Otterbein in 2010- What a Difference a Year Makes

While it is oft noted that change is the only true constant, this past year for Otterbein, and the Department of Life and Earth Sciences has been one of remarkable transition. With our new president, Kathy Krendl, at the helm, Otterbein has divided into 3 schools (Arts and Sciences, Professional Studies, Graduate School) and the Board of Trustees voted at its February meeting to officially change the school's name to Otterbein University to reflect our reorganization and the growing importance of graduate education at Otterbein. In the Department, we are reformulating our curriculum as we prepare to switch from the quarter system to semesters in the Fall of 2011, and after 12 years serving as a most efficient and benevolent Department Chair, Michael Hoggarth has stepped down, and I am doing my best to take his place. But the biggest news for the Department, is that we are finally settled into our new science facility. While we were relatively comfortable in the temporary, modified warehouse on Collegeview Ave, the new building, with its wrap-around glass hallway and towering indoor atrium is a truly beautiful space.

What I like best about the building, though, is that our offices, research labs, and teaching labs are all right next to each other so that we can truly integrate quality research experiences into our courses. Other highlights include state-of-the-art down-drafting tables for dissections, new automated greenhouses, a centralized instrumentation room for molecular and cell biology, and finally, I can put all the fossils and rocks away in a neat and ordered way with the bank of new geological storage cabinets. Our deepest thanks go out to all of our Alumni and friends who donated graciously to make this building possible. If you haven’t yet had a chance, stop by and see it some time. It will be a treasure for generations of students to come.

Dr. Halard Lescinsky, Professor and Chairperson

Dr. Lawrance Investigates Gene Copy Number Variations & Disease

A new and exciting form of genetic variation, called copy number variation, has recently been discovered. Copy number variation is when different individuals vary with respect to the number of copies of a particular gene that they carry. These CNVs have been shown in several instances to influence susceptibility to diseases. In collaboration with Dr. Chack-Yang Yu in the Center for Human and Molecular Genetics at Nationwide Children’s Hospital and Honors students Thad Kandel and Meredith Lum, Dr. Lawrance is investigating the relationship of CNVs within the major histocompatibility complex and system lupus erythematosus.

The work involves extracting DNA from patients and controls and measuring the size and complexity of the MHC by gel electrophoresis and Southern blotting. It is hoped that the research will provide new insights into disease mechanisms and therapies for autoimmune diseases such as lupus.
Dr. Hoggarth and His Students Work on Research Projects for The Ohio Department of Natural Resources and The Ohio Historical Society

Have you ever wondered what the habitat conditions were for a Pleistocene stag moose (*Cervalces scotti*)? Well, Dr. Hoggarth’s Field Biology class got to investigate its habitat fall term. A man working a backhoe in Medina County located the bones of an extinct stag moose 16 feet underground. When curators for the Ohio Historical Society excavated the remainder of the moose, they found the bones (34 total bones) embedded in a muddy layer of shells. They collected some of this substrate, extracted the shells, and asked if we would identify the shells and whether they could tell us something about the habitat of the moose. The class spent a lab period identifying shells and counting the individuals. This moose lived (or perhaps died) in a shallow lake. The class is presenting a poster of its work at the Ohio Academy of Science meeting this April.

Other projects in the works for Dr. Hoggarth and his students include a study of mussel refugia in Lake Erie (in conjunction with personnel from F.T. Stone Laboratory) and a reexamination of the fish, mollusks, and crayfish found in the Ravenna Arsenal. The first project is a two year study of the native mussel fauna of the lake, which has returned despite the presence of zebra and quagga mussels (non-native species introduced into the lakes in the 1980s). The second project is a return to the Ravenna Arsenal (the place Scott Russell Sanders, one of our common book authors, described in *The Paradise of Bombs*) ten years after our initial study of the region. The arsenal stores unexploded ordinance in igloos and boxcars and so doesn’t get a lot of visitors. Habitats in the arsenal are as near untouched as anywhere in Ohio and the diversity of fish, etc. is very good. Dan Rice, former Chief Zoologist with the Ohio Department of Natural Resources, Division of Natural Areas and Preserves will assist again this year with fish identification.

New Role on Campus for Cell Biologist Amy Jessen-Marshall

Associate Professor Amy Jessen-Marshall has taken on a new challenge at Otterbein. As of July 1st, Dr. Jessen-Marshall became the Associate Vice President for Academic Affairs and Dean of College Programs. She now has responsibility for helping set direction and providing support for all the campus Interdisciplinary programs including Environmental Studies, Women’s Studies, Black Studies, Integrative Studies, Senior Year Experience and the Honor’s Program. Growing out of her leadership with the Integrative Studies program, Dr. Jessen-Marshall hopes her experiences with integrative learning and her dedication to the liberal arts focus of Otterbein will allow her to raise the profile of interdisciplinary programs at Otterbein both in our own campus community and nationally as well.

While she leaves the classroom (for now) with much sadness that she won’t get to work directly with students to the same degree as she has before, she hopes her new position will allow her to make an institutional impact that will strengthen opportunities for students in a much broader way than her one-on-one attention in the classroom and in the laboratory allowed her to do on behalf of student learning. She still works closely with Dr. Svitana as chair of Environmental Studies, and has been working with faculty in Chemistry and Biochemistry and Life and Earth Sciences to help develop an integrated Biochemistry Molecular Biology major.

Dr. Jessen-Marshall has also been busy advocating on behalf of the Five Cardinal Experiences, the focus of experiential learning at Otterbein through research and scholarly activities, community engagement, global engagement, internships and professional development, and leadership opportunities. She is co-directing the fledging First-Year Experience program with Kate Lehman in Student Affairs and she’s working on developing an e-portfolio program for Otterbein students that will begin with semester conversion in 2011.
Dr. Svitana's IS Class Explores the Connection Between Superfund and Global Warming

Dr. Kevin Svitana has developed an Integrative Studies class which helps students understand complex environmental problems of the past (Superfund sites) and relate them to pending global warming issues. He is the co-author for the online resource Science in the Courtroom: The Woburn Toxic Trial which documents the "behind-the-scenes" activities of the movie A Civil Action, and serves as an educational resource for understanding the social, scientific, and civic aspects of the hazardous waste legacy associated with the Superfund. The Woburn website can be viewed at http://serc.carleton.edu/woburn/index.html.

The materials for this class trace the industrial revolution into the modern technological era, looking at hazardous waste generation and fossil fuel utilization as unintended consequences of modern technology. Students research the link between the explosion in manufacturing of synthetic chemicals in the early 1900s and fossil fuel use, and then relate current hazardous waste regulations to potential models to mitigate global warming.

First, students view A Civil Action so they relate human issues (childhood leukemia) to the effects of hazardous waste. Svitana adds, "We refer to this theme for the remainder of the quarter. The Woburn web site provides resources which help students explore, understand, and assess the multiple aspects of the Woburn situation." The resource information facilitates students' understanding of the impacts of the hazardous wastes from the perspective of the leukemia victims' families, Woburn's city government and the defendant corporations.

Subsequent modules explore the creation and enactment of hazardous waste, or Superfund regulations. Students are provided with readings that show the successes and failures of the Superfund program from which they develop position papers regarding the effectiveness of Superfund to identify and remediate hazardous waste sites. The last module explores the scientific and social issues related to global warming. Using Woburn and Superfund as their model, students explore and develop strategies and policies which assess the need and method for mitigating sources and effects of global warming.

Science Outreach is Rockin’ and Rollin’ into a new decade, with a Fossil Outreach. Lab Coordinator Tara Grove and Science Education Specialist Andrea Graytock received a mini grant from the Otterbein Center for Community Engagement to help fund the Outreach program which brings Otterbein science students into area elementary schools to teach hands-on science. This year the outreach team will visit two surrounding elementary schools during winter quarter, (St. James the Less, a private Catholic School in Columbus, and Lindbergh Elementary, a Columbus Public School).

St. James has been involved with the Outreach Science program since 2006, and according to Joanne Mobley, a staff member at St. James, the Otterbein Outreach Science Program has “helped expand their Science department” as well as “has helped their students, second thru sixth grade, experience science and enjoy it!” Lindbergh Elementary is new to partner with the Outreach Program and also hopes to supplement and enhance its science curriculum.

The elementary students from both schools will learn to investigate an unknown environment by asking questions such as “what can be learned from a rock, from the animals in the area, and from the plant life in the area?” The elementary students will engage in several hands on activities that will give them a better understanding of fossils and how they can relate them to things, both living and non-living that may be found in the unknown environment.

During the outreach course, the elementary students will get to explore the world of arthropods through a sowbug experiment. They will look at different possible habitats, based on temperature, moisture content and soil type. They will also get to make their very own geological acetate peels, to reveal fossil impressions from coal balls, and they will, of course, learn through play, with a great fossil game to help tie all of the information together. This outreach event is sure to leave the elementary children mining through rocks looking for fossils!
Dr. Hoggarth Establishes the Department of Life and Earth Sciences Faculty Research and Scholarship Endowed Fund

By: Dr. Michael Hoggarth

Anyone who has followed the life of our department knows the level of commitment and success our faculty have had in the area of research and scholarship. Since most of the people reading this newsletter are alumni, you are aware firsthand of the excitement each of us has with discovery and the strong mentoring we provide in all avenues of scholarly activity. The intent of the Department of Life and Earth Sciences Faculty Research and Scholarship Endowed Fund is to help support faculty to do work in their areas of expertise, which, in turn, supports students who eventually leave Otterbein with profound insight into science and the scientist. Over the next several years the intended fund amount will reach $100,000.00. I invite anyone who shares my desire to strengthen this aspect of the life of the department to contribute to this fund. However, there are other needs in the department and it occurs to me that one or more of you may want to do something different but just as important. Two other needs that come to mind are a fund to support student travel (to conferences, to field stations where they are performing their senior research projects, or abroad as Otterbein attempts to strengthen this aspect of our global mission) and another to support equipment repair and reinvestment. We have the ability to acquire new equipment (through grants and college funding), but once here and integrated into the curriculum, repair and replacement are harder to accomplish. I am happy to talk with anyone about these three opportunities for support of the department. I’m sure our new chair, Dr. Halard Lescinsky, would love to talk with you about these too. My direct line is (614) 823-1667 (mhoggarth@otterbein.edu). Hal’s is (614) 823-1565 (hlescinsky@otterbein.edu).

Miesel and Willyerd Complete Doctorate Degrees

The Department wants to congratulate two alums, Jessica Miesel (OC ’01) and Katelyn (Tilley) Willyerd (OC ’05), on recently completing Ph.D.s from the Ohio State University in forest ecology and from Pennsylvania State University in plant pathology, respectively.

Jessica’s dissertation (“Restoring Mixed-Conifer Forests with Fire and Mechanical Thinning: Effects on Soil Properties and Mature Conifer Foliage”) examined the effects of prescribed fire and mechanical thinning on the physical, chemical, and microbial characteristics of forest soil and on nutrient status of mature conifers. Currently, Jessica is a post-doctoral research associate with the Department of Agronomy, University of Wisconsin (UW)-Madison, where she is studying the sustainability of using switchgrass as a biomass energy source. Her long-term interests are “to increase our understanding of how ecosystems function, how they are affected by land management practices, and how we can design our human communities to support, rather than disrupt, natural systems and cycles.” She is designing a course for UW that will explore the existing and potential intersections of ecology and environmental justice. One of her personal goals for the course is “to encourage an awareness of the ‘big picture’ in ecologists at the beginning of our careers -- this ‘big picture’ includes considering the social dimensions of our research, teaching, and service as ecologists.” Despite the narrow focus required of a PhD, Jessica still appreciates her broad-based preparation at Otterbein. She states “the more focused I become in my own career, the more I appreciate the interdisciplinary focus Otterbein emphasizes; and it is a perspective I hope to carry with me throughout my career. I loved my time at Otterbein.” (continued)
Katelyn’s research (“Fusarium Head Blight Disease Development and Mycotoxin Accumulation in Wheat”) examined one of the most devastating plant diseases in the world: Fusarium head blight. Severe epidemics of this disease result in reduced yields and the production of mycotoxins that contaminate the grain and sicken humans and livestock if consumed. The goals of Katelyn’s research were to understand how the environment affects the development and intensity of disease and toxin production and to determine how the fungus and the toxin moved throughout wheat heads based on gas chromatography. Currently, Katelyn is a post-doctoral research associate at the Ohio Agricultural Research and Development Center where she continues to study the epidemiology of wheat diseases and mycotoxin development in wheat and corn. Her long-term goals are to continue to work on mycotoxins. She states: “While they are an annoyance and economic threat in the US, people lose their lives to mycotoxin-poisoning in East Africa every year. There are many unanswered questions.” Like Jessica, Katelyn says she loved her time at Otterbein. “The small class sizes, hands-on lab sessions and broad curriculum at Otterbein were my secret weapon! I feel that I was very well prepared for grad school. In 2001, I entered Otterbein as an ‘undecided’ student. In 2009, I have a terminal degree in a biological science and couldn’t be happier!”

Newton’s Apple

Did the apple actually fall on Newton’s head? That’s the story that tourist guides like to tell, and they also don’t mind giving the impression that the tree planted outside Newton’s old rooms in Trinity College, Cambridge is the actual tree from which the pomaceous fruit fell. It doesn’t take much scientific thinking for the observer to notice that the Trinity tree has not the predicted dimensions of any type of tree that bore fruit in Isaac Newton’s lifetime (1643-1727) and of course the Cambridge guides have to come clean and admit that the actual tree was not at Trinity at all, but at his mother’s house Woolsthorpe Manor in Lincolnshire, where Newton had taken refuge from the plague. Search of the non-academic literature reveals that any specimen of Malus domestica becomes a source of pride and a tourist destination if it reaches anything approaching 200 years of age. The original tree therefore has outlier status, since it has survived more than 300 years despite being blown over by a storm in 1820… that is if it did in fact survive, since reports in the second quarter of the eighteenth century indicate that it did not. Scions of the original tree, or of descendents of scions of the original tree inspire considerable reverence and have been presented as gifts around the academic world, even though genetic testing (even trees have “fingerprints”) has shown that there are at least two sources of “original tree”. Nevertheless the Flower of Kent variety is still sought after and, despite producing coarse sour apples of the “cooking” variety, it can still be obtained from garden centers in Kent.

Cooking apples are large, and undoubtedly the force with which an apple of such mass, accelerating down from a tree of any height, would have attracted attention on impact. However, that popular story is probably another myth of the tourist kind. Historical letters and other documents indicate that in 1665/1666 it was merely the fall of an orchard apple to the ground that caused Newton to cogitate on gravitation, and to realize that this force was not limited to objects falling to the earth but existed among all objects in the universe, even holding celestial bodies in orbit.

In August 2009 Dr. Mary Gahbauer saw the tree that was not the one from which the apple did not fall on Newton’s head at the time when he did not “invent the theory of gravitation” (he described mathematically the universal nature of gravitation). She was in Cambridge to present a study on whether electronic discussion (blogging) can be a useful means of learning about science (it can). Newton famously wrote that if he had seen farther it was by standing on the shoulders of giants. How much farther could he have seen in cyberspace?
Turtles Find a New Home

The opening of our new science building came with a new home for our turtles. They are now settled into the reptile room, which was designed specifically with their needs in mind (top right). Not only does the room allow for the proper light and temperature conditions, but it also provides facilities that make their care and maintenance more efficient. Additionally, we are now able to keep an eye on these critters incognito with our new “turtle cam.” Each of our 1000 liter tanks is equipped with a surveillance camera wired to display monitors in the adjacent laboratory space. This allows us to make experimental observations without disturbing the animals. Lisa Braden and Zack Clouse took advantage of this set up this summer to continue our research into the effects of diet on turtle basking behavior. After logging MANY hours in front of the monitor, they are now busy at work crunching their numbers.

Sabbatical Adventures

For her sabbatical, Dr. Bouchard packed up her field gear and her family and headed for the tropics. She spent five weeks living in a Panamanian Rainforest, studying the diets of neotropical turtles. She found that the diets of turtles from one rainforest pond were largely comprised of fruits. This inspired Otterbein junior Jamie Clapper to begin research into the digestive physiology of frugivory for her senior research. While in the tropics, Dr. Bouchard also expanded her research program to red-eyed treefrogs, by collaborating with researchers from Boston University and Virginia Commonwealth University. Who would have guessed that frog poop could be as interesting as turtle poop?!
Student Scholars for the 21st Century

For the second time, the Department of Life and Earth Sciences and the Department of Chemistry and Biochemistry, received funding from the Merck Institute for Education to support interdisciplinary undergraduate research between the two departments. The grant provides three years of funding for student summer stipends, research supplies, and summer housing. This past summer was a fun, exciting one with eight Merck scholars conducting research related to turtle nutritional ecology, Otterbein Lake ecological system analysis, and fungal perilipin homologues. Students made great progress on their research and presented their results at the Fall dedication of the new Science Building. While working intensively on their projects, students also attended weekly lunches where they presented and discussed their research. Several guest speakers joined us for these lunches, including one from the Bureau of Criminal Identification and Investigation. Merck Scholars also organized field trips to local research centers (USDA Forest Service Research Station) and graduate programs (Ohio State University Environmental Science and Molecular Biology Programs), where they were able to explore and develop future career goals. Overall, it’s been a very successful program for us, and we look forward to two more productive summers.

Partnering with Chemistry and Biochemistry

We’ve expanded our research program over the past year by partnering with our friends in the Department of Chemistry and Biochemistry (complements of the Merck Institute grant). Turtles use fermentation by microbial symbionts in the digestive tract to digest plants, much like cows or horses do. Chelsea Jenney and Lisa Braden are working with Dr. Joan Esson to examine the effects of temperature on microbial fermentation rates. They will connect their results with those of our basking studies to understand factors underlying turtle diet choices. Josh Ozbolt and Laura McDaniels are working with Dr. Tansey to help understand the carnivorous aspect of turtle diets. The invertebrates that turtles consume contain high levels of chitin in their exoskeletons, and Josh and Laura are developing assays to determine if turtles possess chitinolytic enzymes to break down these exoskeletons. We’re still working out the methodologies for these studies, so you’ll have to stay tuned for their results!
## A Costa Rican Sabbatical

From December 2008 to March 2009, Dr. Jeff Lehman spent his sabbatical among coffee trees, sugar cane plantations, tropical birds, and white-throated monkeys at Los Cusingos Bird Sanctuary in Pérez Zeledón, Costa Rica. The bird sanctuary is a 142-hectare tract of land located at the base of Cordillera Talamanca and Mount Chirripo (the highest point in CR). This important sanctuary is home to more than 300 species of birds and 400 species of plants and is currently one of the last remaining forested patches in what is now an agricultural landscape. During his sabbatical, Dr. Lehman established the Pamela Lankester Garden and walking trail that includes 58 different species of plants representing 38 plant families and 55 genera. He also investigated the frequency of sexual dimorphism in plants and how selective forces have led to the evolution of male and female flowers in plants. He and his family stayed on the reserve in a cabin facing Mt. Chirripo. Each morning, as the sun quickly heated the valley, colorful tanagers ate berries from the *Miconia* trees in front of the cabin. The Lehman family enjoyed visiting the friendly locals, swimming in the Rio Blanca River, and walking a half-mile to the little “pulpuria” (snack bar) for a coke. Currently, Dr. Lehman is working with the Tropical Science Center, a non-profit organization dedicated to biological education and preservation, to produce a descriptive pamphlet that provides photographs, scientific and common names, and an area map for the plants included in the garden. He hopes his work will help promote the beauty of Costa Rica’s botanical heritage.

## Otterbein Alum Defends Ph. D. Thesis at Yale

Chris Bailey (class of 2002) successfully defended his Ph.D. thesis at Yale University. He graduated from the school of Pharmacology in May 2009. The title of his thesis is “Mechanistic Insights into Antiviral Resistance, Mitochondrial Toxicity, and Design of Novel HIV-1 Reverse Transcriptase Inhibitors.” Chris is the third of our students to earn degrees at Dr. Lawrance’s alma mater. Laura Winemiller and Jennifer Harrell were the other two.

## More Alumni News

Otterbein graduates working at Nationwide Children’s Hospital include Erin Tracy, Molly Myers, Teresa Young, Sara Long and Leigh Hranilovich.

Stef Szarka ('09) is also working in biomedical research at Nationwide Children's Hospital.

## Professor Fondly Remembered

**Dr. Arnie Leonard, 1926-2009**

Dr. Arnie Leonard, Professor Emeritus of Earth Sciences at Otterbein College passed away, with his family by his side, Friday, October 30, 2009. Dr. Leonard earned his B.S. and M.S. in Geology from Penn State University and his Ph.D. in Earth Sciences from West Virginia University. He began teaching in the Department of Life and Earth Sciences as the sole Earth Scientist in 1964. Upon his retirement in 1989, he left a void in the department that wasn’t filled until Dr. Hal Lescinsky was hired in 1996. Dr. Leonard loved the outdoors and incorporated field studies into his courses and would often take students on extended field excursions (sometimes as assistants on sabbaticals). He was a treasured husband, father, mentor and teacher. In addition, he was an avid supporter of the department as his consistent attendance at departmental functions, even long after retirement, attests. An avid golfer and Penn State fan, he was also a self-taught photographer, gardener, and wood-working craftsman. He will be missed by his family, friends, and all of us here in the Department of Life and Earth Sciences.