HOBART AND WILLIAM SMITH COLLEGES

Department of

Geoscience

Newsletter

Volume 1: Summer 2009

Greetings! We hope this newsletter finds you well, and eager to read about the recent news and accomplishments of the Geoscience Department at HWS. We have an exciting, growing and ever-evolving program, one that reflects the current needs of our students and expertise of our faculty. We hope to see you back on campus sometime soon.

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P.S. Please drop us a line, an email or a short note to let us know about your activities since graduation.

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Department News

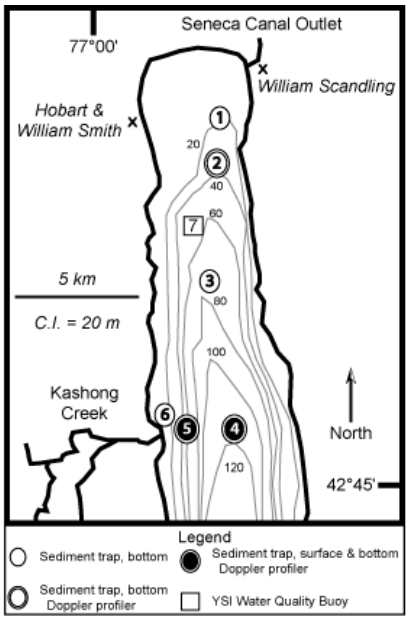
NSF Sponsors Seneca Lake Measurement Network

A recent grant from the Major Research Instrumentation (MRI) program of the National Science Foundation has allowed a collaborative group of HWS professors [Brown (Biology); Bridgeman (Computer Science); Curtin and Laird (Geoscience)] to acquire eight automated sediment traps, two Doppler current profilers, ten submersible temperature recorders, one water quality sonde, and one meteorological station. The instruments have been used to establish a network of seven sites in northern Seneca Lake to investigate the ecology of the diapausing egg of exotic zooplankter *Cercopagis pengoi* (Cladoceran: Cercopagidae), in concert with the meteorological conditions, internal lake circulations, and sedimentation processes that drive its production and distribution.

The network will significantly advance HWS's interconnected undergraduate education and research mission, contribute to its tradition of limnological research, and substantially improve the monitoring and understanding of the Finger Lakes, an important natural resource.

The network will support a number of interdisciplinary projects in addition to the study of *Cercopagis* diapausing egg production and distribution, including studying lake-atmosphere energy exchange, the interpretation of paleoclimatic proxies in sediments, and effective visualization techniques for large, complex data sets.

Undergraduates are actively involved in research at HWS and will make use of the network via coursework at both the introductory and advanced level, summer and academic-year research assistantships, and academic-year independent study and honors projects. Students will gain hands-on experience with field and laboratory methods, data management, and data analysis and interpretation in a framework of integrated interdisciplinary research. Archived data from the Seneca Lake network will be available via the internet early this fall (2009).



Locations of network moorings in northern Seneca Lake

HWS Geoscience Professors Retire

After serving the Colleges for 35 years, Prof. Donald Woodrow retired in 2001. Woodrow had been very active in research in Seneca Lake, using the Colleges' research vessel, the William Scandling, as a primary tool.

Woodrow published research conducted in other areas as well. His research includes major emphases on Devonian sedimentology and stratigraphy in North America and Europe and on Great Lakes sedimentology. He was co-founder of the Environmental Studies Program, co-founder of the Department of

Geoscience, and a co-designer of the "Science on Seneca" program, a program that provides opportunities for hands-on research to middle and high school students and teachers from upstate New York. Woodrow also served the Colleges as associate dean of faculty from 1991-1994, and is a past recipient of the faculty's scholarship and teaching prizes.

Prof. William Ahrnsbrak came to HWS in 1970 and retired in 2004. Over the years he conducted important research on Seneca Lake, documenting the existence and some characteristics of internal waves. With other geoscience colleagues, he obtained numerous grants that helped fund geoscience research and obtain field equipment. Ahrnsbrak was instrumental in bringing the research vessel *William Scandling* (formerly *HWS Explorer*) to the Colleges in 1975. With Woodrow, he was co-founder of the Department of Geoscience. He also served as chair of the Department of Geoscience and on numerous faculty committees.

Curtin & Laird Earn Tenure and Promotion to Associate Professor

Tara Curtin and Neil Laird earned tenure and promotion to associate professor in the Department of Geoscience during the spring semesters of 2008 and 2009, respectively.

Tara Curtin received her Ph.D. from the University of Arizona, a master's degree from the University of Illinois, and a bachelor's degree from Colgate University. Her teaching and research interests lie in the areas of sedimentology, geochemistry and global climate change over a wide range of timescales. Her dissertation research focused on the interpretation of how a 200-million-year-old monsoon system developed and then broke down using time-equivalent lake deposits and soils. More recently, she and her research students have investigated the climate signals preserved in the mud of the Finger Lakes to reconstruct the timing and magnitude of lake level fluctuations and storms that occurred over the past 12,000 years.

Neil Laird earned his Ph.D. and M.S. from the University of Illinois at Urbana-Champaign and his bachelor's degree from the State University of New York at Oswego. His teaching and research interests lie in the areas of meteorology, regional climatology, and atmosphere-lake interactions. His primary research focus is the investigation of several aspects of lake-effect snow storms and severe weather. Since joining HWS in 2004, Neil has obtained several grants from the National Science Foundation to support his meteorological research and the study of the Finger Lakes. He and his students have published numerous articles in prominent meteorological journals, such as *Monthly Weather Review* and the *Journal of Applied Meteorology and Climatology*.

Students & Alumni/ae Present at Annual American Geophysical Union Meeting in San Francisco, CA

During winter break, HWS science students Katherine Hoering '10 (geoscience), Kerry O'Neill '09 (geoscience), Prabi Basnet '09 (environmental studies), and Sam Georgian '10 (biology) presented their summer research activities at the American Geophysical Union annual meeting in San Francisco, CA. While there, they had an opportunity to see presentations by former HWS geoscience students Megan Crocker ('07), Kathryn Loddengaard ('07), Sandy Baldwin ('01) and Rob Stewart ('03).

Current students presented on various facets of their 2008 summer research activities with Professor John Halfman:

Basnet investigated the persistently high nutrient concentration in the bottom waters of Cayuga Lake and its impact on degraded water quality, especially at the southern end of the lake.

Georgian compared the numerous means to analyze the factors that make lake water turbid, and compared the ability to measure them in the field and in the lab.

Hoering assessed limnological data from Otisco Lake, which was surveyed by Finger Lakes Institute for the first time this past summer.

O'Neill investigated water quality trends based on water clarity, nutrient concentrations and other fundamental limnological indicators in eight of the Finger Lakes based on samples she and other students measured since 2005.

Crocker and Loddengaard worked closely with Associate Professor Tara Curtin. Their research focused on determining the origin of a wave-cut scarp found throughout the northern end of Seneca Lake. Their detailed sediment analyses completed during summer research, independent study and honors projects have proposed a viable hypothesis that combines lower lake levels and crustal rebound due to Laurentide deglaciation that has been alluding past investigators (including Halfman and others) for many years.

Hoering, O'Neill and Georgian are in the back (l to r) and Basnet (front).

Baldwin has been working at the U. S. Geological Survey at Woods Hole, Mass. since graduating from William Smith. She presented research on the nitrogen contamination and nitrogen redox hydrogeochemistry in ground water.

Stewart worked for an environmental consulting firm before beginning graduate work at the University of New Hampshire. He is learning more about modeling water resources and surface and ground water contamination.

"The trip was highlighted with a chance to meet with Professor Emeritus Don Woodrow," said Halfman. "Don cares very deeply about geoscience and the other sciences at the Colleges, and helps whenever he can."

All of the students, current and former, have been part of the Summer Research Program at HWS, where students collaborate with faculty on research projects and learn firsthand what it takes to become successful scientist.

Geoscientists are Storm Chasers

This year, HWS is the only liberal arts institution to join the VORTEX2 project, the largest fully mobile tornado field experiment

ever attempted. Assistant Professor of Geoscience Jeffrey Frame and student-researcher Bryan McCorkle (H '11) are working with some of the leading scientists in the area of severe thunderstorms. The project, which is funded by the National Science Foundation and the National Oceanic and Atmospheric Administration, is a collaborative meteorological research study that combines the findings of a team of dozens of universities, colleges and government labs in the U.S. and around the world - all of whom are chasing thunderstorms and tornados in order to gain a better understanding of them.

Traveling from the Dakotas to Texas and from Eastern Colorado to Iowa, Frame and McCorkle - along with more than 100 scientists - are chasing answers by chasing storms. While traveling across the Great Plains, VORTEX2 will attempt to understand why some supercell storms produce tornados while others do not. This information will help improve tornado warnings by increasing the lead time of the warning while reducing the false alarm rate.

Frame and McCorkle spent five weeks chasing storms across the Great Plains. The Doppler on Wheels radar that Frame is navigating scans the storms for rotation and precipitation intensity. McCorkle is spending some of his time in a "probe vehicle," equipped with scientific instrumentation to measure temperature, atmospheric pressure, relative humidity, and wind speed and direction. This vehicle is also equipped with three "tornado pods," which are small deployable devices also equipped with this instrumentation that can be dropped in the path of a tornado to gain data on the internal structure of tornadoes.

McCorkle (left) and Frame (right) in front of the Doppler on Wheels Radar.

With the major inquiries of VORTEX2 in mind, Frame noted the potential that the project has to save lives. "If the lead time for tornado warnings could be increased to 30-60 minutes, people would have much more time to get out of the way of the storm, or to seek shelter," he said. "In addition, if this false alarm rate could be reduced, the public would likely take the warnings more seriously." The project also provided McCorkle with the experience of a lifetime as a science student. "The best way to learn about meteorological phenomena is by seeing it," Frame noted. "Bryan is actually seeing and experiencing these storms and tornados, allowing them to come out of the textbook and the classroom."

Woodrow Seminar Series in Geoscience

Emeritus Professor of Geoscience Don Woodrow established the Geoscience seminar series in 2007-08 that allows the department to invite several guest lecturers to campus, meet with our students, and present current research or policy perspectives. Our speaker series is currently funded with monies generously donated by Dr. Woodrow and a match from HWS. The series provides faculty and students with an external perspective on important trends in Geoscience, Geoscience careers, and Geoscience education, Matthew Lamana (H '97) kicked off the Woodrow Geoscience Seminar Series when he returned to campus to give a talk titled “Hunting Dinosaurs on Four Continents” as part of the President’s Forum Series. The next two speakers, chosen by Geoscience majors and minors, to visit campus were Dr. Amy Leventer (Colgate University) and Dr. John Tarduno (University of Rochester). We will continue to host invited speakers, including alumni/ae, who care to share with students their insights about Geoscience-related topics and career paths.

The Geoscience Fund

Alumni/ae are very loyal to our department and the department wishes to take this opportunity to thank them for their generosity. Established over a decade ago, this fund was created by Dick Steinschneider (’75) to provide financial support that helps the department maintain and improve its curricular offerings and provide field opportunities for Geoscience students. These funds are used to help defray the cost of Geoscience student attendance at national and regional conferences. Funds are also used to help support the costs of field work associated with upper level classes such as Petrology with Prof. McKinney and Problems in Earth History with Prof. Arens, and paleontological research with Profs. Arens and Kendrick.

Mellon Awards $3 Million to Endow the Finger Lakes Institute

The Finger Lakes Institute (FLI) recently received a $3 million 2:1 challenge grant from the Andrew F. Mellon Foundation to endow a professorship and science coordinator, a post-doctoral research position, research funds, summer research student funding, and scholarships for minority student participation in the Environmental Studies Summer Youth Institute. FLI is still seeking funds for the $2 million match stipulated by the award. Donations are matched by Mellon as they arrive on campus up to the pledged $1 Million from Mellon. This most recent commitment follows a progression of previous awards from the Andrew F. Mellon and other foundations as well as New York State and the Federal Government to create and maintain the Finger Lakes Institute on the campus of Hobart and William Smith Colleges.

The FLI at 601 S. Main St. on the campus of HWS.

Established in 2004, the FLI’s mission is to promote environmental research and education about the Finger Lakes and surrounding environments. Since 2004, the FLI has attracted over $7 million in external funding from federal, state, foundation, and private sources. This funding supports a Director, Community Outreach Coordinator, K-12 Education Outreach Coordinator, GIS Education Coordinator, GIS technician, and a research scientist. In collaboration with regional environmental partners and state and local government offices, the Institute fosters environmentally-sound development practices throughout the region, and disseminates the

accumulated knowledge to the general public through workshops, a community lecture series, the annual Finger Lakes and My Place in the Finger Lakes conferences, Science-on-Seneca, and the Environmental Studies Summer Youth Institute. To learn more about the FLI, visit http://fli.hws.edu.

Science on Seneca Wins EPA Award

Science on Seneca (SOS) is a middle and high school educational outreach program of the Finger Lakes Institute at Hobart and William Smith Colleges. It was established in 1986 by Geoscience and Chemistry faculty, Bill Ahrnsbrak, Don Woodrow, and Kenneth Carle, and is based on the environmental study of Seneca Lake. In 2008 the SOS program won the U.S. Environmental Protection Agency's Environmental Quality award for Environmental Education. The program enables local science teachers to use Seneca Lake as an outdoor classroom. To participate, the teachers must take part in one of two yearly training sessions (fall and spring) run by Geoscience, Biology, and Chemistry faculty and coordinated by Barb Halfman (Geoscience) and Sheila Meyers (FLI).

Geoscience Prepares for Review

The Department of Geoscience is undergoing an external review in the fall 2009. External reviews provide valuable information about the department to HWS administrators, faculty committees and the department as they are the primary means through which we assess the effectiveness, progress, and status of the department, and thus improve the quality of our academic program. We will be able to highlight our strengths and achievements, identify areas in need of improvement, develop long range plans to meet those identified needs, and plan for emerging changes in the discipline. This review also, for the first time at HWS, regularizes the review process to occur once every 10 years.

The Geoscience faculty write a "self-study" document for an external review team and HWS administrators. We anticipate the external review team to visit campus by the end of the year ('09) and complete a comprehensive report of their findings. Their report will identify strengths, makes concrete and constructive suggestions for improvement, and finally addresses any other issues the reviewers deem important.

Our self-study document will highlight a number of strengths that include:

(1) We have expanded the department to six tenured/tenure-track faculty lines that have expertise in the following fundamental sub-disciplines of Geoscience: hard rock & structural geology, soft rock & paleoclimatology, paleobotany & evolution, invertebrate paleontology & historical geology, environmental & limno-geology, and atmospheric sciences.
(2) Our graduates find jobs in environmental consulting, K-12 teaching, government agencies and laboratories, graduate school, and/or enter a variety of other professions.
(3) We have recently revised our curriculum to better prepare our students for life after HWS, offering four tracks in Geoscience (Geology, Climatology, Environmental Geology and Earth Science Teaching).
(4) Our support to the general curriculum, the Environmental Studies program and non-majors aspiring to meet their "Natural Science" and "Quantitative" campus-wide goals substantially surpasses the other science departments on campus.
(5) We maintain active research programs and include students in all aspects of research. Many participate in our summer research program and others present their research findings at national meetings such as GSA and AGU, and co-author peer-reviewed journal publications.
(6) A few dedicated alumni and alumnae directly support a speaker series, field trips, research, and attendance at national meetings.

We will also highlight a number of weaknesses that include holes in our coverage of Geoscience (e.g., hydrology, climatology, geophysics); our space is old, frequently floods, and in some cases inadequate; and our budget has been relatively stagnant despite an increase in faculty and course offerings.

We anticipate that the external review team will strongly consider our self-study in their review, and charge us and the administration to outline a strategy that builds on our strengths and overcomes our weaknesses.

Faculty and Staff News

Nan Arens continues to investigate the last two million years of dinosaur times (Cretaceous Period, about 66-65 million years ago) with field research in the badlands of eastern Montana. In 2008, students Sarah Allen (WS '09), Mike Bloom (H '09) and Elisha Harris (WS '10) joined Nan and Assistant Professor David Kendrick for several weeks of fossil collecting in the Hell Creek Formation. This is part of the ongoing "Hell Creek Project", a collaboration between researchers at the Museum of the Rockies, University of California Museum of Paleontology, University of North Dakota and others. Begun in 1999, the project celebrated its first decade with a symposium at the North American Paleontological Convention in June 2009. Nan and Sarah Allen, presented their work at the conference, and with coauthors including Kendrick, will publish four papers in the resulting Geological Society of America Special Paper. The research will continue with fossils collected from many sites in the valley of Hell Creek.

Nan's work in the Hell Creek Formation is also moving west. In 2008, she and her crew of students investigated a new and very rich fossil site in south central Montana. Of about the same age as the floras from eastern Montana, these plants grew in the volcanic highlands and are quite different from those on the comparatively well-studied ancient coastal plain. Plans are underway for a major research and collecting effort that will involve up to 15 undergraduates in field research.

Finding fossils often depends a lot on luck. In 2005, while surveying Early Cretaceous (about 100 million years ago) sediments in Central Utah, Arens and Kendrick stumbled on a cattle watering hole, the banks of which were littered with beautifully preserved leaf fossils. They spent four days collecting sand, returned again in 2007 with students Emma Cochran (WS '09), Elisha Harris (WS '10), and Rose Parker (WS '10) to collect more, and to sort out the fossils' stratigraphic relationships. Harris presented preliminary results on the flora at the North American Paleolontological Convention in June and will use the collection as the basis for her honors project in 2009-10.

The Utah work is part of Nan's ongoing research on the ecology of early flowering plants. Following a series of papers in 2003-07, Nan is moving towards testing some of the hypotheses posed by modern phylogenetic

methods using new and previously collected fossils. A summary of the work to date will appear as a feature article in the fall issue of *American Paleontologist*.

One of the real joys of work at HWS is the opportunity to let students take the lead in research. In fall 2006, Mike Bloom (H '09) took GEO 230: Problems in Earth History. The problem he chose to attack was Devonian-age (about 357 million years ago) sedimentation in Watkins Glen State Park, just down the road from Geneva. The project has evolved into a collaborative study that will try to combine three stratigraphic time scales: one using land spores, one using marine conodonts and the third using stable isotopes. The project is funded by the America Chemical Society Petroleum Research Fund and could be extremely important because it will be the first to unite spore and conodont records with chemostratigraphic time markers in the Appalachian basin.

Recent Publications

(* denotes undergraduate student)

Jahren, A. Hope and Nan Crystal Arens. 2009. Prediction of atmospheric $\delta^{13}CO_2$ using plant cuticle isolated from fluvial sediment: Tests across a gradient in salt content. *Palaios* 24:394-401.

Arens, Nan Crystal and Ian D. West*. 2008. Press-Pulse: A general theory of mass extinction? *Paleobiology*: 34:456-471.

Jahren, A. Hope, Nan Crystal Arens, and Stephanie A. Harbeson 2008. Prediction of atmospheric $\delta^{13}CO_2$ using fossil plant tissues. *Reviews of Geophysics* 46: RG1002, doi:10.1029/2006RG000219. [electronic journal]

West, Ian D.* and Nan Crystal Arens, 2008. Humanity as press and pulse in the modern mass extinction. (HWS) *Public Affairs Journal* 4: 17-22.

Tara Curtin was on sabbatical this past academic year, which afforded her the opportunity to travel and also finish analyzing and writing about the enormous datasets generated by many HWS undergraduates and initiate new research projects. She sailed on the Pacific Ocean and then biked some of the California coast from San Francisco to Big Sur (after the wildfires had been controlled). She also visited an ice core lab at Penn State University, and there was able to see, hold, and taste (!) samples from a 45,000-year ice core from Antarctica. During the fall, she helped sample Triassic-Jurassic rock cores from CT and in the spring, water and algal mats in Oregon with Dr. Dave Finkelstein (Univ. Tennessee).

Over the past few years, she has built a new Sedimentology lab that houses equipment used not only in research, but also her classes. Thanks to funding from the National Science Foundation she has been able to outfit the lab with state-of-the-art instrumentation for the analysis of lake cores. She purchased a laser particle size analyzer and elemental analyzer that are routinely used for sediment core analyses, but can also be used to analyze samples of any unlithified sediment such as till, loess, and fluvial deposits. Her research students have spent many, many hours in the lab processing samples for charcoal abundance, macrofossil content, magnetic susceptibility and anisotropy of magnetic susceptibility, loss-on-ignition as well as grain size distribution and carbon and nitrogen content. One paper with six undergraduate co-authors, including four HWS alums (Clare Morgan (WS '06), Caitlin Rogers (WS '05), Megan Crocker (WS '07), Andrew Baker (H '04)) was just published in 2008 that describes how the timing of past stormy intervals over the last 14,000 years in the Finger Lakes region were reconstructed based on these data. All of these students have presented their research results at national scientific conferences including the Geological Society of America and the American Geophysical Union.

This past year, Tara along with two William Smith alums (Megan Crocker ('07) and Gwendolyn Wheatley ('09) and Leah Joseph (former HWS professor now at Ursinus College) finished up their project investigating the anisotropy of magnetic susceptibility (AMS) of post glacial Seneca and Owasco Lake sediments. AMS determines the degree of preferred magnetic grain orientation. Although typically used to assess the degree of deformation during the coring process, magnetic fabrics can also be used to infer past environmental conditions in subaqueous settings. Three main processes are responsible for grain orientation in these two lakes: presence of elongate magnetite grains originating from glacial sediment washed into the lake, slumping during the mid-Holocene, and possibly the presence of magnetobacteria during periods of high primary productivity. Megan and Gwen presented their work at the Geological Society of America, and a journal manuscript has just been submitted for publication.

With funds from New York State, Prof. Meghan Brown (Biology) and Tara purchased a sediment box corer to sample the historical record of anthropogenic change in two Finger Lakes. Meredith Eppers (WS'08), Cameron Avelis (H '11), Gwendolyn Wheatley (WS'09), and Kerry O'Neill (WS'09) all helped with sample collection and analysis this past summer and fall. They analyzed the sediment for various sedimentary indicators that have been used successfully to reconstruct paleoproductivity, including total phosphorous, organic carbon, inorganic carbon (calcite), nitrogen, and the carbon and nitrogen stable isotopic composition of bulk organic matter. Like with the Great Lakes, European settlement and then the growth in urban population, introduction of phosphate detergents, and expansion of sewage systems played an important role in changes in the lake water column, and in some cases, trophic level.

Recently, Tara teamed up with Profs. John Rayburn (SUNY New Paltz) and Peter Knuepfer (SUNY Binghamton) to develop an isostatic rebound model for the Finger Lakes that builds on the research of Andrew Baker (H' 04), Kathryn Loddengaard (WS '07), and Megan Crocker (WS '07). Preliminary analysis of maps and digital elevation data coupled with field observations of deltas and terraces and analysis of sediment cores collected from lakes and wetlands are being used to constrain the timing of the tilting of lake shores.

This summer, Tara and Jessica Popp (WS '11) will use the recently deployed Seneca Lake instrument network to establish an accurate calibration of the climate signal preserved in the Holocene laminated sediment record of the Finger Lakes. Jessica will help determine whether there are annual layers currently accumulating in Seneca Lake and which climatic (i.e., temperature, precipitation) or limnological (i.e., nutrient availability, plankton blooms) variable, or combination of variables, best explains the proxies preserved in the sediments each season and year.

Over the past several years, Tara Curtin's teaching efforts have been primarily focused on introductory level courses, such as The Fluid Earth and Global Climate Change (an introductory Environmental Studies course). She has twice offered a first year seminar entitled "The Analytical Methods of Sherlock Holmes." Over the next two years, she will contribute to two more introductory geoscience classes, The Solid Earth and Oceanography.

Tara also regularly teaches upper level geoscience courses, including Aqueous and Environmental Geochemistry, Paleoclimatology, and Sediments and Sedimentary Rocks. She looks forward to developing an upper level geomorphology course.

Recent Publication

(* denotes undergraduate student)

Curtin, T.M., Morgan C. K.*, Petrick, B.P. *, Lyons, D. *, Crocker, M. *, Rogers, C.E. *, and Baker, A.P. *, 2008. Reconstructing periods of enhanced precipitation during the Holocene in the Finger Lakes region, NY, *Northeastern Geology and Environ. Sciences*. 30, 277-288.

Barb Halfman is our dedicated Geoscience technician. She sets up all of our introductory laboratories and orders the necessary course and laboratory supplies. Barb also coordinates the Science on Seneca program with Sheila Meyers (Finger Lakes Institute). Barb is often seen peering down a microscope, identifying and counting the plankton collected by John Halfman and his research students as part of their ongoing environmental assessment of the water quality of the Finger Lakes.

John Halfman currently investigates water quality issues in the Finger Lakes region. This effort has blossomed from his earlier efforts to understand the hydrogeochemistry of Seneca Lake and the impact of exotics like the zebra mussel. To accomplish this, he hires up to five students every summer and "drafts" students through classroom and independent study projects to help him sample and analyze water from the eight eastern Finger Lakes, Honeoye, Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, and Otisco, and various tributaries. This effort started in 2005 by measuring surface and bottom water samples for nutrient (P, N, Si), algae, bacteria, and suspended sediment concentrations, and collecting and analyzing plankton tows, CTD casts and secchi disk depths at minimum of two open-water sites in each lake. The project steam rolled after publication of Katie Bush's (WS'06) honors research, in which she designed a simple method to "rank" and thus compare water quality from one lake to the next, and noted that one lake's placement in the rank correlates to the degree of water quality protection in the watershed. The research precipitated significant state, local and foundation support for a number of interdisciplinary and multi-institutional studies in the Owasco and Cayuga watersheds to pinpoint sources to and impacts of these nutrients on these lakes. More recently, Kerry O'Neill (WS'09) analyzed the available limnological data and concluded that land use, particularly runoff of nutrients from agricultural land modulated by the intensity, seasonal timing and quantity of rain, and nutrient loading from septic systems and municipal wastewater treatment facilities have a detrimental impact on water quality in the Finger Lakes. The publications/reports from these efforts are listed in a subsequent section of the newsletter and can be found on my web site: (http://people.hws.edu/halfman/).

The Seneca Lake water quality and meteorological monitoring buoy. Data available at: http://fli-data.hws.edu/clarkpt/conditions.php

This research initiated with students willing to sample the Seneca Lake and its tributaries. Specific studies focused on nutrient loading from non-point sources like agricultural landscapes, and point sources like municipal wastewater treatment facilities and CAFO operations, runoff of atrazine, the impact of zebra mussels and other exotics, and the excess "chloride story". All have kept me and my students busy, along with his efforts to initiate and develop the Finger Lakes Institute and expand the Environmental Studies Program (two new ES faculty and over 100 ES majors). Below are some research highlights.

Nutrient loading is making the lakes greener, i.e., more productive, and in some cases eutrophic. Once Seneca Lake turns green enough to become eutrophic, it will take many years before it will naturally flush out and return to oligotrophic conditions due to its ~20-year residence time and detrimentally impact the lake's usefulness as a drinking water supply, a tourist magnet, and substantial support to the local economy. This return assumes that nutrient loading is significantly reduced and legacy P removed. The nutrient loading is such, that even the filter-feeding zebra and now quagga mussels do not keep the lake as clear as it was in the late 1990's.

Folks in some watersheds are listening to and acting on the warnings. The Owasco Lake Watershed Association and local officials placed sufficient pressure on NYS DEC and a municipal wastewater treatment facility to significantly reduce the phosphorous loading in their effluent. They have initiated and hired a watershed inspector who has been actively inspecting septic systems, construction sites and other venues that aggravate nutrient loading to the lake. Studies are also underway to investigate the feasibility of returning Owasco Flats at the southern end of the lake back into a wetland, so that it may absorb the nutrient and suspended sediments before they enter the lake. These efforts are working, and water quality in Owasco Lake has improved from a "worst" lake in the FLI 2005 survey.

The group also is studying the eutrophication of the southern, Ithaca end of Cayuga Lake, and the controversial impact of Cornell University's Lake Source Cooling project (LSC). The data indicate that the worse nutrient contributor is tributary runoff, followed by wastewater treatment facilities, and LSC is at the bottom of the list. However, contributions from seiche activity and resuspension by waves and currents provide an unknown internal loading from the hypolimnion and sediments. To be fair, the wastewater plants have recently implemented tertiary treatment facilities that have greatly reduced their nutrient loading to the lake.

Effective legislation and control does work. Active watershed groups and local officials in the Skaneateles, Canandaigua and Keuka watersheds have been able to maintain excellent water quality through more stringent legislation. Nutrient loading, a "bottom-up" ecological stressor, is not the only player modifying water quality in these lakes. Dr. Meghan Brown's (HWS, aquatic biologist) data indicates that "top-down" ecological pressures by carnivorous zooplankton is important as well.

The investigations on the impact of zebra mussels have been ongoing. Water clarity dramatically increased after their introduction in 1992 with mean annual secchi disk readings deepening from 3-4 meters to >8 meters. Clearly, zebra mussels died in the mid to late 1990's, returning sequestered nutrients back to the lake and allowing plankton to bloom once

again with mean annual secchi disk readings decreasing to around 6 meters. The reasons for their deaths are unknown, but the research group suspects the first colonists were getting old, and their filter feeding was sequestering nutrients in their live biomass, thus decreasing nutrient availability for algal growth and consequently decreasing the algal food supply for zebra mussels. Since then, quagga mussels (same genus, different species) invaded Seneca Lake, and in a few years we're now hard pressed to find any live zebra mussels as they are effectively being replaced by quagga mussels. Apparently quaggas are better in this ecological niche than zebras. Since then, mean annual secchi disk depths have steadily decreased to around 4 meters. Can't quagga mussels keep up with the nutrient loading? Finally, the zebras/quagga are making the lake very transparent in the nearly isothermal early spring. Combine the transparent water with the transfer of nutrients from the open water to the nearshore by filtering feeding on algae, and nearshore recycling of zebra biomass and poop, most likely induces the observed thicker stand of macrophytes (rooted nearshore vegetation) like Eurasian milfoil and increased anxiety by lakeshore residents.

Students have also generated enough data to publish multiple presentations and a paper on the Seneca Lake chloride story. It has substantiated and recently modified Mike Wing's and Bill Ahnrsbrak's chloride groundwater source hypothesis. Detailed major ion concentration data, resulting tributary flux estimates to the lake, additional mass balance calculations and 1:1 molar ratios for chloride and sodium indicate that tributary fluxes of chloride, sodium and to a lesser extent sulfate are insufficient to balance the concentration of these ions in the lake and dictates an advective groundwater source from the evaporites below. Conversely tributary fluxes of calcium, magnesium and alkalinity exceed the predicted equilibrium concentrations found in the lake, and points to their removal by carbonate precipitation in whiting events and zebra/quagga mussel shells. Tributary fluxes of potassium are in equilibrium with the lake. Research since this publication determined that chloride concentrations have not remained static. In the early 1900's, chloride concentrations were much lower in Seneca Lake and on par with other Finger Lakes. Chloride concentrations peaked in the 1970's, and have steadily decreased ever since, especially after significant runoff events. It suggests that the groundwater advection of sodium and chloride "turned on" in the early 20th century only to "turn off" since the 1970's. Maybe salt mining is responsible for the excess salts in Seneca Lake after all? More research is required to confirm it.

Recent Publications

(* denotes undergraduate student)

Halfman, J.D., and K. O'Neill*, 2009. Water quality of the Finger Lakes, New York: 2005 – 2008. Finger Lakes Institute, Hobart and William Smith Colleges. 33 pg.

Halfman, J.D., and P. Basnet*, 2009. Bottom water phosphates and suspended sediments in southern Cayuga Lake, New York. Finger Lakes Institute, Hobart and William Smith Colleges. 21 pg.

Halfman, J.D., M.E. Balyszak and S.A. Meyer (eds.), 2008. A 2007 Water Quality Study of Owasco Lake, New York. Finger Lakes Institute, Hobart and William Smith Colleges.

Halfman, J.D., and C.K. Franklin*, 2008. Water Quality of Seneca Lake, New York: A 2007 Update. Finger Lakes Institute, Hobart and William Smith Colleges.

Halfman, J.D., C.M. Caiazza*, R.J. Stewart*, S.M. Opalka*, and C.K. Morgan*. 2006., Major ion hydrogeochemical budgets and elevated chloride concentrations in Seneca Lake, New York. *NE Geol. Env. Sci.*, 28: 324-333.

David Kendrick investigates the "endless forms most beautiful and most wonderful" that populate the history of life on our good Earth. He has used computer modeling to understand how simple geometrical rules control crinoid (A crinoid is an echinoderm, a group of marine animals that includes sea-stars and sea urchins, among others.) shapes and how those shapes can reflect different life habits. He has also examined how well the ways that paleontologists study the diversity of ancient life accurately reflect the real history. Most recently he is investigating the novel idea that an enigmatic, 85 million year old crinoid, collected from a tropical sea that formerly flooded much of the central U.S., could have harbored photosymbiotic algae. If true, this crinoid would have potentially functioned as much like a plant as an animal!

The breadth of opportunity for study abroad remains a unique and powerful aspect of an education at HWS. David and Associate Professor Nan Crystal Arens have twice co-directed the Queensland, Australia program, the last time in Fall 2008. The Queensland program is one of the few to focus on science. David and Nan taught a course on the geology of Australia and New Zealand to the 32 high-quality students on the trip. Field opportunities in Earth science are fundamental to understanding features, processes, and techniques across the discipline and this trip gives students first-hand exposure to active and extinct volcanoes, modern reef systems, glaciers, high, active mountains, and eroded, tectonically quiet deserts. Australia and New Zealand are natural labs for the students to compare and contrast the effects that tectonics and geography have on landscape and the development of unique geologic, biotic, and climatic histories.

The Australia trip is not only a teaching opportunity, as David is collaborating with a University of Queensland colleague, Ian Tibbetts, in researching the distribution of carbonate sediments and the meiofauna (the itty-bitty creatures that live in the spaces between the sediment grains) around Heron Island, a coral cay in the Great Barrier Reef. These sediments and the meiofauna within are critical nurseries for fish on the reef and very little is known about them. Reef health is an important indicator of the health of the oceans and we are keen to understand more about how the sediment controls the kinds of organisms present and how that affects fish recruitment on the reef. You wouldn't necessarily guess it, but the meiofauna can be captivating. David encountered a microscopic sea cucumber (yet another echinoderm) that may be new to science.

Closer to home, David's gearing up to teach his Geology of New York (GeoNY) course again this fall. GeoNY takes advantage of New York state's remarkable geological resources to teach students some of the fascinating billion-year history recorded here. Past classes have traveled to Niagara Falls, the Herkimer "diamond" mines, the Catskills, and the Adirondacks, among other places. Extensive writing practice and readings in the primary scientific literature give students a workout but provide them with tools they can use for the rest of their careers as students and maybe the rest of their lives. Looking at rocks along the Thruway will never be the same!

Dramatic advances in paleontology have outmoded many old aspects of paleontology class. David is developing some new approaches to guiding students toward understanding how to ask and answer sophisticated questions in this interdisciplinary field. Next spring, for example, students will

sample their own hair for stable isotopic analysis. “You are what you eat” the old trope says, and, indeed, it’s true. The ratio of ^{13}C to ^{12}C in tissues is a telltale for an organism’s diet. Isotopic techniques have been successfully used to investigate many things -- tracing mammoth seasonal migrations documenting evolutionary shifts from browsing in forests to grazing on grasses, for example.

Rounding out the summer and continuing teaching developments, David is also preparing two invited talks for “Teaching Paleontology in the 21st Century”, an On the Cutting Edge Workshop sponsored by Cornell University and the Paleontological Research Institute later this summer. He’ll be detailing two different teaching exercises, one on testing competition among a group of brachiopods and a second on using a sequential set of readings from the scientific literature on the famous Cretaceous/ Paleocene Bug Creek locality in Montana.

Recent Publications

Kendrick, D. C. 2008. Top Tier: Stephen Jay Gould and Mass Extinctions. *In*: W. Allmon, P. Kelley, and R. Ross, eds. *Stephen Jay Gould: Reflections on His View of Life*. Oxford.

Kendrick, D. C. 2007. Theoretical morphology of the crinoid cup. *Paleobiology*: 33(2):337-350.

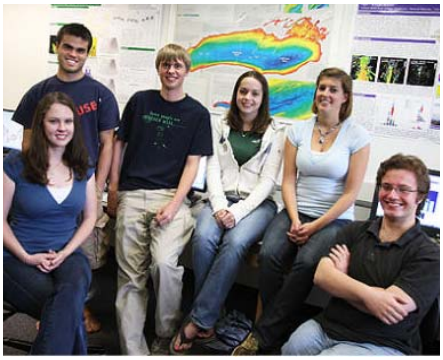
Neil Laird has worked on a number of projects over the past year. During the 2008 summer research program six students joined his research group to conduct meteorological research related to two National Science Foundation grants. Richard Mable (H ‘10) and Marikate Ellis (Cornell University) conducted a climatological study of thunderstorm interactions with the over-lake Lake Michigan boundary layer. Jamie Tucciarone (WS ‘09) and David Zelinsky (Purdue University) investigated the environmental conditions responsible for rapid changes in extensive Lake Erie ice cover during a 30-year period. Melissa Payer (Plymouth State University) and Richard Maliawco (Lyndon State University) performed a climatological study of fronts, troughs, and surface baroclinic zones in the Great Lakes region. Several of the summer research students have presented their summer research results at subsequent regional and national scientific conferences.

Three journal articles have recently been published in *Monthly Weather Review* and the *Journal of Applied Meteorology and Climatology* that present research completed with several students from the 2005 and 2006 summer research programs. These articles include:

Laird, N. F., R. Sobash, and N. Hodas, 2009: The frequency and characteristics of lake-effect precipitation events associated with the New York State Finger Lakes. J. Appl. Meteor. Climatol.

Laird, N. F., J. Desrochers, and M. Payer, 2009: Climatology of lake-effect precipitation events over Lake Champlain. *J. Appl. Meteor. Climatol.*

Cordeira, J. M. and N. F. Laird, 2008: The influence of ice cover on two lake-effect snow events over Lake Erie. *Mon. Wea. Rev*



Students which collaborated with Neil Laird during the summer 2008 research program. (left to right) Marikate Ellis, Richard Mable, David Zelinski, Melissa Payer, Jamie Tucciarone, and Richard Maliawco.

Neil is continuing to investigate lake-effect precipitation associated with both large and small lakes. The work on small lakes is examining lakes in both the northeastern (Lake Champlain and NYS Finger Lakes) and western (Great Salt Lake and Lake Tahoe) United States. This work has lead to a collaborative effort with faculty and graduate students at the University of Utah. Neil and his research students are beginning to compare the conditions favorable for lake-effect events over small lakes with those which support lake-effect snow storms over the Great Lakes. Early results show that the small lake events occur over a much smaller range of environmental conditions, thereby suggesting they are more sensitive to small changes in regional climate conditions and may be an indicator of the impact of regional climate change on local precipitation.

Over the last year, Neil has developed two new atmospheric science courses within the Geoscience Department, Severe Weather (GEO 150) and Applied Climatology (GEO 360). **Severe Weather** introduces many of the fundamental physical processes responsible for the characteristics and development of weather systems. Students learn about the structure of the atmosphere, the jetstream, large-scale pressure systems, as well as an array of severe weather phenomena including hurricanes, tornadoes, lake-effect snow storms, blizzards, thunderstorms, lightning, and ice storms. **Applied Climatology** examines the physical characteristics, processes and controlling mechanisms of Earth’s climate system and the patterns of its change across both space and time. Fundamentals of Earth’s atmospheric composition, heat budget, motion and water are covered with a focus on global climate and regional climate variability. Students develop and strengthen analytical skills through building or enhancing a foundation in statistics; analysis of observational climate data; and through a series of research projects which builds these skills.

Brooks McKinney took a leave from the department in 1996 to become Associate Dean of Academic Affairs, but overseeing the implementation of the new major/minor-disciplinary/interdisciplinary curriculum and helping to shift the colleges to semesters pretty well satisfied his need to administrate. He came back to the department in 2001, but not before getting a new aortic valve--now his third (if you wonder about the high cost of health care, it's him). He spent the falls of 2005 and 2006 in Australia and New Zealand with the College's Queensland program, an experience that he found extremely rewarding--if for no other reason than he learned to play the digeridoo. Since then he has been teaching his courses and dabbling in various geologic pursuits--he maintains an interest in igneous crystallization processes and has built a computer controlled heating stage for looking at crystal growth in low-melting point organic materials. He has been working on adapting CAD techniques to structural geology problems, and sits on the Zoning Board of Appeals for the Town of Phelps, as well as heavily involved in helping the town develop new regulations to control sand and gravel mining. Brooks and his wife Pat still live in the 1841 cobblestone house in Phelps with miscellaneous pets. The current family dog is a 100-lb American Random Bred named Freddy, who regularly comes to work with Brooks and holds down the carpet while he teaches.

Jeffrey Frame joined the HWS faculty in January 2009 as a visiting assistant professor

after earning his Ph.D. in Meteorology from Penn State University in December 2008. Jeff has also received an M.S. in Meteorology from Penn State and a B.S. in Atmospheric, Oceanic, and Space Sciences from the University of Michigan. Jeff's primary research interest is severe convective storms. His dissertation research focuses on the simulation of supercell thunderstorms with both shortwave and longwave radiation. He presented this research at two recent conferences: The American Meteorological Society's Severe Local Storms Conference last fall and the Northeastern Storms Conference in March. For his M.S. research, Jeff modeled lines of thunderstorms traversing Appalachian ridges. Jeff's research has not been limited to only modeling studies, however. He recently published a paper in Monthly Weather Review documenting mobile Doppler and polarimetric radar observations of a supercell thunderstorm. Jeff also participated in the Radar Observations of Tornadoes and Thunderstorms Experiment (ROTATE) in 2004 and 2005, which is an annual field project dedicated to obtaining high-resolution mobile Doppler radar observations of tornadoes. Jeff also studied thunderstorm initiation during the International H2O Project (IHOP) in 2002. In the coming months, Jeff plans to continue his field research as a participant in the Verifications of the Origins of Rotation in Tornadoes Experiment 2 (VORTEX2), as well as to expand his investigation of thunderstorms crossing the Appalachian Mountains.

Jeff's teaching interests also lie in meteorology. He is currently teaching Severe Weather this semester and will continue to teach this course in the future. Additionally, he will collaborate with Neil to redesign Weather & Climate this fall, and will offer Meteorology in the future. Jeff received a teaching award at Penn State last year and is excited to be a part of a department that emphasizes great teaching. He looks forward to sharing his love of the weather with his students!

2008-09 Conference & Invited Presentations

Nan Arens –

Arens, N.C., A.H. Jahren and D.C. Kendrick. 2009. Carbon isotope stratigraphy and sedimentology of the Hell Creek Formation in eastern Montana: Correlation, climate and events. Abstracts of the 9th North American Paleontological Convention, 21-26 June 2009, Cincinnati, Ohio, p. 138.

Thompson, A., N.C. Arens and A.H. Jahren. 2009. Vegetation indicators of environmental stress precede the Cretaceous/Tertiary boundary. Abstracts of the 9th North American Paleontological Convention, 21-26 June 2009, Cincinnati, Ohio, p. 151.

Tara Curtin –

Folga, L.A.*, Curtin, T.M., Rayburn, J.A., and Willard, D.A., 2009. An initial investigation of rebound-driven lake level change in Seneca Lake, NY. Geological Society of America Abstracts with Programs, Vol. 41, No. 3, p. 25.

Curtin, T.M., Crocker, M.L.* and Loddengaard, K.* 2008. Middle Holocene unconformity in Seneca Lake, NY. Eos Trans. AGU, Fall Meeting Suppl. 89.

Climate Clues Trapped in Ice: Teaching Climate Change to Introductory Level Students Using Ice Core Data. *On the Cutting Edge: Teaching Climate Change. The Pennsylvania State University. State College, PA*.

Evidence for Middle Holocene environmental change in two New York Finger Lakes. *Geological Sciences and Environmental Studies Friday Seminar Series, Binghamton University, Invited.*

The (De)glacial History of Central-Western New York and its Impact on Landform and Landscape Development. *Horticulture Department Seminar Series, Cornell University Agricultural Station, Geneva, NY, Invited.*

Geology of Wine in the Finger Lakes, NY. *Department of Horticultural Sciences, Cornell University, Ithaca, NY, Invited.*

John Halfman –

Seneca Lake, an ideal natural laboratory for research, education and outreach. Geological Society of America Northeast Regional Annual Meeting.

Comparative Limnology of the eastern Finger Lakes: 2005 – 2008. 4th Annual Finger Lakes Research Conference. Finger Lakes Institute, Hobart and William Smith Colleges, Geneva, NY.

Sources for Bottom Water Phosphates and Suspended Sediments in Southern Cayuga Lake, New York. 4th Annual Finger Lakes Research Conference Finger Lakes Institute, Hobart and William Smith Colleges, Geneva, NY.

David Kendrick –

Paleontologic Exercise: Testing Competition Among Paleozoic Brachiopods. *On the Cutting Edge: Teaching Paleontology in the 21st Century Workshop.*

Paleontologic Exercise: Sequentia; Reading/Writing Assignment. *On the Cutting Edge: Teaching Paleontology in the 21st Century Workshop.*

Did *Uintacrinus* Have Photosymbionts? *9th North American Paleontological Convention. Cincinnati, OH.*

Neil Laird –

Laird, N. F., 2009: Lake-Effect Conditions associated with Small Lakes in the Northeastern United States. *34th Northeastern Storm Conference, Springfield, MA*

Laird, N. F., M. Payer, R. Maliawco, and E. Hoffman, 2008: Climatology of Fronts and Troughs in the Great Lakes Region. *3rd SUNY Oswego Lake-Effect Conference, Oswego, NY*

Laird, N. F., 2008: Incorporating undergraduate students into atmospheric research: Practice at a small liberal arts college. *Illinois State Water Survey Seminar Series, Invited.*

Laird, N. F., G. Renninger., and C. Zarzycki, and S. Bridgeman, 2008: Rapid variations in Lake Erie ice cover: Event Characteristics and Weather Conditions. 33rd Annual Northeastern Storm Conf.

Laird, N. F., 2008: Lake-effect snows associated with small and large lakes. Geneva Chapter of Sigma Xi and Finger Lakes Institute, Invited.

Jeffrey Frame –

Non-Galilean Invariant Response to Anvil Shading in Simulated Supercell Thunderstorms. *34th Northeastern Storm Conference, Springfield, MA*

Student News

The Donald L. Woodrow Prize in Geoscience

The Donald L. Woodrow Prize in Geoscience was established by students, alums, colleagues, and friends upon Prof. Woodrow's retirement from the Colleges in 2001. The annual award recognizes a graduating major from each college whose academic career, research, and contributions to the community embody the values of scholarship and magnanimous humanity that were the hallmark of Professor Donald Woodrow's time at Hobart and William Smith Colleges. We are pleased to announce the following recipients:

2009 **Sarah Allen**

2007 **Karen Thorp & Jared Desrochers**

2006 **Clare Morgan, Suzanne Opalka, & Ian West**

2005 **Caitlin Rogers**

2004 **Andrew Baker & Elizabeth Reed**

2002 **Sandra Baldwin**

2001 **Derith H. Hart, Micah J. Nicolo, & Timothy C. Riley**

New HWS Geology Club - Hot Spot

Initiated in 2007 by **Evan Brown (H '08)**, **Sarah Allen ('09)**, and **Andrea Rocchio (WS '10)**, the club aims to provide HWS students with many opportunities to explore geology, interact with Geoscience students and form strong relationships with the Geoscience faculty outside of the classroom. The club meets bi-monthly in the Geoscience seminar room, and routinely plans trips to local areas of geologic interest, including Watkins Glen State Park, Letchworth State Park, Niagara Falls, Chimney Bluffs State Park, Howe Caverns, and the Herkimer Diamond Mine. Hot Spot not only goes on exciting adventures outdoors, but also encourages student and professor participation by hosting dinners, the most recent one at Profs. Arens and Kendrick's home, and sponsoring campus movie nights. The current faculty advisor is Prof. Arens.

Club Officers

2007-08 **Evan Brown (President); Andrea Rocchio (Vice President); Sarah Allen (Treasurer); Rachael Dye (Secretary)**

2008-09 **April Abbot and Rachael Dye (Co-Presidents); Sarah Allen (Treasurer); Andrea Rocchio and Samantha Lesser (Co-Secretaries)**

2009-10 **Samantha Lesser (President & Treasurer) and Andrea Rocchio (Vice President & Secretary)**

Geoscience Teaching Fellows

The Teaching Fellows program was designed to create a learning environment different than one-on-one tutoring, to disprove the notion that learning is solely the responsibility of the individual. The idea is to create a culture and community of engaged, active learning. Along with Geoscience, Chemistry, Philosophy, Physics, and Spanish & Hispanic Studies, the Teaching Fellow Program recently had three more departments join.

The interaction between Teaching Fellows, students, and faculty has helped create a supportive, inclusive educational environment here on campus and has made the first floor of Lansing Hall the place to be during the evening "office hours" of the Geoscience Teaching Fellows. This spring Geoscience finished its second year with the Teaching Fellow program and the added energy the Teaching Fellows bring to the introductory Geoscience courses has been great.

The Geoscience Teaching Fellows for this year were ***Sarah Allen (WS '09), Peter Mohlin (H '09), Kaitlyn Van Nostrand (WS '09), Elisha Harris (WS '10),*** *and* ***Tyler Blum (H '10).***

2008-09 Honors & Independent Studies

Katherine Premo & Kaitlyn Van Nostrand conducted an independent study with John Halfman to examine the hydrological and hydrogeochemical response of streams to snow-melt and spring precipitation events in the northern Seneca Lake watershed.

Sarah Allen completed an honors project with Nan Arens. They documented and described a small flora from about 2 million years before the end of the Cretaceous Period and the extinction of dinosaurs in the Hell Creek Formation, Garfield Count, MT. They identified 21 species including several new to science. They also reconstructed the climate and depositional environment associated with the flora.

Michael Bloom conducted an independent study project with Nan Arens to unite three ways of telling time in the Middle and Late Devonian Appalachian Basin: land plant spores, conodonts and chemostratigraphy. Land plant spores and conodonts have never been found in the same section in North America. Chemostratigraphy has been applied in a limited way in the European basins but not in North America. They are examining rocks in Watkins Glen State Park, NY.

Jessica Popp conducted an independent study with Neil Laird to examine the frequency and characteristics of lake-effect snow storms during a multi-year period over the Great Salt Lake, Utah using WSR-88D radar data and meteorological surface observations.

Brooks McKinney worked with a group of six students on their independent study that focused on gaining experience with Computer-Aided-Design (CAD). The students who worked with Brooks are ***Katherine Premo (WS '10), Max Papperman (H '10), Alix Coursen (WS '10), Emma Cochran (WS '10), Peter Mohlin (H '10), and Mike Bloom (H '10).***

Summer 2008 Internships

April Abbott spent last summer interning in the mercury lab at Woods Hole Oceanographic Institution (WHOI) in Cape Cod, MA, where she worked along with 30 other undergraduate students and WHOI scientists on compiling and analyzing mercury data that they had gathered from the field. April presented her research at the American Geophysical Union (AGU) meeting in San Francisco.

Katherine Premo completed an internship with the environmental group at Labella Associates in Rochester. NY. There, she learned how a major in geoscience could be applied to the real world through remediation projects, environmental site assessments and work using GIS.

Sea Semester

Katherine Hoering spent the spring 2009 semester participating in the SEA Education Association program in Woods Hole, MA. The SEA semester is a 12-week program that includes a 6-week onshore component in Woods Hole and a 6-week sailing component on a 135-ft brigantine in either the Atlantic or Pacific Oceans. In Woods Hole, she studied Oceanography, Nautical Science, and Maritime Studies to prepare for her adventure at sea. Her group sailed form Key West, FL to Woods Hole, MA, with port stops in Bermuda and Nova Scotia. For her research project, she studied the temporal and spatial distribution of 18° water, a unique water mass formed north of Bermuda in the late winter.

Sea Semester sailing ship

2008-09 Conference Presentations

Kerry O'Neill – The Finger Lakes of New York: An Ideal Natural Laboratory for Research, Education and Outreach. Geological Society of America Northeast Regional Annual Meeting.

Kerry O'Neill – Water Quality of Eight Finger Lakes, New York: Changes from 2005 Through 2008. American Geophysical Union Annual Fall Meeting.

Katherine Hoering – Water Quality Analysis of Otisco Lake, New York. American Geophysical Union Annual Fall Meeting.

Prabi Basnet – Comparison of Methods to Determine Algal Concentrations in Freshwater Lakes. American Geophysical Union Annual Fall Meeting.

Samuel Georgian – Sources for Bottom Water Phosphates and Suspended Sediments in Southern Cayuga Lake, New York. American Geophysical Union Annual Fall Meeting.

April Abbott – Inferring Regional and Local Sources of Mercury to the Sediments of Seneca Lake, New York. Geological Society of America Northeast Regional Annual Meeting.

Sarah Allen – A Florule From the Base of the Hell Creek Formation in the Type Area of eastern Montana: Implications for Diversity, Climate and Environment. Abstracts of the 9th North American Paleontological Convention.

Elisha Harris – A mid-Cretaceous Angiosperm-Dominated Macroflora from the Cedar Mountain Formation of Utah: Implications for Diversity and Climate. Abstracts of the 9th North American Paleontological Convention.

Alumni/ae News

April Abbott '09 will be starting her graduate work at the Large Lakes Observatory at the University of Minnesota in Duluth under the direction of Dr. Tom Johnson this fall. She is following in the footsteps of John Halfman, who completed his Ph.D. under Tom's direction, and Barb Halfman, who completed her M.S. with Tom. April's Master's research will focus on the paleoclimate interpretation of Lake Malawi sediment cores.

Steve Anthony '83 has worked for the U.S. Geological Survey (USGS) in Honolulu since 1999, and currently serves as associate director of the Pacific Islands Water Science Center. He received a B.S. in geoscience from Hobart College and his research interests are currently focused on understanding the relationship between water quality and land-use in tropical island settings.

Front cover image from report on Water Quality on the Island of Oahu, Hawaii, 1999–2001 led by Steve Anthony. Image shows Island of Oahu as seen by Landsat satellite (cloud-free mosaic by the Pacific Disaster Center).

Water resources are of significant economic importance to Oahu, since they provide all municipal and domestic water for its increasingly expanding population. Streams, in particular, provide habitats for threatened species and affect the aesthetics of estuaries and bays, which are critical to Hawai'i's tourism-based economy. Anthony's research results allow administrators to implement effective aquatic management through evaluation of long-term changes in water quality.

"HWS provided me with a solid academic background that included field and laboratory research. I owe a tremendous amount to Professors Don Woodrow (geosciences) and Ken Carle (chemistry) for helping me to discover my career interests and encouraging me to take risks." After HWS, Anthony received a M.S. in geology and geophysics from the University of Hawai'i at Manoa.

"USGS is a wonderful place to work. Over the years, I have noticed that when new employees are hired, they often begin their careers saying 'I need this' or 'I believe.' Somewhere along the lines, that same person begins to say 'we need this,' 'we want,' 'we believe.' This is when they become part of the team, when a feeling of '*esprit de corps*' develops, when everyone becomes equally important and equally appreciated."

Anthony has authored more than 15 scientific papers on ground-water hydrology and water quality.

Robert Aspinwall '06 worked as a deckhand onboard a 92' wooden fishing schooner, the *American Eagle*, in Penobscot Bay, ME and then transferred to the 126' schooner *Virginia*, the Commonwealth's official tall ship in 2006-07. They cruised the Chesapeake Bay serving as the state's goodwill ambassador. Rob and Gil Carr (H '06) then hiked the entire Appalachian Trail in 6 months and 3 days. Rob then worked in the Caribbean aboard his high school's schooner, the SSV *Tabor Boy*, where they helped evaluate coral reef health by documenting various Elkhorn coral colonies with the U.S. Geological Survey. After obtaining his 100-ton captain's license, Rob joined 198' square-rigged flagship *Niagara*. The Niagara is a reproduction of the vessel that helped to win the Battle of Lake Erie during the War of 1813. Last year they sailed in all five Great Lakes. This summer, he will help teach a geology class to local high school students. Rob is thinking about pursuing a Masters degree in education or environmental science.

Clare Morgan '06 dabbled in an assortment of professions after graduating from HWS. She participated in graduate studies in Soil Science at the University of Vermont for two months before deciding she should change paths. From Vermont, she traveled to Albany, NY where she drew blood for the American Red Cross. While that job was exciting, she kept finding herself talking to donors about sedimentary rocks, stratigraphic columns, and meandering stream, and knew it was time to complete a Masters degree in Secondary Education with a focus on Earth Science. She completed her degree in May 2009 at HWS, and will be teaching earth science this fall at James A. Beneway High School in Ontario Center, NY. The Knowles Science Teaching Fellowship - an amazing organization of thoughtful, compassionate,

motivated science and math teachers- will support her.

Elizabeth Reed '03 realized she wanted to become a teacher after graduating from HWS. Her love of science and the outdoors led her to join the graduate program at the Teton Science School in Kelly, WY, where she studied environmental and place-placed education. After her program, she returned to Boston to teach first grade while completing her M.Ed. in Environmental Education. She recently returned to her home state of Maine where she continues to teach science and environmental education to middle school students. Studying Geoscience at HWS not only allowed her excitement toward science to flourish, it also provided her wonderful teaching role models whom she thinks of often in her career.

Katherine Premo '09 was admitted into the Environmental Science graduate program at the Rochester Institute of Technology this fall. For the next few years, Katie will work in a research group that investigates the biogeochemistry of an estuary in Cape Cod that is undergoing nutrient enrichment due to sewage contamination.

David B. Stephens '82 recently joined The Meadowbrook School, a pre-K-through-6 day school in suburban Philadelphia, as headmaster.

Stephens earned his bachelor's degree in geoscience from Hobart and a master's in geology and geophysics from Syracuse University. He eventually became headmaster of Rivermont Collegiate School in Iowa, a preschool-through-12 day school, and, recently, The Knox School, a 6-12 boarding school in upstate New York.

At Hobart, Stephens was a member of Phi Sigma Kappa fraternity and played hockey and soccer.

Karen Thorp '08 has taken the time to explore different opportunities after graduation: an internship at the Mount Washington Observatory, an environmental educator at Midcoast Maine, and a research scientist at HWS. All of these experiences have been varied and given her more perspective on her plans for the future. She is happy to report that she will be heading to graduate school in the fall (2009) to complete a Master's at the University of Southern Maine.

Douglas Wood '05 has worked with the National Oceanographic and Atmospheric Administration since graduation. For his work on the research ship, the *Thomas Jefferson*, he was awarded the bronze star, the highest award given by the U.S. Department of Commerce. In Sept. 2005, after Hurricanes Rita and Katrina hit the Gulf Coast, the *Thomas Jefferson* was called to the area to survey commerce channel and ensure that they were unobstructed and passable for trade ships. Wood and fellow crew members spent more than two months in the Gulf surveying. He has most recently has been surveying the Chesapeake Bay aboard the NOAA ship *Rude*. He has also spent time aboard the ship *Kilo Moana*, surveying the Gulf of Alaska to possibly increase territorial water. Doug spoke about his work with NOAA at the Finger Lakes Institute in November 2006.