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RESEARCH TOWER TOPPLES ON SOUTH ARM OF GREAT SALT LAKE

Amoco's South Arm weather tower, which is located approximately seven miles from the western tip of Fremont Island and seven miles from Buffalo Point on Antelope Island, tipped over during a storm on February 15, 1979, at 8:30 pm. Interruption of the telemetric weather data from the tower was first thought to be due to instrument failure, and on February 23 Parks and Recreation personnel transported an instrumentation specialist for Oceanographic Services, Inc. to the tower site. A marker buoy identified the tower site, and the toppled tower was located by dragging the anchor.

On March 8, divers from Neptune Salvage Company inspected the tower and found it to be structurally sound, but an initial attempt to raise the tower and remove the instruments was thwarted by high winds. On March 13, a second attempt was made. It was initially planned to remove the instrumentation from the tower deck to make it easier to raise the tower, but the divers found that the instruments were located below the deep brine interface where the visibility was zero. The divers strapped truck tire innertubes to the tower deck and inflated them to break the tower free from the bottom muds. The tubes came bobbing to the surface, with the top of the tower approximately 8 feet below. The divers removed the instrumentation to one of

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Highway is destroyed by mudflow along Smelter Creek.

WET SPRING TRIGGERS AWESOME EARTHFLOW

An earthflow of unusual dimensions with unique characteristics occurred in the lower reaches of Smelter Creek, a tributary of Deep Creek, about 10 miles north of Lapoint and 12 miles northwest of Vernal. Fortunately the area was sparsely populated.

UGMS director, Don McMillan, and Bruce Kaliser, Chief of the Urban and Engineering Section, visited the site on Wednesday, April 18. Gently southeast-sloping pastureland began giving way, about 3:00 P. M. Monday, and in a matter of hours the small gully grew to a giant gash over one half mile long, three hundred feet wide, and in places twenty-five feet deep. Tremendous rumbling

accompanied the dislodging, overtopping and disintegrating of the huge masses of earth which continuously broke off the walls of the rapidly expanding canyon. The millions of cubic feet of earth which moved, mostly silt and fine sand, lique-

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DIGGIN'S

ABANDON SHIP — THE WANSHIP, THAT IS

At a Thrust Belt Conference held at the University of Wyoming, Laramie, April 27-28, Howard Ritzma, UGMS Assistant Director, presented a brief poster session paper outlining the problem of the Wanship "Formation" in the Coalville - Wanship area of northern Utah. Never formally proposed or defined as a formation, the Wanship has come to be applied to different rock sequences spanning a considerable length of Cretaceous (and possibly Paleocene) time. The name has also been recently misapplied to a shallow oil pay zone in the Pineview oil field.

Abandonment of the name Wanship was recommended. A comprehensive paper on the subject was also presented at the meeting by D. J. Nichols, USGS, Denver, formerly of Chevron, USA, Inc. The meeting was a joint effort of the Wyoming Geological Association, Wyoming Geological Survey, and Department of Geology, University of Wyoming.

GAS PROJECT PLANNED FOR UTAH COAL FIELD

The Department of Energy and Mountain Fuel Supply Co are jointly funding a \$1.2 million project to recover methane gas from coal deposits in central Utah.

The project is taking place at the Book Cliffs coal fields in Carbon County, an area known for high concentrations of methane. Mountain Fuel is planning to drill three experimental wells into the coal seams this year, some of which may be 2,500 feet deep. Once the well is drilled, sand slurried in a water gel or liquid nitrogen for foam will be pumped down the passageway to stimulate the flow of methane into the well bore. *from COAL NEWS, No. 4462/3-9-79*

LISBON VALLEY U-ORE FIND

An ore body with at least 4.5 million pounds of economically recoverable U_3O_8 has been discovered in the south end of Lisbon Valley, San Juan County. Grade of the ore is about $3\frac{1}{2}$ to 4 times the average grade of ores in the Utah portion of the Colorado Plateau.

Announcement of the discovery was made by Atlas Corporation, majority interest owner of the ore body and operator of the uranium mill in nearby Moab. The new source of rich ore appears to assure a long life for the milling operation, a major factor in the economy of Moab and southeast Utah.

1:250,000 GEOLOGIC MAPPING

The U. S. Geological Survey has in print five of the $1^\circ \times 2^\circ$ geologic quadrangle maps that will eventually provide coverage of the entire state of Utah. The Grand Junction, Moab, Cortez, Escalante and Salina quadrangles have been issued and Price, Tooele, and Vernal are on open file in preliminary form at U.S.G.S. Public Inquiries offices. The $1^\circ \times 2^\circ$ quadrangles are the familiar "Army Map Service" quadrangles.

The U.S.G.S. 1:250,000 map series, scheduled for possible completion in 1983, will replace the four quadrangles of the State Geologic Map sold by U.G.M.S. and now out of print except for the Northeast (Uinta Basin) quarter. UGMS will replace the out-of-print 1:250,000 maps with a geologic map of the state on one page at the 1:500,000 scale (scheduled for completion in late 1979 or 1980).

TEXAS GULF TO STAY

Rumors that Texas Gulf potash operations near Moab would be shut down were discounted by the plant general manager. Production of potash from its evaporation pond has increased by 35 percent over the last 6 years, resulting in an annual production rate of 200-250,000 tons of potash.

CENOZOIC VOLCANIC CENTERS MAP

U. S. Geological Survey Map I-1091-B, 1978, "Map showing Distribution, Composition, and Age of Late Cenozoic Volcanic Centers in Colorado, Utah, and southwestern Wyoming" has been issued and is now available through the U. S. Geological Survey Public Inquiries Office. The map and accompanying text assemble all pertinent data on areas of late Cenozoic volcanic activity including many age determinations of volcanic rocks heretofore unpublished. The compilation is intended to provide guidance to exploration for geothermal resources.

NEW QUICK LIME PLANT FOR UTAH

Steel Brothers Canada, Ltd., of Vancouver, B. C. announced plans for a 500-ton-per-day quick lime plant to be built south of Delta in Millard County. Limestone ore for the plant will be obtained from an open pit mine a few miles to the west in the Cricket Mountains. The plant will produce quick lime for use in flue gas scrubbers for powerplants and other industrial plants. Construction on the \$7 million plant will begin in 1979, and is expected to be completed in 1980.

MOUNTAIN DELL OIL AND GAS LEASE

The Salt Lake City Commission has issued an oil and gas lease on some 1,300 acres above Mountain Dell Reservoir in Mountain Dell Canyon covering part of the SW $\frac{1}{4}$ of section 25 and all of sections 35 and 36, T. 1 N., R. 2 E. Location is generally northeast of the reservoir and golf course. The lease contains a number of strict provisions for protection of the watershed and carries a 16 $\frac{1}{2}$ % royalty rate in event of production. Amoco paid about \$15.00 per acre for the lease, but has announced no immediate plans to drill. UGMS was consulted by the city on the advisability of leasing and terms of the lease.

**UTAH VALLEY WILDCAT
DEEPER THAN EXPECTED**

On July 1, 1977, Gulf Oil Exploration and Production Company spudded the No. 1 Banks well, NW SW Section 13, T. 8 S., R. 2 E., Utah County, a few blocks west of the town of Spanish Fork and nearly in a central position within Utah Valley. The Banks well was the first oil and gas test in the valley, the deepest prior drilling having been a 1003-foot water well in the town of Spanish Fork.

Before locating this "rank" wildcat, Gulf conducted geological and geophysical studies including seismic, magnetic, source rock analysis, gravity, and surface geological reconnaissance. The well was originally scheduled to 8500 feet, with the primary objective being to penetrate Tertiary sediments estimated to be about 8,500 feet thick based on seismic and gravity measurements. Paleozoic formations expected below the unconformity at the base of the Tertiary were secondary objectives.

The results of the wildcat test differed from its prognosis. Total depth was to 13,000 feet in what palynologists later confirmed as Miocene sediments. Paleozoic formations were never reached. Formation dips in the bottom of the drill hole were considerably greater than expected and several faults and/or unconformities were crossed during the drilling. Minor hydrocarbon gas shows were recorded in the drilling mud but did not

warrant testing. No cores or drill stem tests were run.

Unconsolidated gravels, conglomerates, clays, silts, and sands predominated in the first few thousand feet of the hole. Many of the conglomerates contained pebbles of recognizable formations ranging in age from Paleozoic to Eocene. Clasts of the Wasatch and Green River formations were especially common, as were the more resistant cherts and quartzites of the Paleozoic formations. Some sedimentary volcanics were drilled along with altered tuffs and pyroclastics. Beds were found to be better lithified with depth. Thin beds of lacustrine limestones were common, and occasional thin coals were encountered in the lower part of the hole. Red, green, orange, brown, and gray coloration predominated in the claystones, siltstones, sandstones, and conglomerates.

The well answered some questions but left others unresolved. The Miocene and younger sediments were much denser than expected, and seismic velocities in the Tertiary were faster than expected. Thicknesses of Tertiary rocks, depths of burial, and geothermal temperatures proved sufficient for generation of gas and oil within the Tertiary section, and porous and permeable sandstones were found. Left unresolved were questions relating to the yet undrilled section. Utah valley may contain sediments of Oligocene, Eocene, and perhaps Cretaceous ages, with some hydrocarbons.

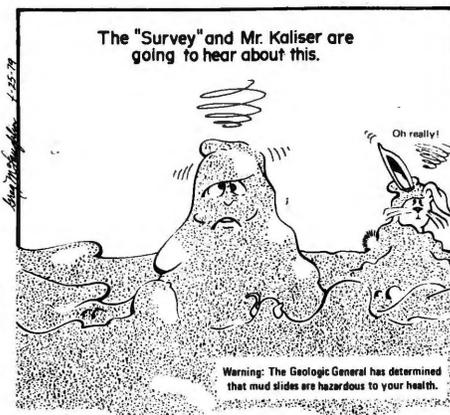
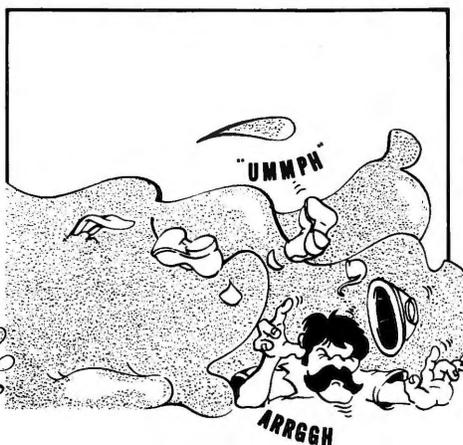
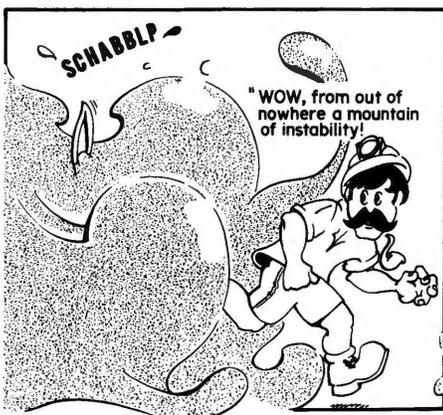
**ENVIRONMENTAL GEOLOGY
SECTION MAPS**

A map entitled "Surface-water resources of the northern Wasatch Front" has been given to the UGMS for publication in our Wasatch Front map series. Don Price and L. J. Jensen of the U. S. Geological Survey compiled the map, prepared some graphs and wrote an accompanying text. The 1:100,000 scale map, which portrays water quality data and stream runoff characteristics, covers the area from Weber Canyon north to Tremonton and includes the south one-half of Cache Valley and most of Ogden valley. A 1:100,000 scale map to depict the mineral resources, petroleum potential, and geothermal resources of the central Wasatch Front is also being prepared. This map, compiled by the economic, petroleum and research sections of the UGMS, covers most of Davis and Salt Lake Counties as well as the eastern part of Tooele valley.

**PROBABLE NATURAL GAS PRICE
HIKES FORESTALLED**

The legislatures of Wyoming and Colorado rejected proposals to hike severance taxes on oil and natural gas production. Utah imports about 67% of the natural gas consumed within its borders from these two neighboring states. The rejected tax proposals very likely would have led to substantial price increases being passed on to Utah consumers.

ROCKY RIDGES



by Greg McLaughlin

ENERGY DEVELOPMENTS

GEOHERMAL ENERGY "HEATING UP"

President Carter, in his energy speech Thursday, April 5th, did not mention the prominent role that geothermal energy can play in solving the nation's energy crisis. The U.S. Geological Survey estimates that about 2400 "quads" of energy exist in such geothermal systems at hot springs and volcanic centers. A "quad" is a quadrillion (1 followed by 15 zeros) BTU's. U. S. consumption for 1979 will be about 80 quads. This estimate means that 95,000 to 150,000 megawatts of electricity (1 megawatt equals 1000 kilowatts) might be producible from geothermal water, and at least 230 to 350 quads of energy for direct heat applications might be available.

Geothermal energy is presently being used in many areas of the U. S. Geothermal water and steam with a temperature above 400°F may be used in place of fuel oil to generate electricity; at the Geysers area of California, 608 megawatts of electricity are produced from natural steam. This is more than enough to meet the electricity needs for a city the size of San Francisco. Moderate and low temperature geothermal water may be used instead of fuel oil and natural gas for direct heat applications such as industrial processing and space heating. Klamath Falls, Oregon; Boise, Idaho; and Reno, Nevada are three cities using geothermal waters for direct heat applications.

Here in Utah, geothermal energy will soon be used to generate electricity and provide heat for a wide variety of buildings including offices and homes. Roosevelt Hot Springs near Milford has been the site of extensive geothermal exploration in recent years and two 50 megawatt electrical generation stations are scheduled to be producing electricity by 1984. Other sites in southern Utah are also being investigated to determine if geothermal systems capable of producing

electricity are present. Numerous hot springs throughout central and western Utah indicate low temperature geothermal systems that will be used to heat office space, greenhouses, warehouses, and homes. The town of Monroe will soon be heating a school and a number of other public and private buildings using 160°F geothermal water.

The Utah State Prison at Draper is presently investigating the possibility of heating the minimum security portion of the prison with geothermally heated water. Utah Roses, a major greenhouse facility in Sandy, plans to replace a heating system that uses expensive fossil fuel with a geothermal space heating system. The Division of State Lands and Forestry has drilled a geothermal well in the same vicinity and plans to use it to heat a forestry greenhouse. (See earlier issues of SURVEY NOTES for other geothermal news.)

The Research Section of the Utah Geological and Mineral Survey is making an evaluation of the low temperature resources of the State under a program funded by the Department of Energy. Over the past 2 years geological and geophysical investigations of known but unexplored low temperature resources have been in progress. To date over 20 geothermal test holes have been drilled along the Wasatch Front from southern Salt Lake County to the Utah-Idaho state line. Investigations by UGMS will continue into 1980.

Utah is fortunate to have a number of low temperature systems close to major population centers where maximum use of the resource can be made. Although energy derived from geothermal systems will never be put into the gas tanks of automobiles, geothermal energy can and will replace large quantities of fossil fuel presently being used to generate electricity and to heat the offices and homes of Utah.

TICABOO COMES TO LIFE

The first signs of activity leading to the birth of Ticaboo, a new town in Garfield County, began this month with surveying operations well under way. Ticaboo will be a community for employees of Plateau Resources, Ltd., a uranium firm that is planning to construct a mill near their present mine, about 20 miles north of Bullfrog Basin. Construction is scheduled to begin in early 1979. Ticaboo, which will be located near the mill, will house about 800 people. U.S.B.M.

MAJOR NEW URANIUM EXPLORATION ACTIVITY STARTED

Mountain States Resources Corp. and Anschutz Uranium Corp. have entered into an agreement which calls for Anschutz to conduct a major exploratory drilling program on the Mountain States Sinbad-Freeway claims in Emery County. The Sinbad-Freeway prospect consists of a group of about 180 claims totaling about 3,700 acres. Under the terms of the agreement, Anschutz will drill 10,000 feet in the first 6 months. U.S.B.M.

COASTAL STATES, GETTY TO DEVELOP UTAH MINE

Coastal States Energy Co., and Getty Mineral Resources Co. have announced plans to develop two underground coal mines near Scofield, Utah.

Under the joint venture, Getty and Coastal States have 50 percent interest in 6,400 acres of coal leases acquired by Coastal States last year. The companies will share equally in the \$65 million development costs over a 10-year period.

Maximum production at the mines is expected to exceed 5 million tons annually and production could begin by 1982, the companies said. The two firms said they plan to develop more mines on the property over the next 10 years as markets develop. *Coal News, March 16, 1979, published by National Coal Assn.*

ENERGY SOURCES

by Howard R. Ritzma, Assistant Director, UGMS

PETROLEUM STILL NUMBER ONE

Petroleum (oil and natural gas) continues to be the dominant source of energy used in the U. S. The share of the gross consumption of energy (national energy mix) provided by oil rose from 34.4% in 1947 to a peak of 46.1% in 1958 and has risen irregularly with subsequent peaks of 46.8% in 1973 and 48.6% in 1977. Oil's share of the national energy mix in 1979 is estimated to be at nearly equal the all-time record of 1977. Natural gas usage also climbed steadily from 13.7% of the national energy mix in 1947 to a peak of 32.9% in 1971 and has declined slowly since. Petroleum (the total of oil and natural gas), which provided less than half the nation's energy (48.1%) in 1947, rose to peak usage (77.6% in 1971 and has declined only slightly since, remaining between 75% and 73%.

Coal usage declined precipitously from 1947 to a low in the early 1970's but is slowly regaining prominence in the national energy mix. However, petroleum continues to supply 4 times more energy than coal.

Hydropower provides about 4.0% of the nation's energy with occasional downturns in periods of drought. There is little capability to expand this source.

Nuclear energy continues to gain slowly but is still a minor part of the overall national energy picture. Geothermal energy provides too small a part to be considered.

It seems safe to predict that petroleum (oil and natural gas) will continue to dominate U. S. energy for decades into the next century despite declining abundance. Prodigious and expensive efforts will be required to provide the replacement energy for petroleum, and a very significant amount of energy will be needed to effect the replacement.

Total consumption of energy in

the U. S. has risen almost without pause since the Great Depression of the 1930's. In 1947 consumption was 33,035 trillion BTUs. By 1963, it had expanded more than 50% to 49,308 and had more than doubled by 1970 to 67,143. Except for a sharp dip in 1975, consumption has continued to increase steadily, reaching 78,161 trillion BTUS in 1978..

The 70+ percent of U. S. energy provided by petroleum will not be replaced quickly or cheaply.

Even if percentages of oil and natural gas in the national energy mix gradually decline, the numbers of barrels of oil and cubic feet of gas will still have to remain high - possibly even increase - to meet the steadily burgeoning consumption.

Gross consumption of energy in U. S. by source % of total in selected years.

Source/year	1947	1958	1969	1971	1973	1974	1975	1976	1977	1978	1979
Oil	34.4	46.1*	43.7	44.7	46.8*	46.1	46.4	47.2	48.6*	48.2	48.5
Natural Gas	13.7	26.4	30.5	32.9*	30.2	29.9	28.3	27.2	25.9	25.7	24.6
Petroleum	48.1	72.5	74.2	77.6*	77.0	76.0	74.7	75.4	74.5	73.9	73.1
Coal	47.9	23.6	22.0	17.6	17.8	17.7	18.2	18.6	18.6	18.1	18.6
Hydropower	4.0	3.9	3.7	4.2	4.0	4.6	4.6	4.1	3.4	4.3	4.3
Nuclear	-	neg.	0.1	0.6	1.2	1.7	2.6	2.7	3.5	3.7	4.0

*Peak percentage. neg. = less than 0.1%. Sources: 1947-1976, U. S. Bureau of Mines; 1977, U.S.D.O.E.; 1978-79, Oil and Gas Journal (Prelim. & estimate).

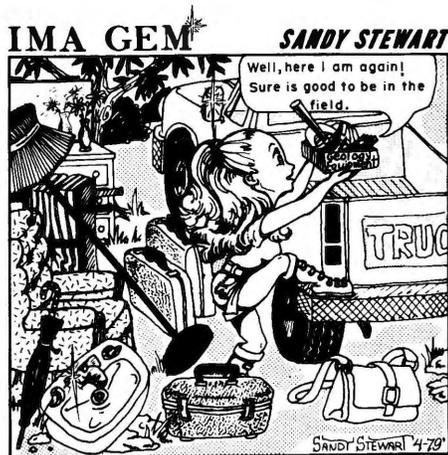
PLANS ANNOUNCED FOR NEW MINI-STEEL MILL

Tentative plans were announced for construction of a \$35 million mini-steel mill at Riverside in Box Elder County by Nucor Corp., a company with similar mills operating in South Carolina, Nebraska, and Texas. The proposed facility would employ 350 persons. Plant construction would begin next year and be completed in late 1980 or early 1981. The mill would process scrap steel (mostly junk automobiles) in electric arc furnaces to produce a variety of shapes such as angle and channel iron, flats, and smooth rounds. *from Minerals and Materials a monthly survey U.S. Bureau of Mines, January 1979*

SCRAP: VALUABLE RESOURCE

The nation's use of scrap continues to increase and the trend seems destined to grow as sources of some metals grow scarcer and prices move relentlessly upward. In 1979, the recycling of lead, aluminum, tungsten and cobalt increased most sharply with recycled amounts exceeding all previous peaks.

METAL	SHORT TONS	% Apparent Consumption
Lead	702,000	48
Silver	1,641	33
Copper	452,000	20
Tin	12,500	18
Nickel	45,000	17
Iron	24 million	15
Magnesium	10,000	10
Aluminum	502,000	9



OPEN FILE REPORTS

- Unpublished reports by the U.S. Geological Survey that describe the geology of Utah are kept on open-file at the Utah Geological and Mineral Survey, 606 Black Hawk Way, Salt Lake City, Utah. These reports may be inspected here or at the U.S.G.S. Public Inquiries Office, Federal Building, 125 South State Street, Salt Lake City, or they may be ordered from Open-File Services Section, Branch of Distribution, U.S. Geological Survey, Box 25425, Denver Federal Center, Denver, Colorado 80225.
- 77-866 Lithologic and Geophysical Logs of Holes Drilled in the Willow Springs Quadrangle, Emery and Sevier Counties, Utah, by Gary M. Edson and Cathy L. Barnosky, 1977.
- 77-872 Geochemical Survey of the Western Energy Regions, Fourth Annual Progress Report, July 1977, by the U.S. Geological Survey, Denver, Colorado, 1977.
- 78-102 Determination of Uranium in Source Rocks by Using Radium in Crystal Springs, Great Salt Lake Area, Utah, by J. Karen Felmlee and Robert A. Cadigan, 1978.
- 78-114 Mineral Potential of Altered Rocks near Blawn Mountain, Wah Wah Range, Utah, by D.A. Lindsey and L.M. Osmonson, 1978.
- 78-121 Selected Hydrologic Data, 1931-77, Wasatch Plateau-Book Cliffs Coal Fields Area, Utah, by K.M. Waddell, H.L. Vickers, Robbin T. Upton, and P. Kay Contratto. (Also known as Utah Basic-Data Release No. 31-628.1, Utlib no. 31).
- 78-147 A Potential Target for Potash Solution Mining in Cycle 18, Paradox Member of the Hermosa Formation, San Juan County, Utah and Dolores and Montezuma Counties, Colorado, by R.J. Hite, 1978.
- 78-148 The Geology of the Lisbon Valley Potash Deposits, San Juan County, Utah, by R.J. Hite, 1978.
- 78-257 Preliminary Geologic Map of Tooele 1° x 2° Quadrangle, Utah, compiled by W.J. Moore and M.L. Sorensen, 1978.
- 78-268 Geophysical Logs of 14 Test Holes Drilled during 1977 in the Kolob Coal Field, Kane County, South-Central Utah, by W.E. Bowers and P.M. Strickland, 1978.
- 78-303 U.S. Geological Survey Oil and Gas Resource Investigations Program, by R.F. Mast, 1977.
- 78-314 Preliminary Structure and Mineralogical Analysis of the Deer Trail Mountain-Alunite Ridge Mining Area, Utah, by C.G. Cunningham, T.A. Steven, and C.W. Naeser, 1978.
- 78-336 Proceedings of Conference IV The Use of Volunteers in the Earthquake Hazards Reduction Program, Convened under the Auspices of National Earthquake Hazards Reduction Program, 2-3 February, 1978, Peter L. Ward, Organizer and Editor.
- 78-337 Leasable Mineral and Waterpower Land Classification Map of the Brigham City Quadrangle, Utah, Idaho, by E.M. Pera, J.E. Smedley, and T.R. Flot, 1978.
- 78-338 Leasable Mineral and Waterpower Land Classification Map of the Price Quadrangle, Utah, by J.E. Smedley, E.M. Pera, L.A. Simpson, and Gale A. Lutz, 1978.
- 78-351 Biostratigraphic Guide to Upper Devonian and Mississippian Rocks Along the Wasatch Front and Cordilleran Hingeline, Utah, by Charles A. Sandberg and Raymond C. Gutschick, 1978.
- 78-380 Proceedings of Conference III Fault Mechanics and its Relation to Earthquake Prediction. Convened Under Auspices of National Earthquake Hazards Reduction Program, 1-3 December, 1977. Co-Organizers William D. Stewart, Amos Nur, and Convener, Jack F. Evernden.
- 78-465 Preliminary Geologic Map of the Price 1° x 2° Quadrangle, Utah, by Irving J. Witkind, David J. Lidke, and Lisa A. McBroome, 1978.
- 78-591 The Utility of Petroleum Seismic Exploration Data in Delineating Structural Features Within Salt Anticlines, by S. L. Stockton and A. H. Balch.
- 78-933 Proceedings of Conference V Communicating Earthquake Hazard Reduction Information, Convened Under Auspices of National Earthquake Hazards Reduction Program. Organizer and Editor, Walter W. Hays.
- 78-943 Proceedings of Conference VI Methodology for Identifying Seismic Gaps and Soon-to-Break Gaps Convened Under Auspices of National Earthquake Hazards Reduction Program, 25-27 May, 1978. Co-Organizers Bryan L. Isacks, George Plafker, and Jack F. Evernden.
- 78-956 Map Showing Appraisal of Oil and Gas Resources Potential of RARE II Proposed Roadless Areas in National Forests in the Idaho-Utah-Wyoming Overthrust Belt, by Richard B. Powers, 1978.
- 78-1040 Geophysical and Lithologic Logs of Two Holes Drilled in the Wasatch Plateau Coal Field, Old Woman Plateau Quadrangle, Sevier County, Utah, by L.F. Blanchard and C.G. Lee.
- 78-1049 Core Drilling in 1978, Willow Springs Quadrangle, Emery and Sevier Counties, Utah, by Gary M. Edson.
- 78-1093 Postulated Model of Uranium Occurrence in the Central Mining Area, Marysvale District, West-Central Utah, by Charles C. Cunningham and Thomas A. Steven.
- 78-1094 Measured Sections of the Lower Member and Salt Wash Member of the Morrison Formation (Upper Jurassic) in the Henry Mountains Mineral Belt of Southern Utah, by Fred Peterson.
- 78-1104 Geophysical Investigations in Southeastern Utah, by Vincent J. Flanigan.
- 78-1105 Geochemical Survey of the Western Energy Regions, Fifth Annual Progress Report, July 1978, by U.S. Geological Survey, Denver, Colorado.
- 79-241 Lithologic and Geophysical Log of Drill Hole BCR 1, Sec. 32 T. 20 S., R. 6 E., Emery County, Utah, by J. D. Sanchez and M. P. Kubatz.
- 79-279 Preliminary Report on Samples Collected During Lithium Reconnaissance Studies in Utah and Idaho, by Richard K. Glanzman and Allen L. Meier.
- 78-573 Preliminary Geologic Map of the Vernal 1° x 2° Quadrangle, Colorado, Utah and Wyoming, compiled by Peter D. Rowley, Ogden Twesta, and Wallace R. Hansen.
- 79-281 Stratigraphic Relations of the Navajo Sandstone to Middle Jurassic Formations, Southern Utah and Northern Arizona, by Fred Peterson and G. N. Pipirinos.
- 79-366 Map of Fault Scarps on Unconsolidated Sediments, Delta 1° x 2° quadrangle, Utah, by R. C. Bucknam and R. E. Anderson. *
- 79-370 Proceedings of Conference VII Stress and Strain Measurements Related to Earthquake Prediction, convened under auspices of National Earthquake Hazards Reduction Program, 1978.
- 79-434 Environments Favorable for the Occurrence of Uranium Within the Mount Belknap Caldera, Beaver Valley and Sevier River Valley, West-central, Utah, by Charles G. Cunningham and Thomas A. Steven.
- 79-535 Clinoptilolite Resources in the Tushar Mountains West-central Utah, by T. A. Steven and C. G. Cunningham.
- 79-552 Leasable Mineral and Waterpower Land Classification Map of Vernal Quadrangle, Utah, Colorado, Showing Lands Withdrawn, Classified, and Prospectively Valuable for Leasable Minerals and Occurrences of Other Selected Minerals Lands Withdrawn or Classified for Waterpower and Reservoir Sites, compiled by Elizabeth G. Allen, E. M. Pera, J. E. Smedley, and Gale A. Lutz.
- 79-724 Preliminary Geologic Map of the Frisco Quadrangle, Beaver County, Utah, by D. M. Lemmon and H. T. Morris.
- 79-727 Geophysical and Lithologic Logs for Thirteen Holes Drilled in the Book Cliffs Coal Field, Range Creek and Woodside Quadrangles, Emery County, Utah, by Howard F. Albee.
- 79-728 Geophysical and Lithologic Logs of Two Holes Drilled in the Book Cliffs Coal Field, Deadman Canyon Quadrangle, Carbon County, Utah, by Howard F. Albee.

WET SPRING TRIGGERS AWESOME EARTHFLOW

(continued from page 1)

fied and flowed rapidly on down the drainage, choking ponds, clogging culverts and lining ditches. Deep Creek and, in turn, the Uinta and Duchesne rivers were heavily charged with silt and soupy mud for at least 20 miles downstream.

Geologists McMillan and Kaliser indicate that the absence of ground frost combined with heavy snowfall and recent melting have contributed to unusual infiltration of water into the ground and creation of intense subsurface water pressure. Some of the area was extensively riddled with animal burrows, and witnesses reported seeing water gushing from passages exposed as the walls of the canyon caved and sank into the soupy morass below.

UGMS received notification by the State Office of Emergency Services on Tuesday. By Wednesday, the day the site was inspected by McMillan and Kaliser, the movement had more or less ceased, but the vertical wall of the gash created by the flow remained unstable and very hazardous.

Bruce Kaliser said that no earth-flow of such size and rapid development has been known to occur in Utah in recent time.

A county road traversed daily by school buses and serving area ranches was severed by the slide and will be relocated by skirting the hazard-susceptible terrain in the immediate vicinity of the flow. The work is already under way by Uintah County crews.

Recently UGMS distributed posters asking the public to report observations of ground cracks, sink holes, earth movements and like phenomena. The information could be of great value in disclosing areas possibly hazardous for building because of adverse geologic conditions.



Tower is floated to surface by inflated tubes.

RESEARCH TOWER

(continued from page 1)

the two service boats, which was moored directly to the submerged tower.

Two flotation booms were built to jack the tower out of the water. Lines attached to a service boat then pulled it upright.

The instruments were taken to the shore and immediately flushed with fresh water. Extensive corrosion by the brine appears to have essentially destroyed them. If the instrumentation can not be salvaged it is possible that Amoco will, when it moves its drilling operations to the south arm of the lake, place the instruments from the north land tower on the south arm tower.

Massive ice flows, normally not found on Great Salt Lake in the winter, were noted this year as late as February 9. It is possible that the tower was toppled by the wind-blown ice.

CARLTON STOWE SELECTED FOR SEMINAR

Carlton Stowe, Information Specialist with the UGMS, has been selected for a month-long expense-paid seminar at Columbia University in New York this June, by the National Endowment for the Humanities.

Mr. Stowe was selected on the basis of his activity in the field of energy and natural resources. The aim of the endowment is to advance public understanding



Divers from Neptune Salvage Company rescue solar panel.

and use of the humanities as a resource for professional leaders. Mr. Stowe will study "The Free Enterprise System of the United States" under Stewart Bruckey, professor of history and economics at Columbia University.

Mr. Stowe has been with the UGMS since 1970, and is also head of the publications and sales office.

PROSPECTING BIG COTTONWOOD

Geology, Ore Deposits, and History of the Big Cottonwood Mining District, by L. P. James is a must for explorers and hikers in the Wasatch Mountains east of Salt Lake City. The new UGMS Bulletin 114 includes a 4-color geologic map and a map showing the locations of more than 150 mines and prospects, between Mill Creek and Little Cottonwood and the Wasatch Front and Park City. Gems of information about the rip-roaring boom-days of mining are included in the history of the district. Cost: \$6.50 at the UGMS sales office, or add 10% for mail order.

SPRING! LAKE RISES

Great Salt Lake continued its annual rise in level as snow pack in the Wasatch and adjacent ranges melts away.

Gages as read by the U. S. Geological Survey:

Date	Boat Harbor (south arm)	Saline (north arm)
Feb. 1, 1979	4198.75	4197.75
Feb. 15	4198.90	4197.85
March 1	4199.10	4198.05
March 15	4199.40	4198.20
April 1	4199.65	4198.35
April 15	4199.85	4198.35

Early season predictions of a high level at 4200 feet will probably be exceeded by half a foot. Although much of Utah has recorded excessive precipitation with heavy mountain snow pack, the watersheds tributary to the lake, the northern Wasatch and western Uintas, have had only normal or less than normal precipitation. Logan in the Cache Valley recorded only 38% of normal precipitation in usually snowy March.

IN MEMORIAM
Ralph Saunders Gray
1899 - 1978

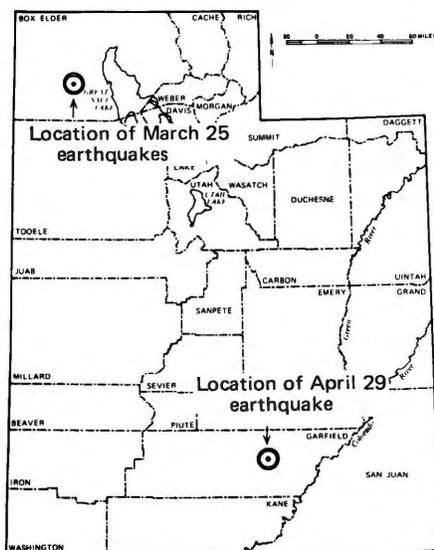
Ralph Gray, geologist and retired chairman of the Chemistry Department, Weber State College, died November 12, 1978 in Ogden, Utah. He was a graduate of the University of Utah in geology and chemistry and was an inspiring teacher and able administrator at Weber State College from 1931 to his retirement in 1968.

He was a member of the American Chemical Society, the Geological Society of America, Sigma Xi, and an honorary member of the Utah Geological Association. Among several of his pioneering projects combining geology and chemistry, one was analysis of the asphalt deposits of Rozel Point on Great Salt Lake.

EARTHQUAKES FELT IN UTAH

Three small tremors, felt on March 25, were clustered from 5 to 7 miles north of the Southern Pacific railroad near Newfoundland Siding, some 70 miles west of Ogden, site of numerous small quakes in the mid-1960's. A fourth tremor was felt April 29, near Capitol Reef National Monument. The University Seismograph Station, reports:

Local time	Latitude	Longitude	Richter Magnitude
March 25,			
12:01p.	41°22.59' N.	113°19.24' W.	2.7
12:14p.	41°23.29' N.	113°24.84' W.	2.9
2:42p.	41°20.53' N.	113°17.31' W.	3.2
April 29			
8:07p	37°52.98' N	111°00.98' W.	3.6



Depth of all events was calculated as 7 kms. No damage was reported.

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