

UTAH GEOLOGICAL AND MINERALOGICAL SURVEY

QUARTERLY REVIEW

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Geologic Investigation in the State of Utah

November, 1965

PLANS FOR LAKE RESEARCH

Mapping

The first concerted effort to complete the topographic mapping of Great Salt Lake shorelands and relict areas will begin in late 1965. The Utah Geological Survey in cooperation with the Topographic Branch of the U. S. Geological Survey plans to produce 47 new quadrangle maps. It is hoped that more State funds will be granted to accelerate the program.

Current data and bathymetric information such as soundings will be collected concurrently and will be published in a Great Salt Lake Special Map or Chart.

Geophysical Survey

Present plans call for a sparker type (seismic) survey to assist in delineating some of the sub-bottom sediments and structures. If such a survey can confirm the presence of the sub-bottom Glauber's salt horizon, the project will be expanded on a grid basis to further map the distribution of this salt.

Drilling and Sampling

If the sparker survey can delineate the salt horizon, drilling will assist in verifying and interpreting sparker records. Present plans call for as many as ten deep holes to be drilled to depths near 500 feet

(Continued on Page 7, Column 2)

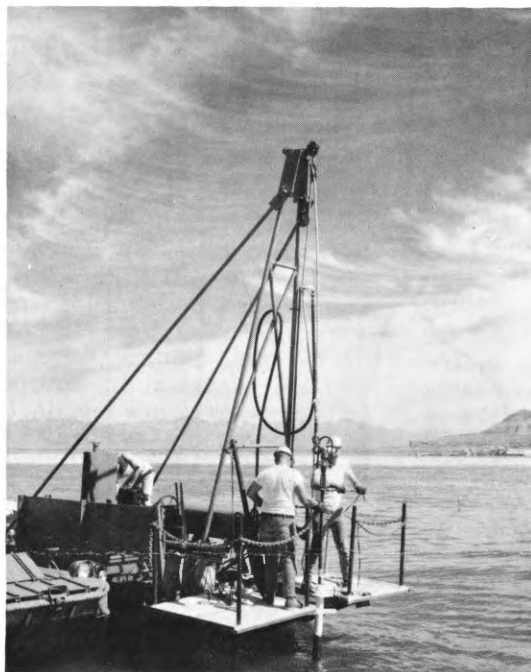
THE GREAT SALT LAKE NAVY

The fleet of the Utah Geological Survey includes three amphibious ducks, one motor dory, and a yard full of iron, barrels, and bolts. The fleet flagship, the Gilbert, has not yet arrived, but it will be a dual-engined jet boat 42 feet in length with a 13-foot beam and a design draft of about 2 feet. Word is out that the Gilbert will join the sink-float outfit sometime in the Spring of 1966.

To date each craft either has mired in the lake ooze and sand or has been rammed by various ob-

square inch is needed for this air hog, so that another amphibious unit is required to carry the necessary compressor. This poses no problem since drilling operations are always conducted with at least two units for safety purposes. The third amphibious unit serves as a utility craft mainly for tending buoys, hauling crews, and assisting other units if they should become stuck on the beach.

The motor dory, the Clyman, is a 22-foot conventional open utility boat powered by an inboard engine.



Drilling in shallow water with amphibious equipment.

jects; however, conditions have improved, and the capability of the fleet is better now than it was a month ago.

One of the amphibious units, which are essentially 6 by 6 army trucks with a hull and propeller, is rigged for drilling. The rotary motion for the drill stem is provided by an oversize air-driven auger motor. Wind at 350 + cubic feet per minute and 100 pounds per

It is capable of speeds up to 30 mph in comparison with the 4 to 6 mph of the amphibious units. This high-speed craft is required for water sampling, which must be completed within a short period of time at intervals throughout the year.

The Gilbert will be used both for lake surveys which require extended cruising and for occupation of observation sites for prolonged periods of time.

QUARTERLY REVIEW

State of Utah.....Calvin L. Rampton
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University of Utah.....James C. Fletcher
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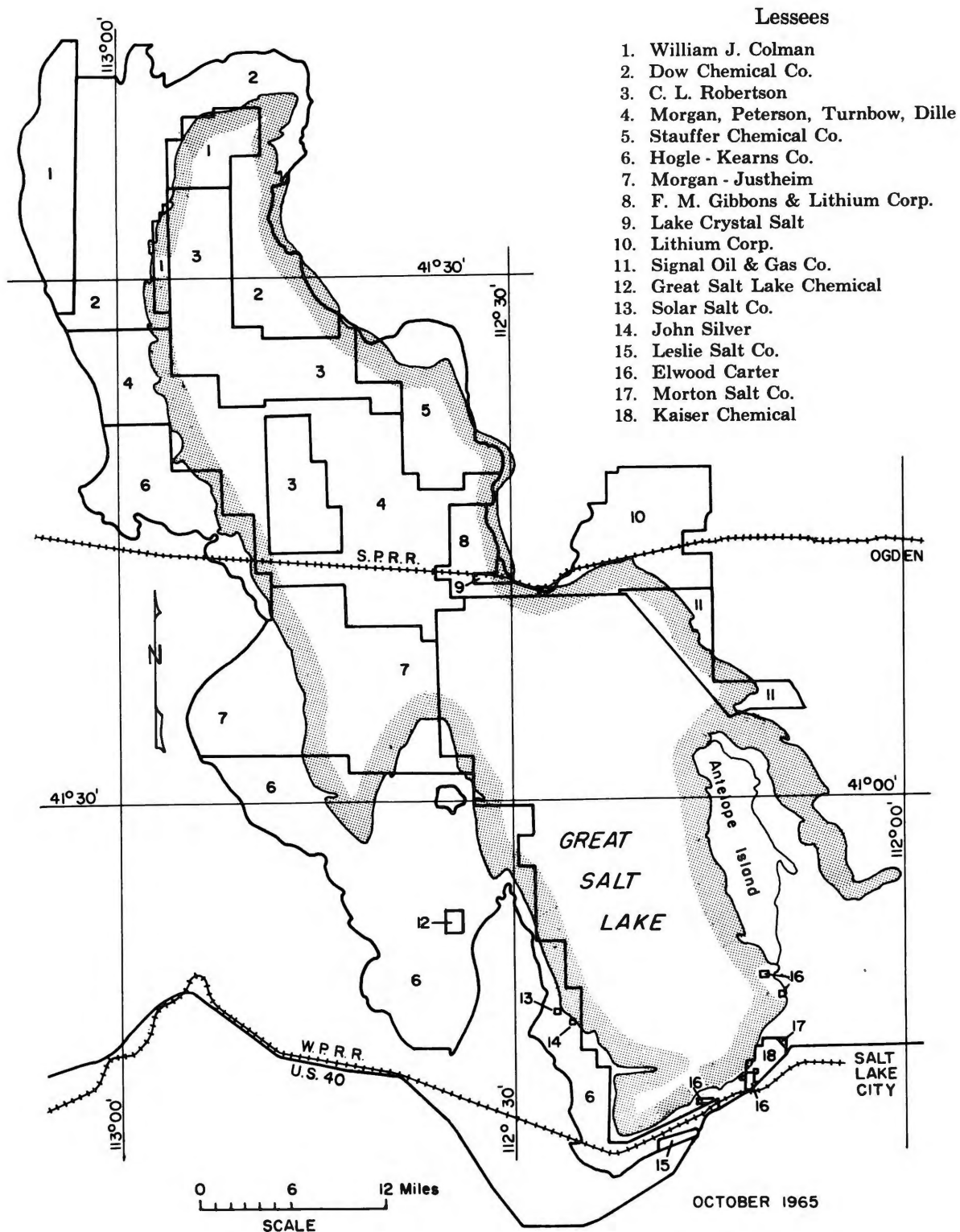
College of Mines & Mineral
IndustriesGeorge R. Hill
Acting Dean

Utah Geological & Mineralogical
Survey.....William P. Hewitt
Director

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BRINE LEASES

Most of Great Salt Lake has been leased for its mineral content (see map). Both **mineral leases** (brine and bottom materials) and **oil and gas leases** are involved. Separate application must be made to the State Engineer for use of either saline or fresh water.



Map of Great Salt Lake showing areas of the lake and related lands under lease.

S. 265 A BILL

To confirm in the State of Utah title to lands lying below the meander line of the Great Salt Lake in such State.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That title to all lands lying below the meander line of the Great Salt Lake in Utah as duly surveyed herebefore or in accordance with section 2 of this Act and in which the United States has any right, title, or interest is hereby confirmed in the State of Utah: Provided, however, That the provisions of this Act shall not affect (1) any valid existing rights or interests, if any, of any person, partnership, association, corporation, or other nongovernmental entity, in or to any of the lands within and below said meander line, (2) any lands within the Bear River Migratory Bird Refuge.

SEC 2. The Bureau of Land Management is authorized and directed forthwith, in cooperation with the State of Utah, to complete that portion of the public land survey necessary to close the existing meander line of the said Great Salt Lake.

On November 12, 1965, a hearing will be held in the State Office Building, Salt Lake City, by the Honorable **Walter S. Baring** (Nevada), Chairman of the Subcommittee on Public Lands of the House Committee on Interior and Insular Affairs. The hearing concerns Senate Bill S. 265 introduced January 6, 1965, by Senator Moss, and its companion, House Bill H. R. 1791.

The disposition of the bill must then await action by the Second Session of the 89th Congress.

Many changes have been suggested, and it is anticipated that the hearing will result in further changes. The Department of Interior is generally in favor of the bill. The Justice Department, after a slow study of the measure may soon render a suggestive opinion.

The Utah State Legislature has apportioned 2.35 million dollars for the new Mines Building under the bonding program for new buildings on the University of Utah campus.

THE GREAT SALT LAKE PROJECT



Storm waves on Great Salt Lake, looking east.

(Photo courtesy of Clyde Anderson)

"It's still there, big, broad, flat, and brutal." The Utah Geological Survey's splendid plans for lake research were more or less stymied by fiscal difficulties and the attendant delays. Most of the time spent on this project has been devoted to assembling equipment and working on procedures which hopefully will result in a more fruitful '66 season.

The major emphasis of the data gathering was the field testing of tailings feasibility for in-lake diking. This information will be used by the Great Salt Lake Authority and Kennecott Copper Corp. Work will continue at intervals throughout the fall and winter seasons. The research involves topographic and bathymetric surveys at and around

the test site, rudimentary current studies, and study of the distribution of the bottom sediments (the algal reefs in particular). Drilling through the use of floating equipment has indicated that **Glauber's salt** (sodium sulfate) exists beneath the tailings test site which is about midway between the County Boat Harbor and the old Saltair Resort. This salt occurs 2.5 to 7.5 feet beneath the bottom sands, and where drilled, was found to have an average aggregate thickness of 11 feet within a 14-foot interval. In all areas examined, the salt was found to rest upon unctuous bluish-gray lake clays of undetermined thickness.

GREAT SALT LAKE WATER IN MUCH DEMAND

Examination on October 20, 1965 of the State Engineer's records indicated that the following applications for Great Salt Lake waters were either pending or approved:

	(acre feet per year)
Bonneville-on-the-Hill	54,300
Deseret Livestock Co.	7,464
Dow Chemical Co.	10,860
Jensen, Frank P.	7,464
Jensen-Sandberg	72.4
Lake Crystal Salt Co.	8,688
Lithium Corp. of America et al	156,000
Morgan, John H. Jr., et al	190,000
Morgan, John H.	190,000
Peterson, Virgil V. et al	190,000
Robertson, Corbin J.	200,000
Salt Lake Potash Co.	19,330
Solar Salt Co.	14,480
Stauffer Chemical Co.	14,480
Total.....	1,063,138.4

LIFE IN GREAT SALT LAKE



ALGAL REEFS — Geologist Robert Cohenour wades into salt surf to gather specimens of orange-colored algal reefs growing in the brine. Although often mistaken for coral, these are porous stony carbonates secreted by colonial algae which cluster on the bottom of the lake.

Photo by Nelson Wadsworth.

SEDIMENT MAKER

The only solitary (non-colonial) megascopic creature living in the brines of the Great Salt Lake is *Artemia salina*, the brine shrimp. Most of the black spots in the photograph are eggs; several of the specimens illustrated still contain eggs. Note also the eyeballs and the dorsal appendages of the shrimp. The anal chute contains tiny rod-shaped faecal pellets, which are highly significant because they comprise the nuclei of more than 95 percent of the oolites of the Great Salt Lake. The following rough calculations indicate the abundance of the brine shrimp. Oolitic sand averaging about 4 feet in thickness covers more than 120 square miles of the lake bottom. Assuming the diameter of the average oolite to be 0.38 mm, it would require 70×10^{16} oolites, loosely packed, to make up the recent sediments.

BOTANICAL RESEARCH

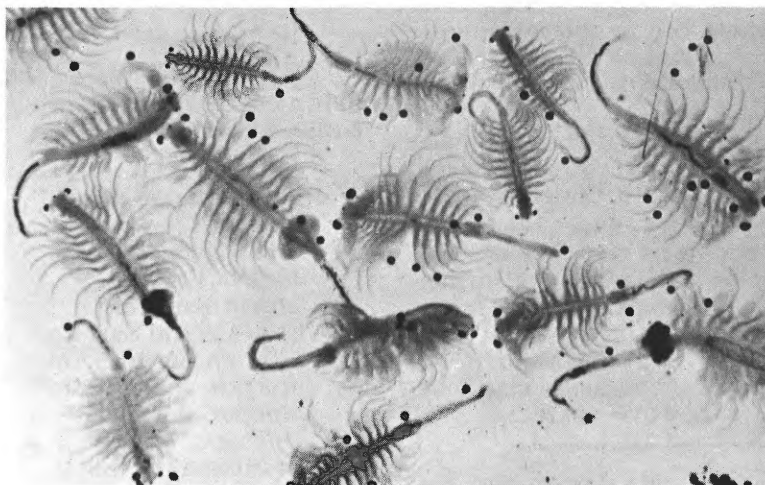
Oscar W. Van Auken (Botany Dept., University of Utah) is studying the algae of the Great Salt Lake.

Algae — Abundant Sediment

Algal secretions (reefs) comprise about 100 square miles of the lake bottom and related lands below the 4,200-foot contour. The porous, stony carbonates are the secretions of the colonial algae, *Aphanothece packardii*. The rough mammillary-shaped colonies occur singly in deeper waters and on the periphery of reefs. In especially favorable locales they coalesce as shown in the photo, and form the main reefs. The thickness of these algal reefs is not well known; however, sub-aqueous scarps as high as 15 feet have been observed in several places.

Data resulting from a qualitative survey (species of algae present) and a quantitative survey (number of each kind present) will be studied in the light of chemical and physical data collected by the U. S. Geological Survey to determine why certain species are found in certain areas and what factors control their population size.

Upon completion of this work, he will study extensively the physiology of one or more species: including such characteristics as the osmotic pressure of the cytoplasm, growth rates, nutritional requirements, and organic and inorganic content of the cytoplasm.



BRINE SHIMP — In addition to algae, the only living creature to make the Great Salt Lake its home is the fragile little brine shrimp. The tiny animal is less than one-quarter inch long and is harvested for tropical fish food.

Photo, N. Wadsworth.

GOALS FOR UTAH

The fourth "Goals for Utah" report concerned the State's **natural resources — WATER, LAND, MINERAL and RECREATION-AL**. This report, prepared by the legislative committee chaired by State Senator Omar B. Bunnell, was released in the Deseret News on Friday, October 15. A panel discussion by members of the committee was broadcast Thursday, October 21 over KUED-TV. Citizens were able to speak directly to the participants by telephone during the question period. A few of the points emphasized are summarized below:

(1) **Utah's water laws** are unnecessarily complex and are based upon **past** (agricultural) needs; They must be revised to meet **modern** (Industrial as well as agricultural) requirements.

(2) To maintain a **competitive industrial position**, Utah must do everything in her power to encourage the development of her natural resources (mineral, land, water) and avoid deterrents such as discriminatory freight rates and taxations.

(3) Maximum utilization of Utah's **land resources depends** upon the early completion of the **cadastral survey** and the **topographic mapping** of the State.

SOUTH CENTRAL UTAH ANNUAL FIELD CONFERENCE

In spite of snow and generally cold weather, the 1965 field trip, sponsored jointly by the **INTER-MOUNTAIN ASSOCIATION OF PETROLEUM GEOLOGISTS** and the **UTAH GEOLOGICAL SOCIETY** was a great success. As described in the Guidebook, the emphasis of the field trip was: "the study of the resources for power in the south-central Utah region."

The first day included a stop at the **Smirl coal mine** in the **Kanab coal field**. Close examination of an 18-foot bed of coal in the Dakota Formation led to discussion of the Dakota-Tropic stratigraphy and the availability of water to develop coal

for electric power generation. **Dr. Goode** pointed out that the Navajo Sandstone offered an excellent potential source of water, but that it had not yet been adequately tested by well drilling in the Kanab coal field area. If the problem of water shortage were solved, the development of the Kanab coal field could progress without further delay.

The second day's trip was highlighted by several excellent talks on the Mesozoic stratigraphy of the area. The group found the stop at Tenneco's Upper Valley unit well no. 2 especially interesting. **Robert Long of Tenneco Oil Company** spoke on the exploration and production history of the **Upper Valley anticline**. Discussion brought in ideas concerning the hydrodynamic conditions in the area and the general stratigraphy of the Permian, Kaibab-Toroweap sequence.

The field trip was considered very beneficial. It introduced the participants to the varied resources of a region which has been little studied, but which is becoming one of the most active areas of exploration and development in the state of Utah.

STRAIGHT CLIFFS COAL

Coal of subbituminous B to high-volatile bituminous C rank occurs in the **middle member of the Straight Cliffs Sandstone**. The coal beds are lenticular, and are generally traceable no more than 1 mile. The U.S. Geological Survey has been mapping in the Kaiparowits region and reports that more than 50 measured sections of the middle members of the Straight Cliffs Sandstone and 3 geologic maps showing their location are now open-filed and are available for study at the U.S.G.S. office in the Federal Building, Salt Lake City. The maps are entitled "Northeast quarter of the Nipple Butte Quadrangle, Kane County," "Southeast quarter of the Nipple Butte Quadrangle, Kane County," and "Northwest quarter of the Gunsight Butte Quadrangle, Kane County." It is anticipated that many more measured sections and 5 new quadrangle maps will be placed on open file early next year, hopefully as early as February.

KANE COUNTY COAL

The **Resources Company** of Phoenix, Arizona, a subsidiary of Arizona Public Service Company, and its associates, initiated a study of their holdings in the **Kaiparowits coal field** of Kane County, in 1962. This 3-phase program was discussed in the February, 1965, issue of this Review. Since February, the State Engineer has approved an application by the **Resources Company** for the use of 102,000 acre feet of **Lake Powell** water. Some equitable charge for the diversion and use of the water will be made by the Bureau of Reclamation. Now that water is available, future developments are principally contingent upon the solution of technological problems.

Utilization of the coal resources also depends upon availability and development of land resources. Requests for land are made to the **Utah State Land Board**, which endeavors to secure title so that the lands can be sold and placed on the tax rolls. Two areas of several contiguous sections have been requested for plant sites: the northwest part of T. 43 S., R. 4 E., by the **Resources Company**; and 3 sections in the northeast part of T. 42 S., R. 5 E. and 3 sections in the southeast part of T. 41 S., R. 5 E. by **Richfield Oil and Peabody Coal Companies**. At least 2 townsite locations of several thousand acres each have been requested: Kaiparowits in T. 43 S., R. 4 E., and the lands peripheral to Glen Canyon City. The **Kane County Commission** may hire a planning expert to assist them in zoning and in producing a master plan for County development. Such a plan would set apart preferred locations for townsites, airports and other support facilities. The Land Board will be guided by the suggestions of the Kane County Commission concerning townsite locations.

At last account the Richfield-Peabody Companies were drilling with two rigs in the Kaiparowits area.

Coal. A black-colored, compact and earthy organic rock with less than 40 percent inorganic components formed by the accumulation and decomposition of plant material (AGI).

LIBRARY OF SAMPLES FOR GEOLOGIC RESEARCH

The Utah Geological and Mineralogical Survey maintains a permanent repository of samples for study of oil and gas drilling in the State of Utah and adjacent areas. Facilities for examination and study of the samples by any qualified individuals or groups are provided. The following wells have been added to the library since January 1, 1965. Additional wells are listed in Circular 39, 43, and 43a, and a new circular 48, which contains a complete listing of the oil, gas, and water well samples in the Utah Geological Survey Sample Library.

Wells Added Since January 1, 1965

	<i>Location</i>	<i>Operator</i>	<i>Well</i>	<i>Footage</i>
UTAH — Duchesne Co.	6-1S-2W	Carter-Stan.	#1 Blue Bell Unit	7390-12,518
	24-9S-15E	Shamrock	#2 Castle Peak	4700-6100
	15-9S-16E	Shamrock	#5 Castle Peak	1400-6140
	27-9S-16E	Shamrock	#6 Castle Peak	2800-6135
	10-9S-16E	Shamrock	#7 Castle Peak	1220-5305
	20-9S-16E	Shamrock	#8 Castle Peak	240-6150
	12-9S-16E	Shamrock	#1 Goates	240-2600
	11-9S-16E	Shamrock	#1 Walton Fed	1300-6300
	14-9S-16E	Shamrock	#2 Walton Fed	238-5200
	12-9S-16E	Shamrock	#5 Walton Fed	2480-4600
	15-8S-23E	Shamrock	#1 Wolf	3900-5350
UTAH — Garfield Co.	15-37S-2W	Tenneco	#1 USA-Tropic	1630-6820
UTAH — San Juan Co.	21-42S-26E	Davis	#1 Honolulu-Navajo	670-5959
	30-30S-24E	Humble	#1 Hatch Wash	0-8957
	5-43S-21E	Marathon	No. 2-5	950-4926
	28-40S-24E	Pure	#4 Aneth 2802	4615-5760
UTAH — Uintah Co.	33-16S-21E	Cal Co.	#5 Horseshoe Bend Fed (42-33)	3700-7746
	3-7S-21E	Shamrock	#3 Horseshoe Bend	3000-7131
	3-7S-21E	Shamrock	#4 Horseshoe Bend	2640-7073
	1-7S-21E	Shamrock	#2 McLish	3000-7190
	27-8S-20E	Shamrock	#1 Wash. Estate	3900-6180
	26-4S-22E	Sun	#1 Gov't Neal Unit	690-7210
COLORADO — Mesa Co.	12-9S-93W	Union Oil (Cal.)	#1 Buzzard Creek	TD8952
COLORADO — Moffat Co.	15-11N-99W	Humble	#1 Lookout Mtn.	0-9100
	29-8N-95W	Intex	#1 J. H. Reust	510-6000
	4-11N-102W	Pan Am.	#1-A Madeline P. Gilbert	0-9000
	25-11N-9W	Pure	#1 Timberlake Creek Gov't.	320-5770
	8N-29W	Sinclair	#1 Clara Sturman	4900-9650
	6-9N-91W	Skelly	#1 A. V. Sager	411-7687
	14-12N-95W	Union	#2 Wilson Fed.	10-4288
COLORADO — Montezuma Co.	10-34N-20W	Calvert	#1 Ute	5675-5938
	23-33N-14W	Continental	#1 Boulder Dome	3581-3675
	12-37N-20W	Hathaway	#2 USG	5205-5521
	11-34N-20W	Phillips	#3 Desert Canyon	5902-5962
	35-39N-16W	Pure	#1-15 Navajo	3930-3943
			Core	
	34-33½N-20W	Pure	#1 Ute Tribal	5712-6047
	28-33½N-20W	Sinclair	#1 Ute	
	25-33½N-20W	Sinclair	#2 Ute	5804-5905
	21-33½N-19W	Vaageey & V.	#1 Ute Mtn. Tribal "B"	0-1000
COLORADO — Pitkin Co.	10-10S-89W	Wadkins	#1 Gov't Coal Basin	0-3000
COLORADO — Rio Blanco Co.	27-1N-102W	Texaco	#1 Gov't-A. Wolf	0-9150
ARIZONA — Apache Co.	18-40N-29E	Marathon	#1 Navajo	164'

DR. EUGENE CALLAGHAN --- New Senior Geologist

Dr. Callaghan, a man of wide experiences in the earth sciences and mineral industries has joined the staff of the Utah Geological and Mineralogical Survey to take charge of mineralogical investigations. A native of Washington, he majored in geology at the University of Oregon and at Columbia University where he held the University and Kemp fellowships. He received his Ph.D. from Columbia in 1931.

His professional career includes positions as educator, administrator, and scientist. In the educational field, he served as professor of economic geology at Indiana University and was a member of the faculty of New Mexico Institute of Mining and Technology. Through employment and in-service training, he has become familiar with the educational needs of students planning careers in earth sciences and mineral industries. In the field of administration, he was commodity geologist for heavy chemical mineral resources in the U. S. Geological Survey during World War II and briefly held the position of acting chief of the Nonmetals Section. He was Director of the New Mexico Bureau of Mines and Mineral Resources for eight years during which time its funds more than doubled, and many projects were initiated. He has been active in engineering geology projects in Massachusetts, Puerto Rico, Turkey, and Iran. He has worked with Haile Mines, Inc.; De Leuw, Cather & Company; Hanna Mining Company; St. John d'el Rey Mining Company, Limited; and Cyprus Mines Corporation. Most recently, his work with Cyprus Mines was devoted to a study of mineral potential of the entire Mediterranean region and Middle East, and to special investigations and property examinations in Greece, Saudi Arabia, Israel, Spain, Portugal, and Morocco.

Dr. Callaghan is a member of the Society of Economic Geologists, The American Institute of Mining, Metallurgical and Petroleum Engineers,



Dr. Callaghan

The Institute of Mining and Metallurgy (London), and Sigma Xi, and is a Fellow of the Geological Society of America. His numerous published contributions in the field of geology are found in scientific journals as well as in publications of Federal and State surveys.

Lake Research

(Continued from Page 1, Column 1)

for the purpose of ascertaining the elemental content of deeper brine zones. Sediment samples will be collected. Various methods including X-ray, infra-red, differential-thermal, and spectroscopic will be used to identify the minerals and to determine the chemistry of the deeper brines. A grid of gravity core samples of the shallow bottom materials will be made.

Geologic Map

A more precise geologic map of the distribution of the bottom sediments of the lake and the relict lands will ultimately be produced.

PERSONNEL NOTE

We regret to announce the departure of **Ed Heylmun**, Petroleum Geologist, who left the Utah Geological Survey staff in late October, 1965, in order to work as a consulting geologist in Australia.

Ed received his B. S. degree from the University of Utah in 1949. Before joining the staff of the Utah Geological Survey in 1963, he worked for General Petroleum Corp. and Pubco Petroleum Corp. in exploration for new oil and gas fields in Wyoming. For the Utah Geological Survey he has prepared two bulletins, two special studies, an information circular, several reports of investigations which are on open file in the Survey office, and has co-authored an outline of Utah geologic history and stratigraphy. For the Intermountain Association of (Petroleum) Geologists, he edited the 1963 "Guidebook to the Geology of Southwestern Utah." In addition to full-time employment on the staff of the Utah Geological Survey, Ed has assisted the Geology Department of the College of Mines and Mineral Industries, and has taught courses in both Elementary and Petroleum Geology. He has been studying the fracturing of the earth's crust, and hopes to complete work on this problem and present the results as his Ph.D. thesis in 1966. Local and regional field study may now be augmented with worldwide data.

He is a member of the American Association of Petroleum Geologists, The Intermountain Association of Geologists, and the Geological Society of America.

Forthcoming Publications

Circular 48, a catalog of well samples in the Sample Library. This is a complete listing of the oil, gas, and water well samples in the Utah Geological Survey Sample Library, and is available from the Survey office. The catalog lists all wells for which we have samples or cores and is up to date through October 31, 1965.

Going to press in December.

Circular 47, Gold Placers in Utah.

Bulletin 77, Geology of the Deep Creek Mountains, Tooele and Juab Counties, Utah, by K. P. Bick.

Bituminous Sandstone Deposits, Elaterite Basin, Wayne County, Utah

Wayne County, Utah

Elaterite Basin is located in Tps. 29 and 30, R. 17 E., in remote southeastern Wayne County. The area is difficult of access by two jeep trails, and the traveler should study the Orange Cliffs topographic quadrangle (U.S.G.S.) and the "Reconnaissance map of bitu-

minous sandstone outcrops, Elaterite Basin, Wayne County, Utah" by H. Doelling, on open file in the Utah Geological Survey (103 Civil Engineering Bldg., Univ. of Utah).

The following formations are exposed in the Elaterite Basin, where they have a gentle northwest dip.

<i>TRIASSIC</i>	<i>Feet</i>	<i>Lithology</i>
Wingate Sandstone	300±	Massive, cross-bedded sandstone
Chinle Formation	300-450	Variegated shale
Moss Back Member	50-130	Gray sandstone & conglomerate
Moenkopi Formation	350-400	Thin-bedded siltstone
<i>PERMIAN</i>		
Upper Organ Rock Tongue	0-60	Gray to tan friable sandstone
White Rim Sandstone	100-200	Massive, cross-bedded sandstone
Organ Rock Tongue	117-870	Red siltstone, sandstone, shale

Most of the bituminous sandstone is found in the Upper Organ Rock Tongue and the White Rim Sandstone, although minor amounts occur in the Moenkopi Formation and the Organ Rock Tongue. The best exposures occur near the contact of the White Rim Sandstone and the Upper Organ Rock Tongue.

The southernmost exposures of the bituminous sandstone occur mainly in the Upper Organ Rock Tongue and consist of gray to tan medium - to coarse - grained sandstones with bituminous matter coat-

ing the grains. The thickness of the bituminous beds varies from 6 to 12 inches in sec. 17, T. 30 S., R. 17 E., to 20 feet in the northernmost sections of this township.

The first report of development of the deposit occurred in 1912 when several shallow assessment wells were drilled in Elaterite Basin (U.S.G.S. Bull. 951, p. 107). Since that time several large oil companies have engaged in exploratory drilling (E. Heylman, Utah Geol. Survey). No commercial production has been achieved at this writing.

New Publications

The following publications are available from the Utah Geological Survey, 103 Civil Engineering Building, University of Utah, Salt Lake City, Utah.

Bulletin 75, Reconnaissance of the Tertiary Sedimentary Rocks in Western Utah, by E. B. Heylman, 1965, 38 p., 5 illus. \$1.25.

Map 20, Shaded Relief Map of Utah, 1965, scale 1:1,000,000. 50c

Special Studies 13, Concentrated Subsurface Brines in the Moab Region, Utah, by E. J. Meyhew

and E. B. Heylman, 1965, 28 p., 7 figs. \$1.50.

Circular 46, Plain Facts About Oil and Gas in Utah, by E. B. Heylman, 1965, 14 p., post paid 25c.

Guidebook 19, Geology and Resources of South-Central Utah — Resources for Power, ed. by Goode and Robison, 1965, 177 p., \$5.00.

GYPSUM OUTCROPS NEAR MILFORD, UTAH

Utah Geological Survey field crews working in the Milford area report that a good grade of gypsum occurs in the central part of the Star Mountain Range just west of Milford, Utah. The gypsum occurs in rocks of Permian age which are exposed in a valley joining Elephant Canyon from the north (sec. 19, T. 28 S., R. 11 W.). Outcrops have been traced for a distance of about 3,000 feet north from Elephant Canyon. They are assumed to extend farther north where they are probably displaced about 600 feet to the east by a fault. The locality is eight miles from Milford and may be reached by the Lund and Elephant Canyon (gravel and dirt) roads.

Although the average thickness of 7 measured sections is 50 feet, there is considerable variation in thickness (32 to 90 feet) due to faulting and flowage.

The gypsum is medium- to fine-grained, compact, and (clean) white in color. A preliminary petrographic examination of several samples indicated that they were essentially pure gypsum. Due to the fact that an equivalent bed of gypsum south of Elephant Canyon is calcareous, additional tests should be made to determine the overall quality of the deposits.

In September, 1964, several unpatented claims were located on the outcrops but the current status of the land is not known.

The Utah Geological Survey field crews have been working under the direct personal supervision of Professor James A. Whelan (University of Utah, Department of Mineralogy) in their reconnaissance of the Star Mountain Range.

OPEN-FILE RELEASE

A map of the Flagstaff Formation has been prepared by Dr. Malcolm P. Weiss, Associate Professor of Geology at Ohio State University. The map is on open file at the Utah Geological Survey.