

Newsletter  
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# EARTH & ENVIRONMENTAL SCIENCES

LEHIGH UNIVERSITY  
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## A message from the chair.....



Welcome Lehigh alumni to the Department of Earth and Environmental Sciences. On behalf of the Department it is really my pleasure to have this opportunity to reintroduce you to our faculty, students, staff, and recent activities. Some time has passed since our last newsletter during which there have been new and exciting things going on in our Department and at Lehigh. Our goal with this newsletter is to get reacquainted and make it easier for all alumni to remain connected, or to reconnect with EES. For our part, we will reach out annually with our newsletter and regularly update our website with news, happenings, awards, and projects (<http://www.ees.lehigh.edu>). New faculty, sharing of a Nobel Prize, award-winning graduate and undergraduate students, novel educational programs, the Environmental Initiative, a new building, a firm commitment to field training and field camp, and world-class research labs represent just a snapshot of all of the great things that are happening in EES. I hope you enjoy reading about these things and more in the newsletter and on the website. As part of the extended EES family, we welcome comments, feedback, and engagement from all alumni.

With best wishes for a peaceful Holiday Season and a happy and prosperous New Year,

Frank J. Pazzaglia, Professor and Chair, Department of Earth & Environmental Sciences

## EES Department

Earth and Environmental Sciences is the home for environmental science, geosciences, and ecological sciences at Lehigh. With 14 (and growing) faculty, we are a core and founding department within the Environmental Initiative, a campus-wide, degree-granting program that brings together science, environmental engineering, education, and policy on all matters regarding the environment. Although not the largest department within the College of Arts and Sciences, we house one of the College's and University's most active and successful research programs. Our faculty, in concert with their graduate and undergraduate students, continue to secure research funds from external, competitive funding agencies like NSF, EPA, and NASA. These efforts result in scientific articles published in high-profile national and international journals. Our graduate and undergraduate students are competitive and successful for

top positions in industry, research, and academics. We are a very international department with research activities and international collaborations literally around the globe. EES faculty continue to be leaders at home here at Lehigh with four members serving beyond normal Departmental responsibilities as Dean (Anne Meltzer), EI director (Dork Sahagian), South Mountain College director (Peter Zeitler), and Deputy Provost for Academic Affairs (Carl Moses). The Department remains committed to offering the best education in the Earth and Environmental Sciences to undergraduates combining both traditional and innovative elements in a hands-on, laboratory- and field-intensive setting. We are proud of our current accomplishments but will continue to strive to offer the best research and education in meeting the Earth and Environmental challenges of the coming decades.

*Download the newsletter online in full color from: <http://www.ees.lehigh.edu>*

# Meet the Faculty



## **David Anastasio - Structural Geology**

My research in structural geology and tectonics largely funded by NSF focuses on the geometry and kinematics of orogenic processes. The research is multidisciplinary, involving sedimentology, geomorphology, and rock and paleomagnetism. Recent emphasis has been on active tectonics and determinations of high-resolution deformation rates from folds and faults. Field areas include the northern US Rocky Mountains, Spanish Pyrenees, Italian Apennines, and the Sierra Madre Oriental, Mexico. I also conduct education research and curricular materials development sponsored by NASA promoting the use of scientific inquiry and online and emerging technologies in the classroom.

## **Gray Bebout - Petrology, Stable-isotope Geochemistry**



One common theme in Gray Bebout's recent research is the use of nitrogen isotopes as tracers of biogeochemical cycling. Ongoing, NSF-funded research by Gray and his students aims at understanding nitrogen behavior during deep-crustal partial melting (field work partly in the outback, Australia; see photo) and the extent to which organic nitrogen is deeply subducted into Earth's mantle in eclogites, rocks that were formed by the eruption of lavas on the seafloor. Characterization of these biogeochemical pathways is key to our understanding of modern volatiles cycling and longer-term Earth degassing and atmosphere evolution.

## **Bob Booth - Ecology, Paleoecology, and Paleoclimatology**



I am a broadly trained ecologist interested in patterns, rates, and mechanisms of climate variability and its influence on the structure and function of ecosystems. Much of my research is designed to address current issues in global change, with recent projects focusing on ecological dynamics associated with widespread drought and pluvial events of the past, the reconstruction of past environmental variability from peatland archives, the ecology, biogeography, and paleoenvironmental applications of testate amoebae, and the climatology of severe drought.

## **Ed Evenson - Glacial Geology**



My group's research is mainly on modern glacial processes and Quaternary glacial activity in Alaska, Idaho, Wyoming, New York, Iceland and Argentina. Our most recent work examines the deglaciation history and paleoglaciology of the Anchorage lowland, the maximum discharge and failure mechanism of an ice dam in Idaho and the age and origin of "Darwin's Boulders" in Tierra del Fuego. I am currently designing a study to use paleomagnetic techniques to measure microfabric in drumlins and flutes in central New York to better understand the processes by which basal till is deposited and deformed. I am actively looking for a student to tackle this interesting problem.

## **Bruce Hargreaves - Bio-optics, Aquatic Ecosystems**



My current NASA-funded project is part of a joint NASA-NOAA mission (GASEX-III) to improve estimates of carbon dioxide flux into and out of the ocean with special emphasis on high-wind conditions. In the spring I will participate in a 6-week cruise between the Falkland Islands and the Antarctic peninsula, a site chosen for its reliably high winds. My specific contribution to this project involves measuring light absorption by ocean phytoplankton to predict photosynthesis using water samples and ultimately satellite data. Because photosynthesis consumes carbon dioxide, these planktonic algal influence the pressure of CO<sub>2</sub> in the water.

### **Ken Kodama, Paleomagnetism, Tectonics**



Ken Kodama continues to work on paleomagnetic research. Over the years, he and his students have developed techniques to identify and correct for inclination shallowing caused by burial compaction. Ken's inclination shallowing work was recently recognized by the Geophysics Division of the Geological Society of America with his receipt of the 2006 George P. Woollard Award for "outstanding contributions to geology through the application of the principles and techniques of geophysics."

### **Anne Meltzer - Herbert J. & Ann L. Siegel Dean , College of Arts & Sciences**



As a seismologist, Anne Meltzer studies earthquakes and the structure of the earth through naturally and artificially generated seismic waves. Along with Peter Zeitler, Anne leads an international research team that is studying the vicinity of Namche Barwa, highest peak in the eastern Himalayas. They are researching whether and how much the forces of surface erosion--wind, rain, rivers--influence the tectonic forces below that give rise to earthquakes, volcanoes, mountain-building, and more.

### **Don Morris - Microbial Ecology, Aquatic Ecosystems**



Together with my graduate students (the 2 Chrisses—Mason & Dempsey), my lab is investigating organic carbon metabolism in aquatic ecosystems. Dissolved organic carbon (DOC), comprise a wide variety of mostly uncharacterized compounds like humic and fulvic acids, tannins, and lignans. Microbial metabolism of these compounds provides energy for aquatic ecosystems and mineralizes this carbon to CO<sub>2</sub>. We have been utilizing dynamic and static bioreactors to characterize the differences in bioavailability and growth efficiency of DOC to microbes. This work has implications in the study of carbon cycling and energetics of aquatic ecosystems.

### **Carl Moses - Deputy Provost for Academic Affairs**



After spending five years in the College of Arts and Sciences Dean's Office (as Associate Dean and interim Dean), Carl has served the last two years as Deputy Provost for Academic Affairs. Among other things, he's responsible for Lehigh's institutional accreditation, and he leads Lehigh's enrollment management team. He doesn't do much science these days, but he does serve on graduate student committees and on the Committee of Science and the Arts of the Franklin Institute of Philadelphia, where he contributes to the Franklin Medal selection process.

### **Frank Pazzaglia, Chair, Tectonic and Fluvial Geomorphology**



I am a tectonic and fluvial geomorphologist with a passion (affliction) for understanding long-term landscape evolution. The data I collect comes from rivers and watersheds focused on erosion rates and rates of river incision. Geologic mapping, particularly of surficial deposits remains one of my core activities. My research takes me to mountain ranges around the world including the Italian Apennines, Crete, Cascadia, the Andes, the Rockies, and closer to home, the Appalachians. Increasingly, I find myself working on local watershed-scale problems related to historic land use, stream channel change, and deposition of legacy sediments.





My research focuses on quantifying and understanding low-temperature geochemical processes using sensitive major and trace element analytical techniques in conjunction with radiogenic and stable isotope measurements. Recent projects have focused on the photochemistry of mercury in aquatic systems, the occurrence and geochemistry of arsenic in groundwaters of the Eastern United States, and elemental stoichiometry as tracers of biogeochemical cycles at the watershed scale. Our analysis of 18,000 groundwater samples statewide in Pennsylvania created the first map of arsenic concentrations and highlighted the elevated concentrations present in the Newark Basin of southeastern Pennsylvania.

**Joan Ramage Macdonald - Remote Sensing, Cryosphere**



I am interested in using satellite observations to understand questions in geomorphology, geoarchaeology, glacial records, land use and land use change, and environmental science. Most of my work has used microwave observations to study snow and glacier melt in Alaska, USA and the Yukon Territory, Canada. I am also working on glacial and paleoenvironmental questions in the Peruvian Andes.

**Peter Zeitler - Director, South Mountain College; Geochronology, Tectonics**



Most recently my research has focused on regional-scale tectonics and geodynamics: I am particularly interested in the influence surface processes can have on tectonic processes and evolution. By training I am a geochronologist, and the lab we maintain here at Lehigh focuses on noble-gas geochronology (U-Th/He and Ar-Ar). Although we conduct studies using the full range of these techniques, we have particular expertise in the application of lower-temperature thermochronology to tectonics. As such, another interest of mine is refinement of the techniques of thermochronology.

**Research Scientists**

**Eva Enkelmann - Thermochronology**



My main research interests focus on low-temperature thermochronology (fission track analysis, (U-Th)/He, and 40Ar/39Ar). I am interested in the application of these methods to understand tectonic processes and the influence of surface processes. Another interest of mine is the refinement of the techniques of thermochronology.

**Bruce Idleman - Tectonics and Noble Gas Geochronology**



I am a geochronologist with broad interests in regional-scale tectonics. Much of my recent research has focused on the evolution of modern and ancient arc-continent collision zones, through on-going projects in the Dominican Republic, Ireland, and Alaska. I'm also interested in the application of detrital mineral dating to tectonic and geodynamic problems, and in the development of novel techniques and instrumentation for noble-gas geochronology and thermochronology

Newly tenured

## Zicheng Yu - Paleoecology, Paleoclimatology



My research interests are interdisciplinary and center on the late Quaternary paleoecology and paleoclimatology. I'm interested in using multiple proxy data in studying dynamics of vegetation, climate, hydrology and carbon cycle and their connections. I have used multiple paleoecological records (pollen, conifer stomata and plant macrofossils) derived from lake and wetland sediments to reconstruct past flora and vegetation changes and to discuss environmental influences on dynamics/succession of upland and wetland vegetation. Reconstructed change in vegetation from these paleoecological records together with independent proxies on climate from oxygen isotopes and on soil/landscape development from elemental geochemistry provide valuable data in discussing past ecosystem processes related to climate-soil-vegetation interactions.

### Recent Publications:

- Yu, Z.C. 2007. Rapid response of forested vegetation to multiple climatic oscillations during the last deglaciation in the northeastern U.S. *Quaternary Research* 67: 297-303.
- Yu, Z.C. 2006. Holocene carbon accumulation of fen peatlands in boreal western Canada: Complex ecosystem response to climate variation and disturbance. *Ecosystems* 9: 1278-1288.
- Zhao, Y., Z.C. Yu, F.H. Chen, and E. Ito. 2007. Holocene vegetation and climate history at Hurleg Lake in the Qiadam Basin, northwest China. *Review of Palaeobotany and Palynology* 145: 275-288.

### Papers accepted for Publication (in press):

- Yu, Z.C., K.N. Walker, E.B. Evenson, and I. Hajdas (in press). Late glacial and early Holocene climate oscillations in the Matanuska Valley, south-central Alaska. *Quaternary Science Reviews*. (Special Issue, Guest Editors: Z.C. Yu, W. Hoek, and J. Lowe).
- Chen, F.H., Z.C. Yu, M.L. Yang, E. Ito, S.M. Wang, D.B. Madsen, X.Z. Huang, Y. Zhao, T. Sato, H.J.B. Birks, I. Boomer, J.H. Chen, C.B. An, and B. Wunnemann (in press). Holocene moisture evolution in arid central Asia and its out-of-phase relationship with Asian monsoon history. *Quaternary Science Review*

### Past Graduate Students:

- Karina Walker (M.S.) 2005. Post-glacial Vegetation and Climate History of the Matanuska Valley, Alaska: A Multiple Proxy Approach (co-advisor: Evenson).

### Present Graduate Students:

- Cheng Zhao (Ph.D.) 2004- Geochemical Evidence for Holocene Climate Change and Variability in Northwest China and the Northeastern United States.
- Paula Zelanko (M.S.) 2006- Multiple Climate Oscillations During the Early Holocene Derived from Multiple Proxy Data at Silver Lake in Northern New Jersey.
- Shanshan Cai (M.S.) 2006- Holocene Carbon Accumulation in Temperate Peatlands and Climate Connection.
- Andrew Gonyo (M.S.) 2007- Late Holocene Climate Variation and Ecological Response at Kepler Lake in south-central Alaska (co-advisor: Bebout).



## Sahagian plays role in IPCC receiving 2007 Nobel Peace Prize

**He contributed to three reports by the IPCC, which recently shared the Nobel Prize with Al Gore.**

*A Lehigh University professor contributed to three of four assessment reports by the Intergovernmental Panel on Climate Change (IPCC), which on October 12 was jointly awarded the Nobel Peace Prize with former vice president Al Gore.*

**Dork Sahagian**, professor of Earth and Environmental Sciences and director of the Environmental Initiative, served as a contributing author for the Second Assessment Report which was released in 1995, a reviewer of the Third Assessment Report released in 2001, and a contributing author for the forthcoming Fourth Assessment Report.

Authors from across the globe have written and peer-reviewed each of the assessments. These reports presented new and then stronger evidence which showed that human activity has contributed to global warming over the last 50 years.

“Through the scientific reports it has issued over the past two decades, the IPCC has created an ever-broader informed consensus about the connection between human activities and global warming,” said The Norwegian Nobel Committee, which awarded the prize.

“The importance of the results of the IPCC process is in the degree to which it represents consensus of a huge community of scientists, social scientists, and other scholars,” said Sahagian. “While there is no specific political agenda in IPCC, I certainly hope that the results will be incorporated in policy-making throughout the world, as they affect everyone living now or yet to be born.”

The IPCC was established 20 years ago to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. Next week, the IPCC will meet in Valencia, Spain to adopt the fourth and final volume of the climate change assessment report.

“People have already created enough greenhouse gas emissions (and land use changes) to impact climate in ways that could disrupt fragile social and economic systems,” said Sahagian. “However, the potential for much more severe human-induced alterations looms large, and is inevitable if we do not immediately take major steps to reduce and soon curtail completely greenhouse gas emissions.”

As director of the Environmental Initiative, Sahagian is working to create a leading program for environmental science, technology, economics, education, policy, and the myriad interactions between people and the environment. He conducts research in paleoclimatology, volcanology, stratigraphy, geodynamics and tectonics, global hydrology and sea level.

“My own contribution to the IPCC has been only very minor, involving humanity’s effect on sea level rise,” said Sahagian. “Nevertheless, I am glad to have been able to provide even the smallest insights into a critically important process.”

### Meet the people of the Environmental Initiative



**Dr. Stephen Reid** has joined the Environment Initiative team as Director of the Earth System Atlas, a powerful web-based data manipulation, visualization and learning tool, with an emphasis on global change and the environment, which will be tailored not only for the scientific community, but also for schools and the general public. Steve's previous appointments include the Norwegian Institute for Air Research and NOAA.



**Jessica Mauro**, Program Coordinator EI, joined the Environmental Initiative as a Program Coordinator in August 2007. Mauro is a graduate of Pennsylvania State University with a B.A. in Political Science, and a minor in Science, Technology and Society. Jessica also worked at the Urban Environmental Center in Wilmington, DE and the Pool Wildlife Sanctuary in Emmaus, PA as an environmental educator, developing and implementing lessons for preschool and school age children. She enthusiastically supports the purpose and goals of the EI.



**George Yasko**, George Yasko is the Field Projects and Laboratory Manager for the Lehigh University’s Lehigh Earth Observatory (LEO). George is responsible for directing the student internship program, technical operations. He provides instruction to student interns on laboratory, field, data collection and analysis techniques. He develops student projects with external partners and also continues to design and build instrumentation.

Learn more about the Environmental Initiative and its people at [www.ei.lehigh.edu](http://www.ei.lehigh.edu)

# Meet the Graduate Students



I'm working in the Big Lost River Valley, Idaho, trying to calculate the peak discharge of a glacial outburst flood using the boulders that were deposited down-valley.  
*Advisor: Ed Evenson*



I will be characterizing the sediment-discharge relationship in fluvial systems using surveys, analogue flume models, and storm hydrology..  
*Advisor, Frank Pazzaglia*



My Ph.D. project has taken me up to Newfoundland and New Brunswick/ Nova Scotia to study reb beds. I study different techniques of measuring magnetic fabrics and hematite anisotropy for inclination shallowing corrections.  
*Advisor, Ken Kodama*

## Ian Barton, MS

## Matthew Bennett, MS

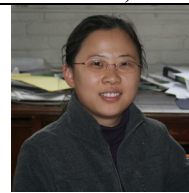
## Dario Bilardello, PhD



I will be using local seismicity to study strain in the eastern Himalayan syntaxis.  
*Advisor, Anne Meltzer*



I'm studying mercury speciation in freshwater systems. The goal is trying to understand how mercury behaves (speciates) under various environmental conditions.  
*Advisor, Steve Peters*



I'm studying climatic influence on peat accumulation of Tannersville Bog  
*Advisor, Zicheng Yu*

## Lucy Brown, PhD

## Mike Bubb, PhD

## Shanshan Cai, MS



I am measuring the amount of labile carbon in different watersheds along the Lehigh River through the use of bioreactors. *Advisor, Don Morris*



I'm researching late Holocene climate variability in south-eastern Alaska. The project is a multiple-proxy reconstruction of a lake sediment core using microfossils and stable isotopes of calcite and organic matter.  
*Advisor, Gray Bebout*



I am investigating the paleo-environmental conditions of NW Pennsylvania using assemblages of fossil-pollen, testate amoebae, macroscopic plant remains, and charcoal preserved in Sphagnum dominated peatlands *Advisor, Bob Booth*

## Christopher Dempsey, MS

## Andrew Gonyo, MS

## Alex Ireland, MS



I am investigating modern and paleo - processes driving glacial and snow variations in Alaska. The goal is to understand the rates and styles of glacial/ snow responses to climate change.  
*Advisor, Ed Evenson*



I am using precision GPS measurements and deformation of Quaternary units to characterize an active fault in SW Montana, north of the Snake River Plain  
*Advisor, David Anastasio*



I am studying the ecology of testate amoebae in fens in the Yukon Territory.  
*Advisor, Joan Ramage*

## Sarah Kopczynski, PhD

## Chrissy Majerowicz, MS

## Erin Markel, MS





I am studying the influence of the river continuum concept on dissolved organic carbon biolability and bacterial growth efficiency in the Lehigh and Delaware Rivers.  
*Advisor, Don Morris*



I am using remote microwave sensors to determine melt characteristics vital to quantifying the Southern Patagonian Icefield's mass balance.  
*Advisor, Joan Ramage*



I am investigating the Nitrogen content of high temperature, partially melted rocks from subduction zones as well as examining the role of cyclo-silicates in storing organic Nitrogen using geochemical and petrologic studies.  
*Advisor, Gray Bebout*

**Chris Mason, MS**



I am a second year Master's student with interests in paleoecology, climatology and landscape history  
*Advisor, Bob Booth*

**Patricia Monahan, MS**



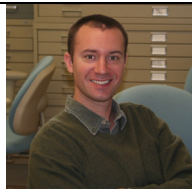
I study the temporal and spatial biogeography of plants and ecosystems. I focus on the refinement of testate amoeba calibrations as a proxy for hydrologic conditions and its application as a proxy in review of the mid-Holocene hemlock decline.  
*Advisor, Bob Booth*

**Annie Palya, MS**



I am working in the Spanish Pyrenees where I have collected hundreds of samples to measure for anisotropy of magnetic susceptibility and other magnetic fabric measurements representative of strain, and the kinematic history of a fold.  
*Advisor, David Anastasio*

**Valerie Sousa, MS**



My Ph.D. research studies the interactions between surficial and tectonic processes in the Apennine Mountains of Italy and Crete, Greece. *Advisor, Frank Pazzaglia*

**Maura Sullivan, PhD**



I am studying an actively growing fold in northern Italy using river terraces, geomorphology, and growth-strata constrained by a variety of surface and subsurface data.  
*Advisors, David Anastasio & Frank Pazzaglia*

**Joanna Troy, MS**



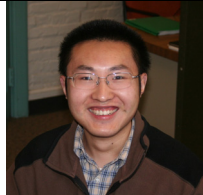
My project focuses on factors affecting mercury emission from lakes and wetlands, specifically light, iron, DOC, and suspended particulates.  
*Advisor, Steve Peters*

**Karl Wegmann, PhD**



My research deals with the effect of environmental conditions on the waterborne parasite *Cryptosporidium*, which causes a gastrointestinal infection in humans.  
*Advisors, Bruce Hargreaves & Kristen Jellison (CEE)*

**Luke Wilson, MS**



I am working on an advance warning system for potential snowmelt-driven flooding with remote sensing technique.  
*Advisor, Joan Ramage*

**Jennifer Wollenberg, PhD**



I have been working on two research projects using lake sediment from several lakes to investigate Holocene climate and environment changes in both humid Northeastern USA and arid Northwestern China.  
*Advisor, Zicheng Yu*

**Elizabeth Wolyniak, PhD**

**Fenglin Yan, MS**

**Cheng Zhao, PhD**





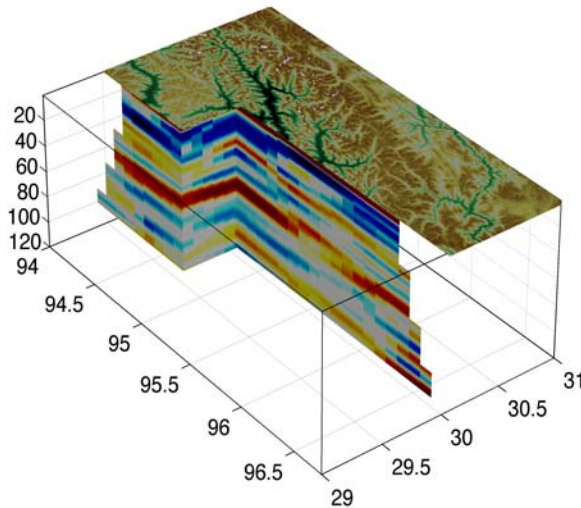
***EES GRADUATE STUDENT CHOSEN  
TO PRESENT RESEARCH POSTER AT  
INAUGURATION OF LEHIGH'S  
13th PRESIDENT***

Brian Zurek, PhD Advisor, Anne Meltzer

Last spring as part of the inauguration for Alice Gast graduate student Brian Zurek was selected to present his findings from his PhD work at 'An Exhibition of Student Research and Scholarship'. He presented a poster entitled 'Seeing roots of mountains, imaging the crust of Tibet', which examined how erosion coupled with tectonics builds mountains. Using the field of earthquake seismology Brian examines the structure of the crust and upper mantle to understand how the landscape evolves over time. For his poster he examined the role crustal isostasy and erosion play in generating the high standing Namche Barwa and Gyala Perri massifs at the eastern end of the Himalaya. As part of the project Brian, with fellow seismologist Prof. Anne Meltzer and Post-doc Stephane Sol, took numerous trips to southeast

Tibet to install and maintain a temporary seismic network that was used to record earthquakes from around the world and locally to the region. The data from this network is currently being used to interrogate how the indenting corner of the Indian plate is modifying the crust of and upper mantle of southeast Tibet.

Attached figure is a cross section of a model of seismic impedance contrasts beneath the namche Barwa / Gyala Perri massifs. The large red line is the crust mantle interface. Image is made by mapping the location of seismic S-waves that were generated when teleseismic P-waves interacted with seismic velocity contrasts. The surface is digital elevation map for the region. Several of the large rivers that incise the region are clearly visible.



## Staff – The best at Lehigh



Laura Cambiotti  
EES  
Administrative  
Assistant and  
Newsletter  
Co-editor

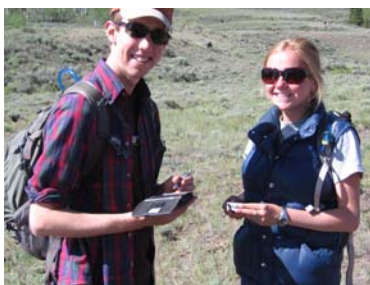


Nancy Roman  
EES  
Receptionist  
and Newsletter  
Co-editor



Joe Seem  
EES Dept.  
Technician

## Field Camp



For the 34<sup>th</sup> consecutive year, EES will offer Lehigh Field Camp in the Rocky Mountains. The camp remains one of the best known and respected summer field programs in the nation. Summer field camps are a long tradition in the geosciences and stand as one of the most formative and enjoyable components of the undergraduate educational experience. Traditional field camps have felt the pressure of changing geosciences enrollments and requirements nationwide. Lehigh has met these challenges a number of ways. First of all, the geosciences curriculum remains rigorous and balanced affording the students both breadth and depth of geological field training. Next, the curriculum identifies and develops specific skills including the integration of GPS and electronic mapping using computers in the field. Third, the camp continues its tradition of a cross-country trip where the students learn about the natural history of their country, seeing much of it for the first time in many cases. The cross-country trip is a component that has been eliminated from many camps based in the east recently and Lehigh is proud to continue the tradition. Lastly, the camp has built a new parallel curriculum in environmental science that provides training in limnology, fluvial hydrology, and landscape ecology. The geoscience and environmental science curricula travel together, camp together, and most importantly, learn from each other throughout the experience. Interest and students numbers are one measure that the camp is

succeeding in its goals. Last year, 12 EES majors attended even though it is not required, and were joined by 34 students from around the country and internationally.

Ed Evenson who directed and built the program through 2003 founded Lehigh Field Camp in 1974. Under Ed's leadership, the camp became identifiable with rigorous introductory and advanced geoscience field training in a rustic, camping environment. Ed continues to be an integral part of the camp as instructor and expert woodsman. The relationships he has built with communities and individuals throughout Wyoming and Idaho are invaluable to the safe and efficient running of the camp. Since 2004, the camp director has been Frank Pazzaglia who has set goals of seeing the camp positioned as a real signature of EES and of summer programs at Lehigh. Long-time and new contributors to the camp and its staff include David Anastasio, Gray Bebout, Steve Peters, Joan Ramage, and Patrick Belmont.

On behalf of the staff, Frank would like to extend his warmest invitation to all EES alumni and their families to visit us in the Rocky Mountains as part of your vacation this summer. All schedules and activities related to camp can be found on the field camp website: <http://www.lehigh.edu/~fjp3/fieldcamp/index.html>. Consider donating to the Vic Johnson Scholarship fund, which we use to help offset camp expenses to deserving students.

## Gateway Courses and the new undergraduate curriculum

An often underappreciated part of the education mission of a vibrant department is the continual effort to offer the very best curriculum to undergraduates that make the major accessible yet rigorous so that graduates are well-trained and competitive for employment or graduate school upon graduation. EES recently went through a revision of its undergraduate curriculum with this over-arching goal in mind. The results are B.S. and B.A. degrees that are very forward thinking and positioned to meet the geological, ecological, environmental, and energy challenges of the

coming decades. The undergraduate curriculum is shaped like interests as seniors. Of particular interest in this model is the base of the double funnel, a component we call the "gateway courses". We are attempting to accomplish two related goals with the gateways. First, we are looking to offer exciting a double funnel: it has a wide base that offers many possible pathways for students to experience the major, a narrow neck that focuses students into courses that provide core training, and a wide top that allows students to explore a range of somewhat eclectic and non-traditional introductory lecture recitation, and lab courses that will attract freshmen and sophomores

## Gateway courses continued...

to the major. We teach these courses to a maximum of 40-50 students in a small classroom setting that promotes discussion and student engagement. The idea is that undergrads will be exposed to a broad range of EES topics and faculty and this will translate to increased recruitment to the major. Second, EES is committed to science education and building science, particularly environmental science literacy, for all students at the University. For some students, an EES gateway course may be the only science course they take during their entire college career. It becomes

important therefore that the gateway courses stress how science provides a way of knowing and managing interactions between the natural world and society. Examples of gateway courses that the EES faculty has developed include Natural Hazards, Ring of Fire, Lands of the Midnight Sun, Energy, Climate Change, and Biodiversity.

Our experiment with the gateway courses and new curriculum is only in its second year, but there are signs that it is beginning to achieve its intended goals. Our majors are engaged, leaders at Lehigh, and enthusiastic about the Earth and Environmental Sciences.



## Undergraduate News

### Undergrad theses and honors

●**Ellen McFadden**, 2008, Ellen is completing a senior honors thesis in remote sensing and snow melt hydrology with Joan Ramage in the high Andes Mountains of Peru.

●**Ryan Lockwood**, 2007, Ryan completed a senior thesis project under the direction of Steve Peters to look at Ca-Sr ratios in *Daphnia* as a measure of Ca availability in lakes.

●**Justin Stroup**, 2007, Justin completed a senior thesis project under the direction of Steve Peters and Ed Evenson looking at a long term record of glacial discharge and dissolved loads from the Matanuska glacier, Alaska.

●**Kirsten Liljeqvist**, 2007, Kirsten completed a senior thesis under the direction of Steve Peters studying metal mobility in soils, focusing on zinc mobility at Palmerton PA.

●**Andrea Luebke**, 2005, "Herbivory Influences on Native Plant Community Recruitment & Growth in Restoration Experiment among Agricultural Fields"

●**Thomas Stretton**, 2005, "Carbon Isotope Response of Oak Trees to Pollution at Lehigh Gap, PA"

●**Catherine Kendig**, 2006, "Effect of Lake Water Chemistry on Spectral Properties of Chromophoric Dissolved Organic Matter: a laboratory study"

●**Christine Regalla** won the Lemon Prize for Best Lehigh Undergraduate Research Project, College Scholar Program and the J. Foster Hewlett Prize from EES, awarded to the student showing the greatest professional promise in EES. She was awarded her BS degree in Geological Sciences with departmental Honor's for her research entitled "Characterization of the Monument



Christine presented a paper at the national Geological Society of America conference, in 2005, and her thesis was published in the Journal of Structural Geology in 2007 v. 29 n. 6, p. 1-14. She is currently completing an M.S. degree at Penn State University.

## Student groups



**Green Action** is Lehigh's Environmental Action club. Their mission is to promote awareness on environmental issues at Lehigh. October marked the first Green Summit at Lehigh and also Green Week, which was an entire week dedicated to green events. An all-natural, local, vegan ice cream social was held to discuss the differences between organic, local, all natural, vegetarian, and vegan. An Inconvenient Truth was shown and a talk on how to reduce your energy bill. Currently, they are promoting recycling and collecting newspaper, paper, cardboard, glass, plastics 1-7, and aluminum.

The **Geology Club's** mission is to promote interest in and appreciation for the natural sciences (geology, ecology, etc.) for both majors and non-majors through field trips, museum visits, outdoor recreation, movies and other events. Fall semester events included: "The Core" movie night, hiking the Delaware Water Gap, and a hike at Hawk Mountain.



## 31<sup>st</sup> Annual D. Foster Hewett Lecture Series!

Supported by an endowed account established in the name of one of our influential alumni, the **31<sup>st</sup> D. Foster Hewett Lecture Series** is recognized university-wide for the high-quality of timely scientific topics it brings to Lehigh. It will be held on March 20 & 21, 2008. Guest lecturers will be **Richard Alley** (Penn State) "Ice Streams in Modern Ice Sheets – what we know", **Johan Kleman** (Stockholm University) "Paleo-ice Streams of the Laurentide and Scandinavian Ice Sheets – what we think we know", and **Jim Titus** (EPA) "Effects of Sea Level Rise if Ice Stream Delivery to Oceans Increases"

Past D. F. Hewett lecturers included:

April 2007:

**Lonnie G. Thompson**, University

Distinguished Professor, Ohio State University

"Abrupt Climate Change: Past, Present and Future"

**Michael E. Mann**, Associate Professor, Department of Meteorology, Penn State University

"The Scientific Case for Climate Change and its Causation"

March 2007:

**Colin Prentice**, Professor of Earth System Science, University of Bristol, UK

**William Ruddiman**, Palaeoclimatologist and Professor Emeritus, University of Virginia

April 2006:

**Eugenie Scott**, Physical Anthropologist, Director of the National Center for Science Education

March 2006:

**Andrew Knoll**, Fisher Professor of Natural History, Harvard

## EES Seminars

Interacting with earth scientists from around the country and world helps us maintain a vibrant learning environment. Donations and endowed accounts from alumni help make our weekly seminar possible. Seminars are Friday at noon in WI 100. Lunch socials precede the seminars at 11 o'clock, in WI 102. Faculty and students are encouraged to meet with speakers during their stay, and everyone is invited to reconvene at The Bridgeworks, usually by 5 pm, for the second phase of discussions.

October 3rd (Wed.) **Mark Koelmel**, Chevron Energy Technology Company

"The Growing Role of Technology: Energizing the World in the 21st Century"

October 12<sup>th</sup> **Julie Brigham-Grette**, University of Massachusetts

"Paleoclimate record of the last 300ka at Lake El'gygytyn, NE Russia: scientific justification of deep drilling in 2009"

October 19<sup>th</sup> **John Tarduno**, University of Rochester

"On the motion of Hawaii and other mantle plumes"

October 26<sup>th</sup> **Bryan Mark**, Ohio State University

"Climate change and tropical Andean glaciers: Evaluating impacts to water resources"

November 2<sup>nd</sup> **Neal Iverson**, Iowa State University

"Testing the bed deformation hypothesis: Inferences from subglacial measurements, laboratory experiments, and the geologic record"

November 9<sup>th</sup> **Eric Kirby**, Penn State University

"A Tale of Two Rivers: Tectonic controls on fluvial incision in the headwaters of the Yellow and Yangtze watersheds"

November 16<sup>th</sup> **Maya Elrick**, University of New Mexico

"Paleozoic paleoclimate change detected from oxygen isotopes of conodont apatite"

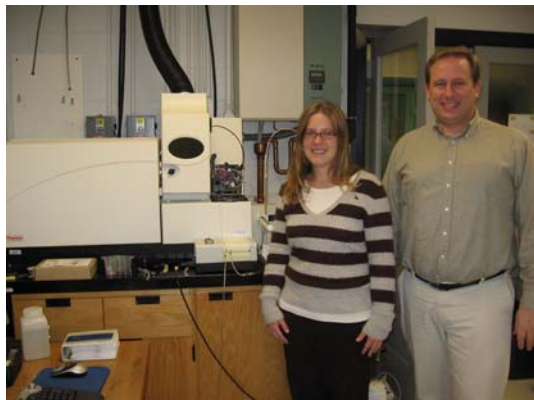
### upcoming seminars

January 18 **Daniel Pauly**, University of British Columbia, Fisheries Center

January 25 **Matty Mookerjee**, Sonoma State University

"Implications of Three-Dimensional Thrust Surface Geometry on Thrust Sheet Kinematics: Integrating field analysis with a kinematics-based mathematical model for the Moine thrust zone, NW Scotland"

## Profile: New EES Labs – Trace Element Geochemistry



Members of the geochemistry group conduct research on low temperature reactions between earth materials, biological organisms, with a focus on understanding fundamental processes. For example, recent work on the photochemistry of mercury centers around understanding the factors that influence the transfer of this volatile element from the earth to the atmosphere. For example, research on the organic carbon interactions showed that small quantities of dissolved organic carbon, even if highly photobleached, has the capability to chemically reduce mercury and enhance emission from remote lakes to the atmosphere. The emission rate depends on a number of factors, including incident solar radiation and the mercury concentration in the water column. Other recently published work discusses the geochemistry of arsenic in the Newark Basin, the distribution of arsenic in drinking water across the state of Pennsylvania, the stoichiometry of trace elements such as strontium as indicators of biogeochemical processes.

The major equipment in the geochemistry laboratory consists of an Inductively Coupled Plasma Mass Spectrometer that can determine the concentration of nearly all inorganic elements at environmentally relevant concentrations. Ion chromatographs are used for analysis of anions in natural waters and the separation of arsenic species. Other equipment includes four mercury analyzers for determination of mercury in gaseous and liquid samples in the field and the laboratory setting, field portable datasondes and autosamplers. All of the instrumentation is computer controlled and data reduction is accomplished on a networked set of five computers.

The lab has supported research projects of graduate students Maura Sullivan (MS 06), Lori Burkert (MS 06), Shannon Haight (MS 07), Andrea Luebbe (MS 07), Jennifer Wollenberg (PhD 08), and Mike Bubb (PhD, in progress). The undergraduate theses of Ryan Lockwood (BS 05), Kirsten Liljequist (BS 06), and Justin Stroup (BS 06), were all conducted primarily within the geochemistry lab. The facility supports educational courses, such as Hydrogeology and Aqueous Geochemistry, and projects through the Lehigh Earth Observatory.

## News and dates....

### Earth & Environmental Sciences Lehigh University

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### We're on the Web!

See us at:

[www.ees.lehigh.edu](http://www.ees.lehigh.edu)

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**Save the date! February 12, 2008** is the birthday of Charles Darwin and Sigma Xi is planning an event with five speakers from different Departments that have agreed to talk about the impact of Darwin on their particular field including biology (Sean Mullen), geology (Ed Evenson), philosophy (Mark Bickhard), economy (Jim Dearden) and theology (Lloyd Steffen). Note that we will likely be interviewing and will also be hosting the grad student seminar this week.

**October, 2008** EES is working with the Department of Geology and Environmental Geosciences at Lafayette College to plan a Lehigh-Lafayette reunion at the Geological Society of America meeting in Houston, Stay tuned for more info.

## We are hiring!

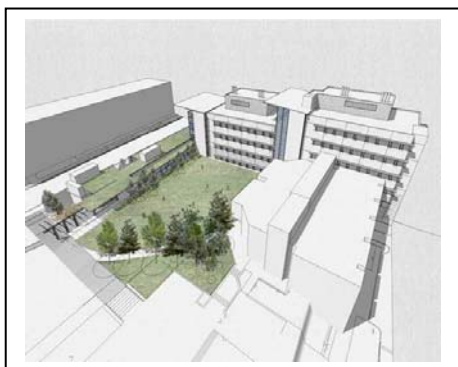
At the time of the writing of this newsletter, we are in the process of reviewing applications for a new faculty member with an expertise in Earth System Science. The applicant pool for this job was huge – some 150 applicants from around the world. The quality of the applicants is equally impressive so we look forward to interviewing some really interesting candidates in the early spring. Visit our web pages in the late spring when we hope we will be able to make an announcement about our newest faculty hire.

## The Department Field Trip

EES has a long tradition of running a Department Field trip every spring involving faculty, graduate students, and undergraduates. The Department subsidizes the cost of these trips and the students cover the balance as an investment in their broader education in Earth and Environmental Science. The goal of the trip is to provide a cross-platform, field-base Future planned trips include St. John in the Virgin Islands, Argentina, Four-Corners Canyon Country, Italy, Tibet, and others. We are interested in learning more about alumni interest in the Department Field Trip. One model we are experimenting with is integrating alumni on the trip given that many of you have diverse experiences and contacts throughout the world. The Department Field trip would be a great way to build contacts and share experiences with EES students. For more information, contact Department Field Trip Chairman Don Morris at [dpm2@lehigh.edu](mailto:dpm2@lehigh.edu)

## A new building on the EES horizon!

As one of the core Departments in the Environmental Initiative, EES will soon be moving out of Williams Hall and into a new environmentally friendly building designed to foster collaborative research and education in environmental science, engineering, and policy. The project, called STEPS for Science, Technology, Environment, Policy, and Society, is an \$85 million, 130,000 sq-ft initiative representing the largest undertaking of its kind in Lehigh's history. The faculty and staff have been busy working with the building architects and Lehigh facilities in designing state of art research and teaching labs. One of the building's hallmarks will be "science in sight" where the research activities of EI faculty and graduate students will be visible and accessible to undergraduate students and visitors. Groundbreaking for the STEPS building is scheduled to take place in the spring, 2008 with a projected opening of June, 2010. More details about the building can be found in the Fall 2007 Alumni Bulletin and on line at: [http://www3.lehigh.edu/News/V2news\\_story.asp?iNewsID=2352](http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=2352).





## An invitation to get involved in your Department

The faculty and staff would like to extend an invitation to alumni to stay in contact with EES and to get involved with your Department. Contact us and let us know how you would like to be involved. Some activities and events open to all alumni include:

- The weekly Friday lunch and seminar (11 AM-1:00PM)
- The Graduate Student Seminar (typically the second week in February)
- Undergraduate and Graduate thesis defenses (typically near the end of the semester)
- Graduation (3<sup>rd</sup> Monday in May)
- Field Camp (see <http://www.lehigh.edu/~fjp3/fieldcamp/index.html> for the schedule)
- The Department Field Trip and field trips during the semester.

Many of the programs we offer in EES that allow us to excel in education and research are made possible by endowed accounts and donations established by alumni. We are always looking to augment our resource base for graduate and undergraduate research, EES Field Camp, faculty development, and/or Departmental labs, equipment, and educational facilities. If you are in a position to donate, please fill out the form below with your gift and send it to us. We will acknowledge receipt as soon as it arrives. Please make your check payable to Lehigh University and we thank you in advance for your consideration and support.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Email: \_\_\_\_\_

I would like to make a donation to support the EES graduate program in the amount of	\$ _____
I would like to make a donation to support the EES undergrad program in the amount of	\$ _____
I would like to make a donation to support EES Field Camp in the amount of	\$ _____
I would like to make a donation to support EES faculty development in the amount of	\$ _____
I would like to make a donation to support Department facilities in the amount of	\$ _____
I prefer to make an unrestricted gift of	\$ _____
Total personal donation	\$ _____
Employer matching gift (if applicable, include employers matching gift form)	\$ _____
<b>Grand Total</b>	<b>\$ _____</b>

Send the completed form with your check to:

Laura Cambiotti, Department of Earth and Environmental Sciences, Lehigh University,  
31 Williams Drive, Bethlehem, PA 18015-3126.

Department of Earth and Environmental Sciences  
Lehigh University  
31 Williams  
Bethlehem, PA 18015

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Lehigh Field Camp, 2007