



Geology Department Newsletter

**Union
College**

Newsletter 68, February 1995

Message from the Chair

As you can see, the newsletter is rather late this year. The reasons will become obvious shortly! It has been a hectic year, to say the least, and for most of it there was uncertainty as to who would be chair of the department. That has now been resolved, with a twist.

About this time last year I submitted my resignation as department chair, effective at the end of my agreed upon two terms as chair (which was last June.) The department was up and running smoothly, and it appeared that I had pretty much used up my powers of persuasion with the administration for improving the lot of geology at Union. It is fairly typical for a department chair to have a useful lifetime of about 5-10 years, beyond which it is difficult to make further advances. As part of my work during the last year, I put together a departmental report for purposes of review by an external committee. The committee, consisting of Raymond Coish from Middlebury College, Maria Luisa Crawford from Bryn Mawr College, and Malcolm McKenna from Columbia University, visited the campus on March 14 and 15. They interviewed each of the geology faculty and staff (including our newest arrival, who came to campus especially for the visit), the chairs of the other science departments, a number of geology majors, the Acting Dean of Arts and Sciences, the Dean of Engineering, and the Dean of Faculty. Unfortunately President Hull was not available during their visit. The committee submitted a report to the acting Dean of Arts and Sciences on May 5, 1994. I have enclosed a copy of their report with this newsletter, so I won't repeat what it has to say. As yet the department has received no formal response to the report from the administration.

Last year saw major changes in the academic administration. A new Dean of Faculty/Vice President for Academic Affairs was appointed at the beginning of July. At the same time a new Dean of Arts and Sciences was also appointed. The new Dean of Faculty, Linda E. Cool, came to Union from Marist College where she held an administrative position. The new Dean of Arts and Sciences, Christina Sorum, was appointed from within the Union Faculty. They join the Dean of Engineering, Richard Kenyon, who came to Union from RIT in July, 1993. The change in the academic administration, especially the addition of Dick Kenyon, is the main reason I decided to continue as Chair of the Geology Department. Indeed, Dick is responsible for the "twist" I mentioned above. In addition to being the Chair of the Geology Department, I am now also the Chair of the Civil Engineering Department. This is an interim appointment for the next 3 or 4 years. The reasons for the appointment are complex, and I will not attempt to explain them all here. The implications for Geology are interesting. One thing NOT implied is a merger of the two departments. Geology and Civil Engineering are in different divisions of the College, and could not be easily merged from an administrative point of view. One result is that I now report

to both the Dean of Arts and Sciences and the Dean of Engineering; I also get to go to roughly twice as many meetings as heretofore - not a perk, believe me!

One very positive result of taking on this extra duty is the addition of a temporary faculty line to the Geology Department. This will be a 2 to 3 year appointment, which we are in the process of filling at the moment. The administration has agreed to assess the situation in the department toward the end of this appointment to see if the number of geology majors and students taught will justify the permanent addition of a fifth faculty line to the department. This gives us the chance to have an important addition to the department much sooner than I had hoped. Another important benefit is (I hope) an increased chance of getting new facilities for the Geology Department. A proposal for a new Earth and Environmental Sciences Building was submitted to the Olin Foundation in September 1993. Unfortunately, that proposal was rejected. A revised proposal was submitted last September, emphasizing some changes such as the closer relationship of Geology and Civil Engineering embodied in a common (if temporary) chair of the two departments. We hope this will strengthen the proposal, which is still under consideration at the present time. We have begun preliminary work on building design (at the concept stage), and I am excited about what a new building could do for us. I'll keep you informed.

Last June we graduated three B.S. students and two Master's in Teaching students. This looks like being the smallest class for some time to come. The current senior class has eight students, which I think may be an all time high for geology at Union. It must at least approach the largest classes in the late 50's and early 60's. Our efforts to recruit new students seem to be very effective. Last Fall the admissions office had inquiries from nearly ten students who expressed an interest in geology as a major. Most of those actually applied for admission, and three of the incoming freshman said they intended to major in geology when they arrived last September. And it appears that we already have a new major for next year! The total number of geology majors continues to grow, from about 15 at this time last year to over 20 at present. Of the total, five are women.

We have a visitor for the remainder of this year to help out with teaching and setting up some laboratory equipment. **Joel Sparks** has a PhD from the University of Massachusetts. He has been in charge of X-ray analytical facilities at Stanford University for a number of years. He is teaching Mineralogy during the Winter Term and will be working on the new laser-ablation system which works in conjunction with our ICP-MS to provide us with the capability to do trace element microanalysis. Joel was most recently a ship-board technician on an ocean drilling cruise.

John Garver is being reviewed for tenure this year. We should be hearing at any time that he has passed his tenure review, and will be promoted to Associate Professor. **Kurt Hollocher** narrowly escaped becoming chair of the department last summer. He seems relieved. **Don Rodbell** and his wife, Cecelia, are now the proud parents of a baby daughter, Erika, born in October.

The department received a state-of-the-art mineral separation system from the USGS last fall. One of their labs in Reston is being closed down and the geologist responsible for this particular piece of equipment did not want it to end up in a warehouse. Since the equipment is

manufactured by a company with headquarters near the Albany Airport, he called them to see if a local college or university would be interested. I was called shortly thereafter and, after looking at a unit set up at the factory, decided we could certainly use it. When it arrived by truck it overloaded an already stressed space situation to the point where we will soon get additional, if temporary space, in the Engineering Laboratory across the street. Dick Kenyon has been very helpful in this regard. The separator will be used by students and faculty on a variety of research projects. It may also become a regional facility, available to surrounding colleges and universities in the same manner as our ICP-MS.

The fund-raising for the Field Geology Endowment has slowed down considerably. We now have about \$70,000 in the fund, far short of the \$250,000 I had hoped we could raise by the end of the Bicentennial Year. Still, there is almost a year to go. I urge all of you who can to help us with this ambitious, but important, project.

On a personal note, my daughter recently finished her B.A. degree in Geology at Bryn Mawr and has just started working for BHP, Inc. in Bangor, Maine. She also passed her driving test, a requirement for the position! Best wishes to you all for a happy and rewarding new year!

Alumni News

Leslie Kahn '91 is married to Cameron Logan. They live in Santa Cruz where Leslie is continuing her graduate work at the University of California.

Pat Lawson '92 is teaching at a small private school near New York City.

John Dreier '64 is president of Mega Metals, Inc. in Golden, Colorado.

William (J.R.) VanOrder '92 is working as an environmental engineer with URS Consultants, Inc., in New Orleans, Louisiana.

New Graduates

Janet Finn returned last year from her year abroad in Australia to complete her degree. Her senior thesis topic was "Geochemistry of mafic enclaves from the Chilliwack Batholith, North Cascades, Washington". Jeff Tepper was her thesis advisor.

Jeffrey Jiampetti finished his thesis "Chemical composition of surface, well, and lake water from Lake Mascoma and tributaries, Enfield, New Hampshire", under the direction of Kurt Hollocher. Jeff was captain of the hockey team during his senior year, and spent the summer trying to break into the IHL. His effort was derailed by the NHL strike, and he is presently a coach and counselor at Northfield - Mt. Hermon Academy in Massachusetts.

Keith Correia also worked with Kurt Hollocher on his senior thesis: "Chemical correlation between Lake Mascoma and its watershed." He is currently managing a fast food restaurant in New York.

Laurie Nickerson finished a Master's Degree in teaching with a concentration in earth science. Her master's thesis was under the direction of John Garver: "Self-guided geology field trips for high school earth science classes in the Capitol District of New York."

Lance Elliott also completed a Master's Degree in teaching, working on his thesis with Prof. Garver. His thesis topic was "Earth Science field trips in Schenectady County."

Student presentations and publications

April Bemis presented a poster at the Seattle meeting of GSA on "Control of peat landforms and hydrology by bedrock topography and subsurface stratigraphy", which is the topic of her ongoing senior thesis work with Prof. Shaw.

The Timing and Nature of the last deglaciation in the tropical Andes

by

Donald Rodbell

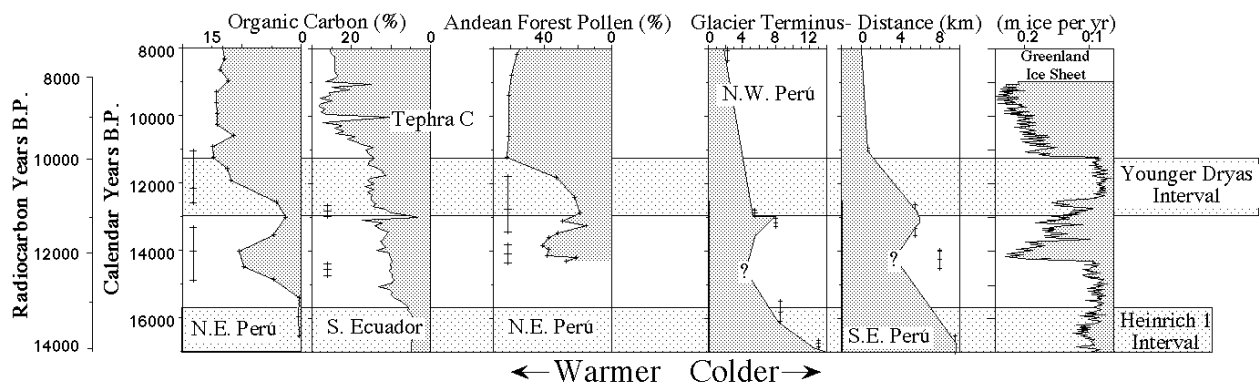
The ongoing concern over anthropogenically-induced global warming has highlighted the need for high resolution records of past climates. Whereas instrumental records can provide data for the past ca. 100 years, the elucidation of natural climatic variations over the last 103 to 105 years requires the acquisition of proxy indicators of climate preserved in tree rings, pollen spectra, stable isotopes, and glacial deposits. Alpine glaciers have short response times to fluctuations in temperature and precipitation; an increase in precipitation or a decrease in temperature will increase the mass balance of an alpine glacier and cause it to advance downvalley, whereas climate change in the opposite sense will cause a glacier to retreat. By dating deposits that mark the margins of paleoglaciers, geologists are able to determine the timing and approximate magnitude of the causative climatic perturbations. Whereas such glacial geological studies have been concentrated in the middle and high latitudes of the Northern Hemisphere, little is known of the timing and magnitude of paleoglacier fluctuations in the tropics of the Southern Hemisphere. The relative paucity of paleoclimatic data from the tropics has hindered our understanding of the mechanism behind several episodes of dramatic climate change in the last 20,000 yr, which have been documented in proxy paleoclimate records from and around the North Atlantic Ocean. The focus of my present research is to begin to fill this void by acquiring high-resolution proxy records of paleoclimate from glacial deposits in the Andes Mountains of Peru and Ecuador. I have been collaborating with a glacial geologist at Syracuse University and with a palynologist at the University of Minnesota; we have been awarded a three year grant from the National Science Foundation to expand on our reconnaissance investigations in Peru and Ecuador.

The tropical Andes are one of the few tropical mountain ranges that have been extensively glaciated since the peak of the last Ice Age, about 20 ka. Mapping and dating moraines in northern Peru have revealed a pronounced east-west asymmetry in the downvalley extent of paleoglaciers; during the last Ice Age, glacier termini on the eastern (Amazon Basin) side of the Andes descended to as low as 2500 m, in what is today a tropical rainforest. In contrast, glacier snouts on the western side did not reach below 3500 m. This pronounced E-W gradient in glacier

extent during the Ice Age reflects the dominance of tropical easterly atmospheric circulation as the source of moisture for these paleoglaciers. Today, the tropical easterlies (the trade winds) transport moisture from the western tropical Atlantic to the tropical Andes. Apparently this circulation pattern was intensified during the Ice Ages.

Radiocarbon-dated ice front positions reveal that the timing and nature of the last deglaciation in the tropical Andes have several similarities with deglaciation in the North Atlantic region (Figure). Radiocarbon dates indicate that rapid climatic amelioration commenced ca. 13.5 ka, which was followed by an abrupt cooling between 11.3 and 10.0 ka and by rapid warming into the Holocene ca. 10 ka. The two-stepped deglaciation in the North Atlantic region has received considerable attention because it requires an abrupt return to near full glacial conditions (the Younger Dryas stadial) during the peak in Northern Hemisphere solar insolation. This suggests that heretofore unrecognized thresholds may exist in the ocean atmosphere system, which, when crossed, can trigger dramatic climate change on a much shorter time scale (102 yr, or less) than has been traditionally assumed. The bulk of the evidence for the Younger Dryas stadial has come from the circum-North Atlantic region, and this has been taken to indicate that this event was limited to the North Atlantic and "downwind" regions of western Europe. However, in the last 3 years paleoclimatologists have reported controversial evidence of Younger Dryas-like stadials in the Canadian Rockies, New Zealand, Alaska, and Africa. These findings suggest a possible global Younger Dryas stadial, however the climatic linkages which could have linked these regions have yet to be identified.

Our preliminary proxy paleoclimatic records from the tropical Andes clearly indicate that a Younger Dryas-like stadial occurred in this region. Both the timing and magnitude of this cooling are similar to those for the Younger Dryas stadial of the circum-North Atlantic region. Moreover, the trade winds serve as a potential teleconnection which could have exported cooler air masses from the North Atlantic to the tropical Andes. Although these preliminary findings are intriguing, more records from diverse localities and closer high precision radiocarbon dates are required to rigorously test this hypothesis.



Donors to the Field Geology Fund

John Dreier '64
Robert T. Brady '47

James H. Scott '51

Donald M. Hoskins '52

Philip L. Perkins '62

Bernard McGrath '47

Andrew D. Lent '87

Todd Smick '91

Carl H. Hobbs III '68

Philip Royce '92

Grants

From National Science Foundation

\$6370 to John Garver: "Geologic reconnaissance of an early Cenozoic Arc-Continent collision, northern Kamchatka Peninsula, Russia" (1/2 match from U.C.)

\$20,000 to John Garver: "Automated stage for fission-track dating by undergraduate students at Union College" (1/2 match from U.C.)

From Union College Faculty Research Fund

\$1500 to John Garver: " Rare earth element geochemistry and terrane accretion in the Canadian Cordillera"

\$1480 to Kurt Hollocher: "Electroplate separation of platinum group elements from igneous rocks"

\$2710 to Kurt Hollocher: "Completion of a laser ablation sampler for ICP-MS analysis"

\$1370 to George Shaw: "An analysis of chemical stability of apatite phenocrysts during bentonitic alteration of felsic tuffs"

From United States Geological Survey

\$162,400 to George Shaw: "Acquisition of mineral separation equipment"

Faculty activities

John Garver and **Jeffrey Tepper** joined **Marian Lupulescu** and seven students on an economic Geology field trip to Romania (described more fully elsewhere.) John co-chaired a session at the Seattle Meeting of the GSA. He presented a paper entitled "The Baja B.C. conundrum: can sediments solve the problem?" He was a co-author of an additional four papers presented at the meeting. John is currently Union College coordinator for the 1995 joint meeting of the New York State Geological Association and Eastern Section of AAPG to be held at Union College in the Fall. John presented seminars to the geology departments at University of Texas at Austin and Syracuse University. He published papers in *Tectonics*: ("Fission-track ages of detrital zircons from Cretaceous strata, southern British Columbia: implications for the Baja B. C. hypothesis") and *Geologiya and Geofizika*: (The presence of ophiolites in tectonic highlands as determined by chromium and nickel anomalies in synorogenic shale: two examples from North America")

Kurt Hollocher presented a paper at the Fall Annual Meeting of the American Geophysical Union in San Francisco on: "Reproducibility of element concentrations and isotope ratios by laser ablation ICP-MS." He also co-chaired a session and presented a paper at the Northeast Section meeting of GSA on: "Geochemistry of igneous rocks in the Taconian island arc system, Bronson Hill anticlinorium, and possible tectonic implications." In April he taught a short course on lunar geology to area high school teachers, using samples he had obtained from NASA. He was a co-author on a paper published in *Rare Metals* entitled: "Spatial distribution of REE within the Abu-Tartur phosphorite bed, Egypt." He has been Director of the college's Environmental Studies program since he returned from his sabbatical. In March he gave an invited talk to the Geology Department at Syracuse University.

Don Rodbell presented a paper at the Seattle Meeting co-authored by one of his students, Jeffrey Nebolini. The paper was entitled "The glacial geologic and palynologic record of the last deglaciation in the Andes of northern Peru and southern Ecuador." Don was co-author on another paper presented at the meeting. He was recently informed that his proposal to the NSF for research in South America has been approved for funding - to the tune of \$170,000! The grant will allow at least one Union College student to go with Don to do field-work in Ecuador.

George Shaw also presented a paper in Seattle, entitled "Trace element chemistry of apatite phenocrysts from bentonites: a possible test of the Baja B.C. hypothesis?" The paper was co-authored by a student from Colgate University who worked on the project with Prof. Shaw as her senior thesis advisor. He continues as a member of the GSA Committee on Public Policy and he is a section representative for the Northeast Section GSA Public Information and Training Workshop scheduled for March.

Jeffrey Tepper, who was Kurt's sabbatical replacement, has taken a position as an Assistant Professor at Valdosta State University in Valdosta, Georgia.

Donors to the Geology Department Discretionary Fund

The following individuals have contributed to the discretionary fund which we use to support a variety of projects including student travel to meetings, support of student research, etc.:

Lisa Korner

Donald Boyd

Mark Dobday

J.R. VanOrder

Field Trips

Carbonate Sedimentology - in the Bahamas!

What is the best way to learn about carbonate sediments and carbonate depositional systems? Go to the Bahamas! Twice now, the Geology Department has offered a class in Carbonate Sedimentology for Geology and Biology majors. This course includes class and fieldwork during the term which exposes students to the principal depositional environments and processes in carbonate environments. Field trips include visits to classic geologic localities in our area which you may remember: the Devonian Reef complexes near Cherry Valley; stromatolites in the Saratoga region; and a cave in Clarksville.

In early December, just after exams, the entire class met in Ft. Lauderdale where they gathered to catch an early morning flight to the island of San Salvador in the eastern Bahamas. The principle reason for going to San Salvador Island is because the difficult logistics of such an excursion are taken care of by the Bahamian Field Station and the ancient rocks and modern environments are spectacular. The Bahamian Field Station, a converted U.S. Coast Guard station, was formerly owned and operated by the College Center of the Finger Lakes until 1987, now it's run by the Bahamian government. Currently, the station functions as a field station for independent field studies in Marine Biology, Botany, Geology, and Archeology (Columbus first landed here in 1492).

While on the Island, the students observe and describe different depositional environments, core sediment from different settings, log the cored sediment, measure paleocurrents from rock outcrops, and perform sediment size analyses - all under the baking sun. In short, they learn first hand, many of the important tools of sedimentology.

One of the unique features of San Salvador Island is that it has been disturbed very little by development and, as a result, the onshore and offshore environment are nearly pristine. Unlike many of its neighboring islands, it has an excellent road system, thanks to a failed development project of the early eighties. The island of San Salvador has some of the most spectacular and easily assessable geological features in the Bahamas. The full cross section of different depositional environments on San Salvador and the easy access afforded by the Bahamian Field Station make this an ideal place to study modern carbonate sedimentology. Barrier and patch reefs, back-reef lagoons, high- and low-energy beaches, tidal deltas, lagoons, high-salinity lakes and subaerial dunes comprise a full cross-section of common depositional environments. Not only does San Salvador have a wide diversity of depositional environments, the Island also boasts numerous Pleistocene and Recent outcrops that are representative of most of the modern

environments. Sea level changes and the Pleistocene and the Recent have provided an equally rich and varied series of bedrock exposures so the same-day comparisons can be made between the modern setting and what is preserved in the geologic record.

The original impetus for establishing this course was a N.S.F funded Teacher Enhancement Program and subsequent funding from N.S.F. helped us establish this course at Union. Even though it is recognized that this sort of course is essential in geologic education, few Geology departments offer courses like this and we know that the intensive field component with student research projects make this course a unique and valuable experience for our majors.

The most recent trip, in December 1994, was partially funded by an endowed Geology Field Fund, which was recently established to defray the cost of field excursions for our students. With funds generated by the Geology Field Fund we were able to cover about 20 to 25% of the cost to the students - support that was much appreciated by the students!

The amount of material covered in eight hour days in the field can be overwhelming, but the intense immersion allows for a wonderful learning environment. One student recently commented "We're learning so much we don't even realize it!"