November 2014 Volume 13 Issue 3

BioMass

Student Coordinator: Brenna Peterson ‘17

Contents

Biology in South India

Nicole Baldwin ‘15

Biology, service, independence, adventure, and India: if you like any one of these things, then the Biology in South India program may be an invaluable experience for you. Last fall, eight of us Oles spent an amazing semester in the state of Tamil Nadu, India, on St. Olaf’s Biology in South India program.

First, we spent a month in Chennai, a city on the southeast tip of India that used to be called Madras. There, we learned about Indian culture and current events, and supplemented our learning through field trips and adventures around the city. We also had a week of orientation in a rural area, where we not only interviewed people of different castes, creeds, genders, and lifestyles, but also had hands-on experiences such as planting rice patties and making pottery.

Continued

After orientation, we split into groups of two and three and left for our first project sites, where we individually conducted research for five weeks. Many sites were great for projects relating to ecology and/or health, but the possibilities for projects were many and sometimes unanticipated. For example, my first project was in the Palni Hills of the Western Ghats range, a breathtakingly beautiful place where I expected to study air quality. However, when I arrived, I discovered a more pertinent issue—a water crisis due to the failure and late arrival of the normal monsoon rains, and the water pollution occurring even in this supposedly pristine place. I spent my days sampling water sources in gorgeous locations, performing chemical tests, and listening to very different perspectives on area life from people I met along the way.

After our first project, we had a travel break: a 10-day-long opportunity to explore other parts of India as planned by our group members. For our break, we all came together again for a Himalayan trek, sightseeing in Delhi and Agra (home to the Taj Mahal), and finally, a relaxing stay on the beach in Goa. Though these areas were more frequented by tourists than our project sites were, I was amazed to see things I had only heard about (such as the Taj Mahal or a Himalayan sunset), things that were becoming familiar (like the cows roaming both city streets and beaches), and new languages and cultural attitudes.

Finally, we arrived at our second project sites, where we again were with one or two other Oles for independent research. My second project site was more conducive to health-related projects: a rural hospital that specializes in leprosy care. I interviewed leprosy patients on the challenges they face and the common means they use to cope with the disease, which still carries much social stigma even though it's now treatable by antibiotics. At that site I encountered new healthcare standards that challenged my assumptions of what is necessary, and I spent quality time comparing cultures with Indian healthcare workers. I also discovered that there is beauty to be found in the evident brokenness, and simply being present with people is a surprisingly powerful way to cross cultural and language barriers and to extend healing.

India has much to discover and to teach, including tasty snack stands, lavish colors and scents, exhilarating auto-rickshaw rides, and unforgettable life lessons. It was definitely worth spending a semester in this wonderful place. It was enough time to recognize I still have much to learn, but I was able to be more than just a visitor briefly passing through. I would certainly love to return, and I would encourage anyone considering Biology in South India to take this opportunity!

Image on prior page: Students in the 2013 Biology in South India program sowing a rice patty field. Photo courtesy of Edward Raja.

Continuing the Discussion on Environmental Racism

Brenna Peterson '17

The chalk advertisements for this month's panel discussion on environmental racism started to fade after just a few days in the elements, but the economic, environmental, and social issues linked to this term will not be so easily erased.

Oxford Press's *Dictionary of Environment and Conservation* defines environmental racism as the "Intentional or unintentional racial discrimination in environmental policy- making, enforcement of regulations and laws, and targeting of communities for the disposal of toxic waste and siting of polluting industries." Here are a few concrete examples of environmental racism in the United States:

- In 2007, 91 percent of Californians who lived less than 2 miles from hazardous waste facilities were members of minority racial groups.
- Altgeld Gardens, a community in southeast Chicago with a majority of African American residents, is surrounded by landfills, toxic waste facilities, sewage treatment centers, and various other polluting industries.

Continued

- When Hurricane Katrina hit in 2005, 60.5 percent of New Orleans residents were African American, and the pre-existing economic disparities between racial groups aggravated the hurricane's effects on minority populations. Minority residents who lived in racially segregated neighborhoods were more likely to live in low-lying areas, and these neighborhoods were more susceptible to the disastrous effects of the hurricane.

One case of environmental racism in Minnesota is pesticide drift from potato farms, which negatively affects people living on the White Earth Reservation, located 225 miles northwest of Minneapolis/St. Paul.

Ronald D. Offutt (RDO) potatoes, the largest potato producer in Minnesota, uses several different pesticides on its crops, including the fungicide chlorothalonil. Cholorothalonil is classified as a "likely human carcinogen" by The U.S. Environmental Protection Agency, and during the peak of potato growing season, pesticides like chlorothalonil may be applied to fields every five days. Pesticide drift was monitored between June 2006 and August 2009 in central Minnesota, and the results show that people in these central MN potato-producing areas are frequently exposed to low to moderate levels of chlorothalonil.

RDO is also a major potato supplier for McDonald's french fries. The Toxic Taters (toxictaters.org) campaign, which uses the slogan "Minnesotans not lovin' pesticide drift," organized a peaceful protest of McDonald's on October 28th, in the hopes that McDonald's will put pressure on RDO to reduce its pesticide use. Currently, Bon Appétit Management Company uses potatoes from RDO, but they are in the process of looking for sustainable alternatives.

Students from the St. Olaf Greenpeace Chapter and The Environmental Coalition participated in the Toxic Taters protest, and more than 120 students attended this month's interdisciplinary panel discussion on environmental racism. Environmental racism is a complex issue without a clear-cut answer, but you can help by becoming informed. If you'd like to join in on the conversation, consider attending one or more of these on-campus meetings:

- **St. Olaf Greenpeace Chapter** (Wednesdays, 7:00 PM, TOH 200)
- **St. Olaf Amnesty International** (Thursdays, 6:30PM, BC142)
- **Talking Circle** (Tuesdays, 8:30 PM, MACO)
- **The Environmental Coalition** (Tuesdays, 8:30 PM, BC 220)
- **The Bridge** (Thursdays, 7:00 PM, Gold Ballroom)

Images: Previous page: Ad for the Environmental Racism Panel Discussion. Photo courtesy of Sarah Barton, Left: Students listening to Professor Bruce Nordstrom-Loeb at this month's Environmental Racism Discussion panel. Photo courtesy of Sarah Barton

What's Still Green in November?

Kate Seybold '15, Student Naturalist

November is a gray and dull month. The trees have lost their leaves, the grass has lost its color. It's such a bare and lifeless time that we find ourselves *hoping* for the snow to arrive, just to make it look prettier outside. This drawn-out transition into winter comes every year, almost like clockwork. Yet, perhaps you've noticed a few agricultural fields while driving in the area that seem to be defying this seasonal pattern with green growth—cover crops.

Cover crops are not a new discovery, but are certainly a recent "buzz" topic in sustainable agriculture. A cover crop is simply a

Continued

crop planted not for harvest and profit, but for the enrichment of soil. Depending on the type of crop planted, a cover crop can protect soil from the elements (wind, rain, etc.), reduce soil erosion, increase organic matter, fix nitrogen in the soil, recycle unused nutrients, aerate the soil, and control weed growth. Some common cover crops include winter rye, clover, tillage radish, and alfalfa.

There are a variety of ways in which cover crops can be planted. One option is to plant cover crops *with* cash crops (i.e. in-between rows), either at the same time or partway through the growing season. The picture below shows a cover crop that was planted in-between corn rows; once the corn was harvested, the soil remained covered by the cover crop. Another option is to plant cover crops opposite the cultivation of the cash crop. For instance, cover crops can be planted following the harvest of a cash crop or be the primary crop for an entire growing season as part of a field's crop rotation.

In Minnesota, where winters can be harsh, a cover crop can be very beneficial by reducing the loss of soil and nutrients from a field. Additionally, for Minnesota's extensive corn and soybean production, cover crops can help replenish nitrogen and carbon taken by crops, and reduce the need for repetitive tillage. However, the challenge of cover-cropping in Minnesota is that most farmers don't get their crops (particularly corn and soybeans) harvested in time to get the cover crop planted before the ground freezes.

Considering all the great benefits, but current challenges, of widespread cover crop use, you should make sure to keep your eyes open for advancements in cover crops. In fact, Field Ecology students Lisa Misch and Connor McCormick are conducting research on cover crops this semester at St. Olaf!

Images: Top right: Red clover—a legume cover crop that fixes nitrogen in the soil. Bottom right: Harvested cornfield with cover crop between field.

Turtle Research at St. Olaf

Samantha Modrak '17

With its picturesque view of Northfield and beyond, the atrium on the fourth floor of Regents offers a great study location for spawning ideas. More immediate inspiration, however, is available right from the aquarium against the wall, from two young map turtles. Whether they're swimming with ease, retracting into their knobbed shells, or simply taking in the sunshine, they provide mental refreshment and a glimpse into the turtle world on campus. Thanks to Professor Steve Freedberg, St. Olaf houses around thirty different species of turtles from all around the globe. Besides being very intriguing in their reptilian ways, the turtles provide a great opportunity for research.

Stuart Behling '16, a biology major, and Charlie Heller '16, a physics major, have been involved with the turtles since last winter. Over the summer, they conducted a CURI-sponsored research project with Professor Jay Demas and Professor Freedberg. Their research addresses the turtles' ability to navigate from their nests to a body of water as hatchlings. The project was based on the fact that turtles have a special, non-vision circuit of neurons in their eyes called photosensitive retinal

Continued

ganglion cells, or ipRGCs, that were postulated to have a role in navigation. Stuart and Charlie worked with freshwater snapping turtle hatchlings to identify these ipRGCs and see if they could find an association between this physical feature and navigation behavior. In the end, they concluded that the turtle retinas contained ipRGCs and their data linking the cells to the light navigation ability was very strong. Stuart and Charlie presented their findings at a conference in Washington D.C. just this month.

It was clear that the team found their research rewarding. As he held out his palm in recollection of the hatchlings, Stuart said "you can handle them and they're pretty cute." Both especially enjoyed their research-time spent in Weaver Dunes, MN. Speaking from experience of boat rides and spotting turtles on land, Charlie convincingly affirmed that "they can move pretty fast."

Vertebrate Biology (BIO 242) is another outlet for turtle research on campus. As one component of lab, students study the functional morphology of turtle shells to see how different structures are beneficial in different environments. By making an evolutionary tree, students can predict shell shape according to certain environments. Professor Freedberg will teach Vertebrate Biology this spring.

Image: Ouachita Map Turtle in aquarium on 4th floor of Regents, (Photo courtesy of Sam Modrak)

Bird Banding on the Prairie

Emily Patterson '15

Thirteen years ago, I participated in a "College for Kids" class on ornithology. On the last day of class, the instructor brought us to a bird banding station at Buffalo State Park near Moorhead, Minnesota. I was hooked, and I spent the next several summers volunteering at BSP before becoming a regular volunteer at the Braddock Bay Bird Observatory near Rochester, NY. Last spring, I received a federal permit allowing me to band birds in Minnesota.

Bird banding is the process of catching a bird, using either finely woven mist nets or specialized traps, putting a uniquely numbered metal band on the bird's leg, determining the bird's species, age, and sex, taking various measurements, and then releasing the bird. By marking individual birds, we can learn more about their behavior, life cycles, and population demographics. Ultimately, we hope that what we learn will be a catalyst for avian conservation.

This fall I am using bird banding to conduct an independent research project under the direction of Professor Kathy Shea. I am looking at the distribution of birds in sections of the Natural Lands burned in different years, and I hypothesize that different species will be found in the different sections. I chose five sections of four different burn years: two sections in 2010, one in 2012, one in 2013, and one in 2014. I set up two nets in each section, for a total of 10 nets. Between September 13th and October 27th, I went out to catch birds on 17 days, usually between sunrise and noon.

Currently, I am in the process of analyzing my results. During the six-week field season, I caught 98 birds of 23 different species, 11 of which were sparrows. The most common bird was a Song Sparrow, with 23 caught or recaptured. Species highlights included a LeConte's Sparrow, a Sedge Wren, and three recaptured Eastern Bluebirds I had banded as nestlings earlier in May.

Using the Shannon and Simpson values of diversity for each section, a significant difference was found in two instances. The first difference is between one of the sections last burned in 2010 and the section last burned in 2014, providing some support

Continued

for my hypothesis that some species prefer some sections to others. The other instance of a significant difference was between the two sections burned in 2010, one of which was restored in 1998 and the other in 2002. I am not yet certain what caused this difference, but one possibility is a difference in plant species present in the two sections.

If there is a difference in species diversity between sections, that may suggest we should continue to maintain our Natural Lands in a mosaic – that is, selectively burning small sections year by year, rather than burning the entire prairie all at once – so that we provide habitat for a wider variety of species.

My first bird banding experience was on a tall-grass prairie in Minnesota, so it's fitting that my first independent research utilizing banding involves the same ecosystem. I'm grateful that St. Olaf has given me the opportunity to unite one of my passions with research and conservation.



Images: L Cooper's Hawk, Middle: Eastern Bluebird, Right: LeConte's Sparrow, Photos courtesy of Emily Patterson

Dear biology majors,

In a short while, I will no longer be sitting at my desk in Regents 360 emailing biology majors, signing out keys or doing the layout for BioMass. No more creating student work applications, waitlists, seminar fliers or website maintenance. Instead, I will be at my home in Northfield, happily toiling away at various home projects, cooking meals and spending time with my family as well as enjoying that extra time and space that is hard to come by in this day and age.

In case it isn't clear, I am resigning from my job as the biology administrative assistant. While I am looking forward to this change, it means saying goodbye to St. Olaf, the Biology Department and you – the biology majors. I secretly imagine that all 284 of you declared majors know me and will greatly miss my presence as the department AAA. And, just supposing that isn't the reality, I wanted to say goodbye and good luck anyway. There will be a new AAA soon who will bring a fresh perspective to the biology department and will assist you with your biology related needs.

See you later! Best wishes as you continue on in your college career and go forth into the world!

Tory