Message from the Chair

This past year has been the most memorable for me since the Geology Department was restarted (and I was hired) in 1985. We have finally and completely moved into the new Olin Building, an experience I will not soon forget. Ongoing work to finish the building and to settle in to the new facilities is progressing, and has also been an experience. The Olin Building provides Geology with much needed new and high-quality research and teaching space, and much else besides. More on that below.

George Shaw has been Chair of the Geology Department since 1988. Including his last several years at the University of Minnesota prior to Union, he had not had a sabbatical leave for more than 16 years (as I recall). George left on his much-deserved sabbatical in mid-July of 1998, and is based at Northern Arizona University in Flagstaff. He is doing research work in the Grand Canyon area, and other points around the world. I am sure he will have a lot to tell when he returns.

George has been Chair so long, that I should probably remind everyone who I am. I was hired by Herman Zimmerman when the Geology Department was restarted in 1985, so I have been around here for 14 years. Zim left for greener pastures at NSF in 1986, where he still is, and I was Acting Chair of the Geology Department until George took over in the summer of 1988. Since I am the old man of the department, I was involved in the hiring of the three other tenure line faculty we now have, including George. Being Department Chair, after so many years of loafing as a regular faculty member, has been a shock to me, especially with our recent move. I am slowly learning the ropes again.

In the past year we have acquired new equipment to further our dedication to providing a state-of-the-art environment for teaching and science. The ICP-MS, long our workhorse analytical tool, is now complemented by a new ion chromatograph, which analyzes water samples for inorganic ions such as sodium and nitrate. The "IC" has rapidly become the most popular analytical instrument on campus, and is regularly used by Geology, Civil Engineering, Biology, and Chemistry. The Environmental Studies Program, in cooperation with Geology and other departments, has acquired a new pontoon boat and other equipment for lake and river bottom mapping, sub-bottom profiling, and sampling of sediment, water, and living organisms. Labs in several courses in three departments are now using the boat, and the sonar equipment has revealed a number of interesting things about some local lakes.

Speaking of analytical equipment, our early successes in acquiring and using sophisticated equipment in an undergraduate setting has come back to haunt us. The old equipment, once shiny and state-of-the-art, is aging and starting to be in need of replacement. This 10-year old instrument has done tens of thousands of chemical analyses of rocks and water for class projects and for student and faculty research. It was the first ICP-MS instrument in the world at an undergraduate institution, and it is still one of only a handful. Though still functional, it is showing its age and is no longer suitable for the expanded, shared uses to which we would like to put it. We are working on grant proposal to fund the replacement. My how time flies!

The Geology Department continues to move forward in the fields of high-quality teaching and research. As the descriptions below indicate, many new and interesting things are happening here, and our alums, as usual, tell us about even more interesting things.

Kurt Hollischer

Ballston Lake initiative

The Environmental Studies program (headed by John Garver) has received a $160,000 grant for equipment and a $40,000 grant for curriculum development from the National Science Foundation. The focus
is on Ballston Lake as an environmental system. The lake is located just north of Schenectady, thus making it relatively easy to integrate it into lab field studies. This project involves faculty in the Environmental Studies Program and from the Departments of Geology, Civil Engineering, Biology, and Chemistry. Along with a pontoon boat, purchased in parallel with the grants, the equipment includes a sonar sub-bottom profiler to image lake sediment stratigraphy, a side scan sonar for mapping the lake floor, and a high-precision global positioning system to accurately track survey paths and sample locations. This initiative involves a variety of class field and research projects in environmental studies, geology, civil engineering, biology and chemistry.

The Environmental Studies group is also collaborating with science faculty at the Burnt Hills-Ballston Lake High School. These two groups have met to explore ideas concerning collaborative research projects, field projects in environmental science, and a possible mentor program between college and high school students.

Ballston Lake offers exciting scientific opportunities because it has characteristics that make the water and lake sediment much different from other lakes in the area. First, the lake basin is relatively small and the hydrologic budget includes numerous freshwater springs that occur throughout the lake basin. Second, the south part of the basin is very deep, with permanent stagnant, iron-rich, anoxic bottom water. Ballston is one of a handful of such lakes in the United States. In the anoxic bottom water biologic productivity is very low, resulting in undisturbed depositional layers that can be used for understanding sedimentation processes and local climate history.

Initial research results have been interesting. Jessica Newell (98) investigated the chemistry of sediment cores taken from the north and the south ends of the lake. Thus far she has found that the chemistry of the upper 10 cm or so of lake sediment reflects European settlement and modern industry, such as lead from gasoline. Sally Hodges (98) investigated the springs that feed the northern part of the lake. These springs often keep small patches of the lake free of ice during most of the winter and pose a potential hazard to snowmobilers, skiers, and ice fisherman. She has found that the springs have little variation in water composition and temperature. Charles Moxham (98) worked on sedimentation in the southern part of the lake. The sediment has excellent preservation of biologic material which will be good for climate studies and for dating purposes. Research work, as part of course projects and theses, will continue to improve our understanding of this natural laboratory.

**Greenland initiative**

Faculty in the Geology Department are looking into the feasibility of taking students to Greenland to see continental glaciation first hand. Students will be able to get direct experience with continental glaciers, environments and deposits at the edge of the ice sheet, and long-term climate change. Logistics and training will be coordinated with the 109th Air National Guard in Schenectady County, who are willing to help with course development and implementation. The 109th Airborne is the NSF-funded air support headquarters for all Polar programs (Arctic and Antarctic) and they are looking for innovative programs that they can support logistically. This course will involve a series of seminars on campus during the Winter and Spring, followed by a trip to Greenland to stay in Kangerlussuaq (west-central Greenland) and to briefly stay at the GRIP ice coring facility on the middle of the ice sheet.

**The Olin Building**

Starting in mid-July we prepared in earnest for the long-awaited move to the new Olin Building. This involved packing collections, dismantling equipment, packing labs and offices, and rescheduling research time. The move took place in three steps, and is now complete. Unfortunately the building is still not entirely finished and the path to getting our courses and labs running has been rocky. The Olin Building is striking in appearance, and the geology space is adequate and of high quality. I am happy that we share some of the building with Civil Engineering, because it is important to continue our strong ties with them. The new building has allowed us to consolidate collections and equipment that were previously distributed between three buildings, some parts of which were almost inaccessible. Now that all of the collections are in one place, we will be able to (slowly) curate the entire collection and check and update the catalogs. Seeing the collection all in one place gives me a different perspective; it is much larger than I had thought. The Olin Building contains some nice display spaces that we will be able to put to good use.

For Geology, the Olin Building contains two research/advanced teaching lab areas: one dedicated to sediment and soil sample preparation and analysis (e.g., grain size, organic carbon, pollen, core analysis), and another dedicated to water, rock, and mineral analysis (ion chromatograph, ICP-MS, wet chemistry). There is also a dedicated fission track lab, an X-ray and seismograph lab, and basement thin section, mineral
separation, and rock crushing labs. We have an office suite that lets all of us interact on a daily basis, a map and computer room for map storage and student work space, and a shop and field equipment storage area for keeping all of our tents and rubber boots, and for preparing core barrels, displays, and so on. Basement storage space is well-lit and accessible, and includes a large cold room for sediment and ice core storage. George, at last, has space to set up and use his high pressure apparatus. We also have at least temporary use of another basement room for analysis of images from side-scan and sub-bottom sonar sensors, and for maintaining the sensors and related equipment. Although we have no dedicated teaching or general lab rooms, we have managed to work out an arrangement that is adequate for the time being.

On October 23, 1998, a week before John Glenn went back into space, the Olin Building was dedicated with help from another space pioneer. Harrison Schmitt, the last of twelve men to walk on the moon, spent the day at Union talking to audiences that ranged from fifth-graders to members of the College's Board of Trustees. Schmitt was the first scientist in space and the only geologist to go to the moon. He gave an afternoon talk "A field trip to the moon" in which he described his "field area" - the landing site of the Apollo 17 mission. In this talk he described the impact crater they landed in, the famous volcanic "orange soil" exposed on the crater margin, and the regolith, which Schmitt hopes will eventually be mined for valuable resources. For the building dedication in the evening, he discussed the Interlune-Intermars Initiative in which a private consortium hopes to mine Helium-3 on the moon for fusion power production on Earth and to power and supply space exploration. In the morning, he enthralled more than 100 fifth-graders from local elementary schools. He made traveling to space sound awesome and possible by anyone. When he asked the children whether they wanted to go to the moon or Mars someday, dozens of hands shot up. Schmitt replied that they might not only travel there but also live there. "By the time you're ready to go to the moon, fifteen or twenty years from now, it may be much more routine" he said. This entire event was an honor for the Geology Department, and it was a great way to dedicate the building.

Notes from the Faculty
Mark Brandriss. Mark is a visiting Assistant Professor, replacing George Shaw during his sabbatical, who joined the Department for the 1998-1999 academic year. Mark is a petrologist and geochemist with interests in
crustal magmatic processes, contact metamorphism, and stable isotope geochemistry. He arrived at Union last fall after a summer of field work in the Coast Batholith of southeastern Alaska, where he worked as a member of the faculty of the Juneau Ice Field Research Program. His work in Alaska deals mainly with magma mixing processes revealed in early Tertiary plutons of the batholith.

Robert L. Fleischer. Bob has joined the Department as a research associate. Bob spent many years at General Electric where he focused on nuclear tracks in solids with several co-workers. Upon his retirement from GE, he took up residence at RPI and then moved to Union in the fall of 1997. Currently Bob is working to improve monitors used to detect radon. He discovered that normal plastic eyeglass lenses are generally made of a material called CR-39 (a polycarbonate) that acts as an excellent detector for alpha particles released during the spontaneous disintegration of Radon. He has found that eyeglasses serve as excellent personal dosimeters, and he has been working with a number of students on this innovative project. If you have eyeglasses that you would like to donate to this study please contact him here at the Department, or e-mail him at fleischr@union.edu.

Kurt Hollocher. Last spring I hosted five Union College students who presented papers at the Northeastern section meeting of the Geological Society of America in Portland, Maine. In my memory this was the best Union College showing at this meeting. Of these students, two worked with me on geochemistry-related theses. Bill Chazey presented our most recent work on the geochemistry of the saline and carbonated Saratoga Springs. New Geology Department instrumentation has allowed us to get a more accurate and complete measure of the chemistry of these unusual waters, and has let us calculate the composition of the water at depth, before its modification by degassing, calcite precipitation, and mixing with shallow fresh aquifer water. We speculate that these waters are ultimately derived from far to the south (Pennsylvania?) where ground water mixes with saline formation waters and dissolves CO₂-rich formation gas. Hydrostatic head from the high elevation recharge area drives water through fracture and solution porosity along the Saratoga Springs-McGregor fault zone to the Saratoga Springs area. Shelly Rourke worked on a new project in the West Warren pluton in south-central Massachusetts. This body is mostly made up of orthopyroxene-bearing gabbro, diorite, and tonalite, and is associated with a long, snake-like body of garnet-feldspar megacryst granite. Shelly's work indicates that some of the mafic and intermediate rocks are derived from melting of the Earth's mantle, and the rest are from melting of deep crustal rocks. The granite is apparently derived from melting of schists. The information these rocks give us about the Devonian deep crust and underlying mantle will help us constrain Devonian Acadian tectonic models. I have also been helping local area school teachers on a number of projects, including use of Internet resources for teaching (mostly maps and data for exercises), and helping to organize and run training workshops.

Don Rodbell: Don spent 6 weeks in Boulder Colorado, working, between family duties, with Peter Castiglia (99) on a project at the U.S. Geological Survey's paleomagnetics laboratory. Peter analyzed over 100 samples from a 9-meter long core that Jeremy Newman (97), Don, and others obtained from Laguna Gueshque in the Peruvian Andes in 1996, and which formed the basis of Chris Moy's (98) senior thesis. Don then traveled to Peru where he was joined by Peter Castiglia and Rebecca Brown (01). They stayed at the house of Alcides Ames, a Peruvian glaciologist, in the spectacular mountain town of Huaraz. They spent most of the trip camped at about 14,000' on the shores of Laguna Gueshque. They were fortunate to have nearly perfect weather and none were plagued by the stomach ailments that are so typical to gringos in South America. Their accomplishments exceeded Don's expectations: they retrieved a core nearly 14 meters long, and discovered numerous exceptional exposures of till interbedded with peat which have submitted for radiocarbon dating. They were joined in the field by a scientist from Lawrence Livermore National Labs, who is working with Don to
date moraines using the cosmogenic isotopes $^{10}\text{Be}$ and $^{26}\text{Al}$. At the end of the trip, Becky and Don returned to the U.S., and Peter stayed on for 10 days with an expedition to the summit of the Nevado Huascarán, which at about 23,000' is the second highest peak in the western Hemisphere. They obtained an ice core spanning the last several decades to help interpret a core previously drilled through ice to bedrock by another team. The new Laguna Gueshque core is being analyzed by Jaimie Garrand (00) and Brendan Geraghty (01). Initial radiocarbon dates indicate that the core spans the last 14,000 years (all of the Holocene), and contains a fascinating record of climate change in the tropics. This winter Don published a paper in Science, and was interviewed by VOA, NPR, and BBC, and had a front-page article in the Albany Times Union.

**John Garver** has been busy as usual. He is currently head of the Environmental Studies Program, and has organized and sponsored two public lecture series at Union College. Last year the four-part series was on climate change. These lectures were taped and played on the local public access cable channel. This year he has organized, with others, a 7 part lecture series on lakes and their record of historic and environmental change. These series have been open to the public, and some were taped and played on cable and network TV.

**Alexey Soloviev** is a Russian researcher from the Institute of the Lithosphere (Russian Academy of Science) in Moscow. He is at Union for 6 months to study fission-track dating with John Garver. He and John have worked in Kamchatka (Far Northeast of Russia) since 1993, shortly after the breakup of the Soviet Union. During this time Alexey has focused on the structural geology of the Koryak Upland at the Northern part of the Kamchatka Peninsula. Alex met John in Kamchatka almost 6 years ago, and learned about the fission track dating method which is virtually unknown in Russia. John and Alex were involved in two extended field trips in 1995 and 1996. Both times he worked with Union Geology students, and was impressed! John invited Alex to study the fission-track method at Union College, and found the support to do it. Alex is thrilled at having the chance to do fission-track dating at Union, which is generating data critical for Alex and John's joint project.

"I would like to extend my gratitude toward the Union College Geology Department for making my visit at Union College worthwhile, interesting and very productive. Most of all I would like to thank Professor John Garver for the time and effort he has devoted over four months to teaching me the concepts behind fission-track dating. I look forward to returning to Russia to start my own lab and to continue to work with Union students."

**Alumni notes**

**John Wold** (38) visited the Geology Department last fall for an alumni gathering. While in town he went on the Mohawk River with members of the Geology Department on the New Environmental Studies Pontoon boat. A unusually strong cold front swept through the area while they were on the river and the water got rough. After some careful maneuvering, the group made it back to Union with just enough time to change into dry clothes before the evening festivities. John recently received the Eliphalet Nott Medal, presented by Union College President Roger Hull. This medal was given in honor of John's outstanding professional achievements and distinction. Among his notable achievements, John is a Union College trustee emeritus, President of Wold Minerals Co., and former Wyoming U.S. Congressman. John was also responsible for re-starting Union's Geology Department in 1985, which included the John and Jane Wold Professorship in Geology.

**Ross Sangster** (61) lives with his wife Nancy on the shores of Ballston Lake. He has been very helpful with the Ballston Lake initiative by granting access to the Lake and actually going out on the boat during Surveys.

**Ed Hood** (91) reports that he is living in Georgia, and plans to attend the SE-GSA conference in Athens this spring. He is busy working for Arcadis Geraghty and Miller, a large environmental consulting company. He is now a professional registered geologist in the State of Georgia. Congratulations, Ed! (e-mail: hooder@negia.net).

**Phil Royce** (92) has moved from a temporary position at the Geology Department at St. Lawrence University to a permanent position as Director of Outdoor Programs. He and Kira Royce announced the birth of their first son Bridger, who was born in December 1998.

**JR Van Order** (93) is recently married (October, 1998) and continues to live in New Orleans. He started out working for URS Consultants (now URS Woodward-Clyde) in New Orleans for about 2.5 years doing mostly air emission calculations, soil and groundwater sampling, and solid waste permitting. He is currently
a Project Manager with Environmental Resources Management, working mostly with air permitting issues, compliance tracking systems, solid and hazardous waste permitting, and wastewater discharge issues. He says there are not a whole lot of rocks in his area, but plenty of fluvial depositional systems (and crawfish). (e-mail: JR_VanOrder@erm.com).

Andy Frisbie (95) is working for a computer company in Seattle Washington. On a snowy day last November, on the flanks of Mt. Rainer he proposed to Aaron. They plan to get married in Lake Placid next fall and plan to move back east. Andy is scheming to climb high peaks in the Andes and in the Tien Shan.

Adam Goodman (96) will be defending his MS at Syracuse University later this semester. His work used soils and radiocarbon dates to constrain episodes of glaciation in Southern Peru. He is attempting to correlate glacial advances (moraines) with other well known advances in South America and the Northern Hemisphere. A strong correlation will support synchronous northern and southern hemisphere climate shifts. He has accepted an internship with Exxon/Mobil which starts most likely in June. (e-mail: aygoodma@mailbox.syr.edu).

Shane Holunga (96) is working for Ogden Energy and Environmental Services, out of Westford, MA (near Boston). He recently reported: "I am going to Snow Lake on Dec. 24 1998 and will return to Boston on Jan. 3. Hopefully the ice fishing will be good. If not, I will have to subsist on garlic sausage and home brew." (e-mail: spholunga@oees.com).

Jeff Nebolini (96) has been working in Boston, and recently took a position in Boulder at a record/multimedia company. The company is small and growing fast, so he is busy and has a lot of responsibility. He is also taking three classes in photography and graphic design, and he is designing web sites. Between that and telemark skiing, it's a wonder he has time to write. (e-mail: jeffrey_n@springhillmedia.com).

Craig Prunier (96, by word from Scott Lewis) has been in Reno, NV, and recently took a hydrogeology-environmental consulting job in San Francisco. (e-mail: prumier@seismo.unr.edu).

Gaeba Schweizer (96) is living in Shutesbury, Massachusetts, and is working for a health care consulting company. She loves home ownership, and is looking for a position in the production of educational materials. Her geology, environmental and health consulting, and interests in teaching, should hold her in good stead.

Chris Sears (96), as reported by Shane Holunga (96) is (or was) engaged.

Mike Bullen (97) is finishing up his MS degree in Tectonics at Penn State University. He has accepted a job with Exxon, where he begins in November. He will take a 2 year training program in which he will learn 2D and 3D interpretation, geochemistry, new technology, and other fun things. (e-mail: bullen@geodn.psu.edu).

Amy Dougherty (97) has been doing argon-argon dating, at MIT, of deformed rocks in the Himalayas. With her co-authors she just presented a poster on at NE-GSA in Providence, RI. Last October she presented an earlier version of her work on at the national GSA meeting in Toronto. She has just started graduate school at Boston University, studying coastal processes. (e-mail: adougher@bu.edu)

John Kronholm (97) started in Virginia working construction, then in a lab, and then began operating heavy machinery, like asphalt pavers, bucket loaders, excavators and bulldozers. After that he operated a rock crusher just like the one he used at Union, but able to handle "4000 lbs of ore at a bite". He just took a new job in Vail Colorado and will probably stay there for awhile.

Scott Lewis (97) is finishing up his degree (MS Geology) at Old Dominion University. His defense will probably be sometime in March. He has been interviewing for environmental consulting jobs in the New Jersey area. (e-mail: TOKAMA@aol.com).

Jeremy Newman (97) is at Humboldt State University, taking courses to prepare for medical school.

New graduates

Alexandra Beuchert (98) is married to a skydiver and is working as a professional photographer.

William Chazy (98) is at Notre Dame and is working on two projects. The first is analysis of lunar mare basalts, and the second is on the Kerguelen Large Igneous Province in the Indian Ocean. Both of the projects will rely heavily on trace element analysis using ICPMS, including platinum group element analyses. He hopes to be on an Ocean Drilling Program cruise in next year. (e-mail: wchazy@kant.helios.nd.edu).

David Conner (98) has recently moved back to Schenectady (after a stint in Massachusetts) and is looking forward to playing with the band again.

Rachael Graham (98) is working for a Christian youth outreach organization in Schenectady.
Sally Hodges (98) is a Hydrogeologist for the consulting firm of Leggette, Brashears & Graham in Ramsey, NJ. She says she can't get over the fact that other geology programs don't spend time in the field like Union does. (e-mail: hoet3ww98@hotmail.com).

Richard Lederer, Jr. (98) is attending graduate school at Brown University.

Karin Lichtenstein (98) is the office manager at an architectural firm (Wood and Zapata, Inc.) in Boston. They are a small but respected firm doing work that includes the new Chicago Bears Stadium, a new concourse on the Miami International airport, and Robert Redford's Sundance Theaters ("I actually met him...cool, eh?"). She likes the work, but it's not very challenging so she is thinking again of going to grad school. (e-mail: klichs@yahoo.com).

George Lombardo (98) is at the University of Rochester studying geochemistry. He has taken a class in aqueous geochemistry and has decided to douse the water with flames by turning to high temperatures, probably focusing on magmas. (He's seen the light!; editorial comment by KH). He enjoys being a TA, and loves learning about and teaching geology. (e-mail: lombarg@aol.com).

Aaron Mango (98) is at the University of Florida and he is working on how groundwater in karst terrains are influenced by tidal forces. He writes "I survived hurricane Earl. It really was not that bad, but now I can say I was in a hurricane." (e-mail: mango@quartz.gly.fsu.edu).

Charles Moxham (98; Biology/Geology double major).

Chris Moy (98) is a graduate student at Syracuse University, and is continuing his studies in South America. He recently came through the Olin Center to work on some samples for his thesis.

Jessica Newell (98) is in the MAT program at Union, teaching earth science at Schenectady High School: two classes and one lab. She also works on an after school program for kids who need academic help. She is also working as mentor and in curriculum development to link mathematics to earth science concepts. She loves teaching! (e-mail: newellj@idol.union.edu).

Shelly Rourke (98) is at the New Mexico Institute of Mining and Technology in Socorro, and she recently traveled to Kamchataka, Russia to work on a project on tephra chronology. She was a TA in Mineralogy, and is becoming an electron microprobe jockey. (e-mail: rourker@nmt.edu).

Joshua E. Snyder (ES/CE double major, 98).

Anne Swasey (98) is working at University of Maine in Orono, where she has been at the library in the information systems office helping edit and design web pages as well as software profiling. (e-mail: Anne_Swasey@umit.maine.edu).

Geology Funds

Donations to the Geology Department can be made to two funds. The Geology Fund, is generally used for special things not covered by the normal department budget. These include special equipment for student research, travel for students to conferences, and field trip support. The Geology Field Fund (GFF), which has grown to $115,500, is about half way to our initial goal of $250,000. This fund is principally to sponsor extraordinary field trips, including extended summer trips, excursions to northeastern lakes for intensive interdisciplinary exercises using our boat, sonar, coring, and related equipment, and for field camp scholarships. This year the fund helped all 12 members of this years Carbonate Sedimentology class working field trip to San Salvador, Bahamas. The fund paid for a morning excursion to Gaulin Reef, which is several miles offshore from the island. The fund fully supported several students who would otherwise not have been able to afford the experience. The Geology Field Fund also helped an interdisciplinary trip in the fall to Sandy Pond, a small back-barrier pond on the eastern shore of Lake Ontario. Crystal clear weather and bright fall foliage made this an unforgettable experience for the students. The objectives were to look at the geomorphology of the barrier island and to investigate the pond for storm deposits and bottom features. Also partly sponsored this spring by the Geology Field Fund was a trip by the Geology Club to Washington DC. The students, John Garver and his visiting Russian scholar Alexey Soloviev, and the father of one of the students traveled to see the Smithsonian Museum and other sights of our nation's capital. This year the Geology Field Fund will provide, for the first time, some support for summer field camp. The following is a letter of thanks from Peter Castiglia ('99), who went on the Carbonate Sedimentology trip last December.

Dear Union College Geology Alumni,

As a direct result of your generous contribution to the Geology Field Fund (GFF) twelve geology students were afforded yet another exceptional research opportunity that extends beyond the typical undergraduate
education. Led by Professor John Garver, students traveled to the remote Bahamian Island of San Salvador to examine carbonate depositional environments for evidence of climate variability. As the field portion for a course aimed at exposing students to the depositional processes of carbonate rocks, this one-week field stay has been the highlight of many students college experiences. This trip was fantastic!

For example, most students will probably never forget negotiating through the intricate Lighthouse Cave system while swimming through warm water, in some cases, over our heads. The chance to swim along side a parrotfish, hover above a giant brain coral, and follow a sea turtle engendered in each of us a greater appreciation for our delicate ecosystem. Such opportunities are rare and long-lasting.

San Salvador provides extraordinary examples of flourishing reef systems, flank-margin caves, hypersaline lakes, and karst terrain. The ability to witness each feature hands-on surpasses the limitations of any laboratory instruction, which could not have successfully conveyed the extent of importance carbonate systems in the global community. Field-intensive instruction is one reason why Union produces some of the leading minds in the geology. However, such projects would not be possible without the generous support that you have provided.

Thank you for enabling the Department to expand its grounds with projects like these and for providing students with such life-changing experiences.

Sincerely,
Peter Castiglia
Union College Geology Department, 1999

Donors to the Geology Department
The following people have generously contributed to the two geology funds described above. I apologize that this list is incomplete. I only have the names of donors that have contributed since I became chair, and I doubt that I have been notified about all of them. I thank all those, named and unnamed.

Howard and Sherrie Bartholomew
Leo Carpenter
Maurice Deul
Mark Dobday
Julia Griswold
Philip Perkins
Gaela Schweizer