GEOLOGY at SMU

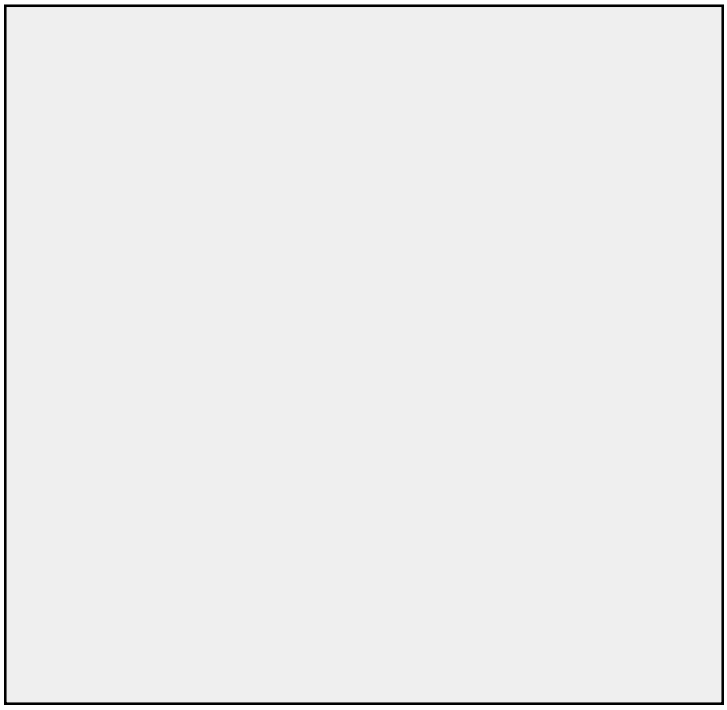
An occasional newsletter for alumni and friends. October, 2001

New holder of SMU's Albritton Chair

Stump helped with nuclear test ban treaty

The September 11 terrorist attack on the United States emphasizes the importance of understanding and limiting the spread of weapons of mass destruction. New Albritton Chair Brian Stump was part of the technical team involved in negotiating the treaty designed to stop the testing of nuclear weapons. The Comprehensive Nuclear Test Ban Treaty (CTBT) supports the Non-Proliferation Treaty that entered into force in 1970 and was renewed in 1995. Ratification of this treaty by nuclear capable countries including the United States, Russian Federation, United Kingdom, France and China means that these countries will no longer be able to conduct nuclear tests for any purposes. This result would be significant enough on its own, but the treaty is much more than that. The U.S. Senate has not ratified the CTBT and the Bush administration does not plan to push for its ratification.

BRIAN STUMP
Appointed to Claude C. Albritton, Jr., Chair of Geological Sciences, August 2001
Chair established by Roy M. ('38) and Phyllis Gough ('43) Huffington in 1981 with a generous $1 million gift in honor of Professor Albritton
Peter A. Scholle was the first holder of the chair from 1985 to 1999



Geological Sciences Professor Brian Stump studies a summary photo of the Phelps-Dodge copper mine in eastern Arizona. SMU is currently cooperating with the mine to study the seismic and infrasound (low-frequency acoustic) signals generated by activities at mines (explosions and other mining activities.)

The CTBT calls for a robust verification system known as the International Monitoring System (IMS) designed to supplement systems developed by individual countries. The international monitoring system includes technology designed to detect and locate the source of signals from any nuclear explosion, conducted in the atmosphere, underwater or underground, whose size is of significance. The IMS is a system of 321 seismic, hydroacoustic, infrasound and radionuclide monitoring stations distributed around the world.

Professors Gene Herrin and Brian Stump and their coworkers within the Department of Geological Sciences have been responsible for the installation, maintenance, and operation of several of the monitoring stations. Field data from these stations is channeled directly through computers to SMU. Earth science research will benefit greatly from the IMS, with the network delivering a wealth of information on geophysical phenomena such as volcanic eruptions, atmospheric disturbances like tornadoes and hurricanes, the rate of micrometeorite bombardment, and the warming of the ocean to name a few. Graduate students in earth sciences are taking advantage of this unique source of data for studying complex problems in the atmosphere and the earth.

Within the U.S., the CTBT has been attacked on two fronts. The first is that the monitoring system is not adequate to monitor zero yield tests. Such a system is a virtual impossibility. However, the IMS has been designed by groups of international experts, including many from the U.S., to detect and locate a source whose size could provide significant scientific and military value if it were a nuclear explosion.

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Chairman's Report

Texas' public schools continue to ignore importance of geology as a subject

By Robert Gregory

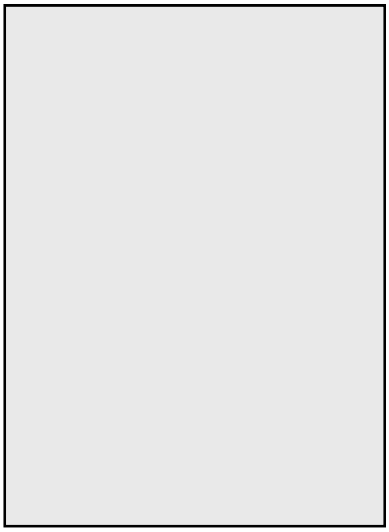
Texas still has a lion's share of the fossil fuel reserves held by the United States, yet the State of Texas declined to add geology to the list of core science courses for secondary schools. The last time Texas public school students will be exposed formally to Earth Science is during the second semester of year 8. Earth science and related topics are a mainstay of public television and radio, cable channels such as *Discovery* and the science pages of major newspapers and magazines. Texans should have more opportunities to learn the basics of geology in a classroom.

Some of the major problems facing *Homo sapiens* are geologic in origin and require geologic knowledge for a solution. These include the location and distribution of natural resources (minerals, oil and water), the protection of the environment, mitigation of natural hazards and the use of geophysical techniques to enforce international treaties regarding the development and proliferation of nuclear weapons. So why are the Earth Sciences such a hard sell? Clearly, they shouldn't be.

The last half of the twentieth century saw revolutions in geochemistry, geobiology, and geophysics. The first gave us the age of the Earth and the solar system as well as methods for tracing planetary and stellar evolution while the latter gave us the unifying theory of earth science, plate tectonics. The practice of geology moved off the Earth and yielded new insights into the solar system. This in turn resulted in a new view of Earth history. Geologic studies on the catastrophic consequences of giant impacts resulted in predictions about the consequences of first strike nuclear war contributing to the decline of the cold war. Seismology became the weapon of choice in the war against the proliferation of nuclear weapons. Before the last century was out, we saw for the first time a series of impacts on Jupiter comparable to the type capable of generating a mass extinction event on Earth.

Views of Mars and Venus reminded us about the importance of atmospheric evolution and the role of plate tectonics and water in providing the stability for higher life to evolve. Measurements of carbon dioxide contents in the atmosphere (almost 50 years worth) and in ice cores (back to 400,000 years) show that human activity is driving levels of greenhouse gases from geologic lows to levels not seen for many milllions of years.

Geochemists and geobiologists working on hydrocarbons and ore deposits recognized the signature of life in many chemical and isotopic reactions in the crust of the Earth. Microbial life could flourish in extreme environments several kilometers beneath the surface of the Earth. There are even claims of traces of life found in a meteorite from Mars, and microbial life will be found perhaps on some of the icy moons orbiting the giant planets.



Robert Gregory

Over the next several newsletters we would like to share some of the exciting research that is underway at SMU with an eye towards problems of general interest. The first of these articles is on the Comprehensive Test Ban Treaty, written by Brian Stump, the new Claude C. Albritton, Jr., Chair of Geological Sciences. It is fitting that this report and our first two features touch on topics that would have been of interest to the late Professor Albritton, who thought a lot about the impact of geological knowledge on our species. We will also try to highlight our alumni (send us your stories); the first in the series is from Dr. Steve Balsley (1994), now a staff member at Sandia National Laboratory working on materials characterization for the nuclear physics program including the quest for controlled fusion.

Meet Robert Gregory, new chairman of Geological Sciences at SMU

* Appointed chairman, July 1, 2001
* Joined SMU faculty in 1989 as Stable Isotope Lab director
* Taught six years in Monash Univ., Melbourne, Australia
* Born in Chicago, Illinois; reared in the shadow of the San Gabriel Mountains, California
* Obtained Ph.D. from California Institute of Technology
* Stable isotope geochemist
* Has mapped in Australia, Saudi Arabia, and the Sultanate of Oman
* Married with three children

A Brief Note About This Publication

Geology at SMU is an occasional publication of the Department of Geological Sciences, Dedman College, Southern Methodist University. It is intended for alumni, faculty, students, friends, and others. Questions and comments are welcome. Please notify us of any address corrections.

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So why is an SMU graduate with a Ph.D. in Geology specializing in the origin of silicic volcanic rocks doing mass spectrometry in a nuclear physics laboratory? The answer: Steve is the person who characterizes the starting materials. If the experiment fails to produce the desired results, then the composition of the starting materials needs to be checked. That's where mass spectrometry comes in. It is well known that if you wish to know how materials are put together, ask a geologist.

To create a high-yield nuclear fusion reactor that will ultimately produce cheap electric power from sea water, Sandia National Laboratory researchers must be able to evenly compress a BB-sized pellet filled with hydrogen gas so that its atoms are forced to fuse. Recently, Sandia's "Z" machine — the most powerful laboratory producer of X-rays in the world — spherically compressed a simulated fusion pellet during a firing, or "shot," of the giant accelerator.

Brian Stump helped in formulating nuclear test ban treaty

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The second criticism is that the nuclear weapons currently in the U.S. inventory cannot be maintained in a safe and reliable condition without testing even though the National Laboratories responsible for the design of these weapons have certified that the weapons can be maintained through computer simulation and material testing of the individual components. There is a perception that the stockpile of nuclear devices cannot be maintained in perpetuity so that someday in the future, the United States may need to return to testing.

Lack of U.S. ratification of the CTBT is potentially a serious blow to limiting the spread of nuclear weapons because of the provision for on-site-inspections for signatories of the treaty. Recent nuclear tests by India and Pakistan attest to this need. Failure by the U.S. to support the CTBT may send the wrong message to existing and potential threshold states and undermine the Nuclear Non-Proliferation Treaty. Rejection of the CTBT would mean that the IMS designed to monitor the treaty would not be fully developed, limiting our ability to monitor activities in countries such as the Russian Federation and China.

Cooperation among the nuclear capable countries, together with the International Monitoring System and on-site-inspection, provides assurances to each that further development of weapons of mass destruction does not occur and that the technology is not spread to others.

On March 10, 2002, Professor Stump will speak to members of the Collegium daVinci, a society for scientific discussion. His topic will be "Seismology and Politics in the Nuclear Age." For further information about the Collegium please contact Jeanene Anderson, Dedman College, SMU, PO Box 750235, Dallas, Texas 75275-0235 or email collegium@mail.smu.edu.

Remember that science project you had to do in school way back when? Well, school kids are still doing science projects from elementary school on up, and SMU is directly involved in supporting them as part of the Dallas Regional Science & Engineering Fair.

Since the first Dallas regional fair in 1957, the annual event has grown to be one of the largest student science fairs in the United States. Each year there are over 1000 projects entered by 7th to 12th grade students from the greater Dallas area.

Winners from the Dallas Fair go on to compete at state and international competitions. Several Dallas students have been recognized as place-winners at the recent international competitions, showcasing a strong science and engineering education tradition in the Dallas area.

Events such as the annual Science Fair give SMU an opportunity to reinforce the importance of learning, experimenting and healthy competition. SMU is one of the principal co-sponsors of the Dallas fair along with the *Dallas Morning News*, Toyota, Beal Bank and the Dallas County Medical Society Alliance.

Additional support comes from the Science Place and UT-

SMU Alum

Charles F. Dodge, 77, dies in Midland, Texas

By James Brooks
Professor Emeritus Geological Sciences

Charlie Dodge was a person of strong loyalties and firm opinions, thoughtfully arrived at and not casually abandoned. His loyalties were to family, friends, former professors and, equally, former students. He was quick to credit a handful of faculty for the education that paved the way for his very successful career as a geologist—teacher and practitioner.

Their names arose frequently in conversations with Charlie—Claude Albritton, Arthur Richards, Kathleen Keithley (all at SMU, where Charlie earned the B.S. and M.S. degrees) and Sherman Wengerd (Charlie's Ph.D. advisor at the University of New Mexico).

CHARLES F. DODGE
Born May 28, 1924, in Dallas,Texas
Died on May 29, 2001, in Midland, Texas
B.S., M.S., Southern Methodist University
Ph.D., University of New Mexico

On that solid educational base Charlie built a career as exploration geologist, teacher of geology (at the University of Texas at Arlington and as Adjunct Professor at SMU) and as independent exploration geologist. In these roles, he touched and influenced many lives—educating both students and professional colleagues.

Intensely enthusiastic about the projects he was interested in and working on, Charlie spared no effort to accomplish his goals. And the projects varied from what one of his students was working on, to a favorite oil or gas "play" that he believed in, to the politics of the local and national geological societies in which Charlie was always an active member.

In fact, more people than probably realize it have been honored at the local or national society level because Charlie knew about and believed in what they were doing and made the effort to aggressively support their being recognized by the society. Such was Charlie's loyalty and friendship.

Similarly, institutions that interested Charlie benefited from his interest and his creative thinking about programs that the institution might undertake that would be good for the profession and, thus, benefit the institution as well. The Institute for the Study of Earth and Man in its energy programs was frequently the beneficiary of Charlie's interest, advice and effort.

Of all the appellations and adjectives that could appropriately be used in connection with Charlie, "Independent" most typifies him—independent in thought and independent in action—and fiercely loyal to family, friends, institutions and ideas—the kind of person to be respected and cherished.

Memorials may be made to the Charles F. Dodge/DGS Scholarship Fund, Communities Foundation of Texas, 4605 Live Oak St., Dallas, Texas 75204.

Ghent to earn doctorate in December 2001.

Rebecca Ghent accepts Smithsonian fellowship

Rebecca Ghent, a Ph.D. candidate who is scheduled to complete her thesis in December, has been awarded a two-year postdoctoral fellowship at the Smithsonian Institution in Washington, D.C. It starts in January 2002. Ghent is specializing in planetary geology and geophysics under the direction of Professor Vicki Hansen. Her dissertation focuses on the structure and tectonics of crustal plateaus on Venus.

In Washington, Ghent will be working with Dr. Bruce Campbell of the National Air and Space Museum, Center for Earth and Planetary Studies on developing radar techniques for planetary exploration.

Ghent is a native of Randolph, New York. She earned her bachelor's degree in physics from Randolph-Macon Woman's College in Lynchburg, Virginia in 1993. She went on to get an M.S. in physics at Georgia Tech in 1994, and then taught physics at Gordon College in Barnesville, Georgia, from 1995 to 1996.

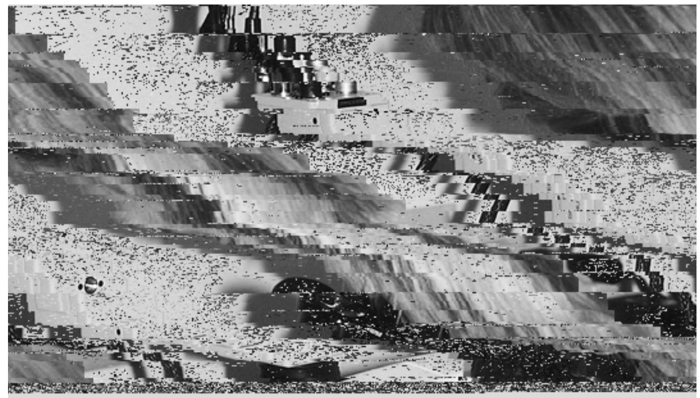
During that time, Ghent decided to fulfill a long-held interest in geology, and enrolled at SMU in 1996. Following her first telephone conversation with Dr. Hansen, she decided to work on Venusian tectonics for her Ph.D. She feels that this has been exciting and rewarding and hopes to remain involved in planetary exploration for many years. Ghent is looking forward to returning to the East Coast, and being part of the planetary research effort at the Smithsonian.

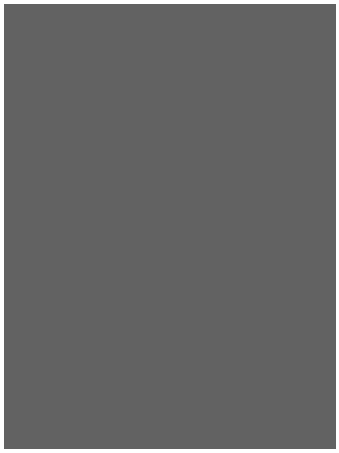
Ghent and her fiancée, Jason Head, another Ph.D. candidate in geological sciences at SMU, will be married in New Orleans in October 2001. Head, who holds a B.S. from the University of Michigan and an M.S. from SMU, also plans to graduate in December. His specialty is vertebrate paleontology.

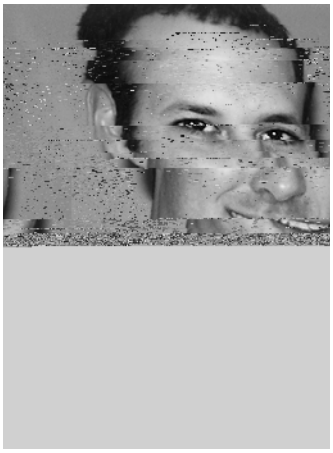
Hedberg Award will go to Robert J. Weimer

Robert J. Weimer, Professor Emeritus of Geological Engineering, Colorado School of Mines, will receive the 2001 Hollis D. Hedberg Award in Energy, presented annually by the Institute for the Study of Earth and Man. (Call 214-768-2424 for ticket information.)

The award will be presented on November 8 at the Dallas Country Club. Keynote speaker will be Tim Severin, noted author and explorer whose most recent book is *In Search of Moby Dick.*








Geological Sciences Faculty, Southern Methodist University

David D. Blackwell, Hamilton Professor, Ph.D., Harvard. Geothermal studies and their application to plate tectonics, especially of the western United States; energy resource estimates and geothermal exploration.

John W. Goodge, Associate Professor, Ph.D., UCLA. Continental tectonics, as approached by petrology, structural geology and thermo-chronology. Petrologic and tectonic evolution of North American Cordillera and Ross Orogen region of Antarctica.

Robert T. Gregory, Professor and Chair, Ph.D., California Institute of Technology. Stable isotope geology and geochemistry, evolution of earth's fluid envelope and lithosphere.

Vicki L. Hansen, Professor, Ph.D., UCLA. Structure, tectonics, geomorphology, earth systems, and terrestrial planet evolution.

Eugene T. Herrin, Shuler-Foscue Professor, Ph.D., Harvard. Theoretical and applied seismology, solid earth properties, computer analysis of geophysical data.

Louis L. Jacobs, Professor, Ph.D., University of Arizona. Director of Shuler Museum of Paleontology, and President of the Institute for the Study of Earth and Man. Vertebrate paleontology, evolution.

A. Lee McAlester, Professor, Ph.D. Yale University. Marine ecology-paleoecology, evolutionary theory, Paleozoic geology, petroleum geology.

Brian W. Stump, Albritton Professor, Ph.D., University of California, Berkeley. Seismology, earthquake and explosion source theory, regional wave propagation, seismic and infrasonic instrumentation and data acquisition, and mine related seismicity.

John V. Walther, Matthews Professor, Ph.D., University of California, Berkeley. Experimental and theoretical aqueous geochemistry, fluid-mineral surface interactions, kinetics of dissolution, and mineral solubilities as a function of temperature, pressure and solution composition.

Crayton J. Yapp, Professor, Ph.D. California Institute of Technology. Stable isotope geochemistry applied to the study of paleoclimates, paleoatmospheres, and the hydrologic cycle.

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