Message from the Chair

The past year has been very good for geology at Union. We graduated our first real geology class since the dissolution of the department in the late sixties. (This is not to say that we do not appreciate those who graduated in the early seventies, the "geology majors" who actually got degrees in other fields in the past twenty years, or the three geology majors who graduated after the restart of the department in 1985. This is the first group of students to graduate together since the rebirth of the department.) You will read about our recent graduates elsewhere in this newsletter, but I want to let you all know that we are proud of this class, and we wish them well. I think we have given them a great start on careers as successful geologists. Included in the group is the first woman to graduate with a geology degree from Union College. We expect there will be many more, as a number of our current students are women. In fact, with the incoming class we will have five women out of a total of twelve geology majors.

This year saw the department gain its second tenured faculty member, when Kurt Hollocher was promoted to Associate Professor and granted tenure. I am delighted that Kurt will be continuing with us. He has done a great job in acquiring and maintaining modern equipment for the department, but especially in helping students to learn to use some of the most sophisticated analytical tools available to geologists. As the result of his efforts, three of this year's graduates were able to do senior research projects using our new plasma mass spectrometer. Those students did an excellent job in presenting their results at regional and national meetings, and one had his paper judged third highly at a meeting of the Vermont Geological Society, where most of the other papers were by graduate students.

We continue to be short of staff, using a visiting lecturer supported by the Pew Foundation during each of the last two years to cover some parts of the curriculum. This coming year we will not have a Pew Visiting Lecturer, and I have been forced to cut some courses from the schedule. Some of you may be thinking: "Well, Prof. Smith covered everything himself, with maybe some help from a visiting lecturer, so why do you need more faculty now?" The answer is twofold. First, geology is considerably more diverse, and the necessary background information is far more complex, than was the case 30-40 years ago. In order to provide our students with the kind of quality geological education they will need to compete in today's job market, we need a diverse faculty. No individual can cover the breadth of modern geology in sufficient depth to provide satisfactory coursework for students. Second, there are twice as many students at Union College as there were when Prof. Smith held forth above the Old Chapel. If we are to keep class sizes small enough so that our students get the kind of attention they should get at Union, we need the faculty to do the teaching. Virtually all the colleges Union likes to compare itself with
have geology departments significantly larger than the department at Union. Indeed, the average size of the departments in those colleges which have geology (which is the vast majority) is about 4-1/2, so we are well below average for our peer group institutions. We hope that this situation will be remedied soon.

Meanwhile, the Department continues to make progress in providing students with a first-rate undergraduate education. We are doing especially well in obtaining equipment and training the students in its use. The plasma mass spectrometer was a great help to our graduating seniors in their thesis work. Our image-processing computer was installed last year, and we hope to get the software running so that students may use this modern view of the world in their studies. We have recently acquired a used scanning electron microscope (to be shared with Physics) from General Electric. This was a very nice addition to our equipment, which we expect to start using in our courses this winter. Unfortunately we are still very cramped for space, and it will be necessary to house the instrument in Physics rather than in the Geology Department. I suspect that there is no department on campus as pressed for space as geology, or where space is used as thoroughly or efficiently.

As usual it is good to have this opportunity to communicate with you. I hope that those who can will stop by for a visit. Many of you have returned cards communicating your activities. Please continue sending those cards in! We enjoy hearing from you, and so do the other alumni through this newsletter. Thank you.

Alumni News

Captain F. A. Wyatt, USN (ret.), '32, works on the staff of the National Interns Assistance Corporation, which helps students find internships in the Washington, D.C. area. He has encountered several Union alums while visiting congressional offices on "the Hill". He recently stopped by the department to say: "Hello!", as we hope all of you will soon.

William H. Parsons, '36 & MS-Geol. '38, is retired and living in Charlottesville, N.C.

Clark Alberts, '44, visited the Tintina Trench, Denali Fault, and many glaciers in Alaska and reports it is "great country."

H. W. Mallery, '47, is "semi-retired" but an active consultant and independent in mining geology and exploration in the western U.S.

Robert M. Fuller, '49, has been retired for about five years, and lives in Wilmington, NC.

George R. Macaulay, '50, retired from Chevron in 1980 but remains active in drilling and producing as a consultant with a number of large and small companies.

Donald M. Hoskins, '52, continues as the State Geologist of Pennsylvania, and was elected Secretary-Treasurer of the Association of American State Geologists. He has given a number of lectures on his discovery of a rare geological map of Pennsylvania, New Jersey, and Delaware which he found in the collections of the Library of Congress.
Dave Glamm, '54, is in the Arkansas State Department of Veterans Affairs after 26 years in the Air Force.

Laszlo Valachi, '61, is a senior geologist for Mobil in Lima, Peru.

Jack Schroder, '61, has initiated new research projects in Czechoslovakia, where he is studying slope degradation near strip mines, and Pakistan, where he is using the geomorphic development of mountains to constrain isothermal surfaces through time in order to calibrate uplift rates.

John E. Dreier, '64, is V.P for Exploration/Development at Azco Mining, Inc.. He has been in mining exploration and development since 1965 and obtained an M.S. from the University of Wyoming and a PhD from the University of Arizona.

Jon P. Broderick, '64, is self-employed as a consulting economic geologist in Reno, NV, mostly involved in gold exploration.

Harold Nilsson, '65, has started consulting in the environmental field on wetlands, peat, permitting, etc..

Ed Kodl, '66, is a senior geologist with Texaco, stationed in Bakersfield CA, but is currently on a 3-4 year assignment in Indonesia.

Dave Conant, '68, is a consultant in acoustics to EuroDisneyland, the U.S Pavillion for Expo-'92 in Seville, and (formerly) the government of Kuwait!

Bill Warcholik, '68, is doing graduate research at the Geoscience Research Institute.

Peter Schiffman, '73, is a research geologist at U.C. Davis working on submarine hydrothermal systems and ophiolites in California. He also teaches X-ray spectrometric analysis and summer field geology.

Daniele Cherniak, '83, completed a PhD in Physics at SUNY-Albany and is currently working as a research scientist in the geology department at RPI.

New Graduates

Edward Hood will be attending graduate school at the University of Georgia in Athens, Georgia. This summer Ed is working for Weston Consultants. Ed's senior thesis topic was: "Chemical composition of the Mohawk River and two tributaries, Schenectady, NY, measured by ICP-MS."

Leslie Kahn is currently employed by Arthur D. Little in Cambridge, Massachusetts, and is investigating graduate departments in the Boston area. Leslie's senior thesis topic was: "Tracking the horizontal spreading of heavy metals in groundwater, Naugatuck, Connecticut."
Eric Morton will be attending graduate school at the University of Connecticut in Groton, Connecticut.

Todd Smick is working for McLaren - Hart Associates in Albany this summer and expects to attend graduate school at Wright State University next year. Todd's senior thesis topic was: "Trace element geochemistry and provenance of Ordovician shales deposited during the Taconic orogeny in New York and Quebec."

Linda Garbellano (Masters in Teaching) has a position at Schenectady Christian School Linda's master's thesis was entitled: "Trace elements in karst springs: Schoharie and Albany counties of New York State."

**Student presentations and publications**

Our students have been very active in independent study and senior theses, and have presented the results of their work in a variety of forms. Seniors Ed Hood, Leslie Kahn and Todd Smick all attended the National Conference on Undergraduate Research at Cal-Tech. Ed's paper was entitled: "Chemical composition of the Mohawk River and two tributaries, Schenectady, NY, measured by ICP-MS." Leslie's work was entitled: "Tracking the horizontal spreading of heavy metals in groundwater, Naugatuck, Connecticut." Todd's paper was on: "Trace element geochemistry and provenance of Ordovician shales deposited during the Taconic orogeny in New York and Quebec." They all also presented their results to their fellow students at Union during the Steinmetz Symposium in May. In addition Ed presented his work at the NE-SE meeting of the Geological Society of America, and Todd's presentation of his work to the Vermont Geological Society was well received at the meeting. Sophomore T. Jeffrey Scott presented a paper at the Steinmetz Symposium entitled: "Multiple K-bentonite layers in the Lower Devonian Kalkberg Formation - Cobleskill, N.Y.", and he was a co-author of a paper by the same title presented at the NE-SE GSA meeting in Baltimore.

**Environmental Geochemistry at Union**

by Kurt T. Hollocher

Although my research interests have mostly been in the field of igneous and metamorphic petrology, I have long been interested in environmental chemistry. In June, 1990 we had installed a state-of-the-art analytical instrument (described in last years' newsletter), an ICP-MS. This instrument allows routine rapid analysis of water solutions for about 72 inorganic elements. Detection limits for some elements is below one part per trillion.

Ed Hood, a senior Geology major, started a project on the chemical composition and chemical variability of some local streams. Ed sampled the stream that runs through the Union campus, the Alplaus Kill, draining an area between Scotia and the southern Adirondacks, and three locations on the Mohawk River. Ed collected samples ten times over a period of about four months, and analyzed the samples for 23 chemical elements, including major elements such as sodium, chlorine, calcium, and sulfur, and trace elements including arsenic, silver, lead, and uranium. Ed found that the elements changed concentration over time in complex ways, but most of the
elements followed predictable patterns. For example, sodium, chlorine, and other elements including uranium, all elements wholly in solution, are more dilute during high flow (more rain) and more concentrated during low flow (less rain). Ed also found that the lead concentrations varied enormously, being low under most conditions but much higher soon after downpours. The lead, probably coming mainly from particulates from automobile exhaust, is washed off of the landscape by the rain. Ed's work contributes to the understanding of the movement of chemical elements in the environment, and is important for establishing background concentrations of chemical elements in the environment, most of which enter water naturally from rock weathering. Information of this sort is useful for estimating the flow of elements into the oceans, which has been measured for most elements only on the world's largest rivers. The information on natural background concentrations is also essential for drafting good laws pertaining to environmental contamination. After all, to draft a law limiting the allowable lead content in public drinking water, it is first necessary to know how much lead is naturally in the water to begin with.

Leslie Kahn, another Union Geology senior, used the ICP-MS instrument for a very different project. Leslie had worked for a consulting company during summer 1990, and was involved in monitoring a small hazardous waste site in Connecticut. The site included a pair of open pits into which metal plating solutions had been pumped for many years, up to about 1975.

The lab reports on water in the monitoring wells was of little value in understanding the migration of metals out of the pits, since all analyzed concentrations of the metals were given as "BLC": below the level of regulatory concern. Leslie decided to find out if the metals were migrating out of the pits in groundwater at concentrations below the "BLC" limit. She analyzed samples from ten monitoring wells over a period of three months for ten elements, including chromium, zinc, arsenic, silver, and uranium. Some of these wells were distant from the pits and were used to establish natural background concentrations. Leslie found that only one element, cadmium, was migrating out of the pits in groundwater and that all other elements were locked as insoluble precipitates in the pit bottoms. Even cadmium approached background concentrations within 100 feet of the pits. Leslie's work has demonstrated that, at least for inorganic elements under the conditions of the site, most inorganic elements do not leach out of hazardous waste sites to pose a long-range contamination hazard.

A Special Thank-you

The following individuals have made financial contributions last year toward our efforts in geology at Union. If I have left anyone off this list it is probably because I did not receive the information from the college development office. They usually do a very good job of letting me know, but occasionally there are slips. Please let me know (you can use the enclosed card) if your name should be included on this list.

Donald Hoskins, '52
Donald Zenger, '54
Mark Dobday, '75
Grants received

From the Union College Faculty research fund:

$2358 to John Garver: "Uplift in a strike-slip fault zone as determined by fission-track dating."

$2000 to John Garver: "Geochemistry of Ordovician shale in the Taconic foreland."

$2526 to John Garver to fund the department field trip to Newfoundland.

$1575 to Kurt Hollocher: Establishment of the scientific validity of measuring Li and B isotope ratios by ICP-MS

$1054 to George Shaw: Correlation of bentonite beds using rare-earth element chemistry of apatite phenocrysts."

From the N.Y. State Pew Cluster to George Shaw,

$2333 for cooperative faculty research with John Cisne of Cornell University to study Ordovician bentonites in the Mohawk Valley.

Most of the above research involves students, frequently in the form of senior thesis projects.

Faculty activities

John Garver attended the GSACordilleran Section Meeting in San Francisco and participated in a field trip to Pacheco Pass and Mount Diablo to look at rocks of the Franciscan Complex and the Great Valley Sequence. John also was one of a select group who attended 14-day, NSF funded, teacher enhancement program on modern carbonate environments, diagenesis, soil formation and Pleistocene analogues. John had two field reports published by the British Columbia Ministry of Energy, Mines and Petroleum resources on his work in the Bridge River Complex in B.C.. He also had two geologic maps published, one from his B.C. research area, and one from area just south, including the Methow basin of Washington State.

Kurt Hollocher presented results of work using the ICP-MS at the Fall Annual Meeting of the American Geophysical Union in San Francisco in December. His paper, co-authored by George Shaw, was entitled: "Boron isotope ratios by ICP-MS: preliminary results." Kurt also attended the joint NE-SE GSA meeting in Baltimore where one of his students presented a paper, co-authored by Kurt, entitled: "Chemical composition of the Mohawk River and two tributaries, Schenectady, NY, measured by ICP-MS." Kurt also had a paper published in American Mineralogist: "Prograde amphibole dehydration reactions during high-grade regional metamorphism, central Massachusetts, U.S.A."

George Shaw presented seminars at the University of Rochester and the University of Massachusetts on "Geochemical Correlation of Lower Paleozoic Bentonites." He also presented
a paper at the NE-SE meeting of GSA entitled: "Multiple K-bentonite layers in the Lower Devonian Kalkberg Formation - Cobleskill, N.Y." The work on bentonites was the subject of a nice article in the Albany Times-Union in July. He also gave the keynote talk at a conference on waste disposal. The conference was hosted by the Graduate and Continuing Studies office of Union College, and was directed at informing the media about the issue of waste disposal. A similar talk at the University of Massachusetts generated considerable discussion.

John Ostrom Honored by Union

Prof. John Ostrom ('51) was the honored speaker at the Union College Founder's Day in February. Prof. Ostrom was granted an honorary doctor of science degree by the college during the ceremonies, after which he spoke on "Planet Earth - Endangered Species or Paradise lost." He also presented a seminar for the Geology Department on "Paleontological Expeditions: In Quest of the Unknown", and one for the Biology Department on "Origin and Evolution of Birds." He is currently Prof. of Geology and Geophysics at Yale University, and curator of Vertebrate Paleontology at the Peabody Museum at Yale. He is internationally known for work which was instrumental in developing the view of dinosaurs as active, warm-blooded creatures, and establishing the links between dinosaurs and birds.

Field Trips

During the Spring Break in late March, Ray Gildner took six students on a field trip to the southern Appalachians. The group spent two days looking at the geology in Shenandoah National Park, and a day in Blue Ridge National Park. They then spent part of a day at Ducktown, Tennessee, where they observed the effects of copper, iron and sulfur production from around the turn of the century. In northern Alabama the students helped collect samples for an ongoing study of bentonites in eastern North America. They brought back sixteen samples from a single altered volcanic ash deposit which is nearly four feet thick in northern Alabama. The group stopped near Nashville to collect some Ordovician fossils, and then went on to Mammoth Cave, where they got a first hand view of the hydrologic problems posed by karst terranes. They returned via Cincinnati, where they tried the local "famous chili", before heading back to Schenectady.

George Shaw took two students on a trip to the Gaspe Peninsula to collect samples for senior research projects. While it was a whirlwind tour (one day to get there, one day to collect, and one day returning!), we all enjoyed the scenery and the geology. The Lower Devonian limestones at the tip of the Peninsula contain some impressively thick (up to four feet) bentonites, which are thought to equivalent to much thinner (inch or less) bentonites found in central New York and Pennsylvania.

In early September, the annual summer field trip involved a sixteen day trip to the island of Newfoundland. The spectacular exposures and and superb geology on this island made for a memorable experience for the eight participants involved. The focus of the trip was a transect across the Island to see the effects of the Taconic and Acadian orogenies. The excursion began on the western side of the Island where the lower Paleozoic continental margin records deepening associated with the Taconic orogeny and subsequent deformation associated with the
emplacement of thrust sheets that include ophiolites. We spent several days in the very scenic Gros Morne National park where the deformation and sedimentation associated with the Taconic orogeny is particularly well displayed. One day was spent walking through the peridotites and gabbros of the Table Mountain massif, an ophiolite that occupies the highest structural slice in the area. The upper part of an ophiolite suite was examined on the nearby Baie Verte Peninsula where we took a boat ride to the remote area around Betts Cove to examine some of the best sheeted dikes and pillows in Newfoundland. Eastern Newfoundland is underlain by the Avalon terrane, a piece of continental crust with "Pan-African" affinities that was accreted to North America during the Acadian orogeny. After examining terrane-bounding mylonites of the Dover fault zone, we spent considerable time in two unique units of the Avalon terrane. The first is a well exposed latest Precambrian tillite that is inferred to record the oldest known glaciation on earth. The second is a world famous Ediacarian fossil locality at Mistaken Point (circa 670-570 Ma), on the southern Avalon peninsula.