Department of Geology

Carleton College
Northfield, Minnesota 55057

July 8, 2003

Dear Friends,

Greetings from Northfield! As always, it has been a busy, exciting year here, and the geology department is doing very well. We graduated 14 wonderful seniors this year and we are delighted and amazed to see how much they've grown and accomplished during their time here — it is such a pleasure and so stimulating to be surrounded by these students. I encourage you to read the titles of their comps projects; you'll see that they have done some impressive things. We had students doing fieldwork in Italy, Australia, Ireland, France, and Alaska, to name a few!

There are some new faces in the department this year; Cam Davidson joined us to teach Mineralogy and Petrology (alternating with Bereket) and Structures, while Jenn Macalady joined us to teach Geomicrobiology and Soils. The other new (and small) face belongs to Luca Galileo Bice, born April 21; his teaching duties have yet to be determined.

I hope that those of you who have not yet met Cam and Jenn will get a chance to do so at either GSA or AGU this year — they are both great and add considerably to the strength and breadth of the department. Cam turns out to share an affinity for water with other Carleton petrology professors; imagine the poor students who now have to worry about a three-body water problem! Cam ran a very successful winter mid-term break structural geology field trip to southern California this year, and found it a challenge to convince the students that an exposure of weathered gouge was indeed the San Andreas Fault. Jenn has set up a geomicrobiology lab in the basement of Mudd and is growing all sorts of slimy things. Her new geomicrobiology class had a great time studying the iron-oxidizing microbes associated with local springs.

We are pleased to report that Clint received tenure this year — quite a major accomplishment, yet not much of a surprise to those of us who know him. Clint ran another successful winter break off-campus program to the Bahamas this year, and had Ed and Cynnie Buchwald and James Bishop ('00) along as assistants. Clint taught Paleo for the first time this year and is developing some new classes for next year exploring modeling and Earth history.

Mary is about to embark on a major new focus of energy as the director of the Learning and Teaching Center on campus; she also is working on a project with Cathy Manduca at the Carleton Science Education Resource Center and so will not teach in the department next year, but she'll still be around. Bereket continues to develop our water

geochemistry capabilities. His ion chromatograph is getting used in many classes and his Intro Environmental class used to it complete an extensive analysis of the water quality of lakes and streams in Rice County as a class project.

This year marked the beginning of a fifth-year internship in the geology department, supported by an endowment created by Gina Michl '96. In fact, we had two interns this year — Katja Meyer and Liz Clark, both '02 graduates. Katja mainly worked with Jenn, setting up the lab and then studying the geomicrobiology of Australian soils and cave deposits from Italy. Liz Clark assisted Cam and Bereket with their research; she also mastered and ran the ion chromatograph and worked with Mary too. Jointly, they developed plans for a geological timescale that will line the top of the wall in the ground floor hallway through Mudd. Gina's endowment will enable us to have an intern each year.

Mary, along with Bereket, Cam, and Tim led our first-ever departmental spring break field trip this year to Death Valley. They spent a week looking at the amazing geology of that region, managing somehow to blow out the shocks on most of the rental minivans. By all accounts, the trip was great and we hope to do another similar one in two years.

Jenn, Luca and I depart soon for another off-campus seminar in Italy — a tough assignment, but somebody has got to do it. We moved into our new house at Christmas, which is not to say it's completed, just livable. After five years living in "the shack," this is quite a nice transition.

Tim Vick and Betty Bray continue to be wonderfully adept at running the department and keeping things on track.

As always, thanks to all of you who provide help and support to our students during the course of the year — the network of geology alumni is really important to us.

Best Wishes,

Dave Bice

DEPARTMENTAL NEWS

Gift From Gina Michl '96 Supports Research Efforts

We're grateful to announce that the Geology Department has received a generous bequest from the estate of Gina Michl '96. Gina was a talented and passionate Geology major at Carleton whose life was cut short by cancer in 2000. Fluent in several languages, Gina's comps project involved creating multilingual interpretive signs for a geologic park in Italy.

Gina Michl '96

At Gina's request, her gift has been used to establish "The Frances and Rol Allensworth Endowed Geology Fund." Named in honor of her grandparents, this fund will be used to support such things as fifth-year interns, lectures, and summer stipends and fellowships for students.

With Gina's gift, the Geology Department has been able to hire two fifth year interns, Katja Meyer and Liz Clark, both '02. Katja is a research assistant for one of our new faculty, Jenn Macalady '91 (who is also Dave Bice's '81 wife and had known Gina from time spent on the Italy Program). Katja and Jenn are setting up a new lab to study geomicrobiology, including work on the geochemistry and microbiology of Australia and the caves near Coldigioco, Italy. Liz is assisting Bereket Haileab with his research and also is creating new displays on minerals, field trips and geologic time for the geology display cases in Mudd.

Additionally, Gina's gift has enabled us to invite a distinguished geologist from Berkeley, Jill Banfield, to campus this winter to spend a week giving talks and interacting with students and faculty. While she was here, Dr. Banfield gave talks, one entitled "How subsurface microbial communities control metal concentrations in the environment," and the other "Microorganisms, nanoparticles, and metal cycling."

We're also using the endowment funds to sponsor student research including lab analyses, fieldwork, and travel to meetings to present results.

Geology Department Chair Dave Bice commented, "It is difficult to properly convey how much this endowment means to us, just as it is difficult to convey how much we miss Gina, but she is remembered fondly and frequently by her teachers. While we are all saddened by the loss of this member of the Carleton community, we are deeply honored that she has remembered Carleton in this meaningful way."

Clint Cowan Awarded Tenure

We are extremely pleased to announce that the trustees of Carleton College have awarded Clint Cowan '83 tenure and promoted him to Associate Professor.

Clint has been teaching with us full time since 1997. Before that he taught here during the fall term of 1992 and he was an International Staff Geologist with Royal Dutch Shell Research Labs in the Netherlands. Clint earned his Ph.D. at Queens University in Kingston, Ontario, Canada.

Mary Savina Appointed Coordinator Of Learning And Teaching Center

Dean of the College Shelby Boardman has appointed Mary Savina, McBride Professor of Geology and Environmental Studies and Director of Archaeology, to a three-year term as Coordinator of the Perlman Center for Learning and Teaching (LTC) beginning in 2003-2004. Mary will replace Professor Susan Singer who agreed to serve an extra year this year. We are delighted that Mary has agreed to serve the College in this important position.

In conjunction with her position with the LTC, Mary has been appointed the Humphrey Doermann Professor of Liberal Learning for three years.

The LTC coordinates programs for new and experienced faculty, circulates new information about teaching theories and strategies, and helps to identify problems and suggest solutions for classroom practice.

The LTC was established in 1992, the result of work done by a faculty-student committee. It was

begun, in part, by a grant from the Bush Foundation. An endowment from the Bush Foundation now supports the Coordinator position in the LTC in the form of an endowed chair titled the Humphrey Doermann Professor of Liberal Learning. The LTC is now named the Perlman Center for Learning and Teaching thanks to a generous endowment from Lawrence Perlman to support the operations of the center.

Located in Willis Hall, the LTC is home to a small library and reading room, open throughout the day while classes are in session.

Alumni Opportunity To Join Week-long Field Course In Bahamas Carbonate Sedimentology

Associate Professor Clint Cowan '83 will be taking his Geology 260 class (junior and senior geology majors) to study Carbonate Sedimentology on San Salvador Island in the Bahamas over next Winter Break (Thanksgiving 2003). We would like to invite our geo alums to join us and brush up on their field skills and knowledge of modern sedimentary systems. We can offer a few spaces on the trip to alums who are interested in being active participants in the course. This is a first for us, so we're not entirely sure how it will work.

Dates are tentative, but we are planning to run the trip from the last day of Fall Term 2003, over Thanksgiving, and spend 7 full days on San Salvador. We plan to assemble as a group in Ft. Lauderdale, Florida, on Tuesday November 25, 2003, and travel by charter flight to San Salvador. We will return to Fort Lauderdale on Thursday December 4th.

You can learn a great deal about the program and conditions on San Salvador by visiting the spectacular website that Dave Auerbach '04 made for the 2003 program (which was two weeks long, so ignore that itinerary). There is a link from the Carleton Geology homepage.

The program is not a vacation. We will study shoreline processes and examine coral reefs and other shallow marine habitats. Alums will be expected to be team members and hard workers! We may have the opportunity to ride an ebb-flood tide cycle if the timing works. We will spend some time applying what we learn from the modern marine settings to the study of Pleistocene limestones deposited on San Salvador approximately 125,000 year ago. Field research in modern marine coastal environments can provide a visceral understanding of the physical processes that move and shape sediments, and can fundamentally change the learning experience for students of sedimentary geology. We will have snorkel-mapping exercises and spend a lot of time in the water surveying marine benthic communities. You will need to bring snorkel gear (fins, mask, snorkel, booties, etc.), and be in reasonably good health (at least not as bad as Clint is!) and comfortable in the water.

San Salvador is one of the outermost (Atlantic) islands in the Bahamian archipelago. In 1492 Christopher Columbus made his landfall in the New World at San Salvador. Today the island is unusual among the Bahamian chain because of its relative lack of resort or harbor development; San Salvador retains a largely impoverished rural culture that is both safe and slow paced. Conditions at the Gerace Research Center are rustic (it is a rather run down, in the 'tropical' sense, former U.S. Naval Tracking Station). Sleeping for alumni participants will be double occupancy (two single beds), but rooms will have baths. The food is cafeteria style and reasonably good, although supplies to the island can be sporadic (all food is shipped from Nassau, and fresh vegetables and fruits are limited since they are procured on the islands only when in season). Bugs can be very bad, and this is a function of the weather. Plants and marine organisms can sting and burn. That said, the learning experience should be both enjoyable and rigorous.

The cost for alums will be approximately $1000 (this is a cost basis, you will not be subsidizing the trip). This cost does not include alums getting to and from Fort Lauderdale from your hometowns, but includes the other expenses (charter flight to the island, room and board, boat and vehicle fees, scintillating interactions with fun and bright geo majors).

Inquiries about participating should be directed to Clint Cowan, 507-646-7021, email ccowan@carleton.edu.

Carleton Faculty And Students Present Research At National Meetings

We are very pleased to note that members of the Carleton Geology Department presented eighteen papers at four national meetings during the past school year.

Papers by Carleton faculty and staff given at the annual meeting of the Geological Society of America in Denver included:

- **Bice, David M.**, "Stella® modeling as a tool for understanding earth systems"
- **Manduca, Cathryn A.**, "Living with Karst in Olmsted County: Lasting partnerships bring science into decision making"
- **Manduca, Cathryn A.**, "Digital Libraries: Helping geoscientists think about issues in teaching"

- **Palmer, Beth A**., **Manduca, Cathryn A**., "Lessons from the Keck Geology Consortium: Benefits and costs of large collaborations"
- **Manduca, Cathryn A**., "A role for digital libraries in facilitating K-16 research"

Papers by Carleton faculty and staff given at the fall meeting of the American Geophysical Union included:

- **Macalady, JL**, Croft, L, Vestling, MM, Harms, AC, Zheng, L, Baumier, DJ, Kaspar, CW, Banfield, JF, "Archaeal Lipid Genes: Clues to Life in Acid and the Evolution of Membranes"
- Green, EG, **Macalady, JL**, Banfield, JF, "Biogeochemical contributions to soil formation and landscape lowering"
- **Savina, ME** and **Clark, EA** '02, "From the local to the global: Integrating fluvial data across spatial and temporal scales"
- **Manduca, CA**, **Macdonald, RH** '76, **Savina, M**, Andersen, J, Patterson, S, Mason, M, "Teaching quantitative skills in a geoscience context"
- **Manduca, CA**, and Mogk, DW, "Drawing connections between local and global observations: An essential element of geoscience education"
- Mogk, DW, **Manduca, CA**, Stillings, N, "Bringing research on learning to the earth sciences: A work shop report"
- **Macdonald, R** '76, and **Manduca, CA**,, "Developing strong geoscience programs and departments"
- **Manduca, CA**, and Mogk, DW, "Using global data sets in a local context"
- **Harrison, BK** '03, and **Haileab, B**, "Trace element analysis of basalt provinces in the early history of the Yellowstone Hotspot"
- **Sundberg, M** '03, Zimmerman, ME, and Kohlstedt, DL, "Development of pressure shadows in partially molten rocks."

Also at AGU, **Chris Poulsen** '94 and **Andrew Gendaszek** '02, together with R.L. Jacob of Argonne National Laboratory, presented "The global climatic effect of opening the equatorial Atlantic gateway in the mid-Cretaceous." Their work also appeared in the journal Geology.

Katja Meyer '02, **Dave Bice** '81 and **Mary Savina** '72, presented "Dynamics of recent sedimentation and carbon storage in the Cannon River Wilderness Park, Minnesota: Implications for the global carbon cycle" at the annual meeting of the Soil Science Society of America.

At a National Association of Geology Teachers workshop on web-based learning resources in the Geosciences in Ann Arbor, MI last February: **Mary Savina** '72 and **Liz Clark** '02, "Creating and teaching case studies in a web design project."

15-Passenger Vans Eliminated From College Fleet

The 2002-03 school year brought a major change in the Geology Department's field trip style, although we are still trying to figure out how great the impact is and what adjustments we need to make.

Last August, the college administration eliminated the 15-passenger vans, our mainstay field trip transportation system, from the college fleet and replaced them with 7-passenger minivans. The change was implemented in time for the opening of fall term, 2002. The reasons have to do with the liability exposure currently connected with 15-passenger vans. At the time of the decision, the college had five large vans that it owned plus that many again which were shared with a local bicycle excursion company. The transportation policy now even prohibits the use of rented 15-passenger vans. What a shock!

It requires at least two 7-passenger minivans to replace a 15-passenger van, so to do the same task with minivans means twice as many vehicles and twice as many drivers. Managing a long string of minivans has proven challenging, especially in freeway situations. In addition, the minivans cannot tow trailers, so our cargo trailer and canoe trailer are currently in limbo. We have substituted school buses or motor coaches on some of the trips. They are adequate in some situations and not so in others, and they are markedly more expensive.

This is a still-evolving picture. We have petitioned the school to consider purchasing at least one or two larger vehicles, such as large sport utility vehicles, which would enable us to tow the trailers again.

During the school year 2001-02, the last year in which we used 15-passenger vans, we ran 91 field trips that had an average of 22 people on each one.

Bill Christner Teaches Soils Class

We'd like to extend a warm thanks to Bill Christner, a Ph.D. candidate at the University of Minnesota, for commuting down to Northfield this term to teach the Soils class. The class was originally scheduled to be taught by Jenn Macalady but the arrival of Jenn's baby early in spring term forced a rejuggling of things.

Bill's Ph.D. dissertation is entitled "Landuse Impacts on Stream Morphology in the Lac qui Parle Watershed, Minnesota." He earned his bachelor's at Montana State, Bozeman, with a senior thesis entitled "In-Stream Obstructions and the Formation of Pools and Scour Holes, and his master's in soil science, also at Bozeman, with a thesis entitled "Septic Interpretations from a Third Order Soils Survey."

Mojave Desert and Death Valley Field Trip

This year, instead of our customary trip to Missouri or central Wisconsin during spring midterm break, we took a 10-day trip during spring break (between winter and spring terms) to Death Valley and the Mojave Desert. The trip was oversubscribed so we took the maximum of 30 people which the accommodations could handle.

Stops on the trip included mapping the geomorphology near the Silver Lake Playa near Baker, the Cima Volcanic Field, Mitchell Caverns and other stops in Mojave National Preserve, a mapping exercise on Ubehebe Peak in Death Valley, and visits to many other great geology sites. A nice selection of pictures (in color!) appears in the field trip section of the Geology Department web site at www.carleton.edu, but here are a few black-and-whites to whet your apatite.

Clockwise from upper left, the pictures show:
- The spectacular view of Death Valley from the Artist's Palette Overlook;
- Bereket led the discussion of the volcanics in the Cima Volcanic field in the Mojave National Preserve, and here he is showing us a lava flow;
- Gabe Nelson and Annaliese Eipert (both '04) check out one of the rocks which has mysteriously scooted across the clay lakebed at Racetrack Playa in Death Valley;
- And Cam Davidson (seated with his hat on backwards) led the mapping project of deformed marbles on Ubehebe Peak.
(Photos by Tim Vick and Katja Meyer)

Sara Gran Mitchell '96 To Teach Geomorph, Intro

We are very pleased to welcome Sara Gran Mitchell '96 back to campus for next year! Sara will be taking a little time out from her Ph.D. work at the University of Washington to teach Geomorphology during the fall term and Introductory Geology during spring term of the 2003-04 school year.

Sara's Ph.D. project is on "The Influence of Uplift, Exhumation, and Climate on the Large-Scale Topography of the Washington Cascades". She completed her masters at the University of Vermont in 2000 with a thesis on the paleoseismic history of the Nahef East Fault, Northern Israel, using cosmogenic dating.

Sara's husband, Dave Mitchell '96, is accompanying her to Northfield. He has been a professional geologist since getting his MS in geology from U of New Mexico in December 1999. Bella, their dog, is accompanying them as well.

Carleton Geology Class Creates Natural Resources Inventory for City

By Kelen Tuttle '03
Carleton College News Bureau

Since its inception in 1855, Northfield has rarely seen the immense growth and booming population that is occurring today. As the resident population grows and houses spring up further and further from the original city limits, issues about urban development and the disruption of nature arise. As a result, the Northfield Planning Commission began to develop a comprehensive plan for the city last year to help Northfield maintain its attractive features during rapid growth. Among the issues raised were the environment, agricultural economy, community draws and growth pressures. Unfortunately, while many of these issues were addressed, the Commission did not have the funding to address all concerns, and the issue of natural resources was put off until a later time.

Fortunately, Mary Savina, the McBride Professor of Geology and Environmental Studies at Carleton College, was present at the City Council meeting when this delay was discussed. Seizing an opportunity to contribute to the Northfield community, Savina offered to include the creation of an inventory of Northfield's natural resources in her Geology/Environmental Studies 120 class that spring.

Through interviews with Northfield residents, Savina's students revealed which natural resources Northfield citizens value most. The responses were complied into eight focus areas, each of which was assigned to a group of two students. These focus areas, watersheds/streams, vegetation, light pollution, soils, wetlands, wildlife, parks/open spaces and groundwater, were then explored, researched, and computer mapped by each group. This provided not only a listing of resources, but also visuals of their specific locations within the Northfield area. Using their knowledge from Savina's course and the expertise of local professionals, the students assessed current conservation measures and suggested further action where necessary.

In June 2002, Savina and her 27 students presented the Northfield City Council with an inventory of natural resources based upon community needs. On Sept. 3, the Council officially thanked Savina and her class for their time, expertise, and dedication to Northfield in a unanimous resolution.

The information contained in the inventory provides the city with a general summary of the city's current resources. It shows the areas where growth will have the least environmental impact, allowing the city to develop further environmental guidelines. With the Inventory of Natural Resources, Savina and her students provided a preliminary inspection into Northfield's natural resources that will provide a framework for planning the course of future development in Northfield. Northfield has an abundance of resources, and the inventory emphasizes their need for protection and maintenance.

Thanks For Loaning Your Posters!

Every year our program is enhanced by the generosity of alums (an others too!) who visit to give talks or who loan us posters they have shown at professional meetings. These are wonderful additions to our program. They help get students excited about the many different areas of research within the field of geology, and they are role models for students who are getting ready to give talks or posters of their own.

This year, the posters we displayed included:

Liz King '94, "Oxygen isotope evidence of the Precambrian continental margin in the northern Great Basin of Utah and Nevada;"

Joanna Reuter '00, Robb Jacobson '79 and Carrie Elliott '98, "Response of physical stream habitat to hydrologic disturbance, Bear Creek, Ozark Plateaus, Arkansas;"

Aleshia Mueller '02 and Jean Chu '73, "Natural disaster preparedness: Earthquake forecasting methods and community involvement; uniting scientists, administrators and the public;"

Joan Ramage '93, "Early quarries in tephra deposits of the late Bronze Age eruption of Thera/Santorini, Greece;"

Carl Tape '01 and Cam Davidson, "Kinematic analysis of brittle faulting in the Prince Rupert area, Coast Mountains, British Columbia;"

Clint Cowan '83, "Facies and stratigraphy of the modern estuarine and nearshore, mixed siliciclastic-carbonate coastline of the southern Belize Lagoon, Central America;"

Anders Noren '96 and Leah Morgan '04, "Grain by grain: Holocene storms and hillslope erosion;"

Mary Savina '72 and Liz Clark '02, "Creating and teaching case studies in a web design project;"

Katja Meyer '02, Dave Bice '81 and Mary Savina '72, "Dynamics of recent sedimentation and carbon storage in the Cannon River Wilderness Park, Minnesota: Implications for the global carbon cycle;" and

Bill Christner Jr. and the spring term 2003 Soils Class, "Collecting and preserving a soil monolith (complete with examples)."

Talks In Our Department This Year

We had quite a number of excellent talks presented in Mudd this year. Many thanks to all the people who visited and shared their research results and other experiences and wisdom with us!

Alison Anders '99, "From meteorology to metamorphism: A geologist's view of the atmosphere;"

Jean Chu '73, "Crustal stress for community awareness in the Philippines, Latin America and China;"

Luc Mehl '00, Mantle flow in subduction zones based on Luc's observations in his fieldwork in Alaska;

Christine Siddoway '84, "The bedrock beneath the West Antarctic Ice Sheet, tectonics and glacial history, or, What Larry Gould might have discovered had he turned east instead of south!"

Simon Hughes, University of Southampton, England, "Mexican volcanoes past, 20 years ago, and today;"

Chris Carlson '87, "Applied hydrogeology and geochemistry: the permitting process and environmental review of the proposed Crandon Mine, northeastern Wisconsin."

Brian Jacobson '80, "Mars exploration: What will it take for humans to get there?"

Jeff Lukasik, Petro-Canada Ltd., Canada, "An epeiric ramp: low energy, cool-water carbonate facies in a Tertiary inland sea, Murray Basin, South Australia;"

Lesley Perg, University of Minnesota, "Mixing it up: Cosmogenic nuclides in the California coast and Swiss Alps;"

Dorothy Merritts, Franklin and Marshall College, spoke in Geomorphology class about geomorphology and tectonics;

Molly Miller, Vanderbilt University, "Late Paleozoic-Mesozoic history of Antarctica: Record of ancient freshwater environments and climate change in high latitudes;"

Paul Myrow, Colorado College, "Early tectonic and depositional history of Antarctica: From Rodinian breakup to Gondwanan assembly;"

Jill Banfield, University of California - Berkeley, "How subsurface microbial communities control metal concentrations in the environment," and "Microorganisms, nanoparticles, and metal cycling;"

Bill Ullman, College of Marine Studies at the University of Delaware, "Marine science careers and graduate school opportunities at the University of Delaware;"

Robert MacKay, Clark College, "Using models to enhance student learning in introductory geoscience courses."

Papers Published In Journals

Jennifer Macalady '91, assistant professor of geology, published an invited "Frontiers Review" paper titled "Molecular geomicrobiology: genes and geochemical cycling" in the journal Earth and Planetary Science Letters. Macalady's co-author is Jillian Banfield from the University of California, Berkeley.

Several Carleton Geology alums are authors on papers appeared in Geology, a prestigious monthly journal published by the Geological Society of America.

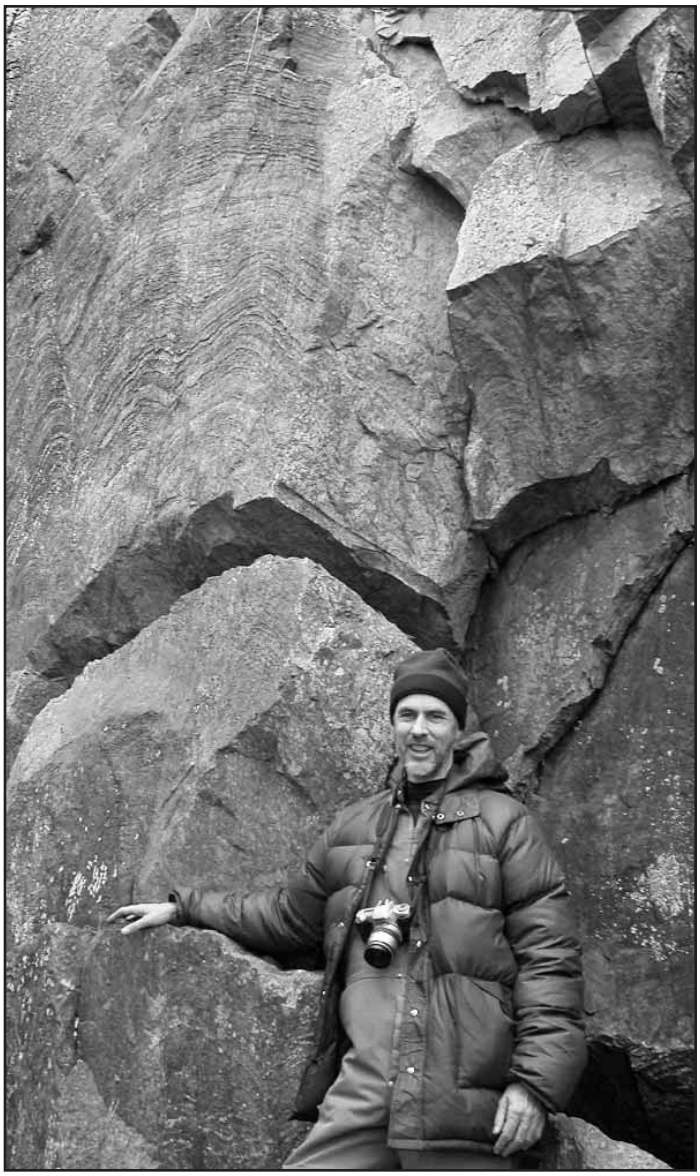
Authors on papers in the October 2002 issue included Beth Pratt '93, Nate Sheldon '99, Laura Cleaveland '01, Jon Jensen '00, Sarah Goese '99, Dave Bice '81, and Sandro Montanari (honorary Carleton alum).

The papers to look for are:

* Impulsive alluviation during early Holocene strengthened monsoons, central Nepal Himalaya. Beth Pratt, Douglas W. Burbank, Arjun Heimsath, and Tank Ojha, pages 911-914.

* Low oxygen levels in earliest Triassic soils. Nathan D. Sheldon and Gregory J. Retallack, pages 919-922.

* Cyclostratigraphic analysis of pelagic carbonates at Monte dei Corvi (Ancona, Italy) and astronomical correlation of the Serravallian-Tortonian boundary. L.C. Cleaveland, J. Jensen, S. Goese, D.M. Bice, and A. Montanari, pages 931-934.



Northern Michigan Field Trip

The fall trip this year was to the Upper Peninsula of Michigan, where the rocks were great as always but the weather outdid itself being nasty.

Clockwise from upper left, Tim poses in front of the giant stromatolites in the quarry near the Marquette Prison; Jenn burrows under the snow to see the enigmatic layering in the Kona Dolomite at the Highway 480 quarry near Marquette; and the group shot taken near Wausau, Wisconsin, at the marker located exactly at 90 degrees west longitude and 45 degrees north latitude (the pile of snowballs mark the exact spot). (Photos by Jenn Macalady, Tim Vick and Katja Meyer)

Walter Alvarez '62 Awarded GSA Penrose Medal

Carleton Geology alum Walter Alvarez '62 has been chosen as the recipient of one of the most prestigious awards in the geological profession, the Penrose Award for lifetime achievements in geology. The award is made by the Geological Society of America, with the presentation ceremony at the society's annual meeting in Denver last October.

"Walter Alvarez has made outstanding contributions to geology in a variety of disciplines and areas that includes South American geology, Mediterranean tectonics, structural geology and magnetostratigraphy," says Ron Clowes, chair of the 2002 Penrose Medal Committee. "His greatest and best known contribution is the novel and provocative hypothesis for the mass extinction of species due to a meteorite impact at the Cretaceous-Tertiary boundary, first published in the journal Science in 1980. Tests of this hypothesis were initiated around the world, bringing together separate fields within the Earth sciences and attracting many of the best minds."

The Penrose Medal was established in 1927 by R.A.F. Penrose, Jr., to be awarded in recognition of eminent research in pure geology, for outstanding original contributions or achievements that mark a major advance in the science of geology.

Congratulations to you, Walter, from the Carleton Geology Department!

Marcus Pond, Long-Time Mudd Custodian, Dies

We were saddened to learn that Marcus Pond, our custodian in Mudd during the late 1970's and early 1980's, passed away on August 15, 2002. He was 84.

People who frequented Mudd during its first decade will remember Marcus as being a person who was wonderfully supportive of our program and people. He was curious and interested in the natural world, having been a life-long farmer until he retired from farming and came to work at Carleton. Marcus knew a lot about the response time of the aquifer ground water to weather events from monitoring the water level in his irrigation well. He also was interested in soil formation and erosion questions, and he loved looking at thin sections through a petrographic microscope.

Cards of condolence to Marcus's family may be mailed to his daughter, Betty Lace, 5960 290th St. W, Northfield, MN 55057.

New Duncan Stewart Fellows Named

Each spring, the geology faculty faces the difficult task of selecting a few students to be Duncan Stewart Fellows. The Duncan Stewart Fellowship was established in 1976 by Daniel Gainey, class of 1949, in honor of Duncan Stewart, professor of geology at Carleton for nearly 25 years.

From time to time we re-examine the wording of the endowment and we now realize that both juniors and seniors are eligible; our selections this year reflect this new understanding. We select the Stewart Fellows based on a combination of excellence in scholarship, a high level of intellectual curiosity, potential for scientific growth, and involvement in departmental activities. As we make this selection, we realize how fortunate we are to have so many talented, interesting, and impressive students within the department.

We are pleased to announce that Kristin Bergmann '04, Breanyn MacInnes '04 and Marshall Sundberg '03 will be the recipient of this year's Duncan Stewart Fellowship in Geology. Kristin, Bre and Marshall will extend the number of Stewart Fellows to 76. Our congratulations to Kristin, Breanyn and Marshall!

Network For Lesbian, Bisexual, Gay And Transgender Alums

The Network For Lesbian, Gay, Bisexual and Transgender Geology And Natural History Alums provides students and alums with career information, fellowship and support. The network was founded in 1990 and now has 36 members from coast to coast.

The network has the twin objectives of helping reduce isolation among alums and helping to provide a more open, accepting and informative environment on campus for students in geology and related fields.

The network consists of a confidential list of names and addresses, circulated only to members of the network, maintained by Marilyn Yohe '88, Dan Spencer '79, and Tim Vick. Inquiries about joining may be addressed to any of them.

LGBT folks might also be interested in the general alumni group called Out After Carleton. We are happy to provide contact information for them as well.

Geology Department T-shirts Available By Mail

We have some geology T-shirts available that we can mail out. The cost is $10 plus $3 postage payable to Carleton College.

The 2003 shirt is dark "hunter" green with white lettering. On the front it has a small patch that says "Carleton Geology 2003," and on the back it has the timeless drawing by S.T. McWhinnie '85 saying, "Meet me behind the outcrop, baby... I'm a little boulder there." It's 100% cotton.

The 2002 shirt is light blue with black ink with a picture of a trilobite and a hand pointing to it and saying "Hoc animal maxime placet," Latin for "this is my favorite animal." 100% cotton.

The 2000 shirt is bright yellow with black printing. The design is a geological take-off on the theme of Charlie Brown's striped shirt in the "Peanuts" cartoon series. 50/50 cotton/synthetic.

Email Tim Vick at tvick@carleton.edu to find out whether your size is in stock.

Buddy Tangalos Speaks At AIPG

George "Buddy" Tangalos '03, a senior geology major and biochemistry minor, recently spoke at a meeting of the American Institute of Professional Geologists (AIPG), Minnesota Section. Buddy was the recipient of the AIPG Minnesota student research grant in fall 2002. During the summer of 2002, he worked with the United States Geological Survey and a University of Southern California grad student on Kodiak Island, Alaska, studying the near-trench intrusion residing there. Buddy's talk was titled "Genesis and contamination of the Kodiak Batholith, Kodiak Island, Alaska: using ∂18O ('delta-oxygen-18') to quantify the assimilated component of the Batholith."

2003 Awards

Phi Beta Kappa
Elizabeth Cassell
Sigma Xi
Benjamin Harrison
Marshall Sundberg
George Tangalos
Nicole Davies
Amalia Doebbert
Elizabeth Cassel
Tiffany Larsen
Devin McPhillips
Melissa Keevil
Duncan Stewart Fellow
Kristin Bergmann '04
Breanyn MacInnes '04
Marshall Sundberg '03
National Science Foundation Fellowship
Joanna Reuter '00
American Institute of Professional Geologists (AIPG) Minnesota Student Research Grant
George (Buddy) Tangalos

Senior Papers - 2003

Graduating senior geology majors, their hometowns and titles of integrative comprehensive exercise projects:

Marc Antinoro, Teaneck, NJ "Surfing Seven Mile Creek: Implications of land-use change on hydrology and water quality in Seven Mile Creek Watershed, Nicollet County, MN"

Elizabeth Cassel, Billings, MT, "The Late Quaternary sedimentary succession and its evolution at Morgan Beach, Cape Liptrap, Australia"

Nicole Davies, Spain, "The reconstruction of the paleo-living environment, death and taphonomy of 'Eva,' a juvenile titanosaur at the Lake Cretaceous site of Bellevue in the Haute Vallee de l'Aude in southwestern France"

Gillian Davis, Cape Elizabeth, ME, "A review of the physical disturbance and biological implications of sediment resuspension from commercial fishing gear in the Gulf of Maine"

Amalia Doebbert, Glenwood, MN, "A stable isotope paleoclimate record of the Late-Glacial/Interglacial transition from Lough Inchiquin, western Ireland"

Adrienne Hacker, Springfield, MO, "Tafoni formation in Castle Rocks, Idaho"

Nancy Harris, Sturgeon Bay, WI, "Effects of hydrothermal activity on obtaining sedimentation rates: From Yellowstone Lake, Yellowstone National Park, Wyoming"

Benjamin Harrison, Bainbridge Island, WA, "Geochemical tracing of basalt provinces in the early history of the Yellowstone Hot Spot"

Melissa Keevil, Ashland, OR, "Fault geometries of south central Oregon and the inferred transtensional stress"

Charles Kittredge, Barre, MA, "Modeling with earthworms: A layman's guide to understanding bioturbation in the Decorah Shale at Wang's Corner, Minnesota"

Tiffany Larsen, Clear Lake, IA, "A paleoceanographic reconstruction of the Mediterranean Sea: Stable isotope analysis of Early Pliocene Foraminifera, II Trave Sud, Italy"

Devin McPhillips, South Glen Falls, NY, "Geochronology in a moderate-temperature, low-pressure metamorphic assemblage, Talkeetna Mountains, Alaska"

Marshall Sundberg, Emporia, KS, "An experimental method for approximating the bulk viscosity of Olivine-Basalt Aggregates"
George Tangalos, Rochester, MN, "Genesis and contamination of the Kodiak batholith, Kodiak Island, Alaska: using delta-oxygen-18 to quantify the assimilated component of the Kodiak batholith"
Graham Zorn, Ashland, WI, "Long Island and Chequamegon Point, Lake Superior Wisconsin: Aerial photo analysis of Barrier Spit Geomorphology from 1939 to 1993"

Class of 2004

David Auerbach	Salem, OR
Kristin Bergmann	Gaithersburg, MD
Sean Bryan	Cincinnati, OH
Gillian Davis	Cape Elizabeth, ME
Jeff Dorr	Storrs, CT
Annaliese Eipert	Seattle, WA
Joseph Graly	Berkeley, CA
Heather Hilchey	Minnetonka, MN
Kristen James	Alexandria, VA
Lisa Kanner	Amherst, MA
Lindsey Kleppin	Anchorage, AK
Bess Koffman	Yelm, WA
Sarah Leibson	Rochester, NY
Breanyn MacInnes	Greensboro, NC
Sarah Margoles	St. Louis Park, MN
Leah Morgan	Essex Junction, VT
Brandon Murphy	St. Louis, MO
Gabe Nelson	Lake Nebagamon, WI
Kristin O'Connell	Minneapolis, MN

Class of 2005

Michael Bagley	Sitka, AK
Timothy Beaster	Grand Marais, MN
William Gallin	New York, NY
Sarah Greene	Alta Loma, CA
Brendan Hughes	Springfield, IL
Callen Hyland	Glenville, NY
Andrew Lorenz	Birmingham, MI
Pamela Moeller	Lincoln, NE
Cristina Robins	Pratt, KS
Emily Schwing	Salt City, UT
Kathyrn Stalker	Seattle, WA
Nicholas Swanson-Hysell	St. Paul, MN

Adventures In Soils: Or, Why To Bring Spare Clothes To Soils Lab

By Bre MacInnes '04 and Sarah Greene '05

We had thought that getting to the hill where we dug our soil pit was an adventure; after all, slogging though two inches of clay mud that sucks your shoes right off your feet is not an every day experience. However, nothing can compare with the trial by mud that awaited us during our return journey.

In talking with us about our soil profile, Bill Christner, a grad student from the U of M who is teaching the soils class this term, noticed how wet our feet were and mentioned that we should return by the higher path to the west. However, clean and dry in no way describes the experience that followed. Slithering down a stream gully, not completely briar-free, brought us back to the wetlands we had traversed before. We kept our precarious footing on piles of scrap metal and loose rocks, only to sink ankle deep into muck and water between each mound. Upon penetrating a dense wall of cattails, we viewed with dismay a nearly vertical cliff comprised of mud of every color. There was nothing we could do but continue on.

Halfway up the slope, we paused for breath. We had begun to notice from the increased weight of our shoes that the mud was getting wetter and stickier. We had, in fact, acquired enough mud for a pair of galoshes. In our brief respite, we heard a quiet gurgling from above our heads. A spring was emerging from the slope above us!

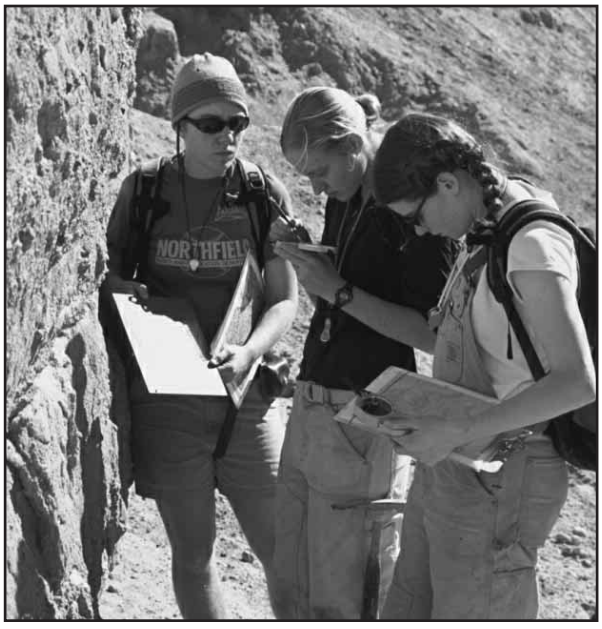
Thinking about how far we had come, we decided things could not get any worse, and continued upwards. We were wrong. Nearing the apex of the hill, every step sunk above the knee into rich black muck. Apart from this difficulty, the last five feet of the cliff above us rose to nearly a 90û angle, culminating in a briar patch. We were stuck and probably would still be there today unless chivalrous Marc had not pulled us up and over, avoiding the majority of the briars. After that, it was merely a matter of another fifty meters of wetland, flowing water and black clay mud between us and the rest of the class. In the end, we must admit that we enjoyed ourselves immensely, thus supplying further proof that we are meant to be Geo majors.

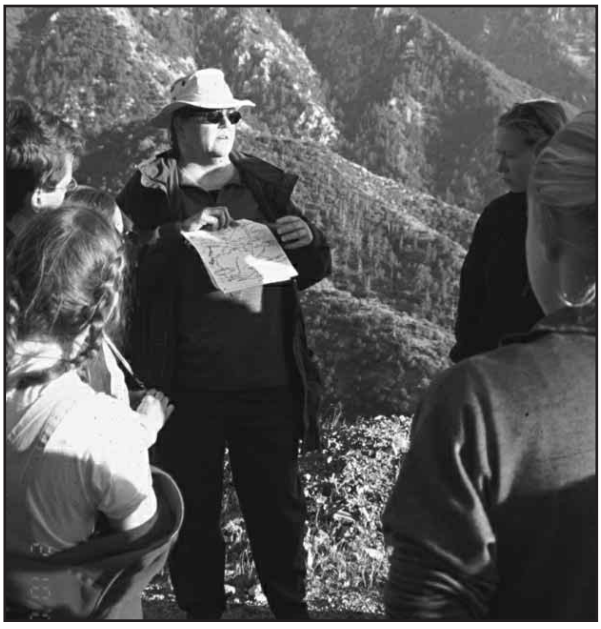
Structure Class Maps Painted Canyon, CA

This past winter the structures class needed a field trip but the usual areas in our region like Carlton Dam near Duluth or Baraboo in Wisconsin sounded kind of chancy for field mapping in January, so the class spent three days in Painted Canyon near Indio, California, instead. The canyon beautifully displays nearly horizontal sedimentary beds disrupted by faults of the San Andreas system. After collecting field data the students returned to campus to do processing and get it all out on large maps and posters.

Above, this is the view of some of the deformed layers from within the canyon, in a picture by physics professor Bill Titus who accompanied us on the trip.

Below left, lab assistant Melissa Keevil assists Melissa Grunst and Kristin O'Connell (both '04) get started on describing the rock units. Below right, at the conclusion of the trip Linda Reinen of Pomona College gave us a quick tour of landslide deposits in the canyon above the city of Claremont. (Photos by Tim Vick)





And now, a word from our interns… Adventures in Interning

What begins with rock cutting and mural planning and ends with apatite picking and paper revisions? That's right, my experience as one of the two original fifth-year interns is now coming to a close. Only 100 apatite grains to go! Thanks to my experiences this year, which include collecting and analyzing water samples from the Cannon River watershed, maintaining the ion chromatograph, creating a GIS database of dates and associated dating techniques for tonalities, granodiorites and many other rocks from southeastern Alaska, picking apatites for U-Th/He dating, creating and maintaining a mineral of the week display, and presenting a geoscience education abstract with Mary at AGU, I am now ready to enter the world beyond Carleton. Once Ben Harrison takes over for us next year, I will be moving to his hometown of Seattle, WA where the Civil and Environmental Engineering department at University of Washington has foolishly accepted me. (Thanks UW! Clint! Mary! Bereket!). And thank you to all the faculty who humored me in the mineral of the week display. I know this really put me on the top of UW's list! Okay, maybe not, but I loved making it.

Aside from the many opportunities provided me this year, I think I will most miss lunch with Tim Vick, who has some surprising stories. You really need the fifth year to get the whole Tim Vick experience. He would have never corrected my "pasty" pronunciation during the U.P. Michigan field trip on my fourth year (He had to define "pasty" for me). I would never have known that Tim used to work for the New York Times. In fact, I may not have realized that Tim really likes to try out different brands of yogurt every day at lunch. I think as alums you should all know this.

-Liz Clark '02

A lot of people might think we are a little crazy to voluntarily spend another year in Northfield, but I would have to disagree. Being a fifth year intern is great! As a lover of most things midwestern, I've been able to take advantage of my not-as-busy schedule and explore the area. But in addition to getting a non-student perspective to life in Northfield, I also learned a ton. Jenn Macalady took me under her wing this year and taught me everything I know about geomicrobiology. Now that her lab is up and running (goodbye XRF prep room) I am working on a project that focuses on the interactions between geochemistry and microbiology and formation of the Grotti di Frasassi caves. Mostly I spend my time in the basement looking through various microscopes and pretending to be a biologist. In addition to the cave project, I have been tagging along on geo field trips, presenting at conferences, and traveling in the name of science. Jenn even spoiled me by sending me to Australia to do some fieldwork. New South Wales is a great alternative to Minnesota in December!

Like Liz, I am headed back to the student life come fall. Now that I think geomicrobiology is the coolest, I have decided to commit to it and will be starting a Ph.D. program in microbial biogeochemistry at Penn State. I am pretty excited to move on, but I will miss the geo department, puppysitting the departmental dog and, of course, geo-lunches with Tim!

-Katja Meyer '02

Liz Clark (on the left) and Katja Meyer, both '02, on the departmental field trip to the Mojave Preserve in California last March.

Water Beds and Magma Beds

by Wendell Duffield '63

In the 1960s and early 1970s love, peace, long hair, and free everything was the order of the day. The waterbed became a popular and important part of that lifestyle. Used properly, a waterbed purportedly would enhance one's love life. Today, I don't know of a single friend or acquaintance who sleeps on a waterbed, and I don't think it's because we have become an old and stodgy generation. I think that conventional beds simply are superior sleep inducers, and let's face it, people of any age spend at lot more time asleep than at play on a bed.

As creatures of the Flower Child generation, Anne and I tried a waterbed for one night. We were passing through King City, California, on vacation, not long before we moved to Hawai'i. In this case, our curiosity got the better of our common sense. It only took a few moments between the sheets for us to realize our mistake, when the fun of sloshing around in a semicontrolled surfing adventure wore off. The water in our bed was way too cold for anyone to sleep on-at rest we shivered uncontrollably. We solved this problem, much to the befuddlement of the motel manager, by placing several extra blankets under us as insulation from the cold. We also turned the heater to its maximum setting, but thermal inertia kept the water in the bed uncomfortably cool through the night.

At Hawaii Volcano Observatory (HVO), I once spent an early morning on a magma bed with Don Swanson. The fluid in this bed was uncomfortably hot, and adding a layer of insulation was not a practical solution to the problem. Management in this case was Pele, the Hawaiian goddess of fire, and she was not about to intervene on behalf of two intruding geologists. Don and I created our own solution: a hasty retreat from the surface of the restless hot monster. The magma bed story starts with the Mauna Ulu eruption.

When I arrived in Hawai'i to begin my stint at HVO, an eruption was underway on Kilauea's east rift zone. That eruption had begun three months earlier on fairly flat ground covered with rain forest, along a two-mile reach of newly formed cracks and rifts. Within days, the rift zone spewing out magma focussed its activity at about the center of a roughly equilateral triangle whose corners were the two preexisting craters, 'Alo'i and 'Alae, and the cinder cone Pu'u Huluhulu. During the following twenty-nine months, sporadic eruption at this spot built a 250-foot-tall mound of lava, called a lava shield. The eruptions also fed some flows that extended across the south flank's grand staircase and into the Pacific Ocean, about 8 miles away. As the lava shield around the vent grew to become a notable figure of the landscape, the U.S. Geological Survey appropriately named it Mauna Ulu, Hawaiian for "growing mountain."

Before Mauna Ulu appeared on the landscape, the Chain of Craters Road continued across the south flank of Kilauea to the south coast and then looped eastward near sea level to connect with a system of paved roads that gave access to the entire southeast part of the Big Island, including Hilo. Lava flows from early eruptions at Mauna Ulu, however, buried several miles of the road, greatly complicating travel between the summit of Kilauea and the parts of the National Park along the south coast. With partial burial, the Chain of Craters Road simply led to a parking lot next to 'Alo'i, beyond which the general public was excluded but HVO staff was expected.

Though stretched thin with leveling, geodimetering, and other studies related to deformation of Kilauea Volcano, the HVO staff also maintained a frequent visual monitor of activity at Mauna Ulu. For most days, this included a half-mile hike from the new abrupt end of the Chain of Craters Road, right up onto the Mauna Ulu shield.

Don and I often hiked to Mauna Ulu together. As our total number of round-trips grew substantially, but the landscape over which we hiked changed relatively little, at least on a daily basis, we became complacent about what was underfoot. This carelessness helped lead to the magma-bed incident.

One day on the hike to Mauna Ulu, as Don and I were walking and talking and perhaps not paying enough attention to our footing, we both suddenly felt the ground beneath us move in a soft and mushy way. This was not an earthquake. Simultaneously, and without a word spoken, we realized that we were literally on thin crust, Pele's magma-filled equivalent of a waterbed.

Apparently, overnight Mauna Ulu had erupted a piddling bit of lava, which had puddled in a low spot along our trail. By the time we arrived on the scene, a lava crust had formed over the puddle. But hidden beneath that skin lay a reservoir of still-molten rock. Though cooling and thickening with time, the crust was still so thin, probably only a few inches, that the weight of our bodies was pushing the crust down into the melt, just as a human body pushes the rubber bladder of a water bed into its liquid interior. We quickly backtracked to solid ground and waited for

our heart rates to approach normal. I don't remember what happened next, but I never again walked cavalierly onto very new looking lava without first convincing myself that only solid rock lay underfoot.

In fact, we probably were never in imminent danger. Obviously, the crust, though thin, was sufficiently strong to hold our weight. Even if the crust had cracked, we may well have been able to walk safely away. The melt beneath the crust was thick, pasty, and viscous enough that we could have stepped from one crack-bounded piece to another before our weight pushed any one piece into the underlying hot ooze. Mind you, I wouldn't want to try this hopscotch dance, but I think it could be done. If the trapped melt was still frothy with gases, a different and more frantic dance might ensue.

The truly frightening thought is what might have happened if we had strolled onto the lava during what geologists call crustal overturn. Many direct observations at Kilauea over the past several decades verify that a pond of lava may evolve through the following series of steps as it changes from hot and restless melt to solid rock.

* Step one: As soon as the pond forms, or even as melt is still being added, a thin black crust coats the surface. This happens as the melt, which solidifies at about 2,000 degrees Fahrenheit, quickly cools when it is exposed to the earth's atmosphere, which at Kilauea is no more than 100 degrees Fahrenheit.

* Step two: With time and cooling, this crust slowly thickens. Simultaneously, gases (mainly water vapor, carbon dioxide, and sulfurous vapors) slowly and continuously escape from the underlying melt and collect under the crust.

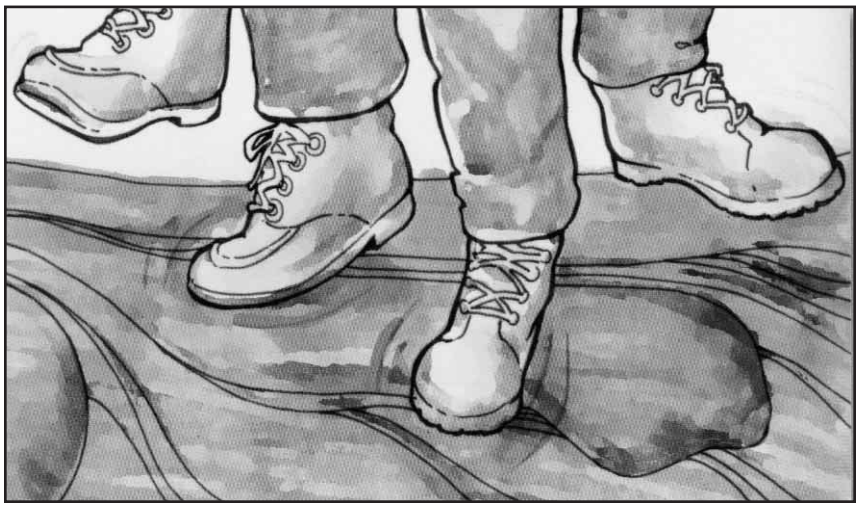
* Step three: If enough of these gases collect, they buoyantly lift the crust until it breaks into pieces that tilt and sink into the underlying less-dense, frothy melt. This is called crustal overturn, because the process destroys the existing crust and new crust eventually takes its place.

* Step four: Depending upon the amount of gases remaining in the melt, steps one through three repeat, or step three ends with a stable crust that thickens until the entire pond of melt has solidified.

If the "crust" on your waterbed cracks and springs a leak, at the worst you will get soaked and have a wet mess to mop up. However, if the crust on your magma bed springs a leak and founders, you probably will have no mess to clean up. You will instead become completely incinerated toast. Perish the thought.

There's more...

"Water Beds and Magma Beds" is actually a chapter from Duff's newly released book, **Chasing Lava**, published 2003 in cooperation with the U.S. Geological Survey's Volcano Hazards Program by Mountain Press Publishing Co., Missoula, Montana. The book is available from Mountain Press at 1-800-234-5308 or through your favorite bookseller (if they're hip).



Watch your footing while walking on lava beds!

Anders Noren '96 Finds Storms History In Lake Beds

From The New York Times

October 25, 2002 - Four times since the last ice age, at intervals roughly 3,000 years apart, the Northeast has been struck by cycles of storms far more powerful than any in recent times, according to a new study. The region appears to have entered a fifth era in which such superstorms are more likely, the researchers say.

No one should necessarily start building dikes right away, say the researchers, who reported their work yesterday in the journal Nature. The stormy periods they identified each lasted a millennium or more, and giant floods occurred only sporadically in those stretches.

But the research could indicate that engineers and planners, when considering the design of public works like bridges and reservoirs, should take into account the possibility of extremely rare, but extremely destructive, floods, said the study's lead author, Anders J. Noren '96, formerly of the University of Vermont and now at the Limnological Research Center of the University of Minnesota. Anders graduated from Carleton College with a major in Geology.

The work illustrates that natural extremes of weather - what one researcher, Paul R. Bierman, a geologist at the University of Vermont, called a "drumbeat of storminess" - are many times greater than those experienced in the modern era.

"If this cycle continues," Mr. Noren said, "the frequency and severity of intense rainstorms that can cause massive flooding should continue to increase for the next several hundred years."

The researchers spent several years extracting 12- to 20-foot-long cores of sediment that accumulated over 13,000 years in the beds of 2 lakes in eastern New York and 11 in Vermont.

Buried in the muck were layer-cake patterns of sandy soil, each layer evidently formed when slopes crumbled under torrents of water and were washed into the lakes. Some of these layers are 10 times as thick as one apparently left by the greatest flood recorded in Vermont, which killed 84 people, drowned thousands of cows and demolished 1,200 bridges in November 1927.

Layers that thick could be explained only by deluges far more potent than the storm of 1927, the scientists said.

By helping to reveal elusive long-term patterns, the findings could eventually improve long-term climate forecasts and models, said Richard B. Alley, a Pennsylvania State University geologist who is an expert on post-ice-age conditions and was not involved with the new study.

"This work shows that extremes are not just acts of God that happen to happen," Dr. Alley said. "They are linked to larger patterns in the climate system that may prove to be predictable."

Experts in the emerging science of paleotempestology, which uses such buried clues to discern past patterns of destructive weather, called the work a significant advance. In particular, it is the first study to compile data from many separate lake beds, reducing the chance that the patterns resulted from fluky local conditions, said Kam-biu Liu, a geographer at Louisiana State University who has used the technique to study ancient hurricanes. Dr. Liu called the new work "a triumph."

The clues from the lakes appear to mesh with evidence of other periods of stormy weather around the North Atlantic, including variations in traces of salt from sea spray locked in layers of Greenland glaciers, the authors said. They also appear synchronized with the occasional cold snaps in Europe that sent glaciers grinding forward down alpine valleys, the study says.