Calder Matters

As we begin 2015, and the start of my second year as Director, I thought it would be a good idea to provide you all with an update on matters at the Calder Center. The question of how best to do that was one I didn’t have to consider for long; a newsletter would allow us to cover a number of topics – with pictures – while keeping the faculty and students working at Calder informed of things going on outside their own labs. Granted, a quarterly newsletter (our current plan) does not rival texting for getting the news out quickly but it can serve a valuable function nonetheless.

For instance, there are a number of things we want to share with you in this inaugural edition about progress that’s been made on several of the projects we outlined last spring: the Lodge renovation, a land management plan for the Center, and outreach efforts are a few of the items. We also wanted to focus on some of the work going on in labs at Calder and asked Dr. John Wehr to provide a snapshot of his lab. No one has been at Calder longer than John, nor does anyone know the station better, and his article is a wonderful way to kick off this feature.

A newsletter is also a way to share the “Calder Experience” with others who have never visited the station and I’m hopeful that that will turn out to be one of the major benefits of this publication. Letting others know about the Calder Summer Undergraduate Research (CSUR) program, for example, is one way to do that, as is spotlighting the work our graduate students are doing. And so, we asked Sarah Whorley, a PhD candidate finishing up in the Wehr lab, to describe her dissertation project on how agricultural activities affect stream algae. While sampling was done off-site, the crucial testing of those samples was done at the station with equipment and resources not available elsewhere at Fordham. Studies like this, in which basic ecology meets environmental regulation, lie at the heart of a “best practices” approach to agriculture with the goal of mitigating potentially harmful effects on the environment. In future issues, we will be highlighting the work of other grad students at Calder not only because their projects are inherently interesting (we certainly see them as such) but because they illustrate the variety of research studies being conducted by our faculty and students.

Most of all, I hope the newsletter will remind all that the work being done at Calder is important not only to the researchers asking the questions but for everyone waiting to hear the answers. Hence, the double meaning of “Calder Matters.” I think you will find the following information interesting, maybe even exciting, and I look forward to your feedback on any and all topics having to do with Calder. Please let us know what you do (or don’t) like about the newsletter, features you’d like included, topics you’d like to see covered, and so on. In the meantime, enjoy the end of winter (it’s about time) and best wishes for the coming spring!

Dr. Thomas J. Daniels
Director
The Lodge: the Space to Be

The log cabin on Calder Lake is one of the oldest buildings at Calder and is, as those of you who had offices in it know, very much in need of renovation.

Until last May, the Lodge housed the administrative staff and provided office space to many of the center’s graduate students. Both groups have since been relocated, Alissa Perrone (Asst. Director) and Petra DelValle (Administrative Asst.) to the Carriage House, and the grad students to a new office in the Routh House.

Once the Lodge was emptied, architects from the firm of Kouzmanoff and Bainton were asked to help develop a plan that would repurpose the building, turning it into much-needed teaching and lab space. Comments from faculty were considered in coming up with a preliminary plan this fall and now we are discussing some revisions.

Briefly, the large main floor will serve as the primary lecture/conference space with folding tables and stackable chairs that can be laid out in a variety of configurations.

The upper level, which used to house the kitchen/dining area, will be a less formal meeting space with some exhibits to showcase the natural history of Calder. A wet lab area (sinks, autoclave) will allow more hands-on exercises to be conducted than ever before, while boating activities will continue to be based out of the boat house below.

But before any of the decorative elements are realized, an overhaul of the Lodge’s infrastructure is being planned. Under the supervision of John Spaccarelli, Director of Facilities at Calder, new lighting, plumbing, and electrical service will be needed, internet access must be enhanced, and building integrity will be strengthened. Finally, the old entrance on the south side of the building will be closed and the new entrance will be located on the western side of the building.

A number of details still need to be filled in but once we have a final plan in place, probably by May 2015, we expect to have a much better idea of the overall cost, and budget matters will need to be worked out before construction can proceed. In the meantime, if you have any questions about the plan or would like to see it on paper, feel free to stop by Tom Daniels’ office to look it over and provide your thoughts.
Land Management Plan

The Calder landscape has seen much change over the past decade, most notably in the variety of invasive plant species (e.g., Japanese knotweed, stiltgrass, barberry, porcelainberry, and garlic mustard, to name a few) that have become established. This isn’t unusual in that forests throughout the northeastern US are facing similar pressures; large tracts of land are being fragmented through development, higher human population density in the region puts a strain on natural resources, wildlife populations are forced into smaller, less disturbed spaces which, in turn, put more pressure on plants and other animal species in the community, etc. The upshot is that biological communities, which were always dynamic, are being modified fairly rapidly, changing in ways more suited to these new conditions. Unfortunately, native species often have a competitive disadvantage to the invasives which, by definition, are better able to exploit newly disturbed areas.

Now let’s complicate the picture just a bit more and throw in the number and severity of storms we’ve had to endure in recent years. Since 2011, for instance, we’ve lived through Hurricane Irene and a Halloween blizzard, Hurricane Sandy (2012), and Tropical Storm Andrea (2013), all of which did considerable damage to the treescape at the station. In addition to the financial burden these storms have had (tens of thousands in clean-up costs) the more obvious reduction in canopy cover you see while walking through the woods effectively results in more points of access for invasives to gain a foothold in and around the forest. And behind those storms may be increased energy in the atmosphere due to anthropogenic (human-caused) global warming. The resulting climate change patterns due to global warming may be both the most subtle and the most devastating to ecosystems in the long-term. Rather sobering.

Of course, none of this is really news to the faculty and students that work at Calder; we’ve all seen the changes that have taken place, most notably over the last decade or so, and this has prompted serious discussion about ways to address these concerns. At the Calder Center faculty/staff meeting last April, the idea of hiring an outside consultant with expertise in developing a land management plan was enthusiastically endorsed by the attendees. After soliciting suggestions from colleagues at other institutions, Scott Quitel of Applied Ecosystem Services was asked to come and meet with interested faculty at Calder. Scott had done similar work at the New York Botanical Garden and expressed a strong interest in helping us to map the landscape, identify all the problem areas we currently have, and find ways to use the resources at Calder to advance both our research and teaching efforts. This last point is critical to the approach we’re taking: be realistic about controlling invasives and embrace the change.

What we mean by “embrace the change” is rooted in the fact that we can’t turn back the clock. The invasive species we now have at Calder took some time to become established and...
all-out control of every species is unrealistic, both biologically and financially. After several site visits from Scott Quitel over the past few months, during which he’s become familiar with the habitats and layout at Calder, we have a better understanding of the breadth of the problem and ways to approach managing invasives that do not rely on pulling out every unwanted plant. In fact, that action alone would simply pave the way for further invasion of one or more species. Rather, we’re looking at this as an opportunity to study the actions of these species, how they affect native species that may be displaced over time, levels of competition, and how community structure is being altered as a result. Work along these lines is already being conducted by students in the (Jim) Lewis, (Steve) Franks, and Vector Ecology labs, for instance.

The Calder Hall Elm

If you spent any time at all in Calder Hall over the past few decades, you will recall the stately elm that stood in the corner of the backyard, providing shade for the nearly half century that the station has been in operation, and for many years before. It was probably just a matter of time, but in the last decade the tree was attacked by the elm bark beetle, sustaining damage it could no longer withstand. After losing a number of limbs this past year, the tree had to be removed last summer and most was carted off site because of concerns that it hosted the fungus causing Dutch Elm Disease (actually, there are three species in the genus Ophiostoma that can cause DED). We always intended to replace the tree and after soliciting comments from faculty, the consensus was that the site was ideal for another elm - no oak or maple would suffice. But given the problems elm trees are facing these days, the question of where to find the next generation was an important one to address. Not only did we need an elm, we needed a resistant form that could better handle attacks by two potential killers: the beetles that burrow into the tree and the fungi they introduce. Fortunately, we were able to locate the next one right at Calder, in the tree farm near the Gatehouse. The ‘Valley Forge’ American elm is a resistant variety – in fact, the form considered to be the most resistant to DED.

...in with the new.

Three years ago, a 1/2 acre patch of former orchard land at Calder was cleared and planted with a variety of trees and shrubs intended to serve as stock for replanting on the Bronx campus. The site was fenced to protect the young plants from our largest herbivores, the white-tailed deer that are so common in Westchester, and the result has been a healthy community of trees and shrubs ready to be transplanted as needed. Under the supervision of John Spaccineelli and Mike Lambros (Caretaker), the stump and roots of the original elm, which had remained in place after tree removal, were dug up and hauled away in November 2014. The ground was prepped, the new elm readied for its short journey to Calder Hall, and replanting took place in early December.

A formal land management plan is still some time off – further field visits by Scott and meetings with faculty will resume in the spring – but we are on track to develop a realistic plan that will highlight the problems we face while finding ways to take advantage of the changes that are occurring. We’re also looking at ways to slow some of these changes and conserve our native species for the long-term.

More on that in our next newsletter!

Out with the old,…

With warmer weather beginning soon, the elm will awaken and, over time, grow into another magnificent tree that all visitors to the station can enjoy for the next century.

A twofer!

Actually, the story isn’t over. It turns out that there were two elms in the tree farm and sometimes it’s just as easy to move two as it is to move one. So, about 100m away from the backyard elm, at the top of the toboggan run in front of Calder Hall, the second elm now resides. It is close to where a stunning tree once stood – a Chinese magnolia that had to be taken down several years ago – and while the elm will never provide the scented breeze we could count on every spring from the flowering magnolia, it will stand taller, someday, as it, too, fills a gap in the Calder tree line.
Research Update

THE AQUATIC ECOLOGY LAB (WEHR)

by John D. Wehr, Ph.D

The lab has been very busy this year. First, the lab is happy to congratulate Xian Wang, PhD! Xian successfully defended her dissertation, “Organellar genome evolution and phylogenetic relationships among populations of freshwater brown algae: Heribaudiella fluviatilis, Bodanella lauterborni and Pleurocladia lacustris.” Xian was co-mentored by John Wehr and Ken Karol (at the NYBG), and is the first person anywhere to fully sequence the organellar genomes of any freshwater brown alga. Her first chapter is being submitted for publication in BMC: Evolutionary Biology. These data will be used to assess how algae have evolved from marine into freshwater environments. The lab welcomes a new cadre of undergraduates (Gabriella Bruzzese, Austen Hartwell, Leah Ibrahim Puri, Michael Yu), a new PhD student, Stephen Gottschalk, and postdoctoral researcher, Nicholas Ballor. Here are some examples of diverse research projects underway in the Wehr Lab:

Agricultural Streams. Students are evaluating the effectiveness of best management practices (BMPs) in agricultural landscapes in upstate New York. The goal is to determine whether riparian planting, fencing, and barnyard improvements reduce negative impacts of farms on headwater streams draining into the upper Delaware River watershed. Sarah Whorley (PhD candidate) leads this project and is using benthic algae as sentinels of environmental change. Using diatoms, soft-bodies algae, biochemical measurements and stable isotopes, she has found that while nutrient levels have been reduced by BMPs, algal assemblages still detect signs of stream deterioration. Algae look to be especially sensitive indicators, especially in detecting the effects agriculture has on aquatic food webs.

Nutritional Aquatic Ecology. Members of the lab are continuing to study the nutritional quality of food resources in aquatic ecosystems, and how they influence ecosystem function. PhD candidate Catharina Grubaugh is digging deeply into this question by examining how conditions in streams and in watersheds may affect the protein, fatty acid and nutrient contents of benthic algae. Based on her work, Catharina won the best student poster award at the Joint Aquatic Sciences national meeting in Portland, OR last year. She has recently completed large-scale experiments using the Experimental Lake Facility to examine how ecological stoichiometry and biochemical composition of phytoplankton change in response to nutrient manipulations.

Biodiversity of Springs. A new area of research is examining the biodiversity of algae in spring ecosystems, in collaboration with scientists at the University of Colorado, John Carroll University, Ohio University, and the NYBG. Accurate estimates of species-level diversity are critical for studies of biogeography, conservation, climate change, and water quality. Biodiversity estimates have long been based on morphology, in groups of organisms from ants to antelopes. More recently, estimates of species richness have been made using molecular techniques, particularly in microbial communities. This study aims to reconcile these approaches, to better understand biological diversity of algae, one of the most evolutionarily diverse and ubiquitous of all aquatic organisms on earth.
Graduate Student Spotlight

SARAH WHORLEY, PHD CANDIDATE

Sarah’s dissertation work has focused on studying how long-term spatial and temporal factors influence agricultural effects on the biochemistry of stream algae. Agricultural best management practices (BMPs) are used to reduce possible negative effects of agriculture on stream water quality. Biochemical properties, such as essential fatty acids are greatly affected by the presence of agriculture. While BMPs are capable of improving surface water quality from a public water supply perspective, an examination of stream algae has shown that there are still profound effects of agriculture on stream ecological structure and function. Her comprehensive assessment of multi-year and multi-season fatty acid profiles of stream algae can be used as a means to understand stream food webs under varying levels of agricultural stressors. A more complete understanding of how seasonal and inter-annual variation affects algal essential fatty acid profiles will provide future researchers with a quantitative assessment of aquatic food web quality, since these compounds are absolutely required for consumers’ development and reproduction. Sarah also recently submitted a manuscript for publication to the journal *Freshwater Biology* describing the effects of frequent flooding on algal fatty acid profiles in the Bronx River. She will be defending her dissertation this summer and is currently interviewing for faculty positions at regional universities. Sarah is an exceptional teacher who brings her enthusiasm for research into the classroom. We wish her the best in finding that school lucky enough to have her on staff!
Calder Summer Undergraduate Research Program

The Calder Summer Undergraduate Research (CSUR) program started in 1998, under the leadership of Dr. John Wehr who wanted to provide opportunities for highly motivated undergraduate students to engage in real science research under the guidance of faculty at Calder. The program was initially funded by the Calder Center budget and individual faculty grants. In 2002, the program became fully funded by an NSF-REU grant, which provided stipends for at least 10 undergraduates for 12-weeks (as of 2011 it became 10-weeks every other year) of a research experience.

If any program at Calder can be labeled fundamental to achieving the mission of the station, it is the CSUR program. The program has seen steady growth over the years and while we are limited to hosting only 10-12 students, applications for these coveted positions have grown from just 55 in 1999 to 227 in 2015. In all, some 150 studies have been conducted as part of the CSUR program through the years.

Of course, the program would be unsustainable without the corps of Department of Biological Sciences faculty members and grad students who serve as mentors each summer. While the cast has changed over the years, the commitment by everyone taking part has not.

Summer 2014 Although the summer of 2014 was an “off” year with respect to the amount of funding available to host the program (NSF provides support on alternate years – 2015 will be the final program in the current funding cycle), the 4 students that took part again proved how much can be accomplished with concerted effort over a 10 week period.

Three students were supported by Dr. Steve Franks’ NSF supplemental REU grant and their topics were:

- Jodie Crose (Oklahoma State University): Pollen limitation in *Penstemon digitalis*.
- Megan Bishop (Humboldt State University): Variation in flower types in ‘Clasping Venus Looking Glass’ (*Triodanis perfoliata*).
- Colette Berg (Fordham University): Baseline field work and Rosedale outreach: summer 2014

The fourth student, Patrick Alford worked with Dr. Evon Hekkala on Cryptic Sucker Species of the Northeast.

Dr. Steve Franks was invited to present the keynote address at the end of the year CSUR Symposium last August, and his talk on “Evolving in a climate of change” gave the audience a humorous but informative view of the problems we have in sharing science fact with the public.

Summer 2015 Applications are now being reviewed for the 2015 summer program and we anticipate accepting 10 nascent scientists. We have received our highest number of applications (227) since the inception of the program. Students accepted for the program this year will be notified no later than March 16th, and the program will run from June 8th through August 14th.

Future of the CSUR program. Drs. John Wehr and Jim Lewis, co-Principal Investigators (PIs) on the current grant, will not be seeking renewals this time around, opting to pass the PI duties along to another team after overseeing the program for 16 years and 13 years, respectively. However, we are lucky that both will continue to advise students as part of the program. In their place, Dr. Jason Munshi-South will pick up the torch, and with the help of other faculty, submit the next proposal as the PI.

While there is never a guarantee that any proposal will get funding, all are optimistic that the tradition of summer undergraduate research funding at Calder will continue.
2014 Outreach

April – Vassar College field trip to Calder. Drs. Mary Ellen Czesak (former Fordham graduate student) and Mark Schlessman brought their class for a visit to Calder. The day was spent touring the station with Alissa Perone and Mike Sekor, who then gave a presentation about his research at Calder. The group then spent the afternoon in the forest, looking at the gaps created by Hurricane Sandy and discussing the changes in the forest community.

May – Arthropod-Borne Disease Workshop. NY State and County Health Department workers attended a workshop to discuss surveillance programs and the current state of tick and mosquito-borne diseases in NY. Hosted by Dr. Rich Falco, over 60 attended (twice what was originally expected) and all commented that they’d like to have the next such meeting at Calder, as well.

July – Rosedale Center field day at Calder. Dr. Jenn Weber, with a grant from the Society for the Study of Evolution and matching funds from the LCC, brought 12 high school-age women to Calder for a day of hands-on science activities (lead by graduate students). These activities included sampling Calder Lake, collecting/identifying insects, and plants. The students also had a chance to talk with Calder faculty to learn more about working in the sciences. The day was a huge success!

In the Works

Science Nights at the Library – The LCC and the North Castle Library are planning a series of science talks for the local community, where faculty and students will present their research at the library. The first talk, to be given by Dr. Tom Daniels, is scheduled for Thursday, April 23rd at 6:30 pm. Any faculty or graduate student interested in speaking at future library talks, contact Alissa (aperrone@fordham.edu).

Project TRUE (Teens Researching Urban Ecology) – During the month of June (select Saturdays), the Project True team will be using the LCC as a training center for high school students to learn field research techniques, and to begin establishing their understanding of landscape heterogeneity and urban-rural concepts.

Friends of Calder – Taking our cue from other non-profit organizations that have “Friends of…“, organizations, like the North Castle Library, we’d like to form a group that will help bring attention to the Center and the programs it will offer, and as well as help raise funds to conduct additional programs that will not be funded by the university. More to come on this!

2014 Calder Center Graduate Student Research Grant Recipients

The LCC offers mini-grants each year to graduate students in support of their scientific investigations in any field of ecology. These grants are specifically for those projects that base their research at the Calder Center or utilize the facilities (laboratory and/or field) at the station. In 2014, the LCC was able to give 9 students a total of $6500 towards their research.

Beth Ansaldi (PhD Candidate) - Pollinator decline and reproductive assurance in Triodon perfoliata, an annual herb.

Chelsea Butcher (PhD Candidate) - Direct measures of gene flow in an urban environment: pollen movement in the wind-dispersed water hemp (Amaranthus tuberculatus) and the insect-dispersed white campion (Silene latifolia) in New York City.

Catharina Grubaugh (PhD Candidate) - Two experimental tests of the Growth Rate Hypothesis.

Justin Pool (PhD Candidate) - Pathogen Infection Potentially Leads to Higher Energy Reserves in Ixodes scapularis.

Rebecca Ravenelle (Master’s Candidate) - Do bat populations exposed to White-Nose Syndrome exhibit changes in summer torpor?

Michael Sekor (PhD Candidate) - Adaptive evolution of drought response traits in an introduced population of Brassica rapa.

Acer VanWallaendael (PhD Candidate) – Examining the community that replaces invasive species after anthropogenic removal.

Sarah Whorley (PhD Candidate) - Anthropogenic Effects on Stream Periphyton

Xiupeng Zhang (PhD Candidate) - Effects of Urbanization on Soil Carbon and Nitrogen Cycles in the Riparian Zone of Low-Order Watersheds in New York Metropolitan Area

LCC Staff

Thomas J. Daniels, Ph.D. – Academic Director
Alissa Perrone – Assistant Director
John Spaccarelli – Facilities Director
Petra DelValle – Business Administrator
Michael Lambros – Caretaker

Anyone interested in submitting an article or information for the newsletter should contact Alissa Perrone aperrone@fordham.edu.