

The Geologic Division Retirees Newsletter



Whitmore with a Small Problem...

An organization of retirees of the Geologic Division, U.S. Geological Survey, who seek to keep in touch with each other and with their former Agency.

Officers

National Officers

President	Susan Russell-Robinson		
Vice-President	John Keith	703-648-4384	jkeith@usgs.gov
Secretary-Treasurer	Jim McNeal	703-648-6650	jmcneal@usgs.gov

Regional Officers

East	John Keith	703-648-4384	jkeith@usgs.gov
Central	Marith Reheis		
Western	Patrick Muffler	650-329-5239	pmuffler@usgs.gov

Newsletter

General Dogsboddy	John Keith	703-648-4384
-------------------	------------	--------------

Production

Dave Newman

Directory Coordinator	Jim McNeal	703-648-6650	jmcneal@usgs.gov
------------------------------	------------	--------------	--

References	Bob Tilling	rtilling@usgs.gov
-------------------	-------------	--

Mailing Address

Geologic Division Retirees
U.S. Geological Survey
953 National Center
Reston, VA 20192

Email Addresses

gdretirees@gmail.com

About the Cover:

Frank Whitmore, 1915-2012, was one of the last of the Survey's vertebrate paleontologists. Here he is thinking, "If I don't get this sucker assembled by noon, I will lose my bet with Dutro. Now, let's see, does Tab A go to Tab AA, or is it Tab B?!" Photo by Dave Usher.

President's Message



Greetings from Northern Virginia.

For those of you who worked at the National Center, it is a beautiful spring with lasting blooms on the cherry trees, lots of yellow forsythia and daffodils, and other spring bulbs. The red buds and dogwood trees are full of blossoms. This will be quite the year for cicadas – both brood II and X (17- year cicadas) are about to hatch.

I hope most of you have received your vaccinations for COVID-19 by the time you read this column. I know it is a game changer for Rob and me as we will soon emerge from “locked down” because of our co-morbidities and the risks to our 8-month-old grandson, Russell. Our daughter works for NIH and participated in biweekly update meetings. Keep wearing your masks! Continue to follow good hygiene practices. The metro DC retirees’s organizations have been creative in keeping alive their monthly luncheons. Once a month – on a clear day – the group gathers appropriately distanced at the Temporary Road Park for bring-your-own lunches and good conversation. John Keith, Paul Hearn, Bill Burton, Sue Marcus, and

Steve Schindler attended the April 2021 meeting, along with 8 WRD retirees.

Some USGS Updates:

David Applegate, Associate Director for Natural Hazards, is steering the USGS in his assignment described as *Exercising the Delegated Authority of the Director, U.S. Geological Survey* (this means Acting Director). There are two Deputy Directors: Cindy Lodge, Deputy Director for Operations and Roseann Gonzales-Schreiner, Deputy Director for Administration and Policy. Geoffrey Plumlee serves as Chief Scientist.

Coastal/Marine Hazards and Resource Program (formerly Coastal and Marine Geology Program) has released a decadal strategic plan.

The plan’s vision is “A Nation prepared for coastal and ocean changes.” Interested in learning more, check out

<https://wim.usgs.gov/geonarrative/cmhrp/>

Tina Roberts-Ashby is the new center director for Geology, Energy, & Minerals Science Center, Region 1 (Reston), following Dan Hayba, who rotated out of the position.

The risk is low that scientists could pass coronavirus to North American bats during winter research, according to a new study led by the USGS. Here’s a link to the news release:

<https://www.usgs.gov/news/low-risk-researchers-passing-coronavirus-north-american-bats>

USGS Releases Estimate of Natural Gas in Alaska's Western North Slope

USGS provides its first estimate of conventional natural gas resources in rock formations west of the National Petroleum Reserve-Alaska. The rock formations in this region are believed to contain no recoverable oil deposits, so no assessment was made of those resources in this study.

<https://www.usgs.gov/news/usgs-releases-estimate-natural-gas-alaskas-western-north-slope>

U.S. Mines Produced an Estimated \$82.3 Billion in Minerals During 2020

U.S. mines produced approximately \$82.3 billion in minerals in 2020- about \$1.5 billion lower than the 2019 revised total of \$83.7 billion – the USGS announced February 2.

<https://www.usgs.gov/news/us-mines-produced-estimated-8-23-billion-minerals-during-2020>

Please continue to be safe and healthy. Help us keep abreast of you and your activities. Send notes or comments to John Keith at jkeith@usgs.gov or to me at r2susan53@gmail.com. Know a colleague who has retired recently? Let me know and I will send an invitation to join our group.

Bye for now,

Susan Russell-Robinson

Treasurer's Report

Treasurer's Report and Membership Statistics for 2020

This report summarizes the financial situation of the Geologic Division retirees as of the end of 2020. We published two Newsletters and one Directory. The primary expense for the last Newsletter (Winter, 2020, Number 78) does not appear in 2020 as it was paid in January of 2021 for \$965.57. This means that the total expenditures for 2020 was actually \$3473.35. Total assets at the conclusion of 2020 were \$7866.40, when that expense is included. Thus, our net worth was reduced by \$454.35 for 2020. Combining the Dues Notice with this Newsletter and the Directory should substantially help reduce this deficit for 2021.

Net Worth, January 1, 2020	8320.75
-----------------------------------	----------------

2020 Income

Dues & Donations	3,019.00
------------------	----------

<u>Total Income</u>	<u>3,019.00</u>
---------------------	-----------------

2020 Expenses

Dues – supplies	271.48
-----------------	--------

Newsletters & Directory	2,228.30
-------------------------	----------

Checks	8.00
--------	------

<u>Total Expenses</u>	<u>2,507.78</u>
-----------------------	-----------------

Total Assets, Dec. 31, 2020	8,831.97
------------------------------------	-----------------

Total Assets, Jan. 31, 2021	7,866.40
(see discussion above)	

Note:

Dues notices for 2021 will be included with the latest Newsletter and Directory to help reduce expenses. Members are asked to please check their Directory entry and make any corrections on the return dues statement. Donations to the Geologic Division Retirees organization are tax-exempt. It is the custom of GDR to remove members from the membership list when they are over three years in arrears of their dues. Spouses of deceased members are removed from the membership list when they are over two years in arrears of their dues.

Membership Statistics:

At the end of 2020, we had 282 members. This is down 44 from the year before when we had 326 members. About 53 members are Emeritus scientists.

Jim McNeal

New Members

Sue Beard
Jane Jenness
Bonnie Claus
Bill Leith

A Note from the Editor

In this issue we were fortunate to receive excellent articles on Survey history from a variety of contributors. And the memorials contain significant historical content in addition to our Essays section. However, for each issue the content is somewhat affected by my own bias toward geologic hazards and for articles from friends in Denver and Reston. We need contributions from a wider variety of members and subjects. So please take the initiative to write up stories that you think would be of interest and send them to me at my Survey email address, jkeith@usgs.gov. Thanks in advance for your efforts.

John Keith

Essays, Anecdotes, and History

Paleoclimate Studies on Lake Baikal

Paul Hearn



Located in eastern Siberia's Buryat Republic, Lake Baikal is both the world's deepest lake at 1,637 meters (1.02 miles) and the largest by volume at 23,143 cubic kilometers (55,214 cubic miles). 80 km (50 miles) in width, the lake extends some 630 km (400 miles). Baikal is an active rift zone, forming some 25-30 million years ago. Its unique ecology provides the home to thousands of species of plants and animals. More than 3,700 species are endemic, meaning they occur nowhere else on earth. By definition, most lakes are ephemeral features, forming and then disappearing within 10 to 20 thousand years. In contrast, Lake Baikal, being an active spreading center, contains buried sediments thought to be more than 20 million years old. Although it was explored by the Russians in the nineteenth century, it was only opened to the West in the late 1980s during Gorbachev's thaw. In 1989, I was contacted by Dr. Doug Williams of the University of South Carolina, who proposed a study to acquire a paleoclimate record from the lake. This initial meeting resulted in a program jointly funded by the U.S.

Geological Survey (USGS) and the National Science Foundation (NSF) to acquire a paleoclimate record and study the deep structure of the lake.



In partnership with several institutes of the Siberian Branch of the Soviet Academy of Sciences, the goals of the program were to collect high-resolution seismic profiles to identify locations where the sediment record was undisturbed and collect the longest cores possible there. The study was to lay the groundwork for eventually conducting wireline coring that would allow a much longer record to be recovered. Russian scientists had previously collected many shallow cores from the lake, but the radio-beacon technology used at the time made it difficult to fix their location with sufficient accuracy. Because Baikal is too deep to allow research vessels to anchor, cores ostensibly collected at a single location sometimes differed significantly from one another, despite the captain's best efforts to keep the ship on station. To help remedy this problem, USGS was able to provide unclassified GPS Global Positioning System (GPS) transceivers that improved the locational accuracy so that cores collected at a single location did not differ from one another.

All three expeditions were conducted aboard the R.V. Vereshchagin, a 125 ft. Russian research vessel, named after a 19th century Russian painter. USGS personnel involved in this work included Steve Colman, Debbie Hutchinson, Paul Hearn, Platt Bradbury, Susan Carter, Ted Callendar, Dave Nichols, Rick Rendigs, and Hans Nelson. Other participants included Cindy Pilskaln (Monterey Bay Aquarium Research Institute) and Jim Broda (WHOI). Mikhail Kuzmin, Director of the Institute of Geochemistry, and M.A. Grachev, Director of the Institute of Limnology, were the senior Russian scientists who helped organize and fund the cruises. Ultimately some 3600 kilometers (2237 miles) of shallow (several hundred meters) seismic transects were collected throughout the lake. Two basic seismic systems were used: (1) a 3.5 kHz system, which gave resolution of >0.5 m and average sediment penetration of 30-50 m, and (2) a single-channel water-gun system, which gave resolution of less than a meter and average sediment penetration of 300-400 m. Due to the need for longer cores, piston corers, which are usually used in deep sea environments, were provided by WHOI. These allowed cores of up to 3 meters (10 ft.) to be obtained.



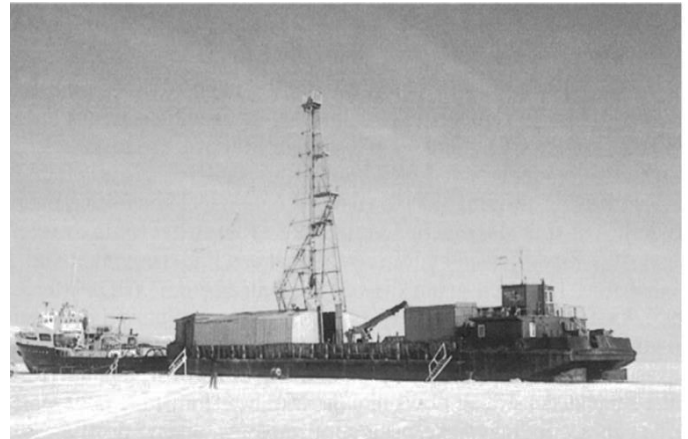
R/V Vereshchagin



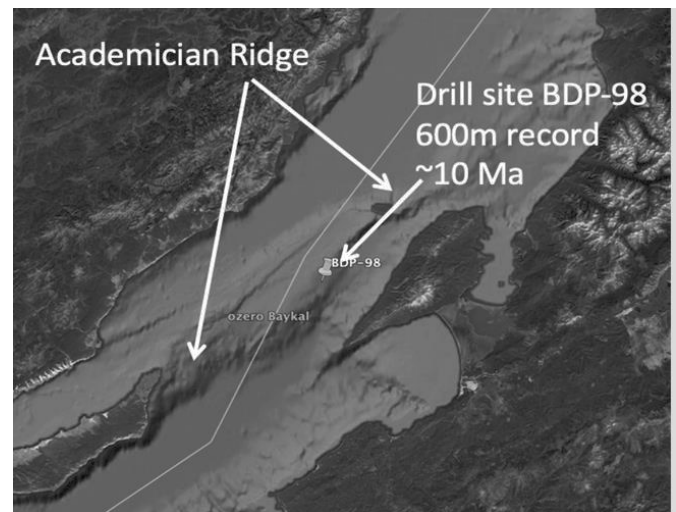
Piston Coring

Among the initial results of the effort was a record of biogenic silica, an indicator of diatom productivity in the lake and a useful basis for paleoclimate studies. The younger (Holocene) sediments in the top layers were rich in biogenic silica, while deeper sediments were significantly depleted, reflecting the transition from the last glaciation, which occurred some 13,000 years ago in the late Pleistocene.

Another accomplishment of this early effort was to establish the Baikal Drilling Project (BDP), which included participants from the U.S., Russia, and Japan. The BDP provided the organizational structure to promote and manage the effort. During the winter of 1992, a barge was towed to the first drill site and a derrick constructed to allow wireline coring. The barge was then allowed to freeze into the ice. The difficulty of doing this in the early Siberian winter cannot be overemphasized. The coring was conducted by the Russian NEDRA Scientific Drilling Company (responsible for the Kola superdeep borehole).



Russian ship and barge for wireline coring

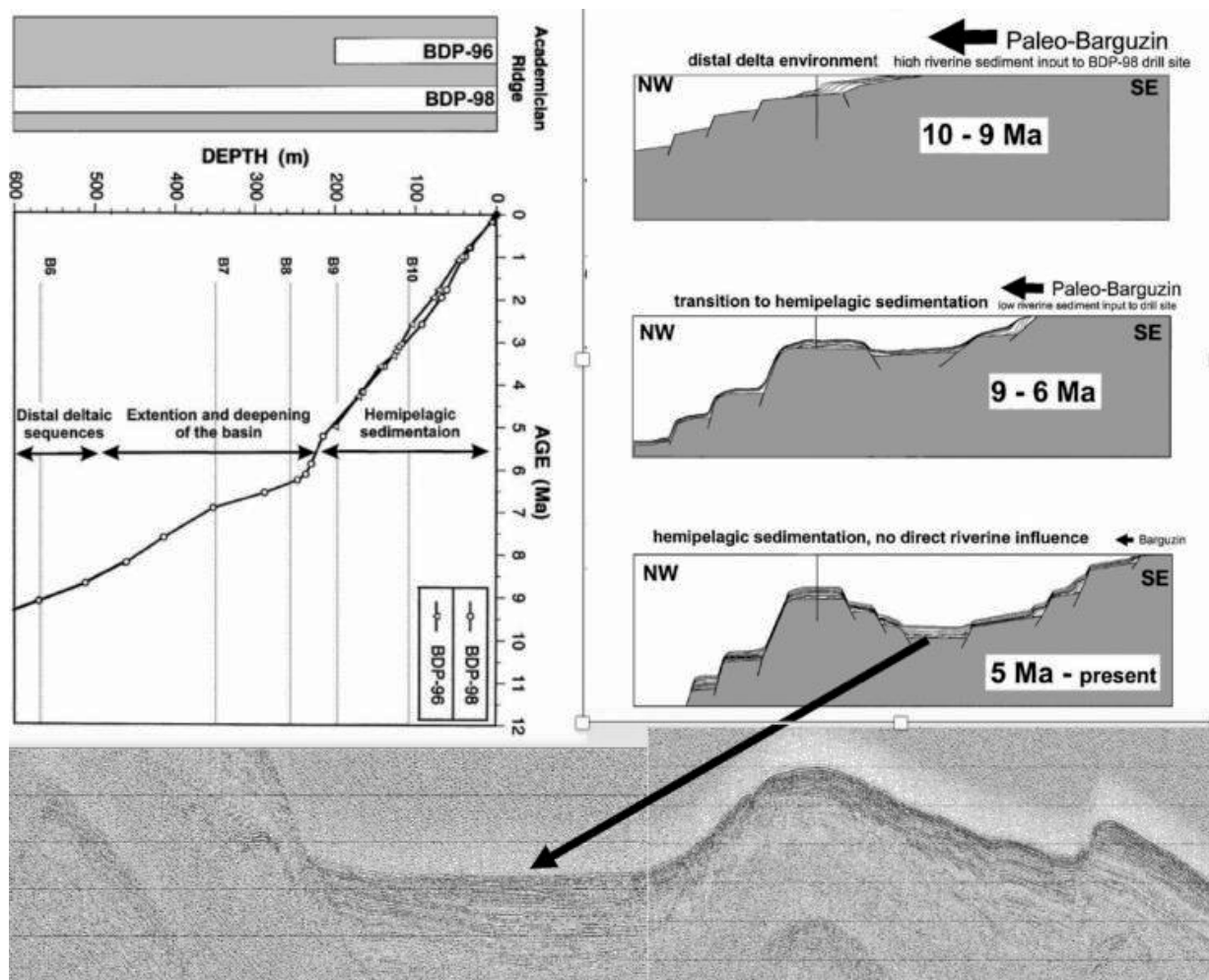


Location of BDP Drill sites

Academician Ridge, an underwater structural high separating the Northern and Southern basins, is isolated from the rest of the lake and not subject to turbidites (underwater landslides) that interrupted the sediment record. This isolation also resulted in very low (hemipelagic) sedimentation rates which were ideal for obtaining a long record. For these reasons, the site was chosen for wireline coring. Carbon-14 dating was used to determine the age of the shallower sediments. For the deeper cores, paleomagnetic dating was used. This technique uses the known record of periodic reversals in the earth's magnetic field, previously dated by other techniques, to determine the approximate age of the sediments. In 1996, a 200-

meter (656 foot) core was retrieved by the BDP consortium, extending some 6 million years to the Miocene Epoch. Two years later in 1998, a 600-meter (1969 foot) core was obtained, adding another 4 million years of record. In 2001 a comprehensive study of this core was published in the Journal of Quaternary Research, authored by 54 scientists from Russia, the U.S., and Japan. Analysis of this core revealed several

glacial-interglacial cycles. Below 200 meters, the character of the sediments changed considerably, reflecting coarser grained sediments from a river flowing into the lake from the west. Between 5 and 7 million years ago, as the Baikal rift enlarged, this source was cut off, isolating the Academician Ridge and resulting in the much finer grained sediments deposited after this point.



Schematic showing changes in sediment sources at Academician Ridge (top) and high-resolution seismic records showing present day hemipelagic sedimentation.

Threats to Lake Baikal

In 1996 Lake Baikal was designated a UNESCO World Heritage site, recognizing its unique flora and fauna and its value for scientific research. The lake, which is known for its crystal clear waters, was thought

to be immune to pollution due to its size and the sparse population surrounding it. In 2013, however, large blooms of algae appeared for the first time near the town of Severobaikalsk, along the northwest shore of

the lake. A large pulp and paper mill on the southwest shore of the lake was finally shutdown that year after years of protests from environmental groups. Since then, tourism, the unregulated release of wastewater and sewage, and the population of municipal areas around the lake have only increased. The forests of iconic sponges that populate the lake have begun to die off, changing color to dull brown and even pink. In December 2020 the independent newspaper Moscow Times reported that the Russian government was soon to roll back environmental regulations protecting the lake, triggering an outpouring of protests. This struggle continues, and how it will end is still unclear.

(Next issue: Russian petroleum and minerals,
Armenian coal, and Ukraine flood risk)

Astronaut Hawaiian Field Trip, 1965

James Moore

In January 1965, the USGS conducted a Hawaiian field seminar for a group of astronauts that were scheduled to participate in the upcoming moon landings. Hawaii was deemed an excellent place to conduct field exercises because the well displayed volcanic features could be compared and related to possible lunar surface features. Since I had recently served as Scientist-in-Charge of the Volcano Observatory, I journeyed to Hawaii to participate in the program. Other local experts that instructed the astronauts were Howard Powers, Jerry Eaton, Don Peterson, Dallas Peck, and Dave Hill. The attendees who participated were Bill Anders, Neil Armstrong, Charlie Bassett, Michael Collins, Walt Cunningham, Russell L. Schweickart, and Elliot See. On the first day we took the participants on a bus trip to several volcanic features on Kilauea volcano including lava tree molds, gas and lava vents, spatter ramparts, and eruptive fissures. This was followed by foot and bus traverses to observe lava tubes, lava lakes, lava blisters, Pele's tears and hair, the Halemaumau fire pit, and pit craters. In the evening, a briefing utilized photos of the

lunar surface that were analogous to features seen during the past two days. The third day started with flights in a 12-passenger aircraft to observe volcanic features from the air. During the afternoon a lecture was given on the various geophysical measurements used to monitor volcanic activity. I followed with a discussion of the structure of Hawaiian volcanoes.

The next day we took the group to the saddle area between Mauna Loa and Mauna Kea. Here we posed problems regarding the relationships of volcanic features for the astronauts to solve. Then we all made the long, tortuous jeep drive to the summit of Mauna Loa for a view of the summit caldera and the many features associated with it. We then investigated volcanic cinder cones on Mauna Kea and collected "cored bombs," which consist of crystalline rocks that were covered with fresh lava before being hurled out of a volcanic vent. The coarse-grained nuclei of these bombs were derived from chambers where early-formed minerals had crystallized and accumulated. Clearly lunar specimens of this type would be important to recognize and collect. The astronauts maintained a sustained interest in this field study, and I believe that such exercises helped to improve their observations and collections when they landed on the moon. Several of these astronauts went on to make history. Walter Cunningham flew on Apollo 7 with more than 263 hours of spaceflight. Charlie Bassett and Elliot See died February 28, 1966, near St. Louis, Missouri, in the crash of their T-38 jet aircraft while flying to a NASA meeting in Florida. Michael Collins was in the third group of astronauts named by NASA and served as pilot on the three-day Gemini X mission launched on July 18, 1966. William Anders was the lunar module pilot for Apollo 8, the first manned lunar orbit flight that departed December 21, 1968, and was the first manned flight that ventured into the gravity field of another body in the solar system. Apollo 8 orbited the moon ten times in twenty-one hours. Russell Schweickart flew on Apollo 9, had more than

241 cumulative hours of spaceflight, and spent more than 1 hour during a spacewalk. Michael Collins's second flight was as Command Module pilot of the historic Apollo 11 mission in July 1969. He remained in lunar orbit while Neil Armstrong and Buzz Aldrin became the first people to land and walk on the Moon.

A Novel Proposal

Eric Force

As of this writing, Eric and Jane Force are still doing fine. Inspired by "The Queen's Gambit," Eric is designing a miniseries to be called "Quadrangle." It pits young geologist Medora Hietenan against the vagaries of nature and a Russian competitor in the 1960s, as she maps a quadrangle in the Dominican Republic. It's a notoriously tricky quad, with plutons ranging all the way from dunite to granite, many faults, and—portentous music with bass drum here—along a seismically active boundary. This quadrangle is of USGS interest due to the chromite found in gold placers there. Once the arrival scenes have rolled, Medora spots a decrepit Lada on the streets of Bonao, driven by a swarthy man in field clothes accompanied everywhere by a man in a thin gray suit. Soon thereafter, as she's looking over the quad, she finds herself at a big mafic dike and across a valley sees the field man looking at its continuation. Medora traces the dike across the valley, noting small offsets within it but not in country rock (suspense music). As she finally encounters the man with a pile of rocks, he mumbles in Russian, then turns away. In episodes 3 and 4 Medora maps in intricate detail all the rocks of the quad and their structural and stratigraphic relations. All these details suggest two different rock clans, separated by the dike, which thus presents a mystery to her mind. One day she finds calcareous and pelitic partings in it, and focusing on those, she finds fossils including a well-preserved blastoid. She remembers (flashback) Prof. Fischer saying these are Mississippian. Yes, it's a Mississippian blastoid! That

makes the dike older than its country rocks. It's NOT a dike. It's some sort of screen, not unlike those in Monty Klepper's area. The Russian is always at the "dike." Medora sees that it contains an abundant oxide mineral but observes it's not magnetic. Ah, this must be the sought-after chromite. But it's not euhedral, and she notes a foliation in the bronzite matrix. So this "dike" is actually an alpine ultramafic! She realizes from the work of Thayer that the chromite in it will be iron-poor but will contain inclusions of olivine, and cables Washington with this news. Ah, the poor Russian is sending off bags of rock that will puzzle petrologists in Moscow. We're in episode 5 when she realizes her evidence shows the "dike," separating rock terranes with different faunas and metamorphic histories, is like a poorly healed wound, a suture if you will. She mentions this to visiting professors Harry Hess and Tuzo Wilson, but she mails off her quadrangle map and returns to duties in the U.S. A closing scene shows her smirking as she passes a newsstand—at the phrase "plate tectonics" in a headline of the Times.

As credits roll there is a dedication to all the fine geologists that the Retirees have lost recently.

Historical Note on Biogeochemical Studies

Vance Kennedy

The May 25th, 2019, issue of the Economist magazine, page 78, has an article on using analysis of trees to look for gold in Australia, with some success. It brings back memories of such work in the Survey after the World War II. I may be one of the few living persons (age 96) who recall such activities. After the war, the Survey decided that some new ideas were needed and sent out a request to the staff. Herb Hawkes suggested that analyses of soils might be a good way of prospecting for ore deposits. Helen Cannon suggested that plant analyses could detect anomalous amount of ore metals in the branches or leaves, and Lyman Huff thought that analyses of

springs or stream water could be useful. There had been some such work of this general type done in Russia already. A project was authorized under Herb Hawkes, and Bert Lakin and Fred Ward, two trace-element chemists from the Department of Agriculture, were hired.

In January of 1948, I had gotten a degree in chemical engineering at Penn State and decided that a new course in geochemical prospecting, headed by Professor Sylvain Pirson of the Geophysics and Geochemistry Department, was attractive. Somehow the Survey found out about my sole enrollment in the course and offered me a summer job in the southwestern Wisconsin lead-zinc district to try out some of the methods being developed. Lyman Huff showed me how to do the analyses and turned me loose. One day, while running water analysis in a sizable stream, I found a rivulet entering from the side that was quite a bit higher in dissolved metals than in the main stream. I followed it up to a small spring in the hillside, which was 100+ higher in metals than in the main stream.

When I returned to the office, I told Allen Heyl about the situation, and I wanted to have the hill drilled. He said we don't do that, we are only a mapping unit. I went back to school, tremendously disappointed, and wrote up my report, which was published in 1953. In 1951 or 1952, Allen called me and said a large lead/zinc deposit had been found in the hill behind that spring loaded with heavy metals. That was the first ore deposit found by geochemical prospecting in the western hemisphere and perhaps in the world. The Survey never got the public credit for the milestone, to my knowledge. Analysis of plants in mineralized soils in Wisconsin had not been promising in 1948, but apparently gold elsewhere may be another matter 71 years later.

It might be worthwhile to recall that situation all these many years later for the benefit of existing personnel and bragging rights for the Survey. A

humorous story goes with this. Standard procedure in 1948 was for field persons to spend their own money for food and lodging and submit a bill to the Survey for reimbursement. I had no money at all and had to borrow for lodging and food. The combination cost me \$2.50 per day by really cutting costs. Standard costs then were about \$6 per day. I did not want to lie, so I requested just the \$2.50 per day. I got a letter from Faye Dowdy saying I had to change the request because it was too little. I'll bet that was the only time in the Survey's history that such a thing occurred. This anecdote may be interest to both retiree groups and any historians of the Survey.

Reminiscences of Ralph Erickson:

Bill Silberman

Edna Mountains Project

I don't remember where I first met Ralph. It probably was on a field trip in Nevada. I had joined the USGS in 1967 in the Western Minerals Branch and was assigned to geochronological and isotopic studies of gold and silver deposits in Nevada and California. Ralph had been Chief of the Exploration Research Branch (later Branch of Exploration Geochemistry). After stepping down, he had a project on geologic mapping, regional geochemistry, and mineral deposits in the Edna Mountains quadrangle in North Central Nevada. Ralph was always innovative, and in this project he introduced the use of field-based analytical labs. Truck-mounted DC arc spectrographs and atomic absorption wet chemistry labs analyzed samples collected in the field, and geochemical maps were produced in real time, along with geologic maps. The field party consisted of geologists, chemists, technicians, and visitors helping in a variety of specialties.

I provided geochronology and isotope support to ore deposit studies and to the dating of igneous rocks in the Quadrangle. The field operations in Winnemucca in the Erickson camp were large.

Geologists, chemists, and technicians were all quartered at the Scott's Motel, or, later, at a house that Ralph rented. Operations were Monday through Saturday, and the days were long. Saturday night was "party." This would start at the Gem bar, where the drink of choice was "Whiskey Sour in the Rough." It consisted of about a pint of bourbon with fresh orange juice and soda in a tall glass. One was formidable, but of course we had more than one. We then went over to a Basque restaurant in the Winnemucca Hotel. where we had a few Amer Picons, a drink with Amer Picon brandy and some kind of sweet stuff. It was deadly. We then had dinner, family style, with red wine, of course. The evening went on with a visit to one of the casinos to watch a show and have some more drinks. I always walked to the festivities since I knew driving would be impossible. One night, I remember I could not find the keyhole to my motel door. Scott's had a Swedish style sauna, and it saved my life many times. Sundays we were too hung over to work, but I would frequently drive out to look at other districts in the area.

Ralph and his assistant Sherman Marsh would hang up our maps on the walls, and many geologists from the mining companies would come in to look at them. These were up to date geochemical and geological maps of the whole project area, the Edna Mts 15' quadrangle. The results of this study were detailed geochemical maps and generalized geologic maps of all four 7.5' component maps of the Edna Mtns quadrangle, published within just a couple of years of the end of the project. In addition, there was a journal article on the integrated geologic and geochemical studies using mobile labs, and there was a USGS publication on the geochemistry and isotopic ages of the igneous rocks and mineralized occurrences that I was honored to co- author. I was very impressed with the efficiency of this operation, and a few years later I did a similar study of the Central Peloncillo Mts., SW New Mexico, using mobile geochemical labs. The method was also adopted by the Branch of Alaskan

geology to provide geochemical analyses for the AMRAP program. A mobile lab was set up in Anchorage that provided chemical analyses for all samples collected in Alaska during the field season.

Ore deposit Models

Another example of Ralph's innovation is his pioneering leadership in the Survey's development of mineral deposit models. In 1981, seeing that we were getting increasingly involved in mineral resource assessment, Ralph saw the need to provide the geologists carrying out these studies with data on the various types of mineral deposits and modes of occurrence in their geologic, geochemical, and geophysical settings. CUSMAP, AMRAP, and various regional mineral resource assessments were in process across the country and internationally. None of us were expert in all sorts of deposits, but most of us had expertise in a few types. Ralph organized a project to obtain the necessary summaries of different deposit types from various experts in the Division. Using a standardized format, they described deposit characteristics, such as favorable geologic settings, and guides to ore from geochemistry, geophysics, or other criteria. He insisted on practical information rather than a scholarly treatise or concern with generative process. That would come later, and it did.

An internal document (Administrative Report) was produced in December 1981, edited by Ralph, as *Characteristics of Ore Deposit Occurrences; Guidebook for use as an aid in mineral resource assessment*. It included about 50 deposit-type descriptions. This compilation was so useful that the document was later published as Open-file Report 82-0795. What followed were many publications of ore deposit models by Dennis Cox, Don Singer, and others over the subsequent years and detailed deposit and district studies under Ed Tooker's direction in the Bulletin 1857 series, as well as so much more. Ralph's contribution to USGS science was without equal. And this summary does not even include Ralph's work on

geochemistry in the Cortez region, Nevada, which lead to the discovery of the Cortez gold deposit, nor his work on the Viburnum Trend that resulted in the discovery of major additional deposits there.

Dire Doings in Flagstaff

(This is one of those anecdotes from my memory that may have been slightly different, but this is the gist of the story. – John Keith)

In March of 1982, there was a GSA Rocky Mountain section meeting in Flagstaff. George Ericksen, Glenn Allcott, and Paul Theobald got together one evening for dinner and adjourned to the bar for a few libations. When they went outside later to return to their hotels, it was snowing furiously. George was staying in a different hotel from Glenn and Paul. They suggested that they drive him to his place, but he insisted that he was perfectly able to drive, and he departed in his government car. He was promptly stopped by the Flagstaff police, checked for alcohol, arrested, and deposited in the local lock-up—and they impounded the government car. The next morning George was able eventually to contact Glenn and Paul, who went to the jail and bailed him out. Glenn had just returned from a trip to our Saudi Project, and he had a large supply of traveler's checks, which he used for bail. George was hopping mad and swore to never darken the doors of Flagstaff again. The remaining problem was the impounded car. Jack Strobell was the Flagstaff Branch Chief, and his neighbor was the City Attorney. Jack said to the attorney, "What do you think you are going to do with a government car?! Give me the keys." The keys were grudgingly returned. What we never learned was how Glenn managed to claim the bail expense on a voucher...

Memorials

Ernie Anderson

Ernest Anderson, 87, died in January of 2021. (We don't have an obituary, but there is an extensive article about his career in the Kern Valley Sun, January 29, 2019. Also, see his career story in the previous GDR News, No.79—Ed.). His education included a B.S. in geology from Marietta College, M.S. from University of Montana, and Ph.D. from Washington University (St. Louis). Ernie was well-known for his work on ash flow tufts of the Nevada Test Site, training of astronauts on volcanic features of California and Nevada, and tectonics and structure of the Great Basin.

Bruce Bryant



Bruce with Marith Reheis at the memorial for Jack Reed, 2015.

Bruce Bryant passed away January 12, 2021, in Boulder, Colorado. He was born in New York City in 1930 and grew up in Springfield, Vermont. attended high school at Hotchkiss in Connecticut and Dartmouth College. He made his first trip west after graduating from college and fell in love with the west.

He attended the University of Washington where he earned his Ph.D. in Geology. He met his wife Dolores Ann Becker (Sandy or San) at Mt. Rainier and they settled in Golden, Colorado, and raised their family. Among Bruce's passions were mountains and the outdoors. He loved fieldwork, skiing (see photo in Ed Post memorial), hiking, and he instilled that passion for the outdoors in his 4 children. He was active in preserving open spaces and natural resources through the Clear Creek Conservancy and Plan Jeffco. In addition to the outdoors, he loved knowledge, learning, and travel. He read deeply and broadly and was always quick to bring out reference books at the dinner table. He had a long and productive career as a research geologist with the U. S. Geological Survey where he mapped in North Carolina, Kentucky, Colorado, Utah, and Arizona, resulting in over 100 publications. After retiring he continued working and publishing as emeritus with the Survey. His family and friends remember him as a person of great integrity and intellect with a fine sense of humor. Bruce was preceded in death by his wife Sandy, 2007. He is survived by his four children Lisa, Ross, Keith, and Mark, eight grandchildren, and four great grandchildren. Memorial gifts can be made to Colorado Open Lands. 1546 Cole Blvd. #200, Lakewood, CO 80401.

Jean Minkin

Jean A. Minkin,, 93, died on July 26, 2019, in Montpelier, VT. The daughter of Nathan and Fannie Albert, she was born on November 17, 1925 in Philadelphia, PA, and grew up there. She attended Bryn Mawr College on full scholarship and graduated in 1947 magna cum laude with honors in physics. After graduation, she married Max Minkin, her wartime GI pen pal, and settled in Philadelphia. Jean was a research physicist at the Franklin Institute, Laboratories for Research and Development and later, after having two sons, at the Institute for Cancer Research, Philadelphia, PA. In the late 1960s, she

moved with family to Annandale, VA, and joined the USGS, Branch of Astrogeology. Jean spent her entire USGS career with Ed Chao specializing in crystallography and analytical mineral chemistry. She conducted research on lunar samples, coal mineralogy and chemistry, and the Bayan Obo REE deposit, China. Jean retired in 1991 to Palm Coast, FL, where she and Max rode their bikes, enjoyed classical concerts, and loved breakfast at Cracker Barrel.

Don Mullineaux

Donal Ray Mullineaux, 95, of Arvada, Colorado, died at home on January 23, 2021. He was born at the base of Mt. Shasta in Weed, California, on February 16, 1925, the son of Lester Ray and Mary Lorene (Drew) Mullineaux. He met his future wife, Diana Suzanne (Charais) Mullineaux during a climb of Mt. Adams, and the two were married in 1951. Don's career combined a commitment to public service with a love of the mountains. He grew up in the mill town of Camas, Washington, near the volcanic peaks of Mount St. Helens, Mt. Adams, and Mt. Hood. He worked as a fire-spotter for the U.S. Forest Service before completing a B.S. in mathematics and a M.S. and Ph.D. in geology at the University of Washington. During this time, he also served in the U.S. Navy in WWII on the destroyer USS Mullany. He was called upon again during the Korean War, where he was a gunnery officer on the destroyer USS Hazelwood. After completing his doctorate, he joined the U.S. Geological Survey in Seattle, mapping mud flow deposits in the Puget Sound area to assess risk to local communities. He then moved to Colorado to work with the USGS Engineering Geology branch. With his career-long professional partner Rocky Crandell, whom he met in 1953, he investigated the eruption history of Mt. St. Helens volcano, and the two wrote a paper predicting an imminent eruption. Don served as the spokesman and Chief Scientist of the USGS Emergency Response Team during the lead-up to the

Mt. St. Helens eruption on May 18, 1980, and this group's risk assessment and recommendations were credited with saving lives. He enjoyed fixing and flying old cars and airplanes, and he was an avid downhill skier, a sport which he continued actively into his later years, becoming a regular at Loveland Basin. He happily supplied friends and family with used skis, snowboards, and associated gear, collected at seasonal sales and distributed from his home, known to many as Don's Ski Barn. He also was an avid birder, a devoted supporter of educational opportunities for Native American students, and passionate about civil liberties. Don was preceded in death by his wife Diana in 2006 and his older brother Richard Mullineaux in 2014. He leaves three children and their spouses, Peter and Leann Mullineaux, Lauren Mullineaux, and Keith and Lisa Mullineaux, a foster daughter Rebecca Finch, and 6 grandchildren: Tim Mullineaux, Lindsay Mullineaux, Cara Mullineaux, Andrew (AJ) Grosenbaugh, Michelle Mullineaux, and Gus Grosenbaugh.

-----the Mullineaux Family

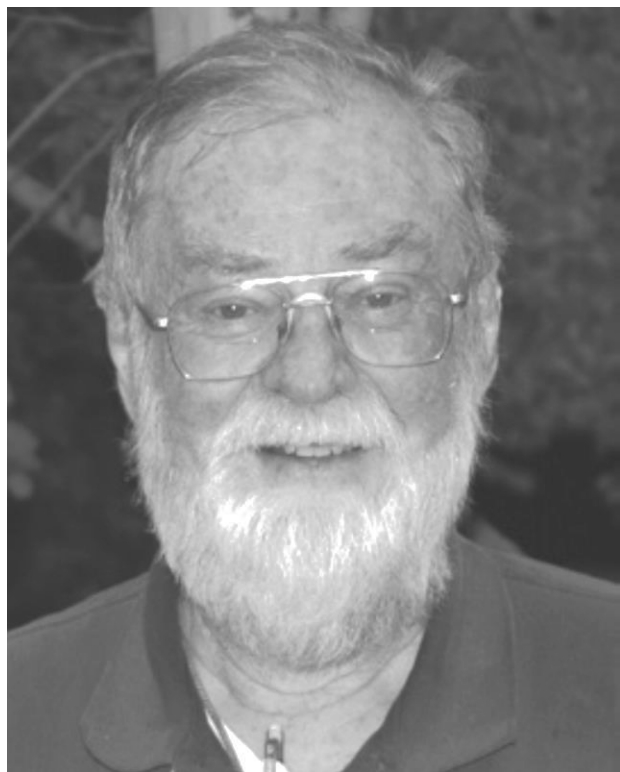
Ed Post



Dartmouth College ski team, 1951, Bruce Bryant on far left, Ed Post on far right, other people not identified.

Edwin V. Post died December 14, 2020, in Denver, Colorado, at age 92. He is survived by his three children, nine grandchildren, and three great-grandchildren. His wife Betty passed in 2016. Ed was born in Illinois but grew up in the Boston area. He spent time in Vermont, where he learned to ski and met and married Betty Davison, second of five daughters of Vermont farmer Max Davison. He attended Dartmouth College, graduating in 1951 with a B.S. in geology. At Dartmouth, he was a member of the ski team, and he raced many of the famous ski hills in Vermont, New Hampshire, and Connecticut before there were lifts. It was “walk up the mountain, ski a run, have lunch and a beer, walk up again, and one more run.” His graduate degree was an M.S. in geology from Washington State University in 1953. After graduation from WSU, he went to work for the USGS in Denver. His field projects included mapping quadrangles in Maine, Idaho, Kentucky, and Colorado. In 1967, Ed and three of his co-workers left the Survey to form Skyline Labs in Arvada, Colorado, where he became President and Chief Geologist. Skyline commercialized a new mineral prospecting method called "trace analysis" - exploration for ore deposits by analyzing samples of stream sediments and plants for very small concentrations of valuable constituents that were leached out of the rocks upstream. Skyline expanded their footprint with satellite offices near the sites of mining operations, eventually establishing analytical facilities in Reno, Nevada, Anchorage, Alaska, Tucson, Arizona, and Hermosillo, Mexico. Ed retired from Skyline in 1994. He and Betty kept themselves busy traveling; buying, refurbishing, and renting real estate; and watching their grandchildren grow up, graduate college, and find wonderful things to do. Ed also volunteered at Dinosaur Ridge in Morrison, showing school children and adults the dinosaur footprints and bones, and demonstrating with his Geiger counter that fossilized bones will concentrate uranium.

Paul Williams



(This memorial is condensed from a more extensive version published in GSA Memorials and written by Pete Rowley, Art Ford, Chuck Thorman, Chet Wallace, and Ken and Linda Pierce. The authors thank Marge Edwards for generous help with their work. –Ed.)

In the heart of Antarctica, not far from the South Pole, lies a lonely and windswept group of snow-draped nunataks called the Williams Hills. The name commemorates Paul L. (Lincoln) Williams. Paul's geo-wanderlust took him from the Earth's coldest desert to one of its hottest, among other places. Paul, 87, died of lung disease in his sleep at home in Driggs, Idaho, on March 15, 2020. He leaves behind his daughter Marjorie and husband Stan Edwards; stepdaughter Suzie Williams and husband James Dudzik; stepdaughter Heidi and husband Richard Eversley; and stepson Charlie Williams and wife Alexa; granddaughters Isadora, Shannon, and Sophia; grandsons Kyle, Forest, and Cameron; and sister Mary E. Lee. Paul was preceded in death by his wife Jean M. Glenn-Meyers-Williams.

Paul had a 39-year, rich and rewarding career with the USGS, mostly in Denver. He was one of the best field geologists in the USGS and one of its best administrators. Paul had many diverse talents and interests. After arriving in Denver, he had an evening gig playing banjo at Your Father's Moustache in Larimer Square. (Bob Fleming reports that he borrowed a banjo from Chuck Pillmore and proceeded to completely wear it out, much to Chuck's dismay. –Ed.)

One night, in the audience was Jean, a beautiful widow with three delightful kids, whom he came to love during several years of dating. This chance meeting led to a happy marriage of 50 years.

Paul was born on July 1, 1932, in Glen Ridge, New Jersey, to Paul L. Williams and Marjorie L. Dean. He and his sister Mary first lived in New Jersey, then the family moved to Maryland in 1942 and eventually to Seattle. Paul's mother greatly influenced his early upbringing, teaching life lessons and bringing home book after book on dinosaurs, volcanoes, and animals. In 1942, the family moved to Maryland, where his father worked in the U.S.–Great Britain Lend Lease Program in Washington. Sadly, his mom died in 1942 from cancer; in 1943, his dad married Dorothy Rodwell, a Canadian. As World War II ended, the family moved to Seattle, where Paul was a good student at Vashon Island High School. As Paul was planning to enter the University of Washington in 1950, he met a cousin who was a geologist, and that experience determined what major he decided to pursue. Paul took geomorphology from legendary professor J. Hoover Mackin, a larger-than-life personality with a sense of humor, and the best teacher Paul ever experienced. He and his best friend Art Ford shared this and nearly all other undergraduate and graduate geology courses (plus beer time at the Red Robin). Once, Hoover joked as he handed back a report to Paul, "Williams, if you truly believe what you wrote here, you should consider getting out of

geology.” Paul thrived under Hoover, who became his advisor on two graduate degrees. Another graduate student of Mackin’s was Dwight Schmidt, and Paul became Dwight’s field assistant for uranium placer deposits in Idaho, as he started on his own master’s degree. Chuck Thorman and Dick Blank were two other graduate students at UW who were friends of Paul, Art, and Dwight. All ended up at the USGS in Denver except Art. Paul’s M.S. thesis was on the Pleistocene glacial geology of Stanley Basin, Idaho, and he graduated in 1957. He then began his Ph.D. work on the Quichapa Group of ash-flow tuffs in southwestern Utah and southeastern Nevada. Paul’s study and those of other Macklin students demonstrated that most volcanic fields in the Great Basin were caldera-derived ash-flow tuffs, rather than lava flows as previously thought. In 1957, Paul went to work full time for the USGS in Grand Junction to study uranium deposits on the Colorado Plateau as part of a new program of ten 2-degree sheets (1:250,000-scale). This was reconnaissance geologic mapping, starting with the Moab sheet. In 1958, the office closed, and Paul moved to the Denver Survey center. For the Salina sheet, Paul, with Harry Covington and others, published 16 derivative maps on the same base, a folio that provides layers on landslides, coal beds, groundwater availability, and groundwater quality, and a model for future USGS environmental maps.

The International Geophysical Year of 1957–1958 sparked worldwide interest in Antarctica, and the USGS was well positioned to do geology and topography of the mostly unexplored mountain ranges, funded by the National Science Foundation (NSF). Paul began his work there in 1960, and he was joined by his friends Art Ford, Dwight Schmidt, and later Pete Rowley. The areas they mapped included the Thiel Mountains, Patuxent Range, and the immense Dufek intrusion. In 1968–1969, Paul was an exchange scientist with the British Antarctic Survey (BAS), doing geology, lectures, and banjo playing during

visits to British Antarctic bases. On his return, he married Jean. Marjorie was born the following New Year’s Eve, but Paul was in Antarctica again! During six field seasons in Antarctica, the group completed 1:500,000-scale mapping of about 50,000 square miles of the last unexplored mountains on Earth.

Upon his return from The Ice in 1971, Paul resumed stateside studies, mapping and coordinating geophysical surveys in the Raft River basin and the Cassia Mountains of Idaho, an important geothermal-resource area of great geologic complexity. From this project, he published, with others, a number of reports and four 15-minute quadrangles at 1:48,000-scale.

Paul was Chief of the Branch of Central Environmental Geology from April 1975 to October 1980. The Branch consisted of about 70 geologists and staff in Denver and 15 in Flagstaff, primarily doing geologic mapping in the Rocky Mountains. Ken Pierce, Chet Wallace, and Pete, all Branch members, considered him to be the best Branch chief they ever had because he knew when to get out of the way of the vast majority who were doing a great job, while fixing those few who were not. Chuck Thorman remembers well Paul’s total concern for the well-being of all persons in the Branch, not just scientists. After five years of management, Paul was glad to return to his Idaho mapping at the end of his management tour.

Paul and Jean sought another adventure upon completion of the Idaho work, so in 1982 he became a geologist in the USGS Mission in Saudi Arabia, which was diversifying its economy through mapping. The Mission in Jeddah consisted of 25 to 30 Americans and 150 to 200 locals, mostly Saudis. Doing geology, geophysics, and remote sensing required a chemistry lab, motor pool, budget people, and a technical reports unit for manuscripts. Paul settled down to mapping, but before long was persuaded to use his managerial talents as mission chief geologist. His main problem was 149 delinquent technical reports and maps, so he installed emergency procedures that rapidly reduced

the backlog. In 1987, Paul was appointed chief of mission, a position he held until he retired in 1992. Accomplishments under his leadership included mapping of a large deposit of phosphate rock, completion of a study of contaminated water wells in the holy city of Mecca and other areas, and a new aeromagnetic map that revealed a new oil field near Riyadh. Jean kept herself busy, using her own administrative skills, as the manager of the Dunes Club, a large athletic and social club for families of Americans and other nationalities working in Saudi Arabia.

Our favorite story about Paul's time in Saudi was when he in the field in Nov.1987 and was caught in a sudden massive rainstorm. His Land Rover was stuck in a wadi, and he waded out to higher ground. As he walked to find shelter, he noticed a bright light in the distance and aimed for it. After about 3 hours, he came to a camp of the indigenous Bedouin ("Bedu"), with the light powered by a generator. Knocking on the door of their building, he was invited into a large room with a group of men seated around a fire. He was given a seat and offered tea, cakes, and dates. Paul had a set speech in Arabic stating that he worked for the Saudi Arabian Deputy Minister of Mineral Resources. Later, the host dismissed the others, made a bed on the floor for Paul, and left a small pan for "my convenience." Paul took off his soaked clothes and got into bed, exchanged good nights with the host, and fell asleep immediately. When he awoke briefly at midnight, the host's young son was kneeling at Paul's bedside to take care of him if needed. When Paul awakened at dawn, the boy was sleeping on the floor beside him, and Paul covered the boy with a blanket. In the morning Paul put on his clothes, which had been dried. The host provided breakfast. Paul's camp boss and driver had rescued Paul's Land Rover and found the Bedu camp. Paul and his host parted with "smiling hand-shakes." Within a week, Paul brought a helicopter to the camp and took the host for a helicopter survey of the area for

several hours. When they returned, there was lunch of the standard cakes and warm camel's milk. Paul later said, "That experience exemplifies the fundamental humanity bestowed by a desert Bedouin on a total stranger, honoring the age-old tradition of his people. Nations should emulate."

After his 1992 retirement, Paul and Jean returned to their home in Golden, Colorado, and Paul was emeritus with the Survey. In 1995, they moved to Santa Fe, where they stayed for 11 years. During that time, Paul mapped the Albuquerque 1:100,000-scale quadrangle. They then returned to Golden to keep track of the kids and old friends. Following Jean's death, Paul moved to Driggs to be close to Marge. There he enjoyed visits from Linda and Ken Pierce, and Art Ford, Pete Rowley, and others called regularly. Paul's happy memories included student years, The Ice, Saudi, Denver, and the Persian poet Omar Khayyam's Rubaiyat. Paul especially loved to recount his marriage to Jean, a wife of wisdom and love, that flourished for 50 years of joy for both, and one that produced wonderful and creative children and grandchildren. Paul's legacy is that of an exceptional scientist, a generous mentor, and a man of great intelligence, work ethic, common sense, and dry wit.

Other Deaths

Alfred (Fred) T. Anderson, 82, formerly Branch of
Field Geochemistry and Petrology

Doug Klein

Phil Hageman

James Papike, 83, formerly Branch of Experimental
Geochemistry and Mineralogy

Cecil Alice Phair, 102, wife of George

Joan Roseboom, 90, wife of Gene

RETIREE PUBLICATIONS

2020 – 2021

Note: The references below are compiled from information available as of 1 April 2021. These references are “new” since the Fall 2020 Newsletter (Number 79). An effort is made to compile **ALL** known publications (whatever year) by Geologic Division Retirees (GDR) for inclusion in the Master List of GDR Publications (now being maintained and updated by Bob Tilling). Please send complete references for any new publications (but not those still “in press”) to Bob (e-mail: volkno.rit@gmail.com or rtilling@usgs.gov), with cc to Jim McNeal (e-mail: jmcneal@usgs.gov) as back-up, for listing in the next Newsletter and for updating the Master List.

PAUL P. HEARN publication:

Akulov, N.I., Melnikov, A.I., Shtelmakh, S.I., Akulova, V.V., and Hearn, P.P., 2021, *A geochemical and lithological correlation of lower Jurassic conglomerates in the area surrounding the Lake Baikal rift zone: An improved reconstruction of the region's palaeogeographic and tectonic evolution*: International Geology Review, DOI: 10.1080/00206814.2020.1836683, 16 pp. *lifornia*: Pacific Climate Workshop, poster. 10.13140/RG.2.2.29885.51684. 16 pp.

JAMES G. MOORE publication:

Moore, J.G. and M.D. Jackson, 2020, *Observations on the structure of Surtsey*: Surtsey Research, v. 14, p. 33-45: doi.org/10.33112/surtsey.14.3

L. J. PATRICK MUFFLER publications:

Downs, D.T., Champion, D.E., Muffler, Patrick., Christiansen, R.L., Clynne, M.A., and Calvert, A.T., 2020a, *Simultaneous middle Pleistocene eruption of three widespread tholeiitic basalts in northern California (USA): insights into crustal magma transport in an actively extending back arc*: Geology, v. 48, No. 12, p.1216–1220. <https://doi.org/10.1130/G48076.1>

Downs, D.T., Clynne, M.A., Champion, D. E., and Muffler, L.J.P., 2020b, *Eruption age and duration of the ~9 km³ Burney Mountain dacite dome complex, northern California, USA*: Geological Society of America Bulletin, v. 132, no. 5/6, p. 1150–1164. <https://doi.org/10.1130/B35240.1>

Miscellany...

The following memo was sent in by John Unger. For various reasons, we suspect that the source may have been the irrepressible Don Kelly...



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA 22092



In reply refer to:
Mail Stop 201

April 13, 1993

Memorandum

To: John D. Unger

From: Jack J. Stassi *JKS*
Assistant Director for Administration

Subject: Environmental Disharmony: First Offense

It has been brought to my attention that you were observed by a reliable witness to commit an act that is not in consonance with one of the highest goals of the Clinton Administration, namely that all the creatures of this planet should live in harmony with each other.

The act to which I refer occurred earlier today in the parking area. In summary, on seeing a squirrel entering a trash receptacle, probably to seek supplemental nourishment, you kicked the receptacle, thereby causing considerable alarm to the squirrel. Moreover, the squirrel might well have been injured on leaping from the receptacle.

Although squirrels are admittedly not on the endangered species list, we must recognize that they are essential participants in maintaining the biodiversity that we all value. As you must be aware, one of Secretary Babbitt's primary goals is to improve our understanding of the environment and to avoid the crises that result all too often from not recognizing the fragility of certain species. Who is to say that squirrels might someday be in peril of extinction? Moreover, as the Secretary plans to form a U.S. Biological Survey in the image of the USGS, is it really appropriate for Survey employees to be seen terrorizing small animals?

As this is your first offense in environmental disharmony and as you have had no other violations in your career, other than the usual offenses of insubordination and irreverence toward management, this letter will be placed in your personnel folder and no further action taken. Let me caution you, however, that we will soon be installing a video-camera monitoring system to monitor all the trash receptacles, so any repeat offense by you will almost certainly be observed and will be dealt with in a severe manner.

Please don't hesitate to contact me if you would like to discuss this most unfortunate incident.

cc: W. Phelps



Jack Stassi, Don Kelly, and Gail Wendt at the opening of the new Map Library in National Center, September, 1991.