SURVEY NOTES

VOLUME 24, NUMBER 2, 1990

UTAH GEOLOGICAL AND MINERAL SURVEY

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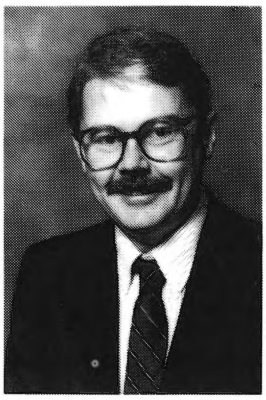

The Director's Perspective

by M. Lee Allison

The purpose of the Utah Geological and Mineral Survey (UGMS) is to gather and disseminate geologic information for the benefit of the citizens of Utah. We do this in two broad areas: natural resources and geologic hazards. However, if we carry out our research and just place the data in our files, we are not fulfilling our mission. Even if we publish our information we still aren't completing our mission if those reports lay on our shelves and no one knows of their existence.

Historically, the UGMS has followed traditional methods for disbursing our information to the public, industry, and decision makers. In recent months however, we have taken a much more aggressive stance in ensuring that our information gets out and is used. These efforts are specifically being carried out in part by the Industry Outreach Geologist and two Information Geologists. More detailed information on what these individuals have been doing make up the theme of this issue of *Survey Notes.*

UGMS has placed an even greater emphasis on information dissemination. In the area of natural resources, we are attending industry conventions and trade shows and actively marketing resource opportunities in Utah. Our newly revitalized Petroleum Section is engaged in a variety of high visibility projects which will soon be providing valuable information. Staff geologists are working with industry geologists daily. Instead of only documenting known energy and mineral resources, UGMS is now also publicizing resource "potential." This is particularly important for smaller companies or companies exploring operating in Utah.

Our information disseminating effort has been organized so that both Information and Industry Outreach Geologists work closely with other UGMS programs as well as on independent projects. Information Geologists, in addition to being highly trained scientists, translate technical information in understandable form for the lay person.

UGMS' role in identifying potential geologic hazards continues to increase. In past issues or articles, I have talked about the state earthquake program and of our significant part in that program. UGMS geologists are working with the State Legislature, the Governor's office, and various other entities to develop a comprehensive earthquake mitigation effort. As part of that effort, geologist Susan Olig has taken an aggressive approach to informing state and national building code officials about the impact her recent findings have for building design along the Wasatch Front. These kinds of strong actions directed to public officials responsible to the citizens of the state marks the direction of all UGMS programs.

Besides the personal commitment of staff members, we are branching out into new avenues of information and technology transfer. Computer data bases are either in place or being compiled on many areas of UGMS responsibility. As these become available they will be produced on computer diskette as well as the traditional printed version. We are also planning to have these databases available to the public at UGMS via a public-access computer. In addition, we hope to have public access and transfer capabilities via telecommunications. UGMS is also moving into video. We are advising and helping to finance an earthquake video being produced by scientists at Utah State University. When it is finished this fall, UGMS will reproduce and distribute it.

All in all these are exciting times for UGMS. Our studies are making more of an impact in the economic development of the state and in being prepared for dealing with Utah's natural hazards such as earthquakes. This is the mission of everyone at the Survey. It is a vital component of everything we do.

Survey Notes *is published quarterly by* ***Utah Geological and Mineral Survey,*** *606 Black Hawk Way, Salt Lake City, Utah 84108 (801) 581-6831. The UGMS inventories the geologic resources of the state, identifies its geologic hazards, disseminates information concerning Utah's geology, and advises policymakers on geologic issues. The UGMS is a division of the Department of Natural Resources. Single copies of Survey Notes are distributed free of charge to residents within the United States and Canada. Reproduction is encouraged with recognition of source.*

UGMS Information Section Public Inquiries 1988-89

by Miriam Bugden, Information Geologist

INTRODUCTION

The Utah Geological and Mineral Survey (UGMS) encourages use of their geological research to stimulate responsible development of well-known and little-known resources, provide safety in rural and urban planning, furnish educational materials, and equip tourists and residents with a better understanding of Utah's scenic resources. Sharing geological ideas and findings provides a tool for effective management of Utah's geological resources. This integral service is provided daily by all members of the UGMS staff through publication of our findings as well as by answering all incoming geological questions.

UGMS receives literally thousands of inquiries about Utah geology each year from all over the world. Whether they are looking for gold, locating active faults, cinder cones, or deposits of artisan's clays, Utahns, tourists, and and decision makers use the UGMS as a resource to explore answers to their numerous questions. Travelers, church groups, civic groups, environmentalists, homeowners and home buyers, advertising agencies, noevelists, engineers, urban planners, county commissioners, legislators, investors, teachers, students, film makers, etc. are all interested in one or more aspects of geology.

In order to efficiently address the growing volume of letters, phone calls and "walk-in" customers, the Survey saw early in its history the need to establish the position of Information Geologist. Initially, the Information Geologist responded to inquiries and produced a few publications directed at the more commonly asked questions. Over time, this position evolved into a full-fledged program within the organization. Officially established in 1989, the Information Section employs two geologists and one geological technician. Along with answering non-technical inquiries of all types, the Information staff manages their own databases, conducts studies, and compiles non-technical geological information for publications.

Questions answered by the Survey are diverse in both complexity and subject matter. Information geologists and geotechnician respond to all inquiries except those that are of a specific technical nature. Those inquiries are referred to geologists with expertise in Applied, Mapping, and Economic Geology Programs or to appropriate state or federal agencies. During the 1988-1989 fiscal year, incoming inquiries received by the UGMS Information Section were monitored to determine the amount and type of incoming inquiries. All questions were placed in one of four categories. Economic-related questions represented 57% of total inquiries; information-related questions represented 20%; mapping represented 17%; and geologic hazards represented 6% (figure below). It is important to note that the figures used in this article do not include public inquiries that were directed to and answered by the other four sections of the UGMS during the last year.

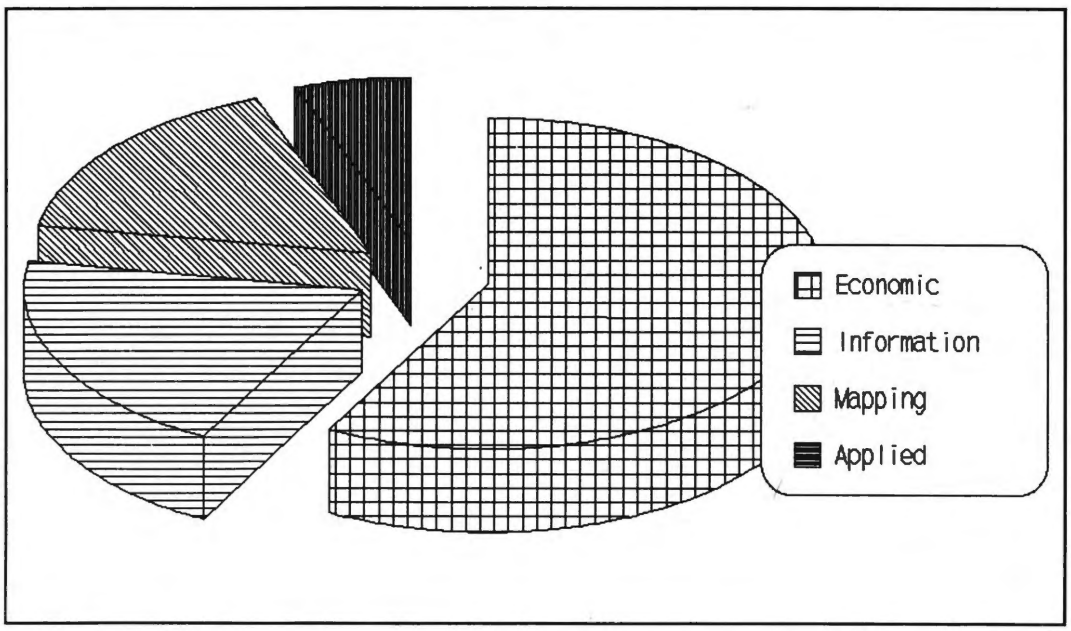

Diagram showing divisions and quantities of questions answered by UGMS Information geologists from mid-1988 to mid-1989.

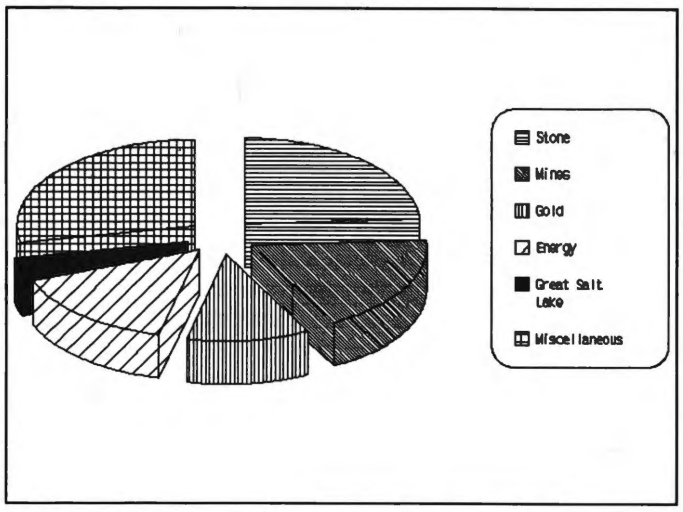

Diagram of divisions and relative percentages of Economic-related inquiries answered by UGMS Information geologists from mid-1988 to mid-1989.

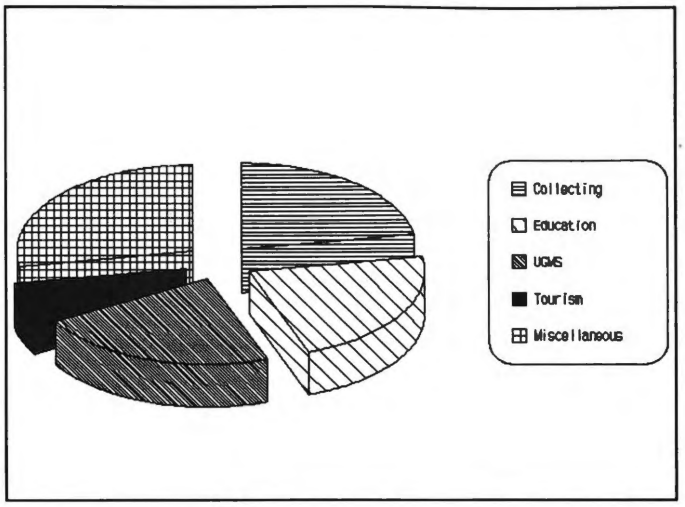

Diagram of divisions and relative percentages of Information-related inquiries answered by UGMS Information geologists from mid-1988 to mid-1989.

ECONOMIC INQUIRIES

The UGMS Economic Program studies, locates, and inventories our state's economic resources. Publications and maps produced by this group are used by industry and individuals who seek new economic resources and new markets for known commodities. Public inquiries that were classified as economic in nature range from questions about locations of attractive flagstone outcrops, to favorable locations for gold prospecting, to the status of active Utah mining operations, to types of metals used in nuclear fission. Fifty-eight percent of all monitored inquiries last year were of an economic nature. Of those, 53 % originated in Utah and 47% were from out of state.

The UGMS Information staff answered six categories of economic-related questions. The largest group of questions concerned Utah building stone, sand, gravel, and dimension stone. These inquiries totaled over 24% of all economic questions for 1988-89. Inquiries about specific mines or mining districts comprised 18% of the economic inquiries and questions on gold and energy totaled 12% and 15% respectively. Three percent of the questions were about the Great Salt Lake and 28% were miscellaneous.

INFORMATION INQUIRIES

Inquiries of a general, non-technical nature range from questions about the purpose of the UGMS, to the availability of educational programs, to directions to favorite geode collecting sites, to questions about the geology of Utah's state and national parks, to which state and federal agencies should be contacted about fossils, defunct corporations, or water ownership.

Last year, 42% of these inquiries were from Utah and 58% were from out of state. Questions classified as collecting included concerns about Utah's state gem, how to become involved in rock and mineral collecting clubs, where to find specific minerals, etc. These inquiries totaled 22% of all Information questions. Queries, primarily from students, teachers, and parents about non-technical, educational materials and field trips also totaled 22%. Another 22% of the questions pertained to inquiries about the purpose and goals of the UGMS. Tourism questions totaled 6% and miscellaneous inquiries were 28%.

MAPPING INQUIRIES

The UGMS Mapping Program is made up of scientists who map the geological formations and structures of our state. Geologic maps serve as foundations for all other types of earth science studies. They are a necessary medium for land-use planners, engineers, hydrologists, energy, metallic, and nonmetallic resource developers, and numerous other professionals.

Mapping-related questions answered by the Information section included stratigraphic inquiries, locations of specific geologic features (cinder cones, volcanic ash beds, geologic provinces, etc.), questions concerning collection of samples from specific geologic formations, and availability of field trips or other educational materials. Category percentages are: feature locations 33.3%, collecting sites 33.3%, education 13.3%, and miscellaneous 20.1%. Sixty-three percent of all recorded inquiries were from in state, 37% originated out of state.

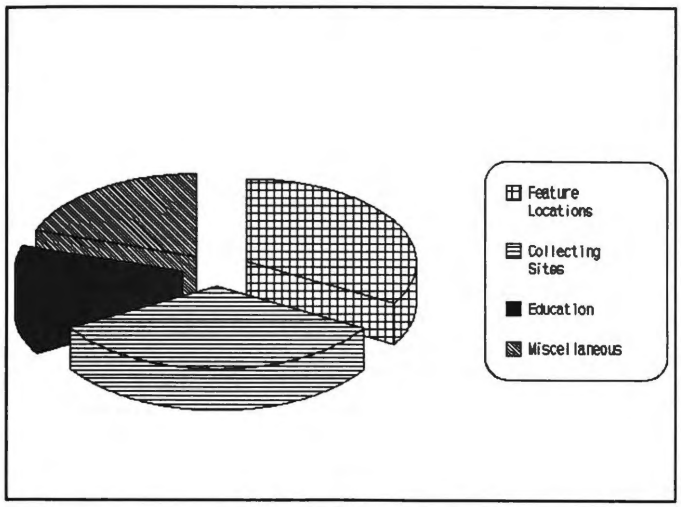

Diagram of divisions and relative percentages of Mapping-related inquiries answered by the UGMS Information geologists from mid-1988 to mid-1989.

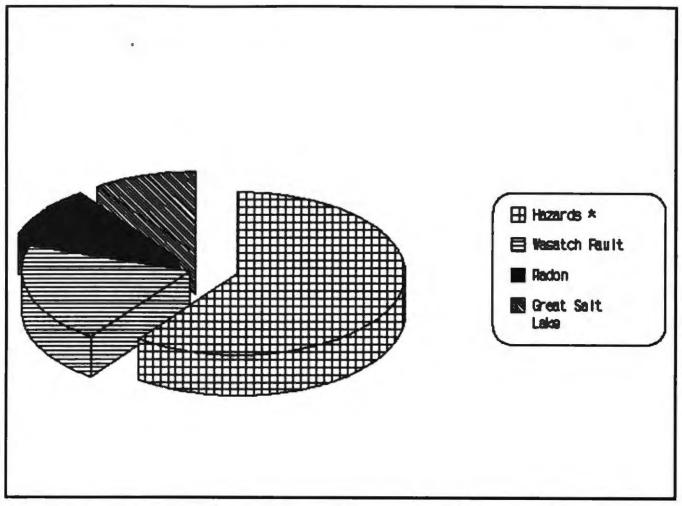

Diagram of divisions and relative percentages of Applied-related inquiries answered by the UGMS Information geologists from mid-1988 to mid-1989.

APPLIED INQUIRIES

UGMS Applied geologists delineate geologic hazards and conduct investigations related to engineering geology. Their duties include helping cities, counties, and school districts select and evaluate sites for critical government facilities including sanitary landfills, schools, water treatment plants, fire and police stations, and water storage tanks.

In 1985, the UGMS instigated the Wasatch Front County Hazards Geologist Program. Three hazards geologists were employed to encourage local governments to use geologic information and expertise to reduce losses caused by hazards. Originally funded for three years by the U.S. Geological Survey's National Earthquake Hazards Reduction Program, the geologists were retained under county funds by Utah, Salt Lake, and Davis Counties in 1988. At present, only Salt Lake County maintains a full-time hazards geologist.

This program and its respective hazards geologists minimized the number of Wasatch Front hazard-related inquiries handled by UGMS Information employees. Those queries not answered by UGMS Applied geologists were referred to the appropriate county. Consequently, the Applied diagram (see above) primarily represents hazard inquiries that concerned areas outside the Wasatch Front.

Seventy percent of the recorded Applied questions were from Utah and 30% were from out of state. Hazards concerns totaled 60% of the inquiries, questions about the Wasatch fault (not hazards per se) totaled 20%, radon issues totaled 10%, and 10% were about the levels of the Great Salt Lake waters.

CONCLUSIONS

In the past, the policy of the UGMS has been to accurately and efficiently answer inquiries as they come to us. This reactive approach to informational needs of industry, the public, and other state and federal agencies has been replaced by a more agressive policy. In addition to the Information Section, the UGMS has established an Industry Outreach Geologist position as well as an Associate Director. These positions were established with the intention of better serving the needs of industry, improving our marketing strategies, heightening our visibility, and strengthening all of our services.

An "H" of a Mess — Uinta(h)

by Howard Ritzma

The spelling of Uinta versus Uintah arises in newspapers, magazines, and publications of all types. With the important new energy developments in the Uinta(h) basin, the word is appearing all over the world with and without the "h" on the end and sometimes (regrettably) mispelled "Unita" even on the prestigious pages of the *Oil and Gas Journal, World Oil,* and the *New York Times.*

Standard usage by the U.S. Geological Survey and the U.S. Department of the Interior Board on Geographic Names has led to this rule of thumb (of course, with exceptions): If it's a natural feature, it's Uinta—Uinta Mountains, Uinta River, Uinta fault, Uinta basin, Uinta Creek, Uinta Gulch, and Uinta Park. If it's something man-made, it's Uintah—Uintah County, Uintah and Ouray Indian Reservation, Uintah (town in Weber County), and Uintah gas field. The exceptions are the Uinta Pipeline, headquartered in Denver, and the Uinta Base Line and Meridian on which the township and range grid is based in the Uinta basin.

There is a Hewinta Guard Station in the National Forest in Summit County, Utah, and a Uinta County, Wyoming, but the less said about them the better.

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Information Geology-Related Mineral Lease Contracts from 1989 to 1990

by Miriam Bugden, Information Geologist

In 1987, the UGMS initiated the Mineral Lease Special Projects Program (MLSPP). This program utilizes mineral lease funds (payments made to the Federal government by industry for mineral exploration and production on Utah's Federally leased lands) to pursue new types of geologic research at reduced costs and to retrieve existing geologic information which might otherwise be lost. While providing an element of stability to the UGMS budget, it also allows the Survey to tap expertise that is currently not employed by the State. This project also allows UGMS involvement in short-term, critical projects without committing to staff increases. Another objective of the Mineral Lease Special Projects Program is to obtain specific geologic information in areas of Utah that are not currently investigated by the UGMS staff and may have been overlooked in the past. Contracts are awarded annually by the UGMS Board of Directors.

One area of geology that in the past has maintained a low priority at the Utah survey and has been understaffed is the compilation and dissemination of non-technical, educational materials. The 1989 Utah Geological and Mineral Survey's informal solicitation of proposals for geologic projects encouraged, for the first time, projects complementary to the goals of the UGMS Information Section. Five of the total 27 contracts awarded this year will fund non-technical educational projects. The contract durations are from July 1, 1989 through June 1, 1990.

Products delivered to the UGMS at the end of a contract period will be published in one of two formats. The UGMS, however, has the right to publish all, part, or none or the final contract deliverables. Projects submitted as open-file reports will not be subjected to outside review processes nor will they undergo UGMS editorial attention. Limited numbers of copies of open-file reports are kept on file for public use in the UGMS library, and most are available for purchase. Projects submitted as editions in the UGMS Miscellaneous Publications Series require outside technical reviews and must be camera ready. They too are available for sale at the UGMS publication sales office (both departments are located at 606 Black Hawk Way, Salt Lake City, Utah 84108-1280, (801) 581-6831.

Information geology contracts awarded for this period will serve several non-technical needs by addressing a wide array of audiences. One of the five contracts awarded was to James R. Wilson, Professor of Geology at Weber State College. His proposal was to create a guide to rock, mineral, and fossil localities of Utah. This compilation of collecting sites will be written as an instructional guide for students, rockhounds, mineral and fossil collectors, and curious amateurs. Along with delineating sites, this publication will contain brief descriptions of local geology, mining histories, federal and state regulations, and many other helpful descriptions.

The depositional environment of Utah's famous Triassic-Jurassic Navajo-Nugget Sandstone has long been debated. Dr. William Lee Stokes has proposed investigating petrified mini-forests in the Navajo Sandstone that should shed new light on the origin of this scenic formation.

Dr. James Baer's (Brigham Young University) proposal for a road log of the geology from Spanish Fork, Utah to Price, Utah, will serve as a prototype for future, educational Utah geologic road-logs. Maps, photographs, and easy-to-understand descriptions of rock types and other geological features are featured in this publication (see New Publications).

Geologic Tours of Northeastern Utah, by Susan K. Morgan, Utah State University, promises to be a valuable contribution to the UGMS. Designed as a teaching aid, Ms. Morgan's project focuses on an area of Utah where rocks of various ages are exposed and form an excellent representation of the geological time scale. Landscapes formed by geologic processes of erosion, deposition, faulting, folding, and glacial and stream activities also characterize the area.

The Mineral Lease Special Projects Program is discussed in detail in *Survey Notes* vol. 22, no. 4, p. 20-25. After considering the aspects of the program as outlined in the the article above and in the article in the previous issue, you may feel that you have a proposal of value. To request detailed information on the program and to add your name to future mailings of "Informal Solicitation for Proposals for Geologic Projects," please write: *Proposals, Utah Geological and Mineral Survey, 606 Black Hawk Way, Salt Lake City, UT 84108-1280.*

New Publications from UGMS

Geologic resources of Salt Lake County, Utah, by Sandra N. Eldredge and Christine M. Wilkerson, Public Information Series 5, 32 p., 1990. $3.50

Coal bed methane resource map, Castlegate A bed, Book Cliffs coal field, Utah, by Alex C. Keith, John S. Hand, and A.D. Smith, 1 pl., 1:100,000, Open-File Report 176-A, 1990. ..... $2.00

Coal bed methane resource map, Castlegate B bed, Book Cliffs coal field, Utah, by A.C. Keith, J.S. Hand, and A.D. Smith, 1 pl., 1:100,000, Open-File Report 176-B, 1990. ..... $2.00

Coal bed methane resource map, Castlegate C bed, Book Cliffs coal field, Utah, by A.C. Keith, J.S. Hand, and A.D. Smith, 1 pl., 1:100,000, Open-File Report 176-C, 1990. ..... $2.00

Coal bed methane resource map, Gilson bed, Book Cliffs coal field, Utah, by A.C. Keith, J.S. Hand, and A.D. Smith, 1 pl., 1:100,000, Open-File Report 176-D, 1990. ..... $2.00

Geologic road log — Spanish Fork, Utah to Price, Utah, by James L. Baer, 70 p., Open-File Report 181, May 1990. ..... $5.60

Utah Mineral Occurrence System Database for the Delta 1° x 2° quadrangle, west-central Utah, by UGMS staff, 1 disk, 1.2M format, Open-File Report 183-DF, May 1990. ..... $5.00

Utah Mineral Occurrence System Database for the Richfield 1° x 2° quadrangle, west-central Utah, by UGMS staff, 1 disk, 1.2M format, Open-File Report 184-DF, May 1990. ..... $5.00

Utah Mineral Occurrence Database for the Cedar City 1° x 2° quadrangle, southwest Utah, by UGMS staff, 1 disk, 1.2M format, Open-File Report 185-DF, May 1990. ..... $5.00

Earthquake data for the Utah region January 1, 1986 to December 31, 1988, by S.J. Nava and others, MPF-4, 96 p., September, 1990. ..... $6.00

Radon hazards in Utah, by D.A. Sprinkel and B.J. Solomon, 24 p., Circular 81, 1990 ..... $3.50

Geology of the Hatch Mesa quadrangle, Grand County, Utah, by J.P. Chitwood, 60 p., 2 pl., Open-File Report 194, September 1990 ..... $7.80

Geology of the Sterling quadrangle, Sanpete County, Utah, by M.P. Weiss, 131 p., 4 pl., Open-File Report 195, September 1990 ..... $16.50

Geology of The Barracks quadrangle, Kane County, Utah, by E.G. Sable and H.H. Doelling, 39 p., 1 pl., Open-File Report 196, September 1990. ..... $4.70

Geologic Hazards and Land-Use Planning: Background Explanation, and Guidelines for Development in Weber County in Designated Geologic Hazards Special Study Areas, by Mike Lowe, in cooperation with Robert M. Robison, Craig V. Nelson, Gary E. Christenson, 70 p., Open-File Report 197, September 1990. ..... $5.75

Structural properties of the American Fork, Provo, and part of the Spanish Fork subsegments, Wasatch normal fault zone, Utah, by Ronald L. Bruhn, Joong-Jeek Lee, and William A. Yonkee, 43 p., Open-File Report 186, May 1990. ..... $3.50

Quaternary geology of the Scipio Valley area, Millard and Juab Counties, Utah, by Charles G. Oviatt, 60 p., 1 pl., 1:62,500, Open-File Report 187, July 1990. ..... $6.00

Lisbon Valley, Utah's premier uranium area, a summary of exploration and ore production, by William L. Chenowith, 46 p., Open-File Report 188, July 1990. ..... $3.75

The Newcastle geothermal system, Iron County, Utah, by R.E. Blackett, M.A. Shubat, D.S. Chapman, C.B. Forster, C.M. Schlinger, and C.E. Bishop, 179 p., 3 pl., 1:24,000, Open-File Report 189, July 1990. ..... $16.00

Cleat and joint system evaluation and coal characterization of the Lower Sunnyside coal, Sunnyside Mines, Carbon County, Utah, by Brigitte Hucka, 30 p., Open-File Report 190, July 1990. ..... $2.50

Ferron oil and gas field, T. 20-21 S., R. 7 E., Emery County, Utah, by Carol N. Tripp, 23 p., 4 pl., Open-File Report 191, July 1990. ..... $4.00

Wasatch Plateau oil and gas field, T. 13-17 S., R. 6-7 E., Carbon, Emery, and Sanpete Counties, Utah, by Carol N. Tripp, 33 p., 6 pl., Open-File Report 192, July 1990. ..... $6.00

Stratigraphy and ages of the basal Claron, Pine Hollow, Canaan Peak, and Grapevine Wash Formations, southwest Utah, by Patrick M. Goldstrand, 186 p., Open-File Report 193, July 1990. ..... $14.50

Geologic Hazards and Land-Use Planning: Background, Explanation, and Guidelines for Development in Davis County in Designated Geologic Hazards Special Study Areas, by Mike Lowe, in cooperation with Robert M. Robison, Craig V. Nelson, Gary E. Christenson, 75 p., Open-File Report 198, September 1990. ..... $6.25

Tertiary geology of the southern portion of the Eureka quadrangle, Juab and Utah Counties, Utah, by Jeffrey D. Keith and Choon-Sik Kim, 22 p., 1 pl., Open-File Report 199, September 1990. ..... $3.50

A Salt Lake Valley field trip guide for educators teaching 8th grade earth science, by Gregory Bemis, 46 p., Open-File Report 200, September 1990. ..... $3.75

—THE JUNE 1990 PUBLICATIONS LIST IS STILL AVAILABLE ON REQUEST—

Prices include shipping but not Utah sales tax of 6.25%

—SALES—

Utah Geological and Mineral Survey
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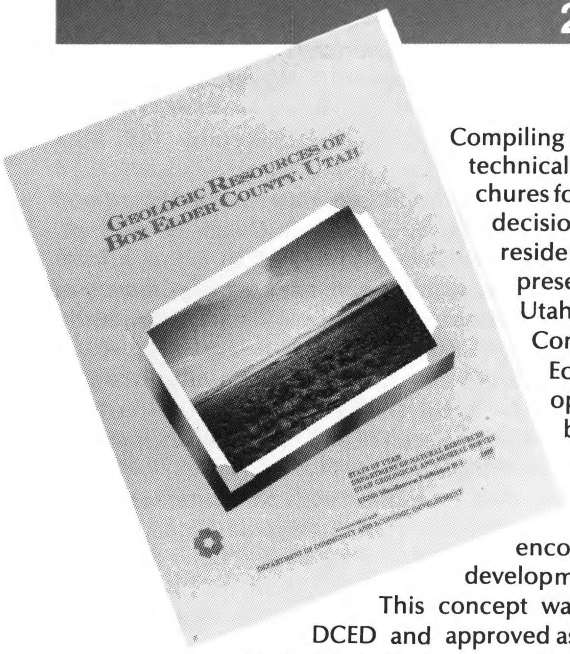
UGMS Produces Special Series 29 County Brochures



Compiling and writing non-technical geologic brochures for Utah's visitors, decision-makers, and residents was an idea presented to the Utah Department of Community and Economic Development (DCED) by former State Geologist Genevieve Atwood as a means to encourage economic development in Utah. This concept was presented to DCED and approved as a joint project with the Utah Geological and Mineral Survey in 1987.

The purpose of the brochure series is to introduce the reader to each county's geologic resources and the role they play in our economy and everyday lives. Research and compilation began on the project in January of 1988. The UGMS geologists assigned to the project selected Box Elder County as the first to study. Upon completing the list of the northwestern county's resources, it became apparent that this project could serve multiple purposes. Along with providing county officials with information concerning historical uses of local resources and helping to guide and encourage future economic development, this brochure would be informative and educational to tourists, teachers, scout leaders, students, civic groups, county commissioners, legislators, rockhounds, etc. A colorful format evolved after numerous meetings with the UGMS management team, Utah educators, and public affairs officers. In addition to listing metallic, non-metallic, and energy related resources in each county, the text discusses common uses of local resources, delineates occurrence locations or mining districts, and discusses historical events that influenced the economic development of each county.

Presently these brochures are available for Box Elder, Salt Lake, and Summit Counties, with others currently in production and preparation. They are bright, full of photographs, and contain color maps of both the generalized geologic resources and the generalized geology of each county. If you would like copies, please copy and use the form below.

ORDER FORM

TITLE	# OF COPIES	UNIT PRICE	TOTAL
Geologic resources of Box Elder County, Utah (MP 89-3) by S.N. Eldredge, M.H. Bugden, and C.M. Wilkerson, 1989. 28 pages, full color, 22 photos, 2 maps.	_____	$3.00	$ _____
Geologic resources of Salt Lake County, Utah (PI5) by S.N. Eldredge and C.M. Wilkerson, 1990. 29 pages, full color, 21 photos, 2 maps.	_____	$3.50	$ _____
Geologic resources of Summit County, Utah (PI7) by M.H. Bugden and C.M. Wilkerson, 1990. 23 pages, full color, 17 photos, 8 illustrations, 2 maps.	_____	$3.50	$ _____

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Information Geology — Its Role in the Utah Geological and Mineral Survey

by
Douglas A. Sprinkel

INTRODUCTION

Geology, like the other physical and natural sciences, has always played a role in the development of our society. Pioneers deciding where to settle were guided by the availability of arable land, good water, and materials for building homes. Although the pioneers didn't fully realize they were using rudimentary geologic principles, they made observations about the world in which they lived and used geologic information to make decisions. Like our ancestors, we make decisions which are influenced by maximizing arable land, protecting water quality, and providing materials used by a modern society. In addition, geologic information plays a critical role when selecting areas to explore for oil and gas, siting critical facilities, or designating areas for parks or wilderness.

The earth's natural resources are the basis on which most cultures and economies depend. The need to use natural resources, particularly geologic-based commodities such as metals, non-metals, and energy resources, is growing in order to provide many of the basic necessities of a burgeoning world population. Although these geologic resources once appeared limitless, many are finite and nonrenewable.

Once again there is general concern over environmental issues. Many people recognize that the earth is dynamic and that natural geologic processes create changes to its face over decades, centuries, and millenniums. Sometimes well-intended human intervention challenges these processes and often causes unsuspected and undesirable results. Likewise, utilization of the earth's geologic resources results in environmental consequences that may benefit the environment, but often threaten it if the development is improperly managed. Understanding and using geologic information can help prevent undesireable results, maximize the earth's limited resources, and minimize environmental side effects.

Society is faced with difficult decisions to maintain standards of living, improve the quality of life, and prevent the annihilation of all species, including our own. Issues concerning dependency on natural resources and protection of the environment are all interrelated and require more informed decisions. Most intelligent decisions are based on information available at the time. The use of accurate, complete, and available information generally leads to higher quality decisions. All too often, geologic observations are ignored or casually employed in the decision-making process. But by educating all sectors of society it is hoped that we can facilitate a more conscious use of geologic information to maintain a balance of wise development and protection of the environment.

Geologic information has traditionally been used by scientists and some governmental agencies to aid in their work or further their own research, but the traditional uses of geologic information are changing. In addition, the roles of scientists and geological organizations in society are also changing. They not only need to work within their traditional confines, but must also adapt to the increasing demand of providing geologic information for the general public. As a society grows in sophistication, the amount of discretionary or recreational time people have also grows. People have more time to explore their natural surroundings, learn about the landscape, and understand why geology is important in the environment. Today there is a growing need for geologic information that can be easily understood and used by a wide audience. The Utah Geological and Mineral Survey (UGMS) sees these changes as positive and has taken steps to adapt to this new role.

THE ROLE OF INFORMATION GEOLOGY IN THE UGMS

UGMS's fundamental mission is to investigate and collect geologic data and report its findings through publications. In essence, we provide geologic information on Utah's diverse and spectacular geology for the betterment of Utah, its citizens, and visitors. The UGMS has an established history of providing technical geologic information through its various publication formats, designed to primarily serve the scientific community, industry, and governmental agencies. The Survey will continue to provide highly technical information published by its Economic Geology, Applied Geology, and Geologic Mapping Programs. However, UGMS recognizes the growing need to provide geologic information for a wider audience and has designated the Information Geology Section to fulfill that mission.

Information geology has always played a role at the Survey. In the past, its primary responsibility was answering daily public inquiries and producing publications in response to popular public inquiries. But with an increasing demand for geologic knowledge, the Information Geology Section is adopting a more active approach to meeting the public's needs. In addition to producing a wider range of publications, this group will also continue its traditional role of answering inquiries from the general public.

The Information Geology Section consists of a small group of geologists skilled in translating technical information for publication. By minimizing or eliminating scientific jargon, these publications address the geology, as well as complex geologic principles and processes, throughout Utah. This is

often a difficult task because terms and principles easily understood by fellow geologists must often be avoided when describing the geology. An information geologist must accurately and simply describe the geology and geologic relationships in a creative way so the reader doesn't get lost in multiloquious geologic rhetoric; simply stated, lacustrine deposits are lake deposits, fluvial environments are stream environments, and gastropods are, for the most part, merely snails.

The task of accurately relating geologic information for non-geologist readers is further complicated because these publications are not always viewed as serious geologic work by many in the field (and often by some lay people as well). Information of this nature rarely conforms to traditional geologic literature formats. But it must have a thorough and accurate foundation — a solid basis in published literature is quite often augmented by independent research. Although this work may never be a landmark publication within the geologic community, it can potentially have an impact upon thousands of people, it helps readers understand more about their world, and it may change attitudes about the utility of geology in decision making. Correctly distilled geologic information is what makes people (especially children) get interested enough to find out more, and therein lies its greatest benefit.

PROJECTS OF THE INFORMATION GEOLOGY PROGRAM

Projects undertaken by the Information Geology Section include independent investigations and cooperative efforts with the other UGMS programs, government agencies and local geological societies. Publication formats depend on the specific audience and are limited only by the author's imagination. Recent published literature includes *The geologic resources of Salt Lake County, Utah* (Eldredge and Wilkerson), *The geologic resources of Box Elder County, Utah* (Eldredge, Bugden, and Wilkerson), and *The geologic resources of Summit County, Utah* (Bugden and Wilkerson).

These are the first of twenty-nine reports highlighting the geologic resources of each of Utah's counties in cooperation with the Department of Community and Economic Development (see "29 County Brochures" article). The publications resulting from this project are directed toward county officials, educators, and the private sector. They are written to increase the awareness of the different geologic resources in each of Utah's twenty-nine counties and the role these resources play in the county's economy; *Earthquake hazards and safety in Utah* (UGMS, 1990) prepared in cooperation with UGMS, Utah Museum of Natural History, University of Utah Seismograph Stations, and Utah Division of Comprehensive Emergency Management; and *Earthquake fault maps of portions of Weber, Davis, and Salt Lake Counties* (UGMS, 1990) produced jointly with the UGMS Applied Geology Program and Wasatch Front county geologists. Publications in press include *Geologic road log, central Wasatch Mountains, Salt Lake and Summit Counties* (Bugden). Projects in progress include a geologic brochure describing the geology of Snow Canyon State Park and homebuyer's guide on geologic hazards. All of these projects are now published in UGMS's new **Public Information Series.** Some of these will be free, but most will have a nominal charge.

IMPORTANCE OF PUBLIC INQUIRIES

The Information Geology staff answers many public inquiries each year. As noted in the article by Miriam Bugden in this issue of *Survey Notes,* UGMS receives inquiries from many individuals ranging from industry officials to investors to school children. The Information Geology Section will continue to answer public inquiries because it is an integral part of UGMS work and is one of the best indicators of what publications are needed in the public arena. Just as it is important for Information Geology to keep in touch with the public, the other UGMS programs need to be in touch with their respective audiences. Thus, more specific and technical inquiries are forwarded to the appropriate UGMS program or to the appropriate state or federal agency.

SUMMARY

Information Geology is not new to UGMS, but the philosophy of actively producing geologic information for a wider audience is. Publications of the UGMS Information Section have always been scientifically based, but encouraging information geologists to conduct field work and collect data as the basis for their translated publications is new. UGMS information geologists have more flexibility than before to conduct independent investigations or utilize published research to develop information for the public. Finally, the Information Geology Section is not simply a support group for the other geology programs at UGMS, but rather a partner in developing and maximizing all geologic information published by the Utah Geological and Mineral Survey.

ACKNOWLEDGMENTS

I would like to thank Sandra N. Eldredge, Michael L. Ross, M. Lee Allison, and Roselyn Dechart for reviewing the manuscript. Their suggestions greatly improve the result. I would like to especially thank Miriam H. Bugden for her critical and constructive comments and for preventing the final stages of writing the manuscript from entering the spirit world.

Meetings

The Annual Meeting of the Arizona Conference of AIME will be held December 2-3, 1990, at the Doubletree Hotel, Tucson, Arizona.

A complete range of technical sessions will cover the technologies of open pit mining, mineral dressing, smelting, underground mining, geology, and hydrometallurgy. The meeting will include the traditional keynote speaker and Conference Banquet.

For further information contact the Meetings Department, Society for Mining, Metallurgy, and Exploration, Inc., P.O. Box 625002, Littleton, CO 80162-5002, or call (303) 973-9550, or FAX (303) 979-3461.

U.S. GEOLOGICAL SURVEY 7TH ANNUAL V.E. McKELVEY FORUM ON MINERAL AND ENERGY RESOURCES will be held at Balley's Reno Hotel and Resort in Reno, Nevada on February 11-14, 1991. The theme of this forum is "Domestic and International Mineral Resource Perspectives." A special session on International Mineral Resource Studies by the USGS and other organizations will be featured. Two days of technical presentations, including two evening poster sessions and one workshop on the third day are planned. Approximately 24 oral presentations and 80 posters on studies related to mineral exploration are scheduled. Abstracts will be published in a USGS Circular that will be available at the Forum. For information contact Buhler and Abraham, Inc., 8700 First Avenue, Silver Spring, Maryland 20910, (303) 588-4177.

Society for Mining, Metallurgy, and Exploration

announces the

1991 Annual Meeting
February 25-28, 1991
Denver, Colorado

For additional information contact the Meetings Department, SME, P.O. Box 625002, Littleton, CO 80162, or call (303) 973-9550 or FAX (303) 979-3461

Teacher's Corner

by Sandra N. Eldredge

What geologic information is available for the area in which I teach? Where can I take my students on a field trip? Such teacher's inquiries received by the UGMS Information Section are addressed in several ways: we provide field trips for teachers so they can do the same with their students; and we discuss and direct teachers to appropriate resources. Often we can refer teachers to a numer of UGMS publications which are in the form of maps, road logs, and reports ranging from specific geologic topics to broad overviews. Following are just a few of the resources available.

Maps. Several base maps for the classroom are *Relief Map of Utah,* scale 1:100,000, UGMS Map 20 ($1.00); *Physiographic Subdivisions of Utah,* 8 x 11, UGMS Map 43 ($1.00); *Geologic Map of Utah,* scale 1:500,000, UGMS Map A-1 ($15.00); *Geologic Map of Utah,* 8 x 11, UGMS Map A-2 ($1.00). Topographic maps are available from the U.S. Geological Survey, Earth Science Information Center, Salt Lake City (524-5652).

Utah Geology. Two books address the state's geology: *Geology of Utah,* by W.L. Stokes, UGMS Miscellaneous Publication S, ($12.00); and *Geologic History of Utah, a field guide to Utah's rocks,* by L.F. Hintze (this is Brigham Young University Special Publication 7, for which UGMS acts as a sales agent), ($15.00).

Illustrative pamphlets. Non-technical publications about the economic resources and associated geology of *Box Elder County, Salt Lake County,* and *Summit County* are now available. Other county reports will be forthcoming (see 29 county article in this issue). The Box Elder County brochure is MP89-3 for $3.00, the Salt Lake County brochure is PI5 for $3.50, and Summit County brochure is PI7 for $3.50.

For those of you interested in Grand County geology, there is a 1987 Miscellaneous Publication, *Geology and Grand County.* This 16-page colorful brochure contains descriptive illustrations and photos, along with a brief text, covering geologic processes in the Uncompahgre Uplift, Book Cliffs, Uinta Basin, La Sal Mountains, salt anticlines, arches, and includes resources and geologic hazards.

Geology and Antelope Island State Park, Utah is another colorful brochure, published in 1988 as a Miscellaneous Publication. In 20 pages, the photos, illustrations, and text lead you through the geologic story of this intriguing Great Salt Lake island.

All these publications are available from Sales personnel at UGMS. For geology of other areas in Utah, contact the UGMS Information Section or request the most recent UGMS List of Publications.

UGMS Showcases Resource Opportunities at Industry Shows

by Patti F. MaGann

In keeping with UGMS's new philosophy of maintaining a high-profile image to public and industry, and with the advent of its newly-formed Industry Outreach Program, UGMS recently participated in the AIME (American Institute of Mining, Metallurgical, and Petroleum Engineers) and AAPG (American Association of Petroleum Geologists) conventions held in Salt Lake City and San Francisco, respectively.

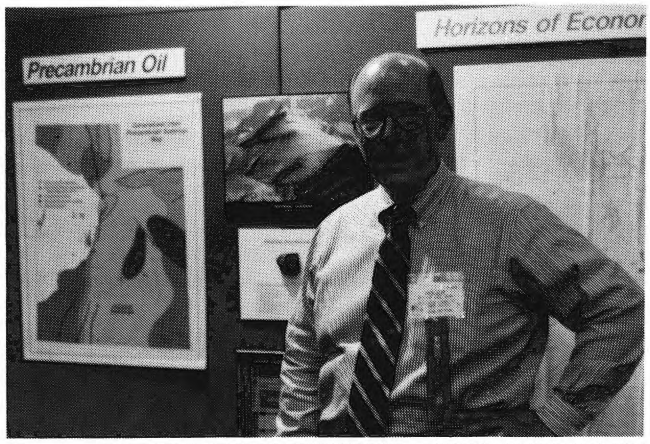
UGMS has a long-standing reputation as an information-disseminating organization, but it was a desire to enhance industry awareness of economic opportunities in Utah and exposure of UGMS that brought into existence the Industry Outreach Program. The program is administered by the Economic Section and headed by Industry Outreach Geologist, Roger Bon.
portable trade show exhibit to display UGMS information products such as maps and publications. The exhibit is the first of its kind for UGMS, and received considerable positive attention.

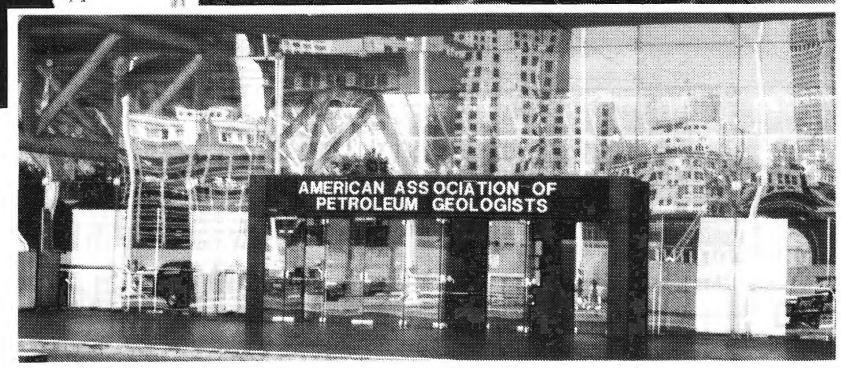
The industry trade-show format allows UGMS staff geologists first-hand opportunity to meet with varied private sector and government agency representatives — generating positive feedback and enabling UGMS to monitor the effectiveness of its on-going public- and industry-assistance/information programs.

"Part of gaining favorable publicity for the Industry Outreach Program and UGMS involves establishing a presence within the local mining and petroleum communities through visits to corporate offices and mine visitations, as well as participating in local, regional and industry-wide professional meetings, seminars, and trade shows," stated Mr. Bon. "Utilizing the convention/trade show format creates a cost-effective avenue to reach a lot of professionals. With 5,200 AIME participants and 6,300 AAPG attendees, the exhibit served as a viable business introduction for staff to meet with visitors to the booth."

Oil and gas exploration information is a new emphasis for the Industry Outreach Program. UGMS geologists presented poster sessions on coal bed methane and the Precambrian oil potential at the AAPG meeting, resulting in substantial interest and attracting further investigations from the industry. Base and precious metals exploration has also accelerated within the state as a result of the Program's efforts.

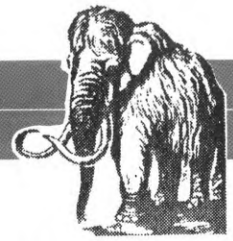
The initial success of the Industry Outreach Program has resulted in scheduled attendance by UGMS geologists at the AAPG Rocky Mountain Section Meeting, September 16-19 in Denver, and the Northwest Miners Association Annual Meeting held in Spokane, December 5-7. UGMS will also be represented at the Utah State Fair, September 6-16, in cooperation with the Department of Natural Resources.





Above: UGMS's introduction to the industry trade shows were successful. Heavy attendance at the UGMS exhibit presented staff geologists with the opportunity to showcase the potential for economic development of natural resources in Utah. Lower right: The San Francisco skyline towers reflected on the Moscone Convention Center, welcoming delegates to the AAPG show.

Upper right: Roger Bon, Industry Outreach Geologist.



Cool off! WASATCH MOUNTAIN GLACIERS

by Sandra N. Eldredge, Information Geologist

The large tusked mammoth drank from the cold, gray water flowing from the base of a 650-foot wall of ice. It was cool here during the summer months. Above, ridges and peaks of rock encompassed by snow capped the skyline. Place? Little Cottonwood Canyon. Time? 20,000 years ago.

Moving 20,000 years ahead, the scene changes: cars speed past where the mammoth once stood, hikers explore huge rock-walled ampitheatres, climbers cling to smooth rock walls, and skiers zip down steep gullies. Back in mammoth time, cars traveling up the canyon would have been under almost 1000 feet of ice, hiking would have been inaccessible, climbers would have needed crampons and ice axes, and skiers would have to traverse glacial crevasses.

What happened during the past 20,000 years was an impressive conclusion of the great Ice Age. The Ice Age, as its name implies, was a time of colder climate, beginning approximately 2 million years ago and continuing until about 10,000 years ago. Throughout the Ice Age, cycles of cold and warm climates occurred. During the colder periods, glaciers, which are moving masses of snow and ice, formed in the high mountains and plateaus of Utah. In the most recent glaciation interval, more than 50 glaciers existed in the Wasatch Mountains, the longest and largest of which was in Little Cottonwood Canyon, with a length of over 12 miles, and a thickness of at least 650 feet near its terminus at the mouth of the canyon.

Glaciers begin in the high reaches of the canyons. As the snow accumulates in basins, the bottom layers are compressed into ice. Once the ice is thick enough, its weight and the effect of gravity cause it to flow downhill. Glaciers carve out crescent-shaped rock basins bounded by high, steep walls (cirques). Glacial erosion is greatest in the upper reaches of the cirques. Erosion on opposite sides of ridges form knife-edged ridges (aretes) and sharp-pointed peaks (horns). The ice picks up rock, and the moving mass scours the valley bottom and walls, leaving striated, grooved, and polished rock that it travels over. The plowing glacier deepends and widens the valley, producing a wide U-shaped valley after the glacier melts. Tributaries of ice join the main glacier from side canyons that often end up "hanging" (hanging valleys) above the more deeply eroded main valley. The glacier tranports huge boulders, rocks, and sediment that are deposited on the sides of the glacier (lateral moraines) and at the front of the glacer (terminal moraine) as hills of debris (this material is called till).

From various viewpoints in Salt Lake Valley, glacial scenery includes the U-shaped valleys of Little Cottonwood and Bells Canyons, several cirques, aretes, and the horn-shaped Lone Peak. A tour of Little Cottonwood Canyon yields fine examples of glacial evidence. Approaching this canyon from any direction you may observe large white boulders scattered out from the mouth of the canyon. These were glacially transported from further up the canyon. The till lodged on the hillside to the north of the canyon constitutes the glacier's right-lateral moraine. The boulder-strewn ridge on the south side of the canyon is the left-lateral moraine. Slope breaks in the moraine are not glacial features but are part of the Wasatch Fault (that's another story). This moraine is adjacent to Bells Canyon right-lateral moraine. Bells Canyon has an obvious terminal moraine and left-lateral moraine as well, and all of these bound the Bells Canyon reservoir. Little Cottonwood's terminal moraine is missing probably because it was washed out by glacial melt-waters and/or wave action of ancient Lake Bonneville.

The glacier's thickness can be determined by several clues. Stop at the "Y" road junction (Utah State Highways 210 and 209) in the canyon mouth. A large white boulder is perched on darker rock on the south wall. The glacier plucked this boulder from further up the canyon and tranported it to this spot over 600 feet above you. Throughout your tour, especially on the way back down (which offers the best views), note a slight break in slope, from smooth walls steepening to a slope break and sometimes blockier rock above (about 1000 feet higher than the creek bottom).

Traveling up this classic U-shaped canyon, find evidence for ancient tributary glaciers on the south side of the canyon. Hogum Fork (3.5 miles from the junction) displays a prominent hanging valley and waterfall, as do Maybird Gulch, Red Pine Canyon, and White Pine Canyon. White Pine Canyon's glacier deposited blocky moraine material evident just off the right side of the road (5 miles from the junction). In the upper reaches of all these drainages, hikers can explore the beautiful cirques and small glacial lakes. At the head of the canyon, much of the Alta ski area would have been buried under snow and ice. The plucking action of ice cut back and steepened the walls of Devil's Castle. Looking down canyon from here, a prominent cliff wall forming one side of an arete bounds the west side of Hogum Fork.

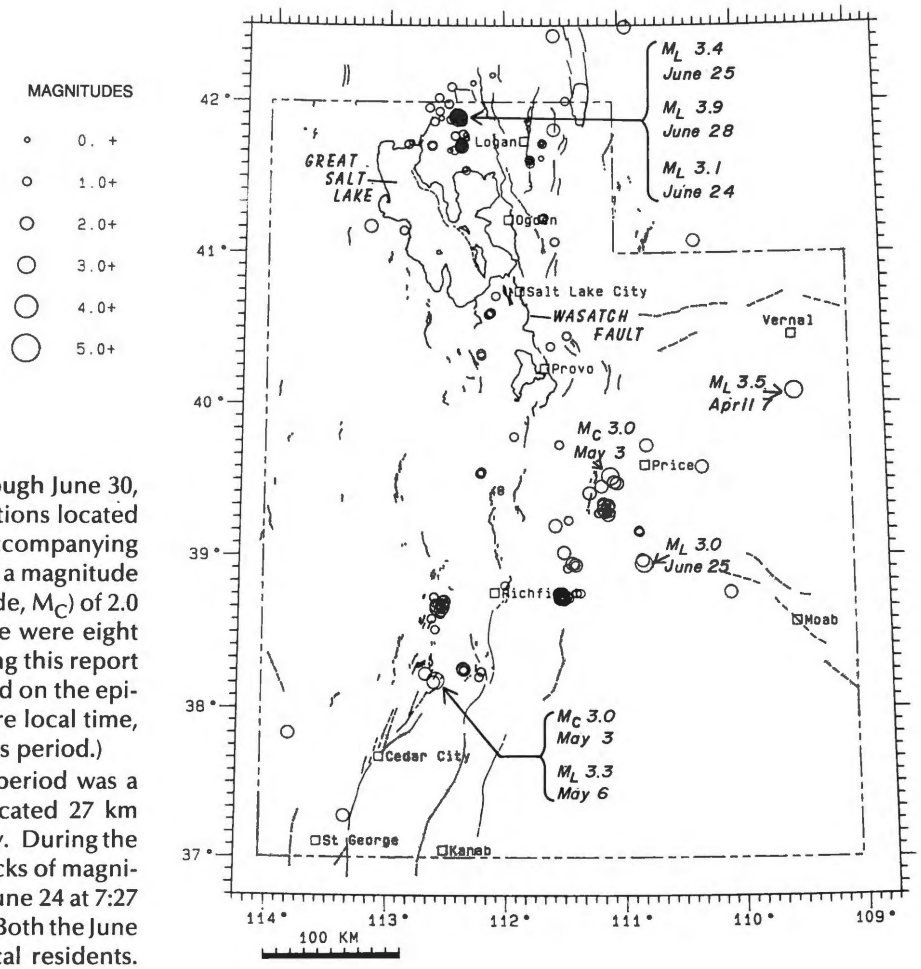
There are many other glacially sculpted areas in the Wasatch, including upper Big Cottonwood Canyon, American Fork Canyon, Mt. Timpanogos, and Mt. Nebo. Big Cottonwood Canyon is notable for the largest lateral moraine in the Wasatch, located on the northeast side of the road across from Solitude ski area. The terminal moraine at Reynold's Flat separates the wide U-shaped valley in the upper part of the canyon from the twisty, narrow part of the canyon below that was not worked by glaciers. The Lake Blanche area (Mill D South Fork) exhibits beautiful polished and striated rock.

These most recent glaciers in the Wasatch Mountains were at their maximum around 19,000 to 24,000 years ago. Slowly they receded as the climate became warmer, until finally they melted out from the highest reaches about 7,000 to 8,000 years ago, leaving behind their legacy.

Earthquake Activity in the Utah Region

April 1 — June 30, 1990

Susan J. Nava
University of Utah Seismograph Stations
Department of Geology and Geophysics
Salt Lake City, UT 84112-1183
(801) 581-6274



During the three-month period April 1 through June 30, 1990, the University of Utah Seismograph Stations located 418 earthquakes within the Utah region (see accompanying epicenter map). Of these earthquakes, 84 had a magnitude (either local Magnitude, M_L, or coda magnitude, M_C) of 2.0 or greater, and five were reported felt. There were eight earthquakes of magnitude 3.0 or greater during this report period; their epicenters are specifically labeled on the epicenter map. (Note: All times indicated here are local time, which was Mountain Daylight Time during this period.)

The largest earthquake during the report period was a shock of M_L 3.9 on June 27 at 6:05 p.m., located 27 km southeast of Snowville, in the Blue Creek Valley. During the four days preceding this earthquake, two shocks of magnitude 3.0 or larger occurred: one of M_L 3.1 on June 24 at 7:27 p.m., and one of M_L 3.4 on June 25 at 4:06 p.m. Both the June 25 and June 28 earthquakes were felt by local residents. During the report period, 185 additional shocks occurred in the same general vicinity.

Five other earthquakes of magnitude 3.0 and greater occurred in the Utah region during the report period: an M_L 3.5 event on April 7 at 9:37 a.m., located 41 km south of Vernal; an M_C 3.0 event on May 3 at 2:19 p.m., located 12 km east-southeast of Beaver; an M_C 3.0 event on May 3 at 10:03 p.m., located 9 km northwest of Hiawatha; an M_C 3.0 event on June 25 at 1:15 a.m., located 36 km west of Emery; and an M_L 3.3 event on May 6 at 7:11 a.m., located 11 km east-southeast of Beaver.

Three other earthquakes were reported felt in the Utah region during the report period. An M_L 2.7 shock on April 19 at 7:25 a.m. was felt at the Thiokol Corporation plant; an M_L 2.6 shock on May 1 at 8:38 a.m. was felt in Beaver; and an M_C 2.8 shock on May 25 at 6:27 p.m. was felt in Hurricane and LaVerkin.

During the report period, 47 earthquakes were located in an area of northern Utah where an M_L 4.8 earthquake occurred on July 3, 1989 (see clustered epicenters 45 km west of Logan and 21 km south of the June 1990 Blue Creek Valley sequence). A cluster of 57 earthquakes (20 events of magnitude 2.0-2.8) occurred 38 km southeast of Salina (see clustered epicenters east of Richfield), and 14 km southeast of the location of an M_L 5.4 earthquake on January 29, 1989.

Books & Papers

USGS research on energy resources, 1990; program and abstracts, edited by L.M.H. Carter, U.S. Geolgoical Survey, Circular 1060, 1990. 99 p. (Sixth V.E. McKelvey forum on Mineral and energy resources). The 92 extended abstracts in this volume are summaries of the papers and posters presented at the sixth V.E. McKelvey forum on Mineral and energy resources. They represent an overview of the scientific breadth of USGS research on energy resources. Titles include: ***Thermal maturation in the Uinta Basin, Utah; Sedimentology, diagenesis, and reservoir character of Paleogene fluvial and lacustrine rocks, Uinta intermontane basin, Utah, evidence from the Altamont and Red Wash fields; Basin development and resultant sedimentation patterns during the transition from Sevier- to Laramide-style tectonism, central Utah; Architecture of clastic facies and location of coals associated with a major marine transgression, the Mid-Cretaceous of the Kaiparowits Plateau, Utah; Geologic evolution of the Uinta-Piceance Basin Province, northwestern Colorado and northeastern Utah; Alluvial sandstone geometrics and their relationship to coal deposition in a transgressive systems tract, Dakota Formation, Utah; Architectural studies in eolian reservoir rocks, the Lower Jurassic Nugget Sandstone of north-eastern Utah;*** and ***Algal mound carbonate reservoir, Aneth oil field, Paradox Basin, Utah, origin and related petroleum geology.***

Hydrology of the Prospector Square area, Summit County, Utah, by J.L. Mason, 1989, U.S. Geological Survey WRI 88-4156,75 p.

The Tooele 1° x 2° Quadrangle, Northwest Utah; a CUSMAP preassessment study, by H.J. Stein, Viki Bankey, C.G. Cunningham, D.R. Zimbelman, D.W. Brickey, M.A. Shubat, D.L. Campbell and M.H. Podwysocki, 1989. U.S. Geological Survey Open-File 89--467.

Aeromagnetic maps of the Uinta and Piceance basins and vicinity, Utah and Colorado, by V. J. Grauch and J.L. Plesha, 1989. Two sheets. Lat 38° to 41°, long 107° to 113°, scale 1:500,000. U.S. Geological Survey Miscellaneous Field Study MF-2008-C.

Geologic map of the Deep Creek Mountains Wilderness Study Area, Tooele and Juab counties, Utah, by D.W. Rodgers, 1989. Lat 39°40′ to 40°02′, long. 113°45′ to 114°. Scale 1:50,000. U.S. Geological Survey Miscellaneous Field Study MF-2099.

Preliminary surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah counties, Utah, by S.F. Personius and W.E. Scott, 1990. Lat 40°27′ to 40°52′30″, long 111°45′ to 112°. Scale 1:50,000. U.S. Geological Survey Miscellaneous Field Study MF-2114.

Mineral resources of the Notch Peak Wilderness study Area, Millard County, Utah, by D.B. Stoeser, D.L. Campbell, Victor Labson, D.R. Zimbelman, M.H. Podwysocki, D.W. Brickey, J.S. Duval, K.L. Cook, U.S. Geological Survey, and William Lundby, U.S. Bureau of Mines. U.S. Geological Survey Bulletin 1749-C, 1990. p. C1-C28, 1 plate in pocket. . . . $4.75

Delle Phosphatic Member; an anomalous phosphatic interval in the Mississippian (Osagean-Meramecian) shelf sequence of central Utah, by K.M. Nichols and N.J. Silberling. Geology, v. 18, no. 1, January 1990. p. 46-49.

Geologic characteristics of carbonate-hosted gold deposits associated with Tertiary igneous rocks, west-central Utah, by D.R. Zimbelman, C.J. Nutt and D.L. Campbell, 1988. U.S. Geological Survey Open-File 88-0244.

Audio-magnetotelluric soundings in the Delta, Utah 1° x 2° CUSMAP Quadrangle, by D.L. Campbell and Andrew Visnyei, 1989. U.S. Geological Survey Open-File 89-0538. Scale 1:250,000.

Coal quality characteristics of the Blind Canyoned, Utah, source of the Argonne #6 premium sample, by B.S. Pierce, R.W. Stanton and C.B. Cecil, 1989, 28 p., U.S. Geological Survey Open-File 89-0634.

Geologic map of the Richfield 1°x 2° Quadrangle, west-central Utah, by T.A. Steven, H.T. Morris and P.D. Rowley, 1990. Lat 38° to 39°, long 112° to 114°. Scale 1:250,000. U.S. Geological Survey Miscellaneous Investigations I-1901.

Upper Cretaceous and Paleogene sedimentary rocks and isotopic ages of Paleogene tuffs, Uinta Basin, Utah **and** ***Ages of late Paleogene and Neogene tuffs and the beginning of rapid regional extension, eastern boundary of the Basin and Range Province near Salt Lake City, Utah,*** by Bruce Bryant, C.W. Naeser, R.F. Marvin and H.H. Mehnert, 1989. p. U.S. Geological Survey Bulletin 1787-J, K.

Structures associated with strike-slip faults that bound landslide elements, by R.W. Fleming and A.M. Johnson, (A.M. Johnson, editor and others), Engineering Geology v. 27, no. 1-4, December 1989. p. 39-114.

Estimates of gas resources in over-pressured low-permeability Cretaceous and Tertiary sandstone reservoirs, greater Green River basin, Wyoming, Colorado and Utah. by B.E. Law, C.W. Spencer, R.R. Charpentier, R.A. Crovelli, R.F. Mast, G.L. Dolton and C.J. Wandrey (J.L. Eisert, editor). Gas Resources of Wyoming, Wyoming Geological Assn. Guidebook 40, 1989, p. 39-61.

Hydrologic evolution and water-supply considerations for five Piute Indian land parcels, Millard, Sevier, and Iron counties, southwestern Utah, by Don Price, D.W. Stephens, and L.S. Conroy, U.S. Geological Survey Water-Resource Investigation 89-4010.

Hydrologic characteristics of the Great Salt Lake, Utah: 1947-1986 by Ted Arnow and Doyle Stephens, U.S. Geological Survey Water-Supply Paper 2332. . . . . $5.00

Mineral resources of the Negro Bill Canyon Wilderness Study Area, Grand County, Utah, by Susan Bartsch-Winkler, J.E. Case, H.N. Barton, J.S. Duval, U.S. Geological Survey; and M.E. Lane, U.S. Bureau of Mines. 1990. p. D1-D19. 1 pl. in pocket. U.S.G.S. Bulletin 1754-D. $3.75

Mineral resources of the Fish Creek Canyon, Road Canyon, and Mule Canyon Wilderness Study Areas, San Juan County, Utah, by D.J. Bove, D.R. Shawe, G.K. Lee, W.F. Hanna, U.S. Geological Survey; and R.E. Jeske, U.S. Bureau of

Continued on page 15.

Survey Notes

Why — you may wonder — do we keep publishing this beast? As many other groups are now realizing, a newsletter is a means of communicating. With the advent of computer word processing and the xerographic copying process, newsletters proliferated and especially so in the U.S. Since desktop publishing packages have become more user friendly and abundant, newsletters with a polished look have begun appearing from minimal-size groups.

Our newsletter began as *Quarterly Review* with volume 1 number 1 distributed in August 1964. Under the Director, William P. Hewitt, the publication was intended as a review of some facet of Utah's geology, mineral inventory, or water resources, announcements of meetings or new publications, and information about the UGMS and its people. We still espouse the same concept, we still send out four issues a year. *Survey Notes* began with volume 10 number 1 of *Quarterly Review* in February 1976 and has since acquired a color cover as well as nicer paper stock.

That first issue of *Survey Notes* featured the newly adopted logo — which was included in the masthead — that reigned on all publications, vehicles, and doors until the winter of 1986, when the logo died and the new masthead emerged. Some things don't change. We still send one free copy within the United States and Canada to interested readers and to most of the schools in Utah. We encourage reproduction of articles or entire issues as long as credit is given. The primary concern is still communication. With the advent of a new approach to information dissemination at UGMS, it is our hope that *Survey Notes* will continue to be both useful and enjoyable. We hope our readers agree.

GREAT SALT LAKE LEVEL

Date (1990)	Boat Harbor South Arm (in feet)	Saline North Arm (in feet)
May 15	4204.60	4203.30
Jun 01	4204.30	4203.20
Jun 15	4204.30	4203.00
Jul 01	4204.00	4202.80
Jul 15	4203.80	4202.60
Aug 01	4203.50	4202.30
Aug 15	4203.20	4202.00

Source: USGS provisional records.

continued from page 14, Books & Papers ...

Mines, 1989. p. B1-B12. 1 pl. in pocket. U.S.G.S. Bulletin 1755-B. $3.50

Flexure and faulting of sedimentary host rocks during growth of igneous domes, Henry Mountains, Utah, by M.D. Jackson and D.D. Pollard. Journal of Structural Geology, v. 12, no. 2, 1990, p. 185-206.

Geologic map of the Leppy Peak Quadrangle and adjacent area, Elko County, Nevada, and Tooele County, Utah, by J.D. Schneyer, 1990. Scale 1:24,000. U.S. Geological Map I-1938 ..... $3.10

The Frontier Formation and associated rocks of northeastern Utah and northwestern Colorado, by C.M. Molenaar and B.W. Wilson. 1990. p. M1-M21. 1 plate in pocket. U.S. Geological Survey Bulletin 1787M. $3.50

Utah; water supply and use, prepared by G.E. Pyper, U.S. Geological Survey; *with sections on* History of water development, and Water management, by B.C. Saunders, Utah Division of Water Resources., U.S.G.S. Water Supply Paper 2350, p. 491-498.

Evolution of resource-rich foreland and intermontane basins in eastern Utah and western Colorado, *in the collection* Field trips for the 28th international geological congress. (P.M. Hanshaw, editor). Washington, DC: American Geophysical Union, 1989. 53 p.

Staff Update

Sharon Hamre joined the Editorial staff as a graphic artist, replacing *Julia McQueen,* who relocated to Denver. Sharon was previously employed for seven years at the Salt Lake Community College.

Alec Keith is on leave for the summer, gaining experience and training as a mining engineer in Washington. He will be back on board at UGMS in late September.

Craig Morgan is our new Petroleum Geologist II. Craig brings 11 years experience (formerly with Celsius in Salt Lake), to the Economic Section.

Effective August 3, *Doug Sprinkel* will assume the position of Special Assistant to the Director, over the Information and Computer Programs. *Bill Lund* will be the Deputy Director, a position which will cover the Editorial Support Program, and *Werner Haidenthaller* will accept dual responsibilities as the Associate Director and Budget Accounting Officer.

The Utah Geological and Mineral Survey Computer System

William F. Case

INTRODUCTION

Collecting, analyzing, and disseminating geologic information critical to governmental agencies, private industry, and Utah's citizens is a primary mission of the Utah Geological and Mineral Survey (UGMS). One of the major responsibilities of the UGMS computer group is to manage UGMS computer resources and data, and to disperse information in digital format.

UGMS COMPUTER FACILITIES

The computer system consists of a Novell local area network (LAN), a confidential-information user station, a computer-aided drafting (CAD) user station, a transportable PC, and a sample library user station.

A LAN is a network of personal computers connected to a personal computer dedicated as a file server. The file server maintains security of files, stores files, distributes files and software to users, and operates peripherals such as printers and communication devices. The UGMS LAN consists of 50 MS-DOS user stations of 8088, 286, and 386 personal computers communicating via Ethernet to a 286 PC file server. A laser printer and two dot-matrix printers (narrow and wide paper) are spooled directly to the file server. Seven dot matrix printers connected to PCs in working-group areas throughout the survey are remote LAN printers spooled by software to the file server. An 8088 PC communication server is dedicated for asychronous communication over telephone lines between the LAN and outside information sources. Another 8088 PC is dedicated as a terminal for a remote LAN user station. The UGMS LAN is connected to the University of Utah campus-wide area network via underground coaxial cable. Communication with 45 campus Novell LANS is possible through this connection.

The CAD user station hardware is a 386 PC which can operate independently of the network, a plotter which uses up to D-size paper, and a large digitizing table. The confidential information user station is a 386 PC which is independent of the LAN and contains all the necessary software on a hard disk. The machine is used only in a secured environment and the confidential data, with derivatives, is stored on a removable hard disk in a secured vault. The UGMS Sample Library has an 8088 PC which can operate independently or as a remote LAN station, and a dot-matrix printer.

UGMS DATABASES

UGMS scientists have developed and are maintaining large databases of Utah's energy and mineral resources, geologic hazards, and essential geologic attributes, e.g., geologic age of formations, stratigraphic sections, and rock chemistry. Mapping Group database characteristics were discussed in New Geologic Databases for Utah, Mark E. Jensen, *Survey Notes,* Vol. 23, No. 1, p. 18-21. UGMS databases available for public consumption will be discussed in a forthcoming *Survey Notes* article.

Some databases are static, they were compiled specifically for a project and are not maintained after the project is completed. Dynamic databases are maintained and updated regularly. Data classified as confidential are stored in secure environments and used only by approved UGMS scientists because they contain proprietary information donated by industry and governmental agencies. Public information data are available on request or as a UGMS publication. UGMS has traditionally distributed geologic information using paper-copy publications, but now, because personal computers are commonplace and users wish to import data into their software, UGMS Open-File Reports with numbers having a DF (Digital Format) suffix include data on a floppy disk. The floppy disk accompanying OFR 82-DF (Significant drill holes of the Wasatch Front ..., 1988) and OFR 87-DF (Great Salt Lake brine sampling ..., 1986) contains data and text files in ASCII format whjich may be imported into a variety of MS-DOS software packages. Open-File Report 182-DF, Computer programs for paleostress reconstruction using fault slip data (1990), contains compiled Pascal programs and sample data on a floppy disk.

FUTURE ACQUISITIONS

The future computer system at UGMS will streamline the flow of data collection, analysis, publication, and dissemination to the user. UGMS databases will be available for remote visitation by the public.

In addition to upgrading user stations for use of updated and more complex software; the future UGMS computer system will include: 1) a desktop publishing and graphics package; 2) a geographical information user station; 3) a UGMS bulletin board; 4) a public information user station at the survey; 5) lap top PCs for UGMS scientists in the field; and 6) a UNIX workstation for number-crunching and communications on a wide area network.

Currently available Open-File Reports in disk form

82DF Significant drill-hole data of the Wasatch Front valleys, including Cache Valley and Tooele Valley, Utah, by W.F. Case and C.D. Burt, 27 p., 1 diskette, 1988. . . . . $5.00

87DF Great Salt Lake brine sampling program 1966 to 1985; history, data base, and averaged data, by P.A. Sturm, 1 diskette, 360 Kbyte, 1986. . . . . $5.00

153-DF Utah Mineral Occurrence System Database for the Tooele 1° x 2° quadrangle, west-central Utah, by B.T. Tripp, M.A. Shubat, R.E. Blackett, and C.E. Bishop, 1 diskette, 1.2 Meg, 1990. . . . . $5.00

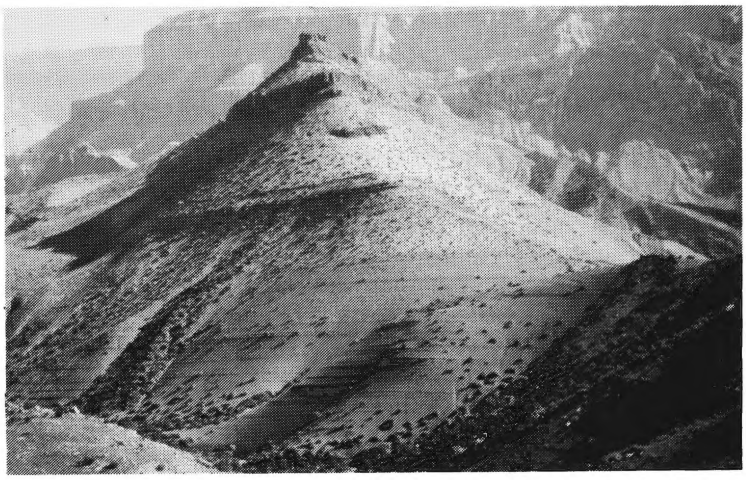
175-DF Utah indoor radon data, by D.A. Sprinkel and B.J. Solomon, 1 diskette, 1.2 Meg, 1990. . . . . $5.00

182-DF Computer programs for paleostress reconstruction using fault slip data, by Michael A. Shubat, 9 p., 1 diskette 360 K format; May 1990. . . . . $5.00

183-DF Utah Mineral Occurrence System Database for the Delta 1° x 2° quadrangle, west-central Utah, by UGMS staff, 1 disk, 1.2 M format, May 1990. . . . . $5.00

184-DF Utah Mineral Occurrence System Database for the Richfield 1° x 2° quadrangle, west-central Utah, by UGMS staff, 1 disk, 1.2 M format, May 1990. . . . . $5.00

185-DF Utah Mineral Occurrence Database for the Cedar City 1° x 2° quadrangle, southwest Utah, by UGMS staff, 1 disk, 1.2 M format, May 1990 . . . $5.00



Chuar Group exposed (foreground and center butte) in Grand Canyon.

Precambrian Oil Information Paper

Geologists at the Utah Geological and Mineral Survey (UGMS) and the U.S. Geological Survey (USGS) have found that Precambrian sedimentary rocks, comparable to the Late Precambrian organic-rich rocks discovered recently by Drs. Mitchell W. Reynolds and James G. Palacas (USGS) in the Grand Canyon, Arizona, may also underlie parts of southern and central Utah.

□ □ □

Tom Chidsey, petroleum geologist with UGMS, stated that Late Precambrian rocks of the Chuar Group exposed in the Grand Canyon, or equivalent rocks, may extend as far north as the Uinta Mountains. This belt of 700-850 million-year-old strata is bounded on the east by the Paradox Basin and on the west by the Wasatch Plateau. Chuar Group strata are absent under the San Rafael Swell, where they were apparently never deposited or were eroded off millions of years ago, and under the Uncompaghre Uplift, an area in east-central Utah adjacent to the Colorado border.

Chidsey explained that he examined records from more than 9000 wells in Utah and found that only 43 penetrated Precambrian rocks composed of various rock types, such as granites, metamorphic rocks, and sedimentary rocks. Using electric logs, rock cuttings from these wells, and outcrop samples from across the state, Chidsey has compiled a map showing distribution of Precambrian rocks over much of the state.

In the eastern part of the Grand Canyon, Arizona within a 5300-foot section of sedimentary rock in the Late Precambrian Chuar Group, Reynolds and Palacas found that more than 1000 feet of dark gray to black mudstones contain significant amounts of petroleum-generating organic matter, indicating good to excellent oil and gas source rock potential. From rock samples in Utah, Chidsey determined that these or equivalent Precambrian rocks extend into southern and central Utah, possible as far north as the Uinta Mountains. The Chuar rocks contain as much as 10 percent organic carbon content and average about 3 percent. Values over 1 percent generally indicate good source rock potential, especially if the organic matter is rich in hydrocarbon-generating material. Oil formed in these rocks could migrate vertically and perhaps laterally into more porous rocks where it can be trapped, forming pools and fields with economic potential.

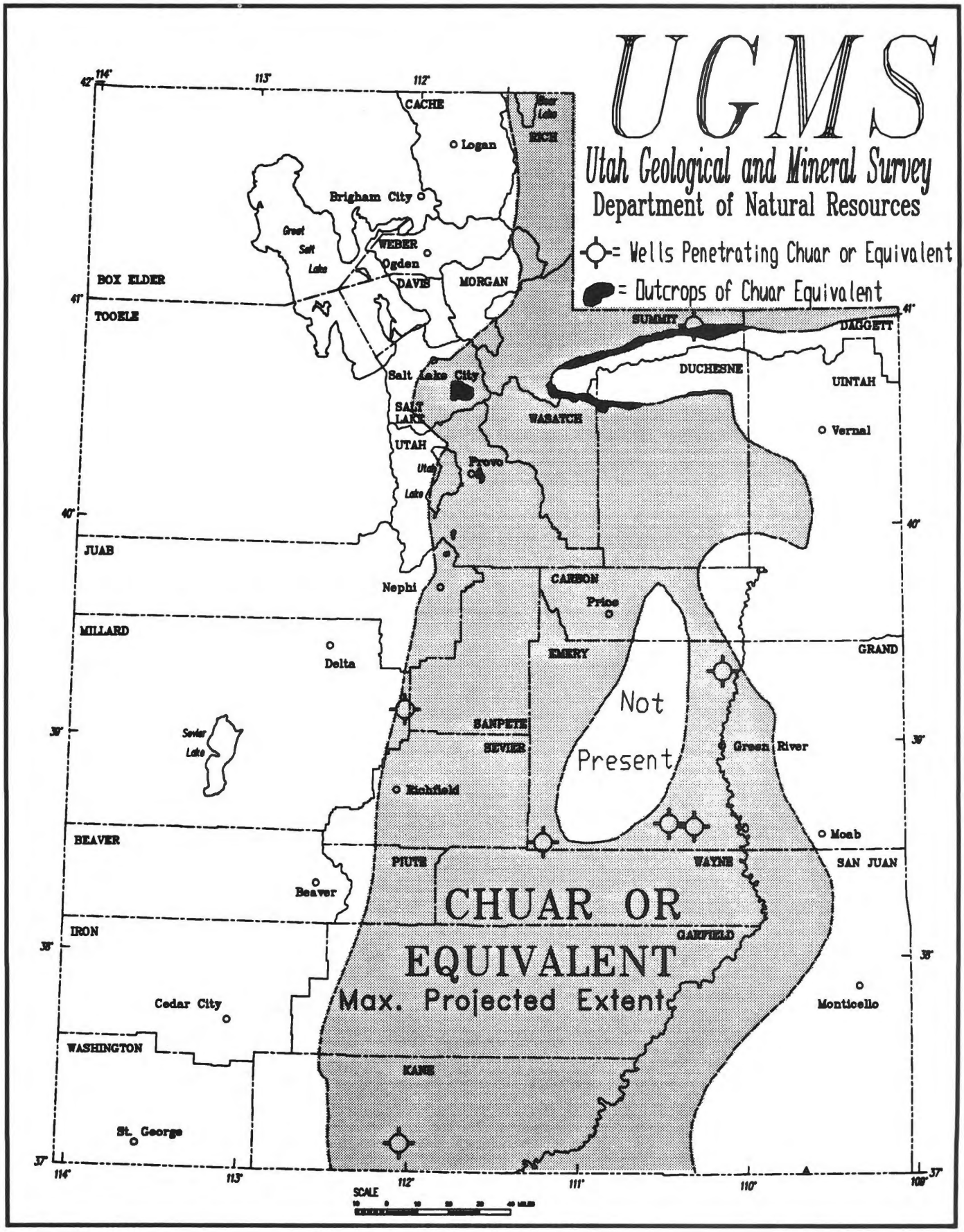
Chidsey also reported that Palacas has carried out extensive "fingerprinting" of various produced oils from across Utah in cooperation with the UGMS. Dr. Palacas identified oils from two fields that cannot be correlated with any oil or known source rocks in Utah but have certain similarities to the geochemical characteristics of Chuar Group rocks. The conclusion is that these two oil fields may have produced oil that originated in the Chuar Group, although Palacas warned that these oils could have come from other possible source rocks not yet recognized by geologists.

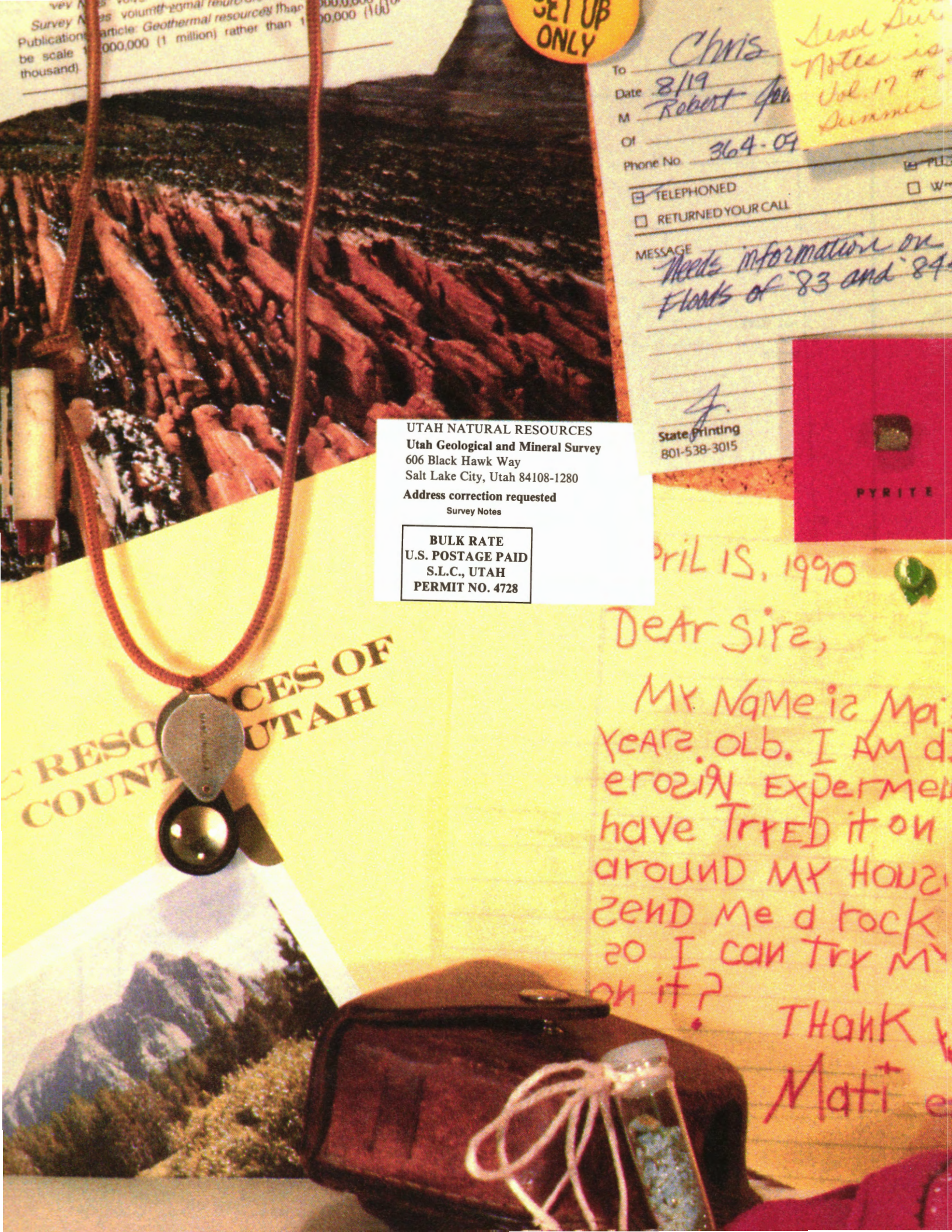
Precambrian-source oil could be trapped in other Precambrian-aged or younger rocks at depths of 5000 feet in the southern part of the state to depth ranges of 10,000-15,000 feet over much of the Colorado Plateau. Precambrian rocks in the Uinta Basin are likely to be too deep to be reached by present technology and economics. Chidsey believes the greatest potential for new oil fields may be in the Paleozoic-aged rocks overlying the Precambrian source rocks. He says these younger rocks generally have more pore space and can thus entrap more oil which would also be easier to produce. Only a relatively few wells have penetrated most of the lower section of Paleozoic rocks in Utah.

Numerous oil companies from throughout the country have indicated interest in the Precambrian oil play and many are thought to be carrying out studies similar to those of the UGMS and USGS. Chidsey said that companies looking for Precambrian exploration opportunities in Utah would likely interpret their own existing seismic lines, well samples, and other data, then collect new seismic data before drilling. The only way to confirm the potential of Precambrian-source oil fields is to drill into them, Chidsey said. This new information indicates that oil may exist in deeper layers than was previously thought.

The UGMS and USGS are continuing their studies on Precambrian rocks across Utah and on fingerprinting all oils and possible source rocks in the state as part of a multi-year, cooperative effort.

The attached map indicates where Precambrian-aged Chuar Group or equivalent rocks may exist in Utah and the location of existing wells that penetrate these rocks.


UGMS
Utah Geological and Mineral Survey
Department of Natural Resources
= Wells Penetrating Chuar or Equivalent
= Outcrops of Chuar Equivalent
CACHE
Logan
RICH
Brigham City
Great Salt Lake
WEBER
Ogden
DAVIS
MORGAN
BOX ELDER
TOOELE
SUMMIT
DAGGETT
DUCHESNE
UINTAH
Vernal
Salt Lake City
SALT LAKE
WASATCH
UTAH
Utah Lake
Provo
JUAB
Nephi
CARBON
Price
MILLARD
Delta
EMERY
GRAND
Not Present
SANPETE
SEVIER
Sevier Lake
Green River
Richfield
Moab
BEAVER
PIUTE
WAYNE
SAN JUAN
Beaver
CHUAR OR
IRON
GARFIELD
EQUIVALENT
Max. Projected Extent
Cedar City
Monticello
WASHINGTON
KANE
St. George
SCALE



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