboratory and a proton precession magnetometer have been added. A laboratory for measuring the electrical property of terrestrial and lunar rocks is being prepared.

The new Mineral Science Building is to be completed in March 1971 and will be dedicated during the week of May 10. Department and faculty offices and faculty and graduate research laboratories will be in this new building; classrooms and laboratories will be maintained in the Physical Sciences, Mines and Geology buildings and Natural History Museum. Continued improvement of teaching and research facilities is planned.

UGMS Editor Attends

EARTH SCIENCE EDITORS MEET

Editors of the earth sciences held their fourth annual meeting in Washington, D. C., on October 12 and 13. UGMS's editor, Mildred Detling, attended the meeting of the Association of Earth Science Editors, along with approximately 50 of the 80 members.

Mrs. Detling participated in a panel discussion entitled "Future writers and the editor's future." A plan for drastic revision of the teaching of scientific writing, recently tried by the biologists through the Council of Biology Editors, aroused great interest and lively discussion. Obviously earth science editors, amateur and professional, agree that many of the problems faced by author, editor and reader might be solved by more adequate education of the graduate student in the craft of scientific writing.

WASATCH WELL WILTS

The well drilled by Gulf Oil 7 miles southeast of Strawberry Reservoir in Wasatch County was abandoned in September. Encouraging oil shows encountered (see UGMS *Quarterly*, August 1970) could not be coaxed into production. Gulf has not announced definite plans for more drilling in the area.

Buried Fault May Trap Oil

A well drilling on the north flank of the Uinta Basin in the Maeser area will test the concept of major overthrusting in this area according to plans filed with the Utah Division of Oil and Gas Conservation by the operator. The well, Atlantic Richfield No. 1 Maeser-Federal, is located in SE SE Sec. 12, T. 4 S., R. 20 E., five miles northwest of Vernal, Uintah County.

The well spudded on Morrison Formation (Jurassic) and is planned to penetrate a normal stratigraphic sequence through the Mississippian to a depth of 6,000 to 6,500 feet. At that depth the well is expected to penetrate a thrust fault and repeat Triassic, Permian and Pennsylvanian formations. Main objective of the test is the Weber Sandstone at 7,750 feet. Proposed total depth is 9,000 feet.

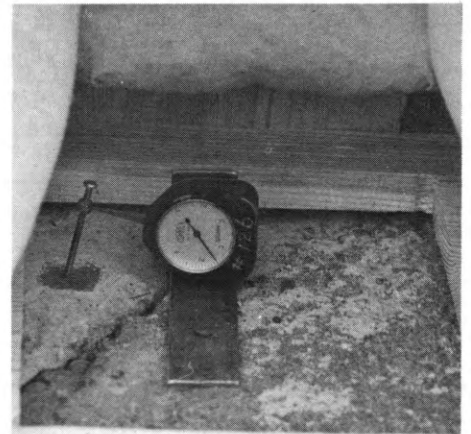
The fault which may form a trap for oil is not exposed at the surface and is presumably concealed in alluvium-covered, steeply dipping Mancos Shale between the well site and Asphalt Ridge to the southwest.

Morgan County Hazards Studied

Work in Morgan County by UGMS engineering geologist Bruce N. Kaliser continues this fall on the hillside stability, landsliding and foundation conditions in areas being considered for subdivision.



Bruce Kaliser records reading on strain gauge. Instrument spans old but reactivated landslide scarp; was operative March through August of this year. Photo courtesy of Henry L. Dequasie.



Displaced driveway has been releveled with concrete pour enabling scarp to be spanned by short-armed instrument.



Raymond L. Hansen, Utah Dept. of Contractors representative in Ogden, measures distress evident in home interior.

USGS Atlas Map Published

A new National Atlas sheet No. 272 has been published by the USGS. The 19 by 28-inch multicolored map shows 17 categories of lands administered or held in trust by the U. S. Government.

Two-thirds of Utah's total acreage is owned by the federal government, excluding trust properties (Indian lands, of which there are two major reservations in the state). This percentage puts Utah third highest, exceeded only by Alaska (95 percent) and Nevada (86 percent). Idaho falls just behind Utah with 64 percent of its land in federal ownership.

These figures for states generally agreed to be major providers of the nation's natural resources emphasize the need for multipurpose planning and multiple use of this territorial heritage.

NEW MINES DIRECTOR APPOINTED

President Nixon nominated Elburt F. Osborn, vice president for research at Pennsylvania State University, to be director of the Bureau of Mines. Dr. Osborn is a former president of both the Geochemical Society and the Mineralogical Society of America. He is the second nominee to the directorship.

The first nominee, J. Richard Lucas, asked Nixon to withdraw his name from consideration on July 10.

Legislators from several coal mining states had fought the nomination saying Lucas was too close to industry. Osborn is reportedly free of political or industrial ties. The post has been vacant since March 1.

UGMS Staff Member Appointed

Bruce N. Kaliser, UGMS engineering geologist, was appointed to the editorial board of the Bulletin of Association of Engineering Geologists, effective this fall.

Wallace R. Hansen of USGS, Denver, is the new editor of the publication.

OIL SPILLS DANGEROUS

Woods Hole scientists say that oil spills at sea are more dangerous than nerve gas—that nerve gas in seawater has a half life of 12 hours, but that cancer-causing hydrocarbons have half lives measured in years.

UGMS Publications Displayed EXHIBIT FOR MEETINGS

Recent meetings in Salt Lake City provided opportunity for UGMS to display publications put out by UGMS to the public.

The exhibit, three feet wide and four feet long, consists of pockets for displaying publications and of space for display of maps and publication lists. The panel is mounted on an easel and is easily set up. It was assembled by the Survey's Department of Geological Illustrations.

The exhibit was particularly well received at the National Petroleum Refiners Association Western Regional Meeting held at the Ramada Inn, September 22 and 23. More than 125 members of the association attended the two-day meeting at which papers were presented by authors from Los Angeles, San Francisco, Tulsa, Dallas, Washington, D.C., Kentucky and Michigan. More than 100 sample bags of Utah oil shale and 150 publication lists were distributed.

The exhibit was displayed before members of the Utah Petroleum Council at their annual meeting at the Hotel Utah on September 16, and the Intermountain Association of Geologists viewed the materials at a recent luncheon meeting. The exhibit was also on display at the Utah Geological Association field trip headquarters in St. George on October 1.

Chevron Oil Company FINED FOR POLLUTION

In New Orleans, Chevron Oil Co. was fined in August \$1 million for pollution of the Gulf of Mexico. Chevron, pleading no contest, was charged with failing to install storm chokes on 90 offshore oil wells in the Gulf. A fine of \$2,000 was imposed for each of 500 counts.

Anti-Pollution PATENT PRIORITIES

The U. S. Patent Office is now giving priority attention to anti-pollution device patents. Processing time can be cut from 3 years to 6 months if the applicant for a patent which can aid in curbing environmental abuses submits a written explanation of how his invention relates to the maintenance or restoration of one of the life-sustaining elements: air, water or soil.

FOSSIL FLORAS DESCRIBED

Two papers on Utah fossil floras appeared in the Brigham Young University Geology Studies series, volume 14, 1967.

A new fern genus, *Astralopteris*, was reported by W. D. Tidwell, S. R. Rushford and J. L. Reveal as occurring in the Cretaceous Dakota sandstone in extreme east central Utah and southwest Colorado.

A flora in Manning Canyon shale, lower Pennsylvanian in age, and its stratigraphic significance, were reported by W. D. Tidwell. A total of 33 genera and 58 species is recognized, and 14 new species and 2 genera are described. Four species are reported from North America for the first time, and one new from the United States. The flora indicates a fresh or brackish swamp environment of deposition for the formation.

AIR QUALITY REGION NAMED

The U. S. Department of Health, Education and Welfare designated a Wasatch Front Intra-state Air Quality Region composed of Salt Lake, Davis, Tooele, Utah and Weber counties, to publish and disseminate air pollution criteria, reports and vital information. President Nixon made public a 326-page report prepared by the White House Council on Environmental Quality which warns of possible "ecological disaster," urges passage of the President's proposals for setting air and water quality standards, and recommends vigorous enforcement, particularly against industry.

Utah Ranks In Mineral Production

Utah ranked second in copper and third in gold, silver and lead production among the states in 1969 and the first half of 1970, according to *Mineral Industry Surveys*, a monthly news sheet put out by the U. S. Bureau of Mines.

The 433,385 troy ounces of gold produced by Utah in 1969 are slightly less than gold produced by South Dakota and Nevada. Utah's silver, 5,953,567 troy ounces in 1969, is approximately one-third of that from Idaho and only slightly less than that produced in Arizona. As for copper, Utah's 296,699 short tons in 1969 are a little more than one-third of Arizona's production in the same period.

The first six months of 1970 show the same trend, with slightly more than one-half of the 1969 totals in all instances.

UGMS FINANCIAL STATEMENT

July 1, 1969 - June 30, 1970

SOURCE OF FUNDS:

Appropriations and allotments	
Mineral leasing fund: fiscal income	\$ 99,810
Land grant maintenance fund	100,000
General fund	90,000
Health, Education and Welfare grant	46,000
	\$289,810
Other	
Publications sales (restricted)	\$ 21,715
Services rendered (restricted)	350
Miscellaneous income and reimbursement from state agency	8,362
	30,427
Carryover	
Operating funds	\$ 64,577
Publications receipts	16,038
Services rendered	1,096
	81,711
TOTAL FUNDS AVAILABLE	\$447,948
	\$447,948
TOTAL FUNDS USED (detailed below)	349,619
FUNDS ENCUMBERED	46,557
UNENCUMBERED BALANCE	51,772
	\$447,948
	\$447,948

UTAH DRILLER CERTIFIED

Results are now available of the nationwide examinations for certification of water well drillers given by the National Water Well Association. This program was launched by that organization from its Columbus, Ohio headquarters in August this year.

The well drilling applicant takes a minimum of two tests, one general, the other on a specialty. Special subjects for which separate exams are available are cable tool drilling in rock or unconsolidated material, air rotary drilling in rock of unconsolidated material, mud rotary, reverse drilling in unconsolidated material, jetting and driving of wells, boring and augering in unconsolidated materials and pump installation for domestic, commercial and industrial applications. Testing in Utah was administered by William Mead, engineering geologist in Salt Lake City. Facilities were made available by UGMS in its building.

The single applicant in Utah, William J. Hill of the Bill Hill Company of Magna, was successful, and he has received a certificate of competence in cable tool drilling in unconsolidated materials.

EXPENDITURES BY PROGRAMS

Administration	\$ 20,780
Employment benefits	12,804
Services to public and state	20,126
Examinations	
Coal	55,585
Hydrocarbons	24,123
Mineral commodity studies	9,012
Great Salt Lake	38,252
Urban and engineering geology	11,373
Regional, structural and stratigraphic	21,475
Cooperative studies	
U. S. Geological Survey	
Topographic mapping	50,000
Water resources	14,775
Geologic mapping	5,030
U. S. Bureau of Mines	
Oil field brines	1,500
Publications (preparation)	53,776
Oil well sample library	5,851
Remodelling and furnishings	3,657
University overhead	1,500
TOTAL FUNDS USED	\$349,619

EXPENDITURES BY IBM ACCOUNTING

Employment costs	
Staff	\$106,930
Summer assistance	20,594
Time card wages	26,434
Employee benefits	12,804
	\$166,762
Cooperative costs	
U. S. Geological Survey	\$ 69,805
U. S. Bureau of Mines	1,500
	71,305
Contract service	26,682
Examination costs and travel	19,343
Equipment, supplies and maintenance	41,620
Printing costs and consignment	20,476
Remodelling and University overhead	3,431
TOTAL FUNDS USED	\$349,619

'Fingerprint' Waterborne Oil TO FIX RESPONSIBILITY

C. H. Thomson of Mombasa Technical Institute in Kenya proposes an international system to "fingerprint" all oceanborne oil cargoes with radioactive tracers to fix liability for contaminating beaches when tankers undertake cleaning operations too far inshore.

In his concept, an international agency would prepare long-lived radioisotopes that could be combined with heavier hydrocarbon constituents common to all crude oils. The agency would allocate an undisclosed isotopic signature to each large oil tanker. Pumps at loading ports could mix the "fingerprint" homogeneously with the oil while loading the tanker. Samples of oil contaminating a beach could be sent to the central agency for formal identification.

GEOLOGIC HAZARDS AIRED

Geologic hazards in Utah's environment were discussed by Bruce Kaliser, UGMS engineering geologist, at the September 21 luncheon meeting of the Intermountain Association of Geologists. Environmental geology was also spoken of by Kaliser at a meeting of Weber County conservationists at their luncheon meeting at Weber State College on October 16.

Kaliser was invited by Region 8 of the Federal Office of Emergency Preparedness to speak on geologic hazards in the Intermountain West at a conference held on October 27th in Missoula, Montana. He also represented the Governor's Advisory Committee on Geologic Hazards at the conference.

FIRST USBM LIAISON OFFICE

The U. S. Bureau of Mines established its first state liaison office in Salt Lake City this summer. To this new office of the Bureau has been delegated the responsibility for cooperation among local, state and federal agencies in mineral resource and related environmental matters of mutual concern. Offices in 22 other states have since been established.

Stephen R. Wilson, with USBM since 1948, heads the office in Salt Lake City.

The office will monitor aspects of the state's mineral industries such as new reserves, processes, plants, environmental issues, mining, incorporation and tax laws of the state, multiple land use, and major legislative issues affecting minerals, mineral rights and the mineral industry.

UGMS has a long-standing cooperative agreement with USBM for the latter's canvassing of producers in the state and the compilation of resulting statistics.

TOO MANY COOKS ?

There is a growing conviction in industry that government officials frequently hinder pollution abatement. Harrison F. Dunning, of the Scott Paper Co., says "At one of our plant locations . . . three federal agencies, one regional agency, one state department, four county departments, two sewer authorities and several municipalities are all participants in developing just one solution to our problem. When so many governmental agencies express different points of view, it is increasingly difficult for industry to know exactly what is expected of it."

ALUMINUM RECOVERY

Adolph Coors Company's cash-for-cans program, launched in January to fight litter, has resulted in recovery of more than one million pounds of aluminum.

The program has netted civic organizations and individuals, at a dime per pound, \$113,907.

The mounting problem of solid waste prompted Coors to launch the recovery program.

The company termed the response to the aluminum recycling program "beyond our expectations." It estimates four million pounds will be purchased by Coors distributors by the end of 1970.

States in which the Coors aluminum recovery program is operating are Utah, Colorado, Arizona, Idaho, California, Nevada, Texas, Kansas, New Mexico, Oklahoma and Wyoming.

QUARTERLY REVIEW	
State of Utah	<i>Calvin L. Rampton</i> <i>Governor</i>
University of Utah	<i>James C. Fletcher</i> <i>President</i>
College of Mines & Mineral Industries	<i>George R. Hill</i> <i>Dean</i>
Utah Geological & Mineralogical Survey	<i>William P. Hewitt</i> <i>Director</i>
UTAH GEOLOGICAL AND MINERALOGICAL SURVEY	
103 Utah Geological Survey Building	
University of Utah	
Salt Lake City, Utah	
84112	

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