2nd Messenger

Summer 2013

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2010 Biology and Environmental Studies Alumna fights climate change

By Shoshana Blank '10

When I graduated from St. Olaf in 2010 as a Biology and Environmental Studies double major, I knew that I wanted to spend my life fighting climate change. Climate change is the most pressing issue our society faces today, and I wanted to be working to reduce our carbon emissions, hoping to lessen the planet's climatic shift in the long run. There are so many different careers and paths to fight climate change and the systems that led our world into environmental degradation. I chose to work for an organization where I could use my strong communication and people skills, as well as my love for science, to make a difference.

I work for The Sustainable Endowments Institute (SEI), a non-profit that works mainly with colleges and universities around the country to assist them in creating green revolving funds, through an initiative called The Billion Dollar Green Challenge. A green revolving fund (GRF) is a way to finance energy efficiency and sustainability projects at an institution. A GRF creates a separate fund of money to be spent on these projects and then the fund is repaid from the measured project savings (e.g., reduced utility bills from upgrading to more efficient light bulbs). These savings are "revolved" back into the GRF until the project's cost has been fully paid back.

GRFs have been extremely successful in funding energy efficiency at colleges across the country and in Canada. SEI wrote a paper last year, *Greening the Bottom Line 2012*, on 76 institutions with GRFs. We found an average return on investment (ROI) from these funds of 28% and projects had a median payback time of 3.5 years. These projects see fast returns and reframe energy efficiency as investments for a college rather than expenses. Endowment investments normally have an ROI in the single digits,

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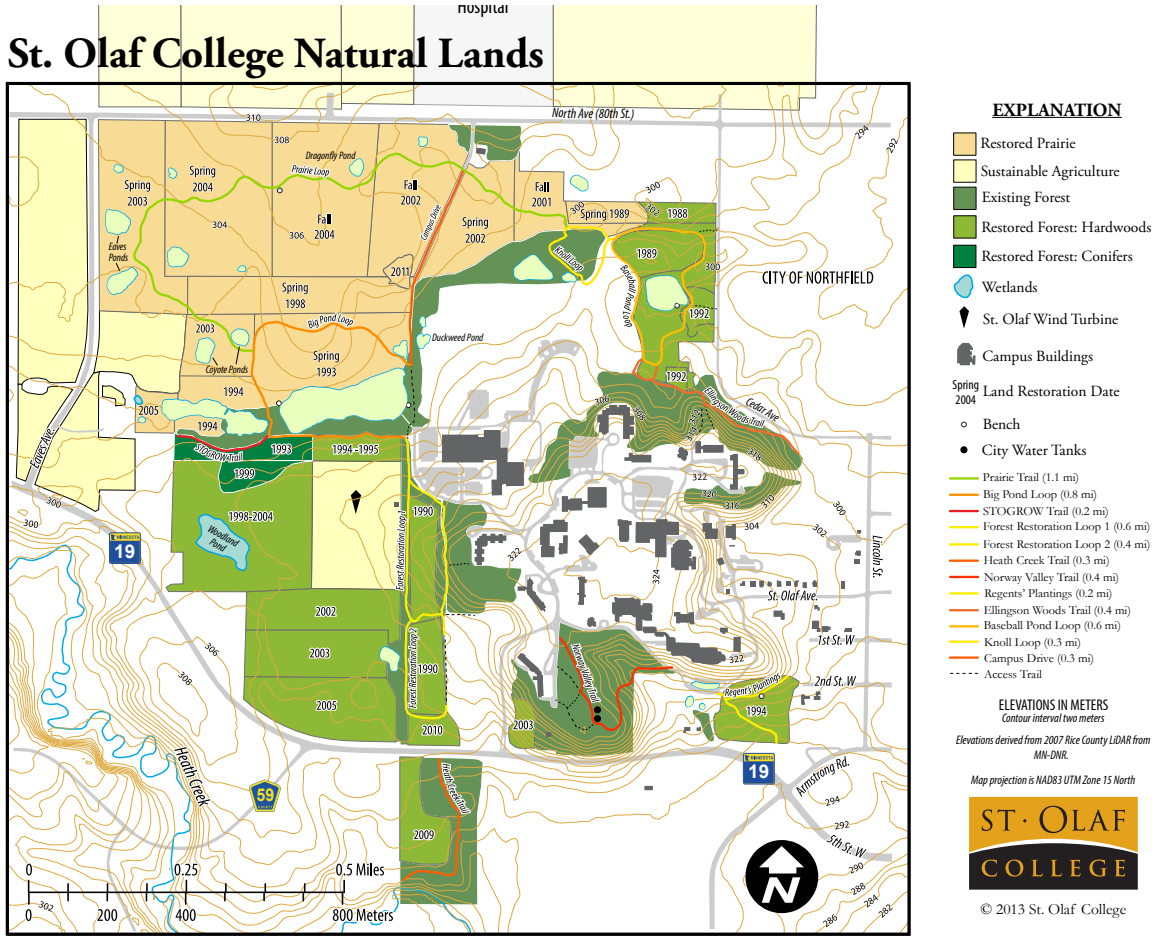
News on the Natural Lands

By Kathy Shea, Ph.D.
Professor of Biology and Environmental Studies
Curator of Natural Lands

A grant to the Environmental Studies program enabled us to hire Jason Menard as a GIS Instructional Technologist. One of the goals of the position is to educate the faculty and staff about how using GIS (geographic information systems) can enhance our teaching and research. Jason and I have been have working together to develop improved maps of the Natural Lands, posted on the Natural Lands website at http://www.stolaf.edu/academics/naturallands/maps/stolafnatlands2013.pdf. The new map features dates of restoration for restored prairie and forest areas as well as lengths of trails through the Natural Lands. The maps provide additional information about the Natural Lands which serve as a community resource used for recreation, research projects and as a green buffer on the edge of campus. As additional data are collected we plan to take GPS locations of the data site whether it be the location of a tree, plot, soil sample or our latest prairie burn. The data will be stored on a central server, where it can be made available to interested people. The Natural Lands provide a respite from the bustle of campus life - remember to take a walk in the Natural Lands when you visit campus! ☐



Shoshana presenting on the GRITS web tool, which measures energy, financial, and carbon savings data, at the Financing the Future of Energy Efficiency Summit 2013 in San Diego, California in April

so 28% is truly meaningful and something that can earn money for the college. Also, by reducing the utility bills with energy efficiency, schools reduce their operating costs in the long run, allowing for increased flexibility with rising energy prices and the ability to hedge against rising tuition costs. GRFs make sure that there is money to spend, year-after-year, on sustainability, even if other budgets get cut.

I do a range of things in my job at SEI. I spend a lot of time talking with sustainability coordinators and administrators from colleges and universities, asking them about how they fund sustainability now, and trying to figure out how they can re-shape their current system into a GRF. I also work with a web developer to create an online tool called the Green Revolving Investment Tracking System (GRITS). GRITS is a site where schools can measure and track their energy, financial, and carbon savings data from their GRF and also share their project data with other institutions.

What I am most surprised about in my job is the amount outside of the field of Biology that I am learning and doing. In my work I have learned a lot about finance and even had to speak the language of a web developer while explaining website edits to them. I have learned how energy flows function on a college campus and how sometimes electricity and steam are produced by the college and in other systems they purchase all of their energy from an outside utility. My science background is helping me to explain and calculate units of energy and carbon emissions from different types of fuel. It's amazing how many fields can integrate together to solve a problem like building energy efficiency.

"It's amazing how many fields can integrate together to solve a problem like building energy efficiency."

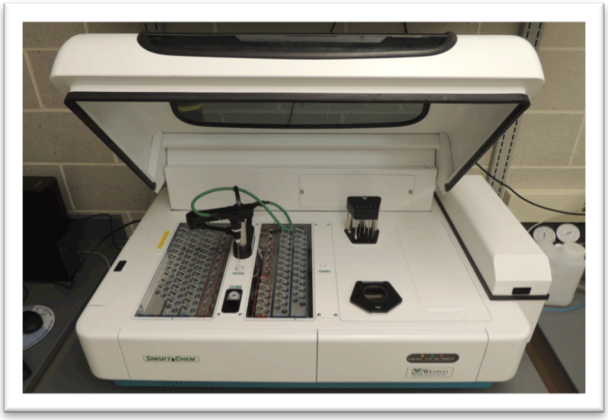
The reality of climate change is still at the forefront of my work, even though it is not immediately obvious. Energy efficiency is one of the most important ways that we can reduce our carbon emissions. I am helping colleges, municipalities, hospitals, and K-12 schools create a mechanism to finance their energy efficiency and renewable energy. If I can further the use of energy efficiency and clean energy, then I feel that my work has a significant impact.

For more information about The Billion Dollar Green Challenge, please visit greenbillion.org. ☐

Equipment Focus: Smartchem 200

By Charles Umbanhowar Jr., PhD
Professor of Biology and Environmental Studies

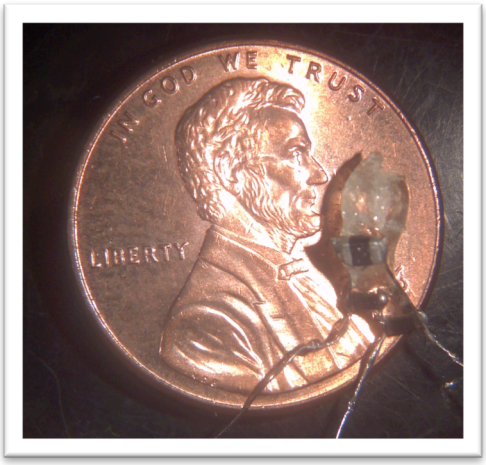
This summer I will be running silica extracted from sediment samples I collected from lakes in Labrador through the Smartchem to describe changes in lake productivity over the past 8000 years. The Biology and Environmental Studies departments recently purchased a Smartchem to analyze water and soil or sediment extracts for environmental and other types of samples. We are using the machine primarily for analyses of nitrate, phosphate and silica. Samples are analyzed colorimetrically which means that color-forming reagents are added to each sample and then light transmission through the sample is measured. In addition to the robot arm that pulls samples and dispenses the color reagent, one of the exciting feautures of the machine is that it requires only small samples and small amounts of color reagent (<1 ml). In particular this means that the amount of hazardous waste we generate is minimized compared to the FIA we previously used. The machine is also easier for students to use. ☐



A Glimpse into one of Many Summer Student Research Projects in Biology

By Shane Allen '14

During the Summer of 2013, Professor Crisp and four undergraduate students worked to develop a passive, wireless sub-millimeter scale probe for intracellular recording of nervous signals. The probe's design incorporates the principles of carrier wave amplitude modulation and exploits the natural conductivity of animal tissues. A high-frequency AC carrier wave is pulsed through a conductive medium and picked up by the probe; the probe modulates the amplitude of the carrier wave in proportion to a voltage signal that it simultaneously measures from a cell. This modulated carrier wave is transmitted through the conductive medium, picked up by a receiver, and demodulated to reveal the signal measured from the cell of interest. This probe design, though in its early testing stages, shows promise for wireless recording of electrophysiological data without the need for implanted batteries. Current methods for taking such readings from live animals is invasive and restrictive, involving battery packs, trailing wires, and transcranial electrode leads. This probe may offer a solution that will allow us to measure the neural substrates of more natural, unrestricted animal behavior. ☐



A prototype probe, encased in epoxy for protection.

Math and Biology

By Anne Walter
Professor of Biology

As part of the new math/bio concentration, we (Becky Vandiver in Mathematics, our students and I) are changing up the mathematicians approach to doing applied math by bringing them a real wet lab experience in the mathematics of biology course this coming spring. This course is taken by biology and by mathematics majors so there are several challenges. The math "leads" here so that whatever we do at the bench has to test or illustrate a mathematical model. The actual labs themselves need to be novel, i.e., not exact versions of exercises that biology majors have done in their courses. At the same time, they can't be too complex! Topics include random walks and diffusion as well as enzyme kinetics. We can do the latter "easily" thanks to our microtiter plate reader and injection system allowing us to collect a full set of kinetic data with or without inhibitors in a short period of time using minimal materials! In the old days, this would be a major production with hundreds of cuvettes and hours of run time.

The Biology students will also get more math and we are starting by adding more math problems in the Animal Physiology course which is also part of the math-bio concentration. We often use the terms "increase" and "decrease" in physiology but this year we will begin modeling key processes (e.g., heat transfer and energy consumption), quantitatively to push our understanding of these biological parameters. ☐

Alumni News

Eric T. Bjorklund '91
It has been many years since I left St. Olaf. But, the memories are good – even though fading to some degree now. I do remember Professor Z. So while I am sad to hear of his passing, I am happy to remember some of my experiences with him. My time in the Science Center, and the experiences in obtaining my Biology Degree from St. Olaf were all great. To this day, in fact right in front of me now, I still have an orange tree obtained from the green house! It is much bigger now, and has even produced fruit! And I have used the seeds from the fruit, to grow more orange trees!!!

Kelsey Gothier '08
I am a 2008 graduate from St. Olaf, and I'm using my Biology degree to graduate from the University of Minnesota College of Veterinary Medicine in May 2013!

Skye Pierce '09
I graduated Olaf in 2009 and am currently serving in Haiti for a year as an aquaponics missionary. I'm working for a non-profit, Healing Haiti, which has invested in a large aquaponics system at their orphanage, Grace Village. I am currently managing this system alongside a young man from the town of Titanyen (where Grace Village is located). Aquaponic farming grows fish and plants in one integrated, soil-less system. While the fish provides nutrients for the plants, the plants filter the water for the fish. Healing Haiti's vision is to feed their orphanage, and members of the surrounding community with food grown sustainably. I arrived in January and plan on staying through 2013. I've included a picture of some of the crops - as you can see I'm just getting started.

Erik K. St. Louis '87

Head of the Section of Sleep Neurology, Associate Professor of Neurology, Consultant in Neurology and Sleep Medicine, and Director of the Cognitive Neurophysiology Laboratory at Mayo Clinic in Rochester, Minnesota. Erik is currently completing a M.S. degree in clinical investigation at the University of Iowa, co-editing a book on the interictal state and co-morbidites in epilepsy for Wiley-Blackwell due in 2014, and serves on the Editorial Boards of the American Academy of Neurology *Continuum* and *Frontiers in Epilepsy*. His research interests include the interfaces between epilepsy, sleep, chronic partial sleep restriction, and cognition under support of the Mayo Center for Translational Science Activities (CTSA). His Cognitive Neurophysiology Laboratory has welcomed over a dozen St. Olaf undergraduate and recent graduate researchers over the last 4 years.

Owen Nelson '54
I graduated with a biology major in 1954, and the prof

I remember most was Harold Hansen. It might illustrate the degree to which biology has changed to mention that I was told I needed no more chemistry, since I had had it in high school.

I only taught high school biology one year before I gravitated toward junior high general science. I got an MS in Science Education at UW-Madison as one of 50 or so "outstanding science and math teachers" who participated in a year-long program that was sponsored by the National Science Foundation.

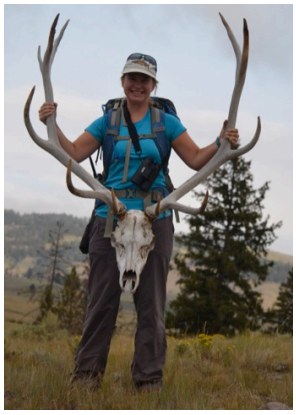
I'm currently "retired", but I'm in my 13th year of teaching as a part-timer in the math department at UNLV. I'm one of at least a dozen who teach the 1000 who take no-credit, remedial algebra every semester. I suspect that StO doesn't offer many such classes.

Claudia Close Andrews '78

Dr. Z memory - I hadn't read about Dr. Z's passing until your newsletter came out. I am one of those who consider Dr. Z the best professor I had at St. Olaf. Sadly I didn't move on in biology after St Olaf, but I still cherish his style and humor. If there haven't been enough anecdotes, here's another one. I was another student fortunate enough to participate in Dr. Z's interim at Pigeon Key in Florida, the last year it was in Florida. He always took students to the mangrove swamp on a nearby key to study the biology around the mangroves. We wore shoes in the swamp to protect our feet from the muck and all the other things in the swamp. While we were knee deep in water and muck, Dr. Z lost one of his shoes. While a couple of students supported him, others groped around in the mud trying to find his shoe. No luck. Needless to say the lesson ended abruptly. However, I have never laughed so hard as during that incident. Dr. Z had us all in stitches. What fond memories!

Julie Dahl '12

Since graduation, I spent my summer in Yellowstone National Park with the Raptor Research Initiative. It was a spectacular summer, and I learned so much about raptors and their reproductive successes (and failures). From there, I got an internship at Penn State's Environmental Center, Shaver's Creek, as the raptor center intern. I have been with them since the end of August and have since been training our young Bald Eagle. I will likely be moving out West at the beginning



of the summer in preparation for graduate school. This is a photo of me in Yellowstone holding some (very heavy) elk antlers we found as we were hiking around looking for Red-Tailed Hawk fledglings.

Jane K. Dickinson '90

Jane K. Dickinson, class of 1990, has published a book about living well with diabetes. ***People With Diabetes Can Eat Anything*** is available on www.amazon.com (print version) and www.smashwords.com (e-version). You can also visit Jane's website to learn more about her book: www.janekdickinson.com.

Steve Johnson '72

In response to the article in the last alumni newsletter about Dr. Z, Steve wrote, "I worked with Dr. Z under an NSF grant in the summer of 1970 to develop materials for the Marine Biology Interim which was then held on Pigeon Key just past Marathon, FL and under the Seven Mile Bridge. We developed a taxonomic guide to the flora and fauna around the island. I just recently found in old notes and books the field notes Dr. Z and I recorded. These were subsequently used for the interim in January 1971. I was his lab/field assistant for the course.

Steve has generously donated the notebook to St. Olaf.

Correction: In the Fall 2011 alumni newsletter, there is an article about the Behrents Family Endowment. This endowment is a generous gift of Gordon Behrents and his wife, Alice Norby Behrents. The photo of Alice Behrents in the Fall 2011 article actually pictures Gordon's sister, Alice Beulah Behrents. The Biology Department is grateful for the student research support that the Behrents Family Endowment has provided over the years, and we apologize for this error.

Email bioalumnews@stolaf.edu and let us know what you are (or aren't!) doing with your biology degree. We will include it in the next alumni newsletter. Pictures are great too!