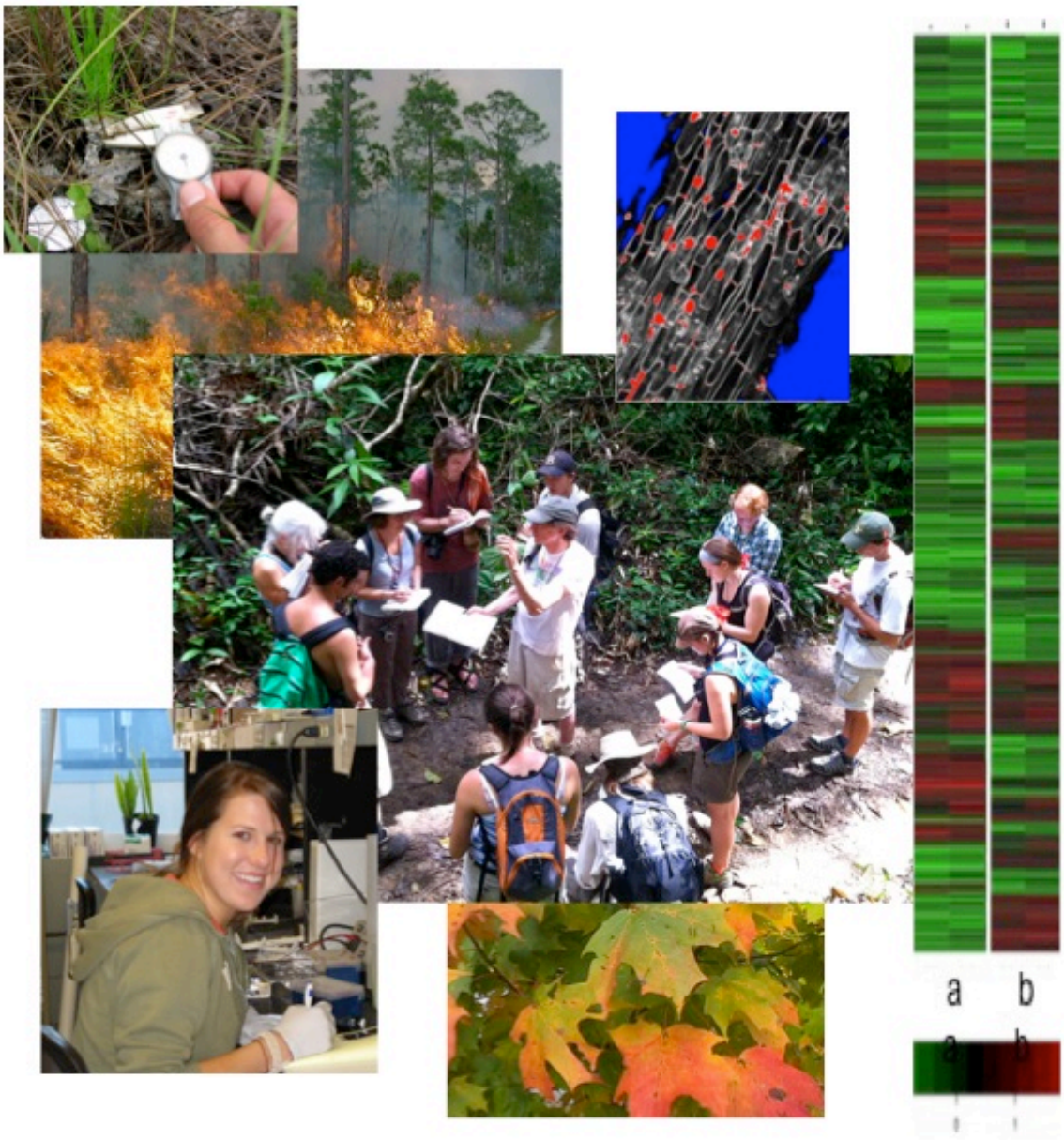
THE PLANT BIOLOGY DEPARTMENT'S SELF STUDY FOR ACADEMIC PROGRAM REVIEW

MARCH, 2013



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SECTION ONE: GENERAL INFORMATION

Name of the Program: Plant Biology

Program Type: B.S., B.A., M.S. Field Naturalist, M.S., Ph.D.

College in which the program is located:
College of Agriculture and Life Sciences (B.S., M.S., Ph.D.), College of Arts and Sciences (B.A.)

Name of the Chairperson of the program, David S. Barrington

Name of the Dean of the academic unit, Thomas Vogelmann

Names of faculty writing the report
David S. Barrington, Laura Almstead, Sarah Goodrich

Date March 26, 2013

SECTION TWO: INTRODUCTION/OVERVIEW

A Brief History. The Department of Plant Biology was inaugurated as the Department of Botany 120 years ago. It has the longest record of commitment to graduate education of any department at the University of Vermont, having awarded the first three Ph.D. degrees granted by this institution. For almost a century, the plant science needs of the university and state were largely determined by traditional agriculture. In Vermont, the focus has shifted in recent years to non-traditional agricultural innovation and sustainable management of natural resources. Environmental science and molecular biology have become pre-eminent. In light of these changes, teaching and research in basic plant biology are even more central to the mission of the University and the College than they were a century ago.

The late 1960s saw the inauguration of the first Biology major and introductory biology courses, which began our history of teaching with the Biology (then Zoology) Department. We continue to play a central role in the education of life-science majors, as we joined with Biology in developing the Integrated Biological Science major in 2005. In 1982, we inaugurated the Field Naturalist Program, leading to the unique and widely acclaimed two-year master's degree providing natural-science training for environmental professionals interested in careers in conservation. Ten years later, we welcomed members of the old Agricultural Biochemistry Department into our department, which set the stage for our continuing involvement in the teaching of undergraduate biochemistry. We changed our name from Botany to Plant Biology in 2006 to better represent our broad advocacy for all inquiry into the basic biology of plants.

In 2010, we, along with the Plant and Soil Science Department, moved into the newly constructed Jeffords Hall, designed and developed by the University of Vermont with two goals in mind: 1) stimulating the advance of plant-science research and teaching at the University and 2) expanding the facilities for education in the life sciences at the University. Now well established in Jeffords Hall, the two departments represent the two major aspects of plant science—basic and applied—important to the students, the state, and researchers interested in plants.

Present Status, an Abstract. Today, the Plant Biology Department comprises a faculty of 15 including 10 individuals with tenure-track appointments, supported by three excellent administrative staff (Appendices 2.2, 2.8). Collectively, we taught over 7300 student credit hours during 2011-12. Our effective student-to-teacher ratio is 23 to 1, reflecting the critical and central role we play in the teaching of biology to life-science majors as well as non-science students at the University of Vermont.

Goals and Mission of our graduate and undergraduate programs. The Department of Plant Biology has served as the intellectual hub for plant-related science at the University of Vermont for over a century. Our overarching mission is to increase knowledge of plants and provide education in basic plant biology as we engage in fundamental research that explores plants at all levels of organization. We pursue these goals in the molecular and cellular areas through research and education in plant genomics, plant cell biology and cell imaging, intercellular signaling, plant resistance to pathogens, plant development, and plant-microbe interactions. In the area encompassing plant ecology, biodiversity, and conservation, we explore and contribute insights into plant biodiversity in an environmental context, including maintenance of species richness, traits of invasive species, the ecological effects of climate change, and patterns and origins of plant diversity.

Basic plant biology is emerging as key to the future prosperity of the human population. In the same way that basic medical researchers seek clinical solutions to fundamental challenges in human health care, as plant biologists we seek to provide the insights that make it possible to feed, clothe, and shelter our ever-larger population in spite of intensifying environmental concerns, especially climate change. To paraphrase the organizers of the AAAS Plant Biology Symposium in February of 2013, fundamental discoveries and sophisticated research in the plant sciences will provide new technologies, novel strategies, and practical solutions or mitigations to some of the major global challenges that face future generations. Major problems plant biologists can address include natural-resource sustainability, food security, global climate change, renewable energy, and human health and well-being. Furthermore, the study of model systems in plant biology contributes significantly to our understanding of general biological phenomena such as metabolism, diversification, and extinction.

The Plant Biology Department, considering these national trends, is focused on achieving two fundamental goals:

First, to discover new insights into the basic biology of plants through our research from the molecular to ecosystem level.

Second, to educate as broad a community of undergraduate and graduate students as possible. These students are the people who will make decisions critical to the future of our species, which must be informed by our insights into plants, the source of all sustenance.

Unique and Distinguishing Characteristics. The Plant Biology Department provides the University of Vermont with teaching, research, and service in basic plant biology. It is the only basic plant biology unit in the State of Vermont, and it is one of only 22 such departments in the country (listed in Appendix 2.1).

Undergraduate Education. We offer the only undergraduate courses in basic plant biology at UVM, which are heavily enrolled by students seeking distribution courses in biology in general and plant biology in particular. These courses all take advantage of the rich diversity of plant life in the Champlain Valley and surrounding mountains. The resulting hands-on understanding provides insight into the relationship of plant function, plant diversity and distribution, and plant relationships to the natural community at large and to the abiotic environment. Enrollments in both the Biology (Appendix 3.2) and Plant Biology (Appendix 3.4) courses we teach are strong and expanding.

SERVICE TEACHING. As a central member of the community of educators involved in the Integrated Biological Science major (BISC) and the BioCore curriculum, we contribute substantively to the life-science education of the undergraduates here at the University of Vermont. In addition, because of our excellent faculty with expertise in molecular biology and biochemistry, we are partners with the Biochemistry and Chemistry Departments in the University's teaching of biochemistry to undergraduates. Our responsibility lies primarily with offering biochemistry as a service course to life-science majors in the College of Agriculture and Life Sciences and the College of Nursing and Health Sciences.

THE PLANT BIOLOGY MAJOR. We offer the same Plant Biology major to students in two colleges (B.A. in CAS and B.S. in CALS—Chart of the required curriculum for the major, Appendix 3.5). The major is grounded in a strong physical-sciences and mathematics preparation, with attention to developing strong analytic skills. Our two more specialized concentrations are

tailored to different career tracks for graduates, emphasizing two areas of specialization: 1) molecular biology and 2) ecological and evolutionary biology of plants. Undergraduate research experiences in the laboratory and the field are a high priority for us in advising our majors; these projects often lead to presentations at national meetings and peer-review publications. A unique experience often cited as life-changing by our undergraduate majors is the Plant Diversity in Tropical Plant Communities Field Trip offered every other year in Costa Rica.

Graduate Education (Graduate Program descriptions, see Appendix 4.1)

THE FIELD NATURALIST MASTER'S PROGRAM: We are proud to be the home of the Field Naturalist Program, one of the first professional master's degree programs established at UVM. Developed by Plant Biology Professor Emeritus Hub Vogelmann in the early 1980s, the Program stands apart in providing graduate-level natural science training for environmental professionals interested in careers in conservation, with emphasis on scientific integration, communication, and environmental problem-solving. Enrollment is limited to a small number of mature, highly talented individuals who have demonstrated sustained interest in field sciences.

THE PH.D. IN PLANT BIOLOGY/BOTANY: For over a century, plant biologists in our department have been training graduate students to become productive researchers and educators specializing in basic plant biology. Our thesis-based graduate program provides training in basic scientific research in diverse aspects of plant biology, including genetics, molecular and cell biology, plant physiology, systematics, evolution, and ecology. Most students in the thesis-based Plant Biology graduate program earn a Ph.D. Exceptional candidates seeking a M.S. are also accepted if they are likely to enhance the research program in a specific laboratory; these students sometimes move on to a Ph.D. program in the department. We continue to contribute highly trained professionals who are competitive in finding positions in plant science across the country (see Appendix 5.1). Our diverse expertise with particular focus on plants as impacted by climate change and atmospheric pollution, on the movement of sap in plants, and the interaction of plants with fungi and bacteria has put us in a position to offer unusually talented and experienced scientists to the profession.

The Research Program in the Department. The Plant Biology Department unites faculty with a broad array of research specialties. At the molecular level, our researchers are expert in exploring the biochemistry, molecular physiology, and development of plants. At the cell and organ levels, our faculty are engaged in understanding the physiology of plant processes with special attention to their chemistry and biophysics. At the organismal, community, and landscape levels, department members develop insights into the diversity and interactions both between plants and their abiotic environment and between plants and other members of their communities.

Our commitment to basic plant biology in many different contexts, molecular to ecological, stems from our belief that integration of our group of plant-centered scientists into a single community brings together an extraordinary array of perceptions of plants. This breadth of insight provides us a deep understanding of the plant world that is simply not possible when plant biologists are isolated in units with research agendas driven by specialty disciplines.

RESEARCH PROFILES FOR DEPARTMENT FACULTY

Barrington: the diversity and evolution of spore-dispersed plants, especially ferns and clubmosses, with special attention to how hybridization and polyploidy impact speciation

histories. Elucidation of the patterns of ecological and geographic isolation that lead to diversity in tropical montane regions.

Beckage: population and community dynamics including tree demography, maintenance of species richness, and the ecological effects of climate change. The emphasis is on the use of quantitative approaches to investigate the mechanisms structuring ecological systems, including statistical, analytical, and computer simulation models.

Delaney: the mechanisms by which plants protect themselves from disease and recover from disease once infected, especially focused on plant signal-transduction pathways in *Arabidopsis thaliana* and several of its pathogens using genetics, molecular biology, and biochemistry.

Harris: Environmental regulation of root architecture—especially the signaling networks within the plant that regulate nodule and/or lateral root formation and the integration of distinct environmental inputs to modulate nodulation.

Lintilhac: the interplay between cell-interior pressure and cell-wall stretching during cell enlargement. Biophysics of sap ascent in plants.

Molofsky: the elements of success of an invasive species, using the invasive reed canary grass, *Phalaris arundinacea*, as a model system. Emerging patterns include the importance of multiple introductions to increasing genetic diversity, natural selection of novel traits in regions where the grass is introduced, and the impact of successful invasives on the new ecosystem.

Preston: the genetic and genomic basis for evolution of plant reproductive traits in response to different abiotic and biotic environments, with an emphasis on flowering-time adaptations to cold seasonal environments and the co-evolution of flower form and pollination strategies.

Tierney: the mechanisms by which structural proteins within the plant cell wall determine aspects of cell form and function during plant development, through studying a family of *Arabidopsis* proline-rich cell wall proteins whose function is involved in tailoring the structure of the plant cell wall in root hairs and stomata.

UNIQUE RESOURCES. The Plant Biology Department houses two research facilities that are unique international resources.

The **Proctor Maple Research Center** (PMRC) in Underhill, Vermont caters to the needs of maple producers within the state and throughout the northeast. Issues of concern addressed by the research carried out at the PMRC include the introduction of exotic pests and pathogens to Northeastern forests, the effects of climate change on forest health (including air pollution, acid-rain, and regional warming trends), and the contamination and adulteration of maple syrup. Students regularly participate in the research at the center.

Director **Perkins**'s research is on physiological ecology of managed and unmanaged sugar maple forests, centering on elucidating the factors involved in maple-sap yield during the spring and ways to improve sap production through taphole/tubing sanitation practices and tubing vacuum transfer. This research has led to several changes in how maple syrup producers collect sap, and has also resulted in several patent applications and one licensed product, the Leader Check-Valve spout adapter.

Proctor Research Assistant Professor **van den Berg**'s research addresses maple syrup chemistry, contamination and adulteration, and maple physiology, focused on identifying the effects of sugaring equipment and technology on the chemistry and flavor of maple syrup, finding ways to clean maple evaporator pans using reduced amounts of hazardous chemicals, and

identifying and developing rapid tests for novel methods of syrup adulteration or sources of contamination.

The **Pringle Herbarium**, located in Torrey Hall on the UVM campus, serves as an archive for modern plant research relating to inquiries into the diversity of plant life. Director **Barrington** and other Pringle researchers are focused on 1) the origin of plant diversity and 2) the management of plant diversity in a conservation context. The scope of the Pringle's collection is worldwide, but the focus is on the American tropics and Vermont and its surrounding regions. The documentation of plant diversity with pressed, dried museum specimens is at the heart of the activity, but sharing of digital data and images of these collections has become a prominent goal.

As the largest resource of its kind in northern New England and the third largest in New England as a whole, this remarkable collection has assumed a central role in providing service to its extended research community. The Herbarium is a central player in the national push to present digital data and images of plant collections in an integrated portal on the web. Herbarium personnel have attracted substantial National Science Foundation and Mellon Foundation funding for this activity.

In addition to Barrington's herbarium-based research, the research activity at the Pringle includes Post-Doctoral Fellow **Sundue**'s research on the evolution and systematics of tropical ferns and lycophytes. His current focus is on an analysis of relationships within the grammitid ferns (900 species of morphologically diverse epiphytes) using molecular and morphological data, in collaboration with Tom Ranker and Cliff Morden (University of Hawaii, Manoa) and Barbara Parris (New Zealand).

LINKS WITH OTHER UNITS

Shared Undergraduate Service Courses: The Plant Biology Department is a central player in life-science education at the University of Vermont. **Most of our time, energy, and budget is dedicated to these activities.** We work together with faculty in the Biology Department to offer the heavily enrolled cross-college Integrated Biological Science major, and we provide half of the instructors to the introductory biology sequence (BioCore) that serves 10 different life science majors at UVM. Of the 15 total faculty in the Plant Biology Department, 10 are instructors in courses offered to these majors.

In addition, the Plant Biology Faculty makes a major commitment to other service teaching in the life sciences, including:

- in the cross-college Biochemistry Program
- in Biology 001 and 002—the service courses in laboratory biology for non-majors—both in the regular academic year and in the summer
- in Plant Biology courses—both with and without laboratories—for students across the university.

Joint Faculty Appointments and *Research Collaborations*:

Our Plant Molecular Biology group has a strong presence in the Cell and Molecular Biology (CMB) Program, which had as its first director Plant Biology Professor Emeritus Bud Etherton. **Mary Tierney** is, at the time of this report, director of the CMB program in its new formulation as an umbrella graduate program shared across four colleges (CALS, CAS, COM, and CEMS) at UVM. **Jeanne Harris, Terry Delaney,** and **Jill Preston** are also program

members. Faculty from our department host CMB graduate students in our research labs; currently there are two.

Among members of our ecology and systematics group, **Jeffrey Hughes** stands out for his joint appointment in the Rubenstein School, where he has a strong presence in undergraduate and graduate teaching activity.

Individual faculty members in our department are currently involved in the following collaborations with other faculty at UVM:

Brian Beckage is involved in the Vermont Complex Systems Center and the EPSCoR Research on Adaptation to Climate Change (RACC) project. The overarching questions at the center of the RACC project are, "how will the interaction of climate change and land use alter hydrological processes and nutrient transport from the landscape, internal processing, and eutrophic state within Lake Champlain?" and "what are the implications for adaptive management strategies?"

Jeanne Harris is currently collaborating with Alison Brody (Biology) and Taylor Ricketts (Gund Institute) on a project exploring the effects of native pollinators and mycorrhizae on reproductive success in high-bush blueberry, *Vaccinium corymbosum*.

Jane Molofsky has collaborated with Margaret Eppstein (Computer Science) and Charles Goodnight (Biology), and with Ph.D. candidate Ted Harte in the Gotelli lab (Biology). She plans to collaborate with Deborah Neher (Plant and Soil Science).

Tim Perkins and **Abby van den Berg** collaborate with Tim Wilmot (Extension) on maple sap flow, yield, and tree health; with Brian Beckage (Plant Biology) on effects of climate change on forests; with Thomas Vogelmann (Plant Biology) on new approaches for maple sap collection; with Michael Rosen (Engineering) on student engineering projects; and with Don Tobi (Entomology) on forest tree health.

Mary Tierney is an adjunct member of the MMG faculty; she teaches a course in Research Ethics with Marcus Thali, an MMG Department faculty member.

SERVICE AND OUTREACH

Our discipline naturally lends itself to an integrated approach that brings basic research activities to bear on contemporary problems. Four activities are prominent:

1. Our Proctor Maple Research Center caters to the needs of maple producers within the state and throughout the northeast. Issues of concern to the industry that we address include the introduction of exotic pests and pathogens to Northeastern forests, the effects of climate change on forest health (including air pollution, acid-rain, and regional warming trends), and the contamination and adulteration of maple syrup.
2. Our Field Naturalist students, as part of their training, provide landscape analysis to planning and resource management groups in local and regional organizations.
3. Three of us (Barrington, Delaney, and Paris) regularly provide plant identification and fungus identification assistance to the community. This service is particularly important to medical and veterinary personnel who seek identification of potential toxic plants and mushrooms and to agriculturalists who seek to identify invasive plants.
4. Our faculty's grants from the USDA Hatch monies have all been selected in a competitive process that emphasizes quality of science and relevance to Vermont agriculture.

SECTION THREE: STANDARDS AND CRITERIA

The extent to which the Plant Biology Program meets six standards as articulated in criteria set by the University. *University language in italic type.*

Standard I: The program has a clear and publicly stated purpose that contributes to the mission of the University.

Criterion 1: The program ***contributes to the mission*** *of the University, the College/School, and department by:*

a) Having an active strategic plan that is aligned with the vision, mission, and strategic plan of the University.

The University's mission is "to create, evaluate, share, and apply knowledge and to prepare students to be accountable leaders who will bring to their work dedication to the global community, a grasp of complexity, effective problem-solving and communication skills, and an enduring commitment to learning and ethical conduct." The Department Vision Document developed in 2010 by the chair in collaboration with the faculty details our current five-year strategic plan (Appendix 1). The goals articulated there, which are in concert with the University mission and were shared with the College of Agriculture and Life Sciences, are manifest in this Self-Study Report.

b) Supporting research and creative activities that generate new knowledge and understanding; and enrich the intellectual environment for students, staff, and faculty

We are actively engaged in an array of research activities, as detailed in Section Two. Of particular importance is the development of our majors through active participation in undergraduate research (see Appendix 2.6). Thirty-nine students have participated in the past five years. We have shared this research in three peer-reviewed publications including the undergraduates and three undergraduate student presentations at national meetings over the past five years.

c) Engaging in relevant application of new knowledge to contemporary problems through teaching, scholarship, creative activities, and service and outreach.

Department members are constantly bringing current knowledge gained through research activities and collaborations to the broad array of courses in which we teach. These activities are detailed in the part of Section Two that addresses service and outreach.

d) Preparing students for productive, responsible, and creative lives.

Central to this criterion is our training of undergraduate and graduate students in the skills necessary to conduct high-quality scientific research. Through one-on-one interactions, we instruct our students in experimental design and laboratory procedures (including laboratory safety) and mentor the continuing development of these skills as they progress through their degrees. We also work with our students to train them in writing research proposals for their work in the field and laboratory. Many of our students share their research at the University of Vermont Research Conferences as well as at meetings of national and regional societies.

On a second front, we are fortunate to be part of a network of employers from across the country who regularly seek undergraduate students for summer internships and employment. We regularly communicate these to the undergraduates and maintain a list of opportunities on our department webpage. A number of our majors take advantage of these opportunities.

e) Promoting global perspective and appreciation of cultural and intellectual diversity.

Our Plant Diversity in Tropical Plant Communities Field Trip offered every other year in Costa

Rica provides our majors and minors a rich experience of a very different culture through substantial interaction with an array of Costa Ricans including the complex mix of intact ethnic groups, subsistence farmers, and large middle class that make up the country's population.

f) Fostering an enduring commitment to learning.

Plant Biology is inherently oriented to learning through the discovery and sharing of new knowledge. Our activities as a faculty are all oriented to developing this perception and approach to the natural world in our students.

g) Fostering the qualities of integrity, accountability, and leadership.

We provide strong education in these ethical matters as an ordinary part of the education we deliver in our broad array of service courses, as students must exhibit these traits to succeed in the courses. Undergraduate and graduate research students develop an understanding of personal responsibility and scientific ethics. These students participate actively in lab meetings and train younger students in the lab, leading to development of leadership skills. Finally, we teach one of the popular graduate courses in scientific ethics, collaborating with Microbiology and Molecular Genetics.

Standard II: The program is of high quality

*Criterion 2: The **program quality** is evidenced by:*

a) Faculty - The Program faculty are qualified to teach the curriculum, as indicated by earned academic degrees and professional certifications. The program invests in the professional and scholarly development of its faculty, including the mentoring and guidance of junior faculty members through the RPT process.

All faculty in the Department have Ph.D.s, and 13 of 15 have post-doctoral fellowship training in their background. Scholarly development is a high priority for the Department. Faculty benefit from our substantial investment in research infrastructure and shared research equipment, commitment to providing opportunities for students to join research laboratories, and distribution of research-incentive funds. Junior faculty are mentored as they develop their research program by a combination of advice from the chair, interaction with a research mentor, and informal contact with collaborators and more senior faculty in and outside the department. (Curricula vitae for all faculty: appendix 2.3).

b) Resources - The program has adequate faculty, support staff, library resources, equipment, and facilities to accomplish its purpose.

Though we are taking full advantage of our present resources, the Department needs an increase in tenure-track faculty to fulfill its mission of providing expertise in basic plant biology to the University and to the State. Despite level enrollment at UVM, the number of life-science majors has increased significantly, resulting in substantially higher teaching loads for our faculty (see Appendix 2.2, 3.2). In contrast, ours is the smallest Plant Biology Department in the set of such departments we surveyed nationally (details, Appendix 2.1). At our current size, our ability to provide quality education in life science and plant biology is suboptimal.

c) Reputation – The program is well regarded, as evidenced by external rankings and assessments by external reviewers of students, faculty, resources, and productivity. The program attracts and retains excellent students as evidenced by admission qualifications, performance on standardized examinations, etc.

Plant Biology programs are not nationally accredited, nor are they ranked, so we do not have external benchmarks with which to compare ourselves. However, our enrollment

data (Appendix 3.3) give some insight into the quality of our Plant biology major. Typically, all UVM applicants interested in Plant Biology meet UVM requirements and are accepted. Our yield rate over the past six years has been an average of 43.8%. The combined SAT score of these students, on the average, is 1814, which is at or just above the 50th percentile for students admitted to the University in general. We did not assemble data on the larger body of BISC majors, but they are presumably roughly equivalent.

d) Faculty performance – Faculty demonstrate effectiveness in teaching and student advising, scholarship, and service, as evidenced by evaluations, awards, honors, grants, research contributions, publications, citations, and service endeavors.

Teaching --- 46% of the teaching faculty have won teaching awards. Five faculty have College-level Carrigan teaching awards (Barrington, Harris, Paris, Stratton, Vogelmann) and two have won the Kroepsch-Maurice University Teaching Award (Barrington and Hughes).

Research --- Lintilhac received the Botanical Society of America Century Award in 2006 for ongoing research and contributions to the plant sciences; Perkins, four different awards for Sugar Maple Research from national and regional associations; Tierney received the American Society of Plant Biology Fellows award in 2009. Barrington and Paris shared the Fernald Award for best paper in the Journal Rhodora, 2007.

Grants: In this review period, the faculty have averaged $815,000 per year in external funding from an average of nine active extramural grants in the department. Total grants for the five years of the review were just over $4 million (Appendix 2.5).

Publications: From 2007 to the present, department faculty have published in a total of 85 peer-review journals. Since 2008, department faculty research has been cited 6181 times (Appendix 2.4).

Service endeavors: The faculty's diverse array of service activities (Appendix 2.7) include service as associate editors of journals, to professional societies and peer-review journals, on national granting-agency review panels, to the community, and professional service providing advice relating to plant biology.

e) Student performance – Students demonstrate mastery of knowledge by means of formative and summative assessments, performance in the field, professional achievements, and performance on professional licensure exams. Program graduates succeed in finding jobs and progress well in their chosen careers; alumni are satisfied with the program. Undergraduate and graduate students produce creative works, publications, and receive grant awards. Graduate students are awarded post-doctoral fellowships.

Our survey of alumni (n=66 including 30 graduate-degree recipients) for this report (Appendix 5.1) revealed patterns of successful career development. Of responding Bachelor's degree students, 44% are employed as laboratory or field technicians and scientists without advanced degrees, 22% are enrolled in Ph.D. programs, 8% are in M.S. programs, 17% are in an enterprise related to Plant Biology, and 8% are in non-related careers. M.S. recipients include 19% Ph.D. candidates, 44% scientists and technicians, and 8% in non-science positions, whereas the M.S. (Field Naturalist) group includes 57% in environmental non-profits and environmental education; the remainder includes a naturalist/author and an environmental scientist. Among our responding Ph.D. recipients, 57% are employed as college-level academics, 29% are research associates, and one is Biology Dept. chair at a charter school.

Standard III: There is demand for the program.

Criterion 3. There is ***demand*** *for the program as evidenced by:*

a) external demand based on local, regional, national, and global trends and forecasts for persons with particular types and level of education. Included in the following response:

b) internal demand as reflected by both student enrollment in the program and the scope of service teaching for students from other programs.

At the undergraduate level, the enrollment figures reveal that there is a huge and growing demand for life-science education, in which we are deeply involved (National, Appendix 3.1; UVM, Appendix 3.2). Courses in Plant Biology offered both for non-majors and majors have stable and often increasing enrollments (Appendix 3.4). We provide specialized training in Plant Biology for a small subset of the life-science students with particular interest in the basic biology of plants (student profiles Appendix 3.3). As evidenced by previous graduates, many of these students are likely to continue on to advanced degrees. Those who do not are likely to enter the workforce in a life sciences-related capacity (see Appendix 5.1).

At the graduate level we attract, enroll, and graduate strong candidates for all our graduate degree programs (see Appendix 4.3) in keeping with national trends (Appendix 4.2).

Standard IV: The program provides graduates who contribute to social institutions.

Criterion 4: ***Societal need*** *for the program is reflected by:*

a) evidence for private, public and/or not-for-profit sector needs for persons with particular knowledge, skills, attitudes, and values required to make social institutions work.

b) evidence of the need at national, state, and local levels for persons who can be informed and responsible citizens.

The jobs that our graduates find lie in the societally critical areas relating to natural-resource sustainability, food security, global climate change, renewable energy, and human health. The array of jobs is portrayed in this section under Standard IIe and in Appendix 5.1. Evidence for our relevance to social institutions lies in the array of positions that our graduates have won, including employment at state and federal agencies, conservation organizations, research labs, and environmental education centers. We also regularly have graduates go on to Peace Corps assignments, where the unique skills gained through their training in our department have often led to their assignment to plant-related positions in provincial and national governments.

Standard V: The program uses an identified plan for systematic evaluation and assessment of goals and purposes.

Criterion 5: The program has ***quality control processes*** *that are used:*

a) to evaluate how well the program is achieving its strategic goals.

We review our strategic plan (Appendix 1.1) on a regular basis and make decisions as a faculty on how to adjust our activities to improve our program.

b) to monitor on an ongoing basis the design and delivery of the curriculum/curricula as informed by student outcomes.

We use standard college teaching evaluations to provide insight into our effectiveness in the classroom (most recent data, Appendix 3.6).

c) for ongoing evaluation of student outcomes. This includes but is not limited to formative and summative assessments of student learning. As appropriate, other outcomes should include academic or professional achievements; job placement and career progression; alumni

satisfaction with the program; employer satisfaction with program graduates' performance; graduates' performance on professional licensure exams; post-doctoral placement of graduate students; publications, grant awards, and creative works of undergraduate and graduate students, etc.

Administrative staff regularly collect information from faculty and from Alumni Relations about our graduates. These data are maintained in a spreadsheet that is regularly updated and used to improve offerings to current students. We are able to track current employer and job title from this source, which allows us to assess career advancement. There is substantial loyalty to our program; we regularly have visits from past students eager to be in touch. We also maintain a current address list for all graduates, who receive a newsletter from the department from time to time. An abstract of data from these sources is presented in Appendix 5.1. Alumni report high satisfaction with the department's programs (Appendix 5.2), but note that an increased sense of community among the students in the department is worth pursuing.

d) to monitor the quality of student advising.

We use standard college advising evaluations to monitor our advising quality. Quality of advising in the Department, as in the College, is excellent as quantitatively represented by these evaluations (Appendix 3.7). Recently, we volunteered to add to our advising responsibility by taking some of the Biology majors in CAS, where the advising load is unusually high. For the Plant Biology majors, we are in the unusual position of being able to provide customized, one-on-one advice on a regular basis. Students deeply appreciate this approach to career support.

e) to determine needed changes in tactics, policies, curriculum, and course contents.

This activity is a regular part of the discussions at our bi-weekly faculty meetings.

f) to implement the self-determined changes in a timely manner.

Here we can do better.

Standard VI: The program accomplishes effectively its educational and related purposes

*Criterion 6: The **effectiveness** of the program is reflected by:*

a) improvements in the design and delivery of the curriculum based on assessments of new knowledge in the discipline, student outcomes, societal need and demand for the program.

Department members are among the leaders in the College and University in the development of new teaching strategies, especially those related to improving teaching effectiveness in large-classroom situations typical of introductory life-science courses. These innovations have been specifically noted in several of the recent teaching awards to our faculty. One of our faculty (Bermingham) has been sought after as a contributor to Center for Teaching and Learning workshops because of her success with innovative large-classroom techniques.

b) measures to maintain or improve high quality student advising.

Our data suggest that we deliver very high quality student advising (see Appendix 3.7).

c) programmatic features that foster an appreciation of cultural and intellectual diversity.

In our teaching, we have several courses that relate to cultural and intellectual diversity. Prominent is our large service course Plant Biology 006 (The Green World), which addresses the way in which diverse cultures across the world incorporate plants into their cultures, including religious, medicinal, culinary, and household uses and implications for the health and sociology of the cultures. Our Costa Rica Tropical Plant Systematics Field Trip puts students into an array of contacts with a diversity of cultures in the country, including farmers and intact indigenous cultures. In the Department, our diverse international graduate student and post-

doctoral fellow community brings cultural richness to the undergraduate experience. Our undergraduates commonly choose international experiences for their junior year abroad and for their first job or internship after graduating.

d) linkages with other programs, including articulation agreements, co-sponsored academic majors, minors, or concentrations, joint appointments of faculty members, cross-listed courses, student internships, practica, or field-based projects with organizations outside the University, resources shared with other academic units, dual degrees, and 3-2, 4-1 or other undergraduate + graduate degree arrangements.

Our extensive linkages with Biology, Biochemistry, the environmental programs here at the University, and with external groups are presented in Section Two.

SECTION FOUR: ANALYSIS

The Plant Biology Department at the University of Vermont is the only department of its kind in New England and one of only 22 departments specializing in basic plant biology in the country. Our unique role as a department is our advocacy of basic plant science as a wise strategic investment in the future. Our service courses in Plant Biology provide a substantial working knowledge of plant diversity and the relevance of plants to human culture to students from across the University. We train our undergraduates who seek to join our discipline with a well-rounded undergraduate curriculum. Our best students finish their Plant Biology degrees with substantial individual mentoring and fully prepared to join a research laboratory or win entry into competitive graduate programs with the training we provide. Though the number of plant-biology undergraduate and graduate degrees we award is small, the relevance of these degrees to societal priorities is evidenced in the students' success in finding employment and pursuing advanced degrees.

We have been most productive as researchers in the areas of ecology, physiological ecology, and systematics. The inclusion in the Department of separate research facilities dedicated to physiological ecology (of maples at the Proctor Maple Research Center) and systematics (the Pringle Herbarium) enhances our ability to contribute in these areas. At the same time these well-known facilities are destinations for researchers from other institutions throughout the region who seek to take advantage of the expertise and resources they provide. We see plant molecular biology and developmental biology as significant areas in which we can continue to develop strength, especially as evidenced by our recent tenure-track hire of Jill Preston, whose focus is the evolution of developmental pathways. Funding has been especially difficult to assemble in the area of plant molecular biology, and we recognize the need to explore new avenues to research funding in this critical area of plant-related research.

The Plant Biology Department makes a major commitment of personnel and resources to the education of majors and non-majors seeking biology courses at the University of Vermont. A major milestone since our last review in our contribution to teaching was joining the new, University-wide Integrated Biological Science major (BISC) as principals in 2005. The dramatic increase in the number of life-science majors here at UVM, as well as nationally, has led to our investing increased resources, especially personnel, into the teaching of the BioCore curriculum in partnership with the Biology Department. Our activity here is central to the needs of all life-science majors on campus.

Despite the increased number of students, we have stayed true to our commitment to quality. Plant Biology faculty are among the pacesetters in educational innovation at the

University of Vermont, and they have won an impressive set of University and College teaching awards.

A key part of our mission is graduate education, with a focus on the preparation of Ph.D. scientists in plant biology. At the same time, our highly competitive Field Naturalist Program attracts master's candidates with the strongest academic credentials. As part of their training, our graduate students also provide a vital teaching function to laboratory education in life sciences, especially biology and plant biology, at UVM.

Significant changes to our graduate program since the last review are:

1) the change of focus to Ph.D. education
2) the change from supporting grad students mostly on teaching fellowships to funding them after the first year or two on extramural dollars
3) the introduction of lab rotations for our Ph.D. candidates

SECTION FIVE: PROSPECTIVE

For more than 100 years, Plant Biology has been central to life-science studies at the University of Vermont. The Plant Biology Department is a community of scholars focused on the full array of basic plant sciences. Our research mission is integrative: we provide improved understanding of plants across all levels of organization, from the molecular to the landscape, with relevance to the environment, to food systems, and to complex systems. As Vermont moves into the 21st century plant biology will become ever more important as world agricultural resources are impacted by climate change and environmental degradation. With the increased evidence on University-State partnerships, the University of Vermont will be called upon to provide expertise relating to local as well as global issues. Plant Biology has critical expertise relevant to central issues such as environmental change and food security. As the UVM department specializing in the biology of plants, we continue to embrace a vision that focuses on basic research, seeking to provide new insights into fundamental plant function, interactions between plants and the rapidly changing world environment, and into the growth processes that yield new plant organs. We will continue to focus on plant ecology, evolution, and biodiversity as well as plant genetics, physiology, and development.

Plant biology is relevant to all of the greatest challenges faced by our human species (e.g., protecting the environment, feeding our increasing population). Basic plant-biology research is the way to move forward to long-term solutions to these challenges. Climate change directly impacts food security, and it is through research programs like ours on plant function, plant communities, and plant diversity relating to climate change that we will find solutions. At the university level, our research mission is relevant to two spires identified as part of the current UVM trans-disciplinary research initiative (TRI), Complex Systems and Food Systems. Further, our focus on plants in relation to the environment (e.g. global climate change, invasive species, biodiversity conservation) makes us key players in UVM's current "Envisioning Environment" initiative.

We believe that the choice of faculty specialties during hires is at the heart of defining the destiny and enabling the success of a department. Two concepts for research areas emerged from our 2010 discussion that led to the current five-year plan (Appendix 1.1), the first in molecular plant development in an evolutionary context (which we realized in hiring Jill Preston) and the second in ecological genomics. In the 2010 vision statement, we also noted the appeal of a new tenure-track hire with a specialty in the biochemistry of secondary compounds, which would be

relevant to the ecology of interactions between plants and their pollinators, herbivores, and dispersers. In the coming months, we will come to closure on this choice of specialties and move to hire our next tenure-track faculty member.

The Pringle Herbarium and the Proctor Maple Research Center both have clear agendas for the future. The Pringle Herbarium, having won new space through recognition by the University of the value and relevance of its mission, will continue to expand the sharing of digital versions of the collections online and develop the comprehensive reference library at the herbarium, supported by grants for the development of these activities and substantial endowments. We envision an expanded mission for the Proctor Center, casting it as a mid-latitude center for climate-change research and teaching, especially the teaching of summer-semester courses—in tune with the University's interest in broader summer academics.

In the fall of 2012 we held two departmental faculty retreats, one dedicated to research and the other to teaching in the Department. These were valuable exercises, rich in new ideas for teaching and effective in sharing current research goals and activities across the whole Department. Particularly prominent was our interest in promoting the success of our majors. A clear set of ideas came out of the teaching retreat:

- to offer more 200-level courses. We should aspire to offer an array of 200-level courses each semester in addition to the special topics courses that we currently offer. However in this area we are constrained by our huge current investment of faculty in service teaching. Broadening the pool of faculty who teach introductory biology by including other life-science departments that rely on those courses could free us to offer more advanced plant biology options.
- to include a capstone experience for all undergraduates, who would choose from 1) a semester or two of undergraduate research 2) an internship or other form of experiential learning, or 3) a seminar-style course in which the student assumes responsibility for some of the course content and delivery
- to provide opportunities for students to develop a sense of community, with their peers and with their professors, including field trips, clubs, potlucks, and informal gatherings

In our teaching retreat, we also discussed the at-once rewarding and challenging increase in life-science enrollments in both service and majors courses; the contrast with our declining tenure-track faculty numbers is stark (Chart, Appendix 2.2). The dedication of the new Jeffords Hall in 2010 provided a much-needed boost to the physical space necessary to deliver quality life-science education to undergraduates. Because of increasing enrollments, the new laboratory facilities are already near capacity. We have constantly been called on to offer more sections in our introductory courses in the BioCore curriculum. The temporary solution has been to hire additional lecturers with the knowledge that securing the necessary tenure-track positions takes time. We have been fortunate to attract two lecturers with extraordinary talent (Almstead and Bermingham), but the long-term solution will require the addition of permanent tenure-track faculty.

Graduate education, and especially the training of Ph.D. students, will remain a defining part of our mission. The University of Vermont is unusual in dedicating itself to maintaining and developing expertise in plant biology, which leads us to be prominent among universities offering Ph.D.s in basic plant biology. The work of these students in our research laboratories facilitates the success of our faculty researchers. Additionally, the contribution of graduate students to the teaching of plant biology and biology labs to our undergraduates is critically important both as a teaching resource and as an integral part of their training. Thus, the integrated research and

teaching activities of the graduate students are vital to plant sciences in particular and life sciences in general at the University of Vermont. The development of integrated graduate programs with other units will enhance the attractiveness of our graduate programs to high-quality students. We have begun discussions of developing an umbrella program in ecology and evolutionary biology with units likely to be interested in this approach. The group has begun by committing to host a shared web portal for the attraction of undergraduate and graduate students to our programs in this area.

The Plant Biology Department plays a vital role in life-science education and research at the University of Vermont. We are fortunate to have excellent new facilities in which to carry out our vision. The specific goals we have for the near future, as developed in this document are:

1. the expansion of the tenure-track faculty with the goal of meeting expanding life-science teaching responsibilities while promoting fundamental research on plants at the University;
2. the enhancement of the program for the undergraduate majors through greater attention to a capstone experience, the undergraduate community, and expanded 200-level offerings; and
3. the support of the current research faculty through the exploration of alternative sources for research funding.

SECTION SIX: APPENDICES

APPENDICES SECTION 1: DEPARTMENT VISION

1.1 Five-year vision statement

A vision for teaching, research and graduate education in the Plant Biology Department in the context of the likely University environment in the coming five years

David Barrington

Feb 8, 2010

1. Introduction

Plant biology has for more than 100 years been central to natural science studies at the University of Vermont. As Vermont moves into the 21st century the plant sciences will become increasingly important as world agricultural resources are impacted by climate change and environmental degradation. The University of Vermont will increasingly be called upon to provide expertise relating to local as well as global issues; Plant Biology has critical expertise relevant to central issues such as environmental change and food security. Fortunately, our history places us in a strong position.

The Plant Biology Department is a community of scholars focused on the full array of basic plant sciences. Our research mission is integrative; we provide improved understanding of plants across all levels of organization from the molecular to the landscape, with relevance to the environment, to food systems, and to complex systems. Our approach is to focus on basic research; we seek to provide new insights into basic plant function, interactions between plants and the rapidly changing world environment, and into the growth processes that yield new plant organs. We have long been known for our consistently strong level of external funding, the success of our undergraduate and graduate degree recipients, and the quality of our research publications. Our history and reputation in mind, we will continue to focus on:

1) plant ecology, evolution, and biodiversity
   a. climate change
   b. ecology of invasive and endangered species
   c. genetic diversity and origin of biology diversity, conservation biology of plants

2) plant genetics, biochemistry, and development
   d. genetic systems underlying plant development.
   e. basic plant functions (plant physiology) including sun-gathering, gas exchange, sap flow, and soil-plant interactions
   f. plant growth and development

These pursuits are relevant to near-term applications in:
   a. the maple industry,
   b. disease resistance,
   c. crop improvement, and
   d. non-timber forest products

Our award-winning instructors (Barrington, Harris, Hughes, Paris, and Vogelmann all have college and/or university awards) offer an array of courses in service to a diversity of university programs as well as to our own majors, most notably in our central role in BIOCORE, the integrated biology major. A key part of our mission is graduate education, with a focus on the preparation of Ph.D. scientists in plant biology. At the same time, our highly competitive field naturalist program attracts master's candidates with the highest academic credentials. Our graduate students provide a vital teaching function to laboratory education in life sciences, especially biology and plant biology, at UVM. Also prominent is the training of undergraduates in our research labs—these students have had remarkable success in developing careers in plant biology.

Significantly, students finding a home in our department either as undergraduates or as graduate students leave with much more than a well-developed factual basis for a career. They leave with a well-developed understanding of the frontiers of the science of plant biology and substantial training in how to design and conduct research. We continue a long tradition of placing both undergraduates and graduates in high-quality positions and graduate programs. Recent undergraduates and master's recipients have gone on to do graduate work at Cornell, Duke, the New York Botanical Garden, the Rancho Santa Ana Botanical Garden, the University of Maine, and the University of Massachusetts. The graduating Field Naturalists places program graduates across the country in competitive, high-impact positions

2. Plant Biology Department Research Areas

In overview, the Plant Biology Department seeks to provide new insights into plants by addressing two broad focus areas: 1) plant ecology, evolution, and biodiversity and 2) plant genetics, biochemistry, and development. Our research expertise is detailed in Table 1.

Our research mission is relevant to two spires identified as part of the current UVM trans-disciplinary research initiative (TRI), 1) Complex Systems and 2) Food Systems. Although not a spire, the concept of the University of Vermont as "The Environmental University" remains prominent, and we see ourselves as deeply invested in research related to the environment.

Table 1. PLANT BIOLOGY RESEARCH AREAS AND RESEARCHERS		
Research Discipline	Relevance to UVM Focus Areas	Research Faculty (**bold = tenure-track**)
Ecology	Complex systems The environment	**Beckage**, Bermingham, **Molofsky**, Perkins, van den Berg
Evolution and Systematics	Complex systems The environment	**Barrington**
Physiology	Complex systems Food systems The environment	**Harris**, Lintilhac, Perkins, **Tierney**, van den Berg, **Vogelmann**
Plant-Microbe Interactions	Complex systems Food systems The environment	**Delaney, Harris**
Biophysics and Biochemistry	Complex systems Food systems	Lintilhac, **Vogelmann**
Genetics	Complex systems Food systems The environment	**Barrington, Delaney, Harris, Molofsky, Tierney**
Cell and Molecular Biology	Food systems	**Delaney, Harris, Tierney**
Development	Complex systems	**Harris**, Lintilhac

3. Unique Research Resources in the Plant Biology Department

The Plant Biology Department is fortunate to have two research facilities with a rich history of productive activity relevant both locally in Vermont and internationally.
The Pringle Herbarium is the University's dried plant collection for research on biodiversity and evolution; the first collections were assembled in the 1840s by University president Joseph Torrey. The collection currently includes over 270,000 sheets of mounted and accessioned plants; it is the third largest herbarium in New England. The plants gathered by Cyrus Pringle on his pioneering explorations in northern Latin America and southwestern United States are the centerpiece of the collection. The current emphasis on Latin American systematics and plant distribution, as well as research cooperation with Latin American herbaria, derive from this early emphasis of Pringle's. At the same time, the herbarium is the definitive repository for the flora of Vermont, including the largest Vermont flora collection in the world. Vermont's climatic and edaphic diversity has interested a community of plant floristicians and collectors for well over a century; the herbarium houses all of the major collections from the state. Recent activity has expanded the older collections of Pringle and others to build an extensive representation of the North American flora, and the institution has significant collections representing every continent

except Antarctica. Current activities, including sharing digital versions of the collections online and developing the unusually strong reference library at the herbarium, are supported by grants for the development of these activities and substantial endowments.

The Proctor Maple Research Center is a Field Research Station in Underhill, Vermont. Basic and applied maple research at the University of Vermont (UVM) began in the early 1890s. The Center was established in 1946 with the donation of the former Harvey Farm in Underhill Center to the University of Vermont by Governor Mortimer Proctor. Research has centered on the sugar maple tree and its products--sap and syrup. Funding for research comes from Federal, State, and private sources. Much of the applied research has provided new and/or improved techniques for efficient sap collection and evaporation systems and for improvement of maple syrup quality while basic research has contributed to an improved understanding of the physiology and towards the continued health of sugar maple trees. We envision an expanded mission for the Proctor Center, casting it as a mid-latitude center for climate-change research and teaching, especially the teaching of summer-institute courses.

4. A Vision for the Research Community in the Department

The greatest challenges now facing our own species all relate to plants: basic plant biology research is the way to move forward to long-term solutions to these challenges. Climate change directly impacts food security, and it is through research programs like ours on plant function, plant communities, and plant diversity relating to climate change that we will find solutions.

The response of plant communities and their species to environmental change is the focus of an array of research activity in the department. The response of plants to climate change itself is the focus of Beckage's well-publicized research. Though new uses for plants are discovered each day, the documented loss of plant diversity is alarming. Barrington's research on the evolutionary processes in centers of biodiversity, and Molofsky's work on the ecological impact of invasive species address this critical loss of diversity. Bermingham also addresses the environmental factors that impinge on species at risk.

A group in our department are pursuing research agendas that relate to the complex signaling networks in plants that ultimately relate to environmental variation: Tierney on interactions at stomata and root hair, Harris on signaling in the nitrate-manufacturing root nodule, and Delaney on the response to pathogens. At the same time, Perkins and van den Berg are focusing on the physiology of Vermont's emblematic sugar maple with work on sap quality and improving sap production, as well as exploration of the reasons for fall coloration of leaves.

Also active in our department are researchers exploring the way plants receive and use light (Vogelmann) and the structural constraints on plant growth (Lintilhac).

The Plant Biology Department has the goal of attracting and nurturing new faculty engaged in cutting-edge research in our recently inaugurated plant-sciences building, Jeffords Hall. Our proposed hires all target key research areas that will add to the rich array of scientific inquiry already under way in the department. Discussions over the past five years have identified the best research directions to add to our department, given our understanding of the frontiers of basic plant biology research, our overall vision of an integrated basic plant biology group, and the strengths of the faculty currently conducting research in our department. Two concepts for research areas emerged from this discussion, the first in molecular plant development in an evolutionary context (plant evo-devo) and the second in ecological genomics.

Evo devo is cutting edge—this young discipline will be the basis for understanding functional traits that relate to food systems and climate mitigation. For instance, evo devo researchers with expertise in the ecological significance of such characters as timing of flowering and fruiting are likely to contribute to securing the food supply through providing insights into the impact of climate change on flowering and fruiting of agricultural plant species. The evo-devo search is currently underway, having been approved under the rubric of the TRI spire focused on complex systems. Integral to research in plant molecular development is an understanding of the signaling networks that govern plant development; these signaling networks have emergent properties not discernible from consideration of individual proteins, hence the relevance to complex systems.

It is increasingly clear that understanding environmental change will require a systems approach focusing on relationships between aspects of the natural world that have not previously been compared. An emerging emphasis is on the integration of genomics with communities and ecosystem dynamics in a systems approach called ecological genomics. Thus, our ecology search will target cutting-edge research in ecological genomics, with a focus on the emergent properties of higher ecological levels of organization (like communities and ecosystems) as constrained by the genetic attributes of the individual components. In this work, the principles of population and quantitative genetics are brought to bear on the study of complex communities and ecosystems in an evolutionary framework. The goal is to understand the genetic basis of ecosystem processes. Inherently relevant to the complex systems spire and to the environment, this sort of approach to an ecology hire is timely and relevant to the current UVM vision. We expect that the ecological genomics faculty member will find a research community that includes our current ecologists (whose expertise is in invasive species and climate change) with our molecular biologists interested in the interface between organisms and their environment.

Very recently, our plant biochemist (Currier) has announced his retirement at the end of academic year 2010-2011; we are moving to define the most appropriate research direction for his successor, a critical hire because of the department's long-term commitment to the teaching of service courses in the cross-college biochemistry program. A possible specialty for this person is the biochemistry of secondary compounds, which would be relevant to the ecology of interactions between plants and their pollinators, herbivores, and dispersers. A faculty member exploring the biochemical nature of secondary compounds as they relate to ecological functions necessarily adopts a systems approach to research; at the same time biochemistry of pollinator attraction and herbivore deterrence are manifestly relevant to agriculture in a changing climate.

5. Our Teaching Mission and the Balance of Lecturers (dedicated instructors) and Tenure-Track Professors (instructor-researchers)

The Plant Biology Department has a central role in the teaching of general biology at the University of Vermont, both to students in the integrated biology major (BIOCORE) and in service courses in plant biology. Our faculty and graduate students participate in all five of the introductory and second-year courses for BIOCORE majors, teaching over 800 students per year. Our faculty also has critical leadership roles, providing direction for the major as well as in program oversight. In addition, we have a broad role in teaching service courses in plant biology and biology, accounting for an additional 500 students per year. The rapidly increasing number of students interested in careers in the life sciences has meant steadily increasing enrollments: this increase has presented a major challenge to our ability to 1) put qualified

professional academics in the classroom as instructors for these courses and 2) place highly talented graduate students in the teaching laboratories for these courses.

We currently have two very strong lecturers dedicated to our teaching mission (Paris and Stratton). These faculty members make a heavy commitment to delivering strong education in plant biology in the classroom. As enrollments have burgeoned, we have addressed the need for covering additional sections of our basic courses with temporary appointments (notable among these is Bermingham). However, in the long term, we must use limited resources to attract faculty who are both strong instructors and effective researchers. The emerging problem is that it will take a number of tenure-track positions to cover all our teaching needs. Hence, the proposed approach, involving the hire of at least two additional tenure-track faculty members (beyond the evo-devo hire), is central to our teaching mission as well as to our vision for the research community in the department. Given the dramatic rise in student interest, we clearly need to secure the third lecturer position, currently held by Bermingham, now supported only by one-time funds.

6. Graduate Education

The Plant Biology Department has been offering the Ph.D. degree for over 100 years; a long history of contributing high-quality professionals with expertise in plant biology to the life-sciences disciplines characterizes the department. Graduate education, and especially the training of Ph.D. students, remains a defining part of our mission. The University of Vermont is unusual in dedicating itself to maintaining and developing expertise in plant biology, which leads us to be prominent among universities offering training to graduate students in the plant sciences. The work of these students in our research laboratories enables the success of our faculty researchers. The contribution of graduate students to the teaching of plant biology and biology labs to our undergraduates is also critically important. Thus, the integrated research and teaching activities of the graduate students are vital to plant sciences in particular and life sciences in general at the University of Vermont. The development of integrated graduate programs with other units will enhance the attractiveness of our graduate programs to high quality students. We have begun discussions of the development of an umbrella program in ecology and evolutionary biology with units likely to be interested in this approach.

APPENDICES SECTION 2: DEPARTMENT, FACULTY, AND STAFF

2.1 Plant Biology and Botany Programs in the United States

2.1a Faculty and Students in Plant Biology and Botany Programs most similar to UVM

Institution	Department	Tenure-track Faculty/grad students (Faculty in 2001)	Faculty Specialties
Georgia	Plant Biology	25/48 (25)	Balanced, includes teaching
Hawaii	Botany	15/40 (12)	All ecology & evolution
Miami of Ohio	Botany	23/? (20)	Balanced, diverse
Minnesota Twin Cities	Plant Biology	24/48 (?)	Molecular emphasis
NC State	Plant Biology	22/35 (17)	Molecular emphasis
SIU	Plant Biology	10/42 (14)	Mostly ecology & evolution
Wyoming	Botany	15/35 (9)	Heavily ecological, some evolution
Vermont	Plant Biology	9.5/25 (8)	Balanced

2.1b A Catalog of Research Faculties in the United States focused on Plant Biology

Plant Biology programs roughly similar to UVM in size and approach

1. University of Georgia: Plant Biology http://www.plantbio.uga.edu/
2. Univ. Hawaii Manoa: Botany http://www.botany.hawaii.edu
3. Miami University of Ohio: Botany http://www.cas.muohio.edu/botany/index.html
4. Univ. of Minnesota, Twin Cities: Plant Biology http://www.cbs.umn.edu/plantbio/
5. North Carolina State University: Plant Biology http://cals.ncsu.edu/plantbiology/
6. Southern Illinois University, Carbondale: Plant Biology http://www.plantbiology.siu.edu/
7. University of Wyoming: Botany http://www.uwyo.edu/botany/

Plant Biology programs unlike UVM (too big, too different, etc.)

8. University of Arizona: School of Plant Sciences
   http://cals.arizona.edu/spls/undergraduate

9. University of California, Berkeley: Department of Plant & Microbial Biology http://pmb.berkeley.edu/academics/undergraduate-program
10. Cornell University http://plantbio.cornell.edu/cals/plbio/
11. University of California, Davis http://www-plb.ucdavis.edu/
12. Michigan State: Plant Biology http://www.plantbiology.msu.edu/
13. Minnesota: Plant Biology http://www.cbs.umn.edu/plantbio/
14. University of Missouri: Plant Sciences http://plantsci.missouri.edu/undergrad/
15. University of Oklahoma: Microbiology and Plant Biology http://mpbio.ou.edu/plant-biology
16. Oregon State http://bpp.oregonstate.edu/
17. Purdue: Botany & Plant Pathology https://ag.purdue.edu/btny/Pages/default.aspx
18. University of California, Riverside: Botany and Plant Sciences http://plantbiology.ucr.edu.html
19. Rutgers: Department of Plant Biology and Pathology http://aesop.rutgers.edu/~plantbiopath/Plantscience_main.html
20. University of Texas, Austin: Plant Biology http://www.biosci.utexas.edu/graduate/plantbio/faculty.asp
21. Illinois, Urbana-Champaign http://www.life.illinois.edu/plantbio/faculty.htm
22. Wisconsin-Madison http://www.botany.wisc.edu/

Additional Plant Biology programs (centers, graduate programs, etc.)

Plant Molecular Biology

23. Carnegie Institute for Science (Stanford): Plant Biology http://dpb.carnegiescience.edu/
24. Colorado State University: Program in Molecular Plant Biology http://www.plantbiology.colostate.edu/
25. Florida-Gainesville: Plant Molecular and Cellular Biology Program http://pmcb.ifas.ufl.edu/
26. Illinois Urbana-Champaign: Plant Molecular Biology and Physiology, Dept. of Crop Sciences http://cropsci.illinois.edu/content/plant-molecular-biology-and-physiology
27. NIU Department of Biological Sciences: Plant Molecular Biology Center http://www.bios.niu.edu/pmbc/

28. OSU: Plant Molecular Biology & Biotechnology Program http://pmbb.osu.edu/
29. Penn State: Plant Molecular Biology and Biotechnology, Huck Institute of Life sciences http://www.huck.psu.edu/education/plant-biology/faculty-and-research/plant-molecular-biology-and-biotechnology
30. Stanford: Plant Cell and Molecular Biology at Biological Sciences Department and Department of Plant Biology, Carnegie Institution http://plantbiology.stanford.edu/

Plant Ecology and Evolution

31. Syracuse: Plant Ecology and Evolution Research Group http://plantecology.syr.edu/
32. Washington, St. Louis: Evolution, Ecology & Population Biology http://wubio.wustl.edu/EEPB

2.2 Profiles of UVM Plant Biology Faculty and Staff

Faculty/Staff Group	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Faculty: Full-Time Tenure Track	10	9	7	7	7	6
Faculty: Full-Time Not Tenure Track	8	7	6	7	6	6
Faculty: Part-Time Tenure Track	.	.	.	.	.	.
Faculty: Part-Time Not Tenure Track	.	.	2	1	1	2
Faculty: Extension	.	.	.	.	.	.
Faculty: General Fund FTE	9.6	9.4	8.2	9.0	8.2	.
Staff: Full-Time	9	11	11	9	5	8
Staff: Part-Time	.	.	.	1	3	1
Student-Faculty Ratio-excl T&D (budget)	13.8:1	14.4:1	18.3:1	20.4:1	24.3:1	.
Student-Faculty Ratio-incll T&D	14.3:1	15.2:1	18.9:1	20.8:1	24.6:1	.

2.3 Curricula Vitae for Faculty

Laura L. Almstead, PhD

CONTACT INFORMATION

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EDUCATION

Yale University School of Medicine, Department of Genetics, New Haven, CT 2007-2011
Mentor: Dr. Daniel DiMaio
Position: Postdoctoral Fellow

Stanford University, Department of Microbiology & Immunology, Stanford, CA, 2001-2007
Advisor: Dr. Peter Sarnow
Degree: Ph.D. in Microbiology and Immunology (June 2007)

Williams College, Williamstown, MA, 1997-2001
Advisor: Dr. Deborah L. Weiss
Degrees: B.A. Magna Cum Laude (June 2001)
Highest Honors in Chemistry (June 2001)
Program in Biochemistry and Molecular Biology (June 2001)

TEACHING & MENTORING EXPERIENCE

Lecturer, Plant Biology Department, 2011-present
BIOL 001 Principles of Biology: Fall 2012

- Developed questions for on-line homework assignments directed at concept application
- Incorporated discussion questions and activities to increase student involvement in a large-lecture setting

PBIO 187 Survey of Biochemistry Laboratory: Summer 2012

- Revised and updated laboratory curriculum
- Re-wrote laboratory manual
  - clarified instructions
  - expanded upon and clarified background
  - developed and implemented several new experiments
- Developed supplemental materials including a laboratory report writing guide, laboratory notebook guide, and a reference handout containing key concepts (concentrations, statistics, etc.)
- Generated set-up lists and instructor notes to facilitate laboratory preparation and teaching

BIOL 002 Principles of Biology: Spring 2012

- Introductory biology course (large lecture)
- Implemented the use of iClickers to administer concept tests to promote engagement in a large lecture setting and receive immediate feedback on students' understanding
- Assigned weekly homework exercises to allow students to consistent practice applying course concepts

BCOR 012 Exploring Biology Laboratory curriculum development, Spring 2012

- Created a Scientific Writing Workshop laboratory and associated materials
  - goals: develop students' scientific writing skills and allow them to participate in a peer review process
  - integrated workshop into the laboratory activity for which the students wrote their lab reports

BCOR 011 Exploring Biology: Fall 2011

- Introductory biology course for students in the integrated biological sciences program
- Used iClickers to administer in-class concept tests and promote peer instruction
- Assigned pre-lecture short answer questions that covered concepts in the assigned readings to assess student misconceptions prior to lectures

PBIO 185 Survey of Biochemistry: Fall 2011, Summer 2012, Fall 2012

- One-semester, upper-level biochemistry course (large lecture)
- Implemented weekly homework assignments to give students a consistent practice applying concepts
- Assigned biochemistry in the news blog posting to highlight relevancy of course concepts
- Obtained funding to set up an iClicker loan program with the goal of assessing student's perceptions of iClicker use in a large lecture class when the financial burden was eliminated
- Incorporated discussion questions and activities to increase student involvement in a large-lecture setting

Guest Lecturer, Yale University, New Haven, CT, 2009-2011

Cellular and Molecular Biology of Cancer, Winter 2011

- Lecture Title: "Senescence, Telomeres, and Cancer"

Molecular Virology of Animal Viruses, Fall 2010

- Lecture Title: "Picornaviruses"

Cellular and Molecular Biology of Cancer, Winter 2010

- Lecture Title: "Senescence and Telomeres: Connections to Cancer"

Cellular and Molecular Biology of Cancer, Winter 2009

- Lecture Title: "Senescence and Telomeres: Cancer Connections"

Department of Genetics Graduate Student Seminar, Winter 2009

- Assist student in selection of paper to be presented in class and advise on presentation content
- Critique student presentations

Teaching Assistant, Stanford University, Stanford, CA

Biochemical Structure, Metabolism, and Energetics, Winter 2002

- Led discussion section:
  - prepared review materials and led review sessions prior to exams
  - explained answers to problem set questions and addressed common mistakes
  - administered quizzes
- Prepared questions for quizzes, mid-term, and final exam

- Graded problem sets, quizzes, and exams with co-teaching assistants
- Helped to administer all exams
- Assembled necessary course materials
- Set up lecture presentations for and attended all class meetings

Topics in Microbiology, Spring 2003

- Presented several lectures on emerging pathogens (i.e. SARS virus)
- Assisted students with paper presentations
- Prepared course materials and assisted in evaluating students' performances

Laboratory Teaching Assistant, Williams College, Williamstown, MA

Biochemistry I and II, Fall 2000 – Spring 2001
Organic Chemistry I and II, Fall 1999 – Spring 2000
Introductory Chemistry II, Spring 1999
Advanced Introductory Chemistry I, Fall 1998

- Attended all lab section meetings and assisted in setting up experiments
- Provided hands-on help during labs
- Assisted with written lab reports and answered questions outside of class time
- Graded lab notebooks, lab reports, and general lab performance
- Responsible for ensuring students thoroughly understood laboratory materials and related course concepts

Grader, Williams College, Williamstown, MA

AIDS: The Disease and Search for a Cure, Spring 2001

- Graded problem sets, quizzes, midterm exam, and final exam
- Assisted in grading final papers

Science for Kids Workshop Winter Study Course, Williams College, Williamstown, MA, January 1999

- Created a science workshop for fourth grade students
  - selected original workshop topic ("The Chemistry of Slime")
  - designed hands-on activities to demonstrate properties of various non-Newtonian fluids
  - responsible for organizing necessary all materials
  - set up and directed multiple 4 hour long workshops over two days
  - prepared workbook and handouts for teachers to run workshop for future classes

Mentoring

- Primary mentor for several students in graduate school and as a postdoctoral researcher
- Mentor to several undergraduate females through Women in Science at Yale
  - served as resource to assist in making decisions regarding future graduate school careers

Relevant Coursework

Yale Scientific Teaching Fellow, Fall 2010

- Selected by competitive application process to participate in a nine-week training course in using scientific teaching methods to teach science
- Topics included fundamentals of scientific teaching, assessment, how people learn, active learning, diversity in the classroom, and instructional technologies
- Class sessions included activities to practice scientific teaching techniques
- Developed and taught short "teachable tidbit"

Preparing Future Science Faculty: Teaching Your Own Course, Spring 2010

- Topics included course and syllabus design, lecture writing, active learning techniques, creating assignments, and technologic teaching tools
- Developed syllabus for course titled "How to Survive as a Biologist: Mastering the Arts of Literature Reading, Experimental Design, and Data Communication" and associated assignments

Learning to Mentor the Next Generation of Scientists (seminar series), Spring 2010

Fundamentals of Teaching in Science, Yale University, Winter 2009

Responsible Conduct of Research for Postdocs, Yale University, Spring 2008

RESEARCH EXPERIENCE

Postdoctoral Research, Yale University School of Medicine, New Haven, CT, 2007-present

Mentor: Dr. Daniel DiMaio

Identifying Requirements for Irreversible Rb Pathway-Induced Senescence in Cancer Cells

- Establish cell-based system of reversible senescence in human cervical cancer cells
- Assess differences between reversibly and irreversibly senescent cells
- Identify and test roles of factors important in establishing irreversible senescence

Investigating the Role of microRNAs in Rb Pathway-Induced Senescence

- Verify induction/repression of regulated microRNAs identified through microarray analyses
- Perform biochemical analyses to assess effects of microRNA regulation during Rb-induced senescence

Examining the Dependence of Primary Cervical Cancer Cells on Human Papillomavirus Oncogene Expression for Continued Growth

- Establish methods to repress HPV E6 and E7 in primary cervical cancer cells by BPV E2 expression
- Assess characteristics of growth arrest induced by E2 expression in primary cancer cells and cell lines

Genetic Screens to Assess Simian Virus 40 and Human Papillomavirus Infection

- Screen SV40 VP1 mutant library for viruses that do not require the ER chaperone BiP
- Perform high-throughput siRNA screen for genes required for HPV L1 uncoating

Graduate Research, Stanford University, Stanford, CA, 2001-2007

Advisor: Dr. Peter Sarnow

Inhibition of U snRNP Biogenesis by a Virus-Encoded Protease

- Identified a novel host target of the poliovirus 2A protease, Gemin3
- Analyzed the potential role of Gemin3 in viral replication, transcription, and translation
- Investigated effects of poliovirus infection and Gemin3 cleavage on cellular processes
- Analyzed association of Gemin3 with the Survival of Motor Neurons (SMN) complex

Senior Honors Thesis Research, Williams College, Williamstown, MA, 2000-2001

Advisor: Dr. Deborah L. Weiss

Characterization of the NEG-1 Binding Protein Complex: A Negative Regulator of the Interleukin-4 Gene

- Identified proteins associated with the IL-4 negative regulatory element (NEG-1)
- Examined NEG-1 interaction following calcium ionophore-induced stimulation of IL-4
- Performed mechanistic analyses to determine if association was dependent on transcription or translation

Whitehead Scholar Research Program, The Whitehead Institute, Cambridge, MA, Summer 1999

Advisor: Dr. David M. Sabatini

Exploring the effects of the immune suppressive drug rapamycin on human B-lymphocytes (BJAB cells)

- Constructed mutations in a mouse ecotropic receptor to block undesired increased arginine uptake
- Observed previously undocumented development of rapamycin resistance in BJAB cells
- Investigated potential rapamycin resistance mechanisms
- Designed a specialized thymidine incorporation assay

Summer Assistant, Union College Department of Biochemistry, Schenectady, NY, Summer 1996

Advisor: Kristin Fox

- Evaluated laboratory manual for newly designed biochemistry course

AWARDS and HONORS

Ruth L. Kirschstein NIH F32 Individual Postdoctoral Fellowship, 12/2008-11/2010

NIH T32 Training Grant, 12/2007-11/2008

Publication noted Editor's Choice section *Science*, "Probing Neurodegeneration," May 2007, 316: 955.

National Science Foundation Graduate Fellowship Honorable Mention, 2002

Cellular and Molecular Biology Predoctoral Training Grant, 2002-2004

James F. Skinner Prize in Chemistry, 2001

- Awarded to the chemistry graduate showing a distinguished record in chemistry, and an outstanding promise for teaching and scholarship.

Beckman Scholar, 2000-2001

Phi Beta Kappa, inducted Spring 2000

Class of 1960 Scholar in Chemistry, 2000

- Selected during senior year to participate in a lecture series involving interaction and discussion with prominent researchers from other institutions in the field of chemistry.

Class of 1960 Scholar in Biochemistry and Molecular Biology, 2000

- Selected during senior year to participate in a lecture series involving interaction and discussion with prominent researchers from other institutions in the fields of biochemistry and molecular biology.

Whitehead Scholar, Summer 1999

Robert C. Byrd Merit Scholarship, 1997-2001

National Merit Scholar, 1997

ACADEMIC SERVICE

Ad Hoc Reviewer (via Daniel DiMaio), Journal of Virology, 2008-2011

Women in Science at Yale, Yale University, 2008-2011

Chemistry Students Advisory Committee, President, Williams College, 1999-2001

- Initiated and organized series of dinner discussions focused on women in the sciences

Chemistry Department Job Search Student Advisory Committee, 1999 and 2000

- Met with faculty candidates informally, attended pre-seminar discussions and candidate presentations
- Presented opinion of candidates to chemistry faculty members

Purple Key Society Volunteer, Williams College, 1999-2001

Reading For the Blind & Dyslexic Volunteer, Berkshire/Williamstown Regional Unit, 1999-2001

PUBLICATIONS, PRESENTATIONS, and POSTERS

Publications

Thomas Magaldi, **Laura L. Almstead**, Stefania Bellone, Edward Prevatt, Alessandro Santin, and Daniel DiMaio. "Primary Cervical Carcinoma Cells Require Human Papillomavirus E6 and E7 Expression for Ongoing Proliferation." (2012) *Virology*. 442: 114-24.

Ivan Martinez, **Laura L. Almstead**, and Daniel DiMaio. "MicroRNAs and Senescence." (2011) *Aging (Albany NY)*. 3: 77-78.

Ivan Martinez, Demian Cazalla, **Laura L. Almstead**, Joan A. Steitz, and Daniel DiMaio. "miR-29 and miR-30 Regulate B-MYB Expression During Cellular Senescence." (2011) *Proc Natl Acad Sci U S A*. 108: 522-527.

Laura L. Almstead and Peter Sarnow. "Inhibition of U snRNP biogenesis by a virus-encoded proteinase." (2007) *Genes & Development*. 21: 1086-1097.

Presentations

Almstead, LL. "Regulation of Gene Expression by microRNAs During Rb Pathway-Induced Senescence: B-MYB and DNA Methyltransferases." Biology of Aging Seminar. New Haven, CT. February 2011.

Almstead, LL. "Studying Cellular Pathways through Viral Disruption: Inhibition of U snRNP Biogenesis in Poliovirus Infection." *Union College Chemistry Department Seminar Series*. Schenectady, NY. May 2008.

Almstead, LL. "Reduced Sm Core Assembly In Poliovirus Infection." *Bay Area RNA Club.* San Francisco, CA. May 2006.

Almstead, LL. "Inhibition of U snRNP Biogenesis by a Virus-Encoded Proteinase." *Translation Supergroup Meeting.* Berkeley, CA. December 2006.

Almstead, LL. "Cleavage of Gemin3 During Poliovirus Infection." *EUROPIC 2005.* Lunteren, Netherlands. May 2005.

Posters

Laura L. Almstead and Peter Sarnow. "Reduced Sm Core Assembly in Poliovirus Infection." *Cellular and Molecular Biology Symposium.* Stanford, CA. May 2006.

Laura L. Almstead and Peter Sarnow. "Cleavage of Gemin3 During Poliovirus Infection." *Cellular and Molecular Biology Symposium*. Stanford, CA. May 2005.

Laura L. Almstead and Peter Sarnow. "Examining the Role of Gemin3 Cleavage in Poliovirus Infection." *Cellular and Molecular Biology Symposium*. Stanford, CA. May 2004.

Laura L. Almstead and Deborah Weiss. "Characterization of the NEG-1 Binding Protein Complex." *Beckman Scholar Symposium*. Irvine, CA. July 2001.

CURRICULUM VITAE

David S. Barrington

Present Address
Department of Plant Biology
111 Jeffords Hall, 63 Carrigan Drive,
University of Vermont, Burlington, VT 05405

E-Mail: David.Barrington@uvm.edu
Phone: (802)656-0431, 656-3221

EDUCATIONAL BACKGROUND

Ph.D. in Biology, specializing in plant systematics and evolution — Harvard University, 1975
B.S. in Biology — Bates College, 1970

EMPLOYMENT HISTORY

University of Vermont, Burlington, Vermont: 1974-present

Professor of Botany/Plant Biology: 1988 - present
Interim Chair, Plant Biology Dept., July 2008 – present
Chair, Dept. of Botany & Agricultural Biochemistry, 1995 - 2002
Chair, Dept. of Botany, 1991 - 1995
Associate Professor of Botany: 1983 - 1988
Assistant Professor of Botany: 1978 - 1983
Curator, Pringle Herbarium, 1974 - present.

TEACHING EXPERIENCE

Introductory Biology Courses

Lecturer: BCOR 12, Exploring Biology: 2005-2008, 2011
Lecturer: Biology 1,2; Principles of Biology: 1978-2004
Laboratory Coordinator: Biology 1, 1975-1983

Undergraduate Botany Courses

Morphology & Evolution of Vascular Plants: 1978-1991 except 1983, 1985
Field Botany: 1978-present

Upper-level Courses in Botany

Biology of Ferns: 1979-1994, 2004-present; alternate years
Tropical Plant Systematics: 1980-present, alternate years
Botany Field Trip to Costa Rica: 1979-present, alternate years

AWARDS AND HONORS

Merritt Lyndon Fernald Award (with Cathy Paris, for the best paper published in Rhodora, 2007)
Phi Beta Kappa — elected to honorary membership March 2006
Wherry Award (for the best contributed paper, Pteridological Section, Botanical Society of America). 2002
Kroepsch-Maurice Outstanding Teacher Award, 1987
Joseph E. Carrigan Award for Excellence in Undergraduate Teaching, 1982

RESEARCH ACTIVITIES

Publications in Refereed Journals and Books (35)

1. Barrington, D.S. and Sonja A. Schmitz. 2013. Quaternary Divergence and Holocene secondary contact via the Northwest Passage in the circumpolar *Lathyrus japonicus* (Leguminosae). Rhodora 115: in press.
2. McKeown M, M. Sundue, and D.S. Barrington. 2012. Phylogenetic analyses place the Australian monotypic *Revwattsia* in *Dryopteris* (Dryopteridaceae). PhytoKeys 14: 43–56.
3. Barrington, D.S. 2011. The fern genus *Polystichum* (Dryopteridaceae) in Costa Rica, Annals Missouri Botanical Garden. 98: 431–446.
4. Koenemann, D.M., J.A. Maisonpierre, and D.S. Barrington. 2011. Broad-scale integrity and local divergence in the fiddlehead fern *Matteuccia struthiopteris* (L) Todaro (Onocleaceae). American Fern Journal 101: 213-230.
5. Barrington, D.S. 2011. Should Hybrids be Protected by Listing; *Betula* × *sandbergii* and *Botrychium minganense* in Vermont. Journal Torrey Botanical Club. 138: 465-471.
6. Dragon, J.A. and D.S. Barrington. 2009. Systematics of the *Carex aquatilis* and *C. lenticularis* lineages: geographically and ecologically divergent sister clades of *Carex* section *Phacocystis* (Cyperaceae). American Journal of Botany 96: 1896–1906.
7. Dragon, J.A. & D. S. Barrington. 2008. East vs. west: Monophyletic clades within the paraphyletic *Carex acuta* complex, section *Phacocystis* (Cyperaceae). Pp. 215-226 in R. F. C. Naczi & B. A. Ford (editors), Sedges: Uses, Diversity, and Systematics of the Cyperaceae. Monogr. Syst. Bot. Missouri Bot. Gard. 108.
8. Li, C. X., S.G. Lu, and D. S. Barrington. 2008. Phylogeny of Chinese *Polystichum* (Dryopteridaceae) based on chloroplast DNA sequence data (*trnL-F* and *rps4-trnS*). Journal of Plant Research. 121: 19-26.
9. Barrington, D.S. and C.A. Paris. 2007. Refugia and migration in the Quaternary history of the New England flora. Rhodora 109: 369-386.
10. Driscoll, H.E. and D.S. Barrington, 2007. Origin of Hawaiian *Polystichum* (Dryopteridaceae) in the context of a world phylogeny. American Journal of Botany 94: 1413–1424.
11. Lu, J.M., D.S. Barrington, and D.Z. Li. 2007. Molecular phylogeny of the polystichoid ferns in Asia based on *rbc*L sequences. Systematic Botany 32: 26-34.
12. Barrington, D.S. 2005. Helechos de los páramos de Costa Rica. *In* M. Kappelle and S. P. Horn [eds.] Páramos de Costa Rica, 375-395. InBio Press, San José, Costa Rica.

13. Driscoll, H.E., D.S. Barrington, and A.V. Gilman. 2003. A re-examination of the apogamous tetraploid *Phegopteris* (Thelypteridaceae) from northeastern North America. Rhodora 105: 309-321.
14. Barrington, D.S. 2003. *Polystichum lilianae sp. nov*. (Dryopteridaceae) and its relationships to *P. fournieri* and *P. turrialbae*. Brittonia 55: 317-325.
15. Little, D.P. and D.S. Barrington. 2003. Major evolutionary events in the origin and diversification of the fern genus *Polystichum* (Dryopteridaceae). Am. J. Bot. 90: 508-514
16. Churchill, H.W., R.M. Tryon, and D.S. Barrington. 1998. Development of the sorus in tree ferns: Dicksoniaceae. Canadian Journal of Botany 76: 1245-1252.
17. Paler, M.H. and D.S. Barrington. 1995. The hybrid *Cystopteris fragilis* x *C. tenuis* (Dryopteridaceae) and the relationship between its tetraploid progenitors. Syst. Bot. 20: 528-545.
18. Barrington, D.S. 1995. *Polystichum*. In: R.C. Moran and R.Riba N. eds., Flora Mesoamericana. v. 1, Pteridophyta. British Museum, London.
19. _____ 1993. Ecological and historical factors in fern biogeography. J. Biogeogr. 20:275-280.
20. _____ and M. Kato. 1993. Changing concepts in the biogeography of pteridophytes, the biogeography symposium at the 1990 Progress in Pteridology Conference--Ann Arbor, Michigan. J. Biogeogr. 20:253-254.
21. _____ 1992. Climate and the disjunct distribution of *Polystichum alfarii* (Christ) Barr. in Mesoamerica. Rhodora 94:327-339.
22. _____ 1990. A festschrift in honor of Alice Faber Tryon and Rolla M. Tryon, Jr. Ann. Missouri Bot. Gard. 77:225-227.
23. _____ 1990. Hybridization and allopolyploidy in Central American *Polystichum*: cytological and isozyme documentation. Ann. Missouri Bot. Gard. 77: 297-305.
24. Paris, C.A. and D.S. Barrington. 1990. William Jackson Hooker and the generic classification of ferns. Ann. Missouri Bot. Gard. 77:228-238.
25. Stein, D.B. and D.S. Barrington. 1990. Recurring hybrid formation in a population of *Polystichum* X *potteri*: evidence from chloroplast DNA comparisons. Ann. Missouri Bot. Gard. 77:334-339.
26. Barrington, D.S. 1989. New species and combinations in tropical American *Polystichum* (Dryopteridaceae). Ann. Missouri Bot. Gard. 76:365-373.
27. _____, C.H. Haufler, and C.R. Werth. 1989. Hybridization, reticulation, and species concepts in the ferns. Amer. Fern J. 79:55-64.
28. _____, C.A. Paris, and T.A. Ranker. 1986. Systematic inferences from spore and stomate size in the ferns. Amer. Fern J. 76:149-159.
29. _____ 1986. The morphology and cytology of *Polystichum* X *potteri* hybr. nov. Rhodora 88:297-313.
30. _____ 1985. The morphology and origin of a new *Polystichum* hybrid from Costa Rica. Syst. Bot. 10:199-204.
31. _____ 1985. Hybridisation in Costa Rican *Polystichum*. Proc. Roy. Soc. Edinburgh 86B:335-340.
32. _____ 1985. The present evolutionary and taxonomic status of the fern genus *Polystichum:* The 1984 Botanical Society of America Pteridophyte Section Symposium. Amer. Fern J. 75:22-28.

33. _____ 1983. *Cibotium oregonense*: an Eocene tree-fern stem and petioles with internal structure. Amer. J. Bot. 70:1118-1124.
34. _____ 1978. A revision of the genus *Trichipteris*. Contr. Gray Herb. Harvard 208:3-98.
35. _____ 1976. New taxa and nomenclatural changes in the genus *Trichipteris*. Rhodora 78:1-5.

Research Grants

Collaborative Research: Digitization TCN: Mobilizing New England: Vascular Plant Specimen Data to Track Environmental Changes. National Science Foundation: 2012-2015. $101,575.

Participation in the Global Plants Initiative by the University of Vermont's Pringle Herbarium. Mellon Foundation: 2012-2014. $48,991.

Genetic Diversity and Watershed in Vermont's fiddlehead fern (Matteuccia struthiopteris, Onocleaceae). CSREES: Hatch Funds 2010-2013. $30,000.

Assessing distribution and origins of genetic diversity in Vermont's fiddlehead fern (*Matteuccia struthiopteris*, Onocleaceae). CSREES: Hatch funds 2007-2009. $42,000.

Exploring the Diversity and Evolution of Holly Ferns (genus *Polystichum*) in southwestern China. National Geographic Society 2006-2007. $22,600.

Genetic features and origin of wild polyploid species. CSREES: Hatch funds 2006-2007. $15,000.

The genetics and geography of new polyploid species origin in nature. CSREES: Hatch funds 2003-2006. $43,000.

Genetic variation in *Lathyrus maritimus* Bigel.; a wild legume with significant agronomic potential (with C. Paris). CSREES: Hatch funds 1999-2000. $6,867

Genetic variation in *Lathyrus maritimus* Bigel.; a wild legume with significant agronomic potential (with C. Paris). USDA: CSREES: Hatch funds 1998-1999. $2,000

A direct test of the relation between cell size and cold hardiness in a polyploid herb. Hatch Project. ($11200)

Population Genetics and Hybrid Evolution of Central American Tree Ferns. Univ. of Vermont Institutional Grant, 1990 ($3000)

Evolutionary genetics of the *Adiantum pedatum* complex: phylogeny and biogeography. National Science Foundation Doctoral Dissertation Improvement Grant with Cathy A. Paris, Ph.D. candidate, 1988 ($11,370)

Genetic and Structural Variation in Five Species of Tree Ferns from Puerto Rico. Univ. of Vermont Institutional Grant, 1987 ($5420)

Morphometric and allozymic documentation of hybridization and polyploidization in the fern genus *Polystichum*. Univ. of Vermont Institutional Grant, 1985 ($3850)

Symposia Organized

The Ecological and Historical Determinants of Pteridophyte Distribution (with Masahiro Kato, Tokyo Botanical Gardens). International Association of Pteridologists Conference, Ann Arbor, Michigan - 1990

A Festschrift in Honor of Alice F. and Rolla M. Tryon, Jr. Annals of the Missouri Botanical Garden 77(2):225-339. 1990.

Invited Papers at Professional Meetings

Recent progress in the quantitative analysis of form and color in fern hybrids. Botanical Society of America Symposium on Leveraging the Use of Herbarium Collections in Modern Systematics, August 2010.

Polystichum biogeographically: a history of vicariance, long-distance dispersal, and secondary contact. Botanical Society of America Symposium on Fern Biogeography, Snowbird, Utah, August, 2004.

The Ecological and Historical Influences on the Distribution of Pteridophytes. International Workshop on Chinese Pteridophytes, Beijing, China, May 2001.

Addressing the Speciation Process in the Montane Tropics: an Example from the Genus *Polystichum* (Dryopteridaceae), Smithsonian Conference on Biosystematics of Tropical Pteridophytes, April, 1995

Tropical American Montane Habitats as Biogeographic Islands. American Institute of Biological Sciences symposium at Honolulu, HI, August 1992

Hybridization, polyploidy, and species concepts in ferns. American Institute of Biological Sciences symposium at Columbus, OH - August 1987

Systematics of the Fern Genus *Polystichum* in southern Central America and the northern Andes, American Institute of Biological Sciences symposium at Fort Collins, CO - August, 1984.

Hybridization and speciation in Central American *Polystichum*, International Biology of Pteridophytes Symposium at Edinburgh, Scotland - September, 1983.

Theses & Dissertations Directed

Weston Testo (NSF Predoctoral Fellow), Ph.D. in progress. Phylogeography and ecological physiology of *Huperzia* and *Phlegmariurus*.

Stacy Jorgensen, M.S. 2012. An investigation of the genetic diversity and evolutionary history of the allotetraploid fern *Polystichum Braunii* (Dryopteridaceae).

Monique McHenry, Ph.D. 2012. Systematics and biogeography of Andean ferns in the genus *Polystichum* Roth (Dryopteridaceae).

Erin Sigel, M.S. 2008. Polyphyly of polyploid species: an inquiry into the origin of *Dryopteris campyloptera* and *Dryopteris dilatata* (Dryopteridaceae).

Julie Dragon, Ph.D. 2006. The phylogeny and biogeography of the *Carex aquatilis* group, section *Phacocystis* (Cyperaceae).

Heather Driscoll, M.S. 2005. Origin of Hawaiian *Polystichum* (Dryopteridaceae): evidence from *rbcL* and *trnL-F* IGS sequences.

Julie Dragon, M.S. 2002 - Phylogeny and species delimitation in the *Carex acuta* complex.

Sonja Schmitz, Ph.D. 2002 - Systematics of the circumboreal seabeach legume *Lathyrus maritimus*.

Elizabeth Perkins, M.S. 1994 - A comparison of genetic diversity estimates of central and peripheral populations of jack pine (*Pinus banksiana* Lamb.).

Beth Ann Howard, M.S. 1992 - Evolutionary Relationships of Cytotypes in the fern *Asplenium trichomanes* in eastern North America.

MaryBeth Deller, M.S.1992 - An Analysis of Morphology, Habitat, and Reproductive Isolation in the *Cypripedium calceolis* Complex in Vermont.

Cathy A. Paris, Ph.D. 1991. - Biosystematic Revision of the *Adiantum pedatum* Complex (ex officio advisor only).
Bruce Howlett, M.S. 1990. - The Genetic Structure and Colonizing Strategy of Autopolyploid Fireweed.
Peter T. Hope, M.S. 1987. - Morphological variation in Three Populations of the Triploid Hybrid *Dryopteris filix-mas* X *D. marginalis*.
Cathy A. Paris, M.S. 1986. - A Biosystematic Investigation of the *Adiantum pedatum* Complex in Eastern North America.
Roger Stern, M.S. 1982. - Morphometric and Phenologic Variability in *Ammophila breviligulata* Fernald.
W. Donald Hudson, M.S. 1980. - The Reproductive Biology of *Saxifraga stellaris* var. *comosa*.
Jerrold I Davis, M.S. 1978. Systematics and geography of *Phytolacca* from Chiapas, Mexico.

Undergraduate Research Projects Directed

Brendan Lyons, in progress. In search of the ecological significance of non-synonymous substitutions in *pgi*C of Andean *Polystichum*.
Abigail Flint, 2012. Phenology and selection in *Symplocarpus feotidus*.
Kelsey Cook, 2012. Flow cytometry as a means to ploidy-level determination in the *Polypodium virginianum* complex in Vermont.
Morgan Moeglein, 2010. Nucleus diameter as a tool in distinguishing cytotypes in New England *Polypodium* (Polypodiaceae).
Daniel Koenemann, 2009. Historical biogeography of the fiddlehead fern, *Matteuccia struthiopteris* (L.) Todaro (Onocleaceae) in relation to Holocene climatic improvement in northeastern North America.
Stacy Jorgensen, 2009. What is the source of the mystery genome shared by *Polystichum orbiculatum* and *P. talamancanum*?
Jacqueline Maisonpierre, 2009. Distribution of genetic diversity with reference to human impacts in Vermont populations of *Matteuccia struthiopteris* (L.) Todaro (Onocleaceae).
David Steakley, B.S. 2007. The single-copy nuclear gene *PGIc* witnesses ancestral genomes in fern hybrids and polyploids.
Lisa Weiss, B.S. 2006. A nuclear and chloroplast DNA profile for the fern hybrid *Polystichum concinnum* X *P. speciosissimum*.
Heather Driscoll, B.S. 2002. Is the hybrid between *Phegopteris connectilis* and *P. hexagonoptera* really a hybrid?
Damon Little, B.S. 1998 - A preliminary molecular phylogeny of the fern genus *Polystichum*.
Bryan Connolly, B.S. 1996 - The question of multiple periglacial origins of the northern, apogamous races of the ground-nut (*Apios americana*).
Michael Paler, B.S. 1993 - Genetic, ecological, and biogeographic dimensions of the boundary between the allotetraploids *Cystopteris fragilis*. and *C. tenuis* in Vermont.
Karen Lanoue, B.S. 1990. - Hardiness and its contribution to fitness in polyploid races of *Polystichum* species.
Edward Davis, B.S. 1990. - Genetic characterization and evolutionary origin of the Central American fern passing as *Polystichum fournieri*.
Gregory Adams, B.S. 1990. - Comparative Morphogenesis of the Hypanthium in Three Genera of Onagraceae.

Josephine W. Ewing, B.S. 1979. - The Origin of the White Trillium in Nebraska Notch.
Amy W. Pool, B.S. 1979. - *Carex paupercula* in North America: A Taxonomic Reassessment of the Varieties.
James C. Kelley, B.S. 1978. Phenology of the Flora of Job's Pond Cliffs.

OTHER PROFESSIONAL ACTIVITIES

University of Vermont Committee Experience

University of Vermont Presidential Search Committee, 2011-12
Joint Faculty-Administration Committee on General Education, 2010-2011
University of Vermont Provost Search Committee, 2010
College of Agriculture & Life Sciences Hatch Funds Review Committee, 2010 and 2011
Review Committee for Eleanor Miller, Dean — College of Arts & Sciences, 2009
UVM Transformational Change Committee, 2009.
UVM Honors College Curriculum Committee, CALS faculty representative, 2006-present.
University of Vermont Premedical Committee. 1980-1984 (Chair 1983-1984), 2006-present.
Faculty Standards Committee, College of Agriculture and Life Sciences (Chair). 2002-2006, 2007-2008.
Review Committee for Jill Tarule, Dean — College of Education, 2000-2001
Ad Hoc Committee on a Core Curriculum, CALS. 1997-1998 (Chair)
Review Committee for Howard Ball, Dean — College of Arts & Sciences, 1994-1995 (Chair)
College of Agriculture & Life Sciences Hatch Funds Reorganization Committee, 1991-1992
College of Agriculture & Life Sciences International Committee, 1996-2004
College of Agriculture & Life Sciences Teaching Evaluation Committee, 1991-1993
College of Agriculture & Life Sciences Committee on Farms and Forests, 1991-1992
College of Arts and Sciences Curriculum Committee 1988-1991. Chair, 1990-1
President's Task Force on Undergraduate Education 1991
Geneticist Search Committee, Botany Dept., 1987-1988
College of Agriculture and Life Sciences Honors Committee 1987-1988
University Press of New England Advisory Committee 1985-1990, 2004-2005
University of Vermont Greenhouse Committee 1982-1994
Botany Dept. Curriculum Committee 1980-2008 (Chair, 1983-1991)
University Committee on Research and Scholarship 1982-1985

Service to Community and State

Moderator, Town of Jericho, 1999-present
Member, Scientific Advisory Group on Flora, Vermont Endangered Species Committee 1985-present; Secretary, 1991-1995
Member, Town of Jericho Planning Commission, 1988-1996
Member, Town of Jericho Natural Resources Advisory Committee, 1988-1989

Service to Societies and Organizations

President, New England Botanical Club 1990-1992

Vice President, New England Botanical Club 1988-1990
Councillor, New England Botanical Club 1981-1986
Records Treasurer, American Fern Society 1984-1991
Manuscript and Proposal Reviewer: American Fern Journal, Annales Botanici Fennici, Annals of the Missouri Botanical Garden, American Journal of Botany, Biological Conservation, Botanical Journal of the Linnaean Society, Botanical Studies, Brittonia, International Journal of Plant Science, Journal of Biogeography, Molecular Phylogenetics and Evolution, National Science Foundation, Rhodora, Science.

Memberships in Professional Societies

American Fern Society
American Society of Plant Taxonomists
Botanical Society of America
New England Botanical Club 09 27 12

BRIAN BECKAGE

Curriculum Vitae

CURRENT POSITION

Associate Professor
Department of Plant Biology
University of Vermont
Burlington, VT 05405
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SPECIALIZATIONS

Computational Ecology; Fire Ecology; Forest Ecology; Statistical Ecology; Theoretical Ecology.

EDUCATION

Duke University, Department of Botany, Durham, NC: 1995-2000
Ph.D., September 2000. Advisor: Dr. James S. Clark
Dissertation: Seedling recruitment in Southern Appalachian forests: Does spatial heterogeneity maintain species diversity?

Duke University, Institute of Statistics and Decision Sciences, Durham, NC: 1998-2000.
M.S., September 2000. Advisor: Dr. Michael Lavine
Thesis: A long-term study of red maple (*Acer rubrum* L.) seedling survival in Southern Appalachian forests: the effects of canopy gaps and shrub understories.

University of Central Florida, Department of Biology, Orlando, FL: 1992-1995.
M.S., August 1995. Advisor: Dr. I. Jack Stout
Thesis: The effects of repeated burning on the distribution and abundance of flowering plants in central Florida sandhills.

Cornell University, Department of Civil and Environmental Engineering, Ithaca, NY: 1985-1989. B.S., May 1989

Eau Gallie High School, Melbourne, FL. Graduated Salutatorian, 1985.

PROFESSIONAL EXPERIENCE

Associate Professor**,** University of Vermont, Department of Biology, Burlington, VT. Sep 2009-Present.

Sabbatical Fellow, National Institute for Mathematical and Biological Synthesis, Knoxville, TN. Jan 2010 – July 2010.

Assistant Professor**,** University of Vermont, Department of Plant Biology, Burlington, VT. Sep 2003-Sep 2009.

Postdoctoral Research Associate**,** University of Tennessee, Department of Ecology and Evolutionary Biology, Knoxville, TN. Nov 2001-Dec 2003. Advisor: Dr. Louis Gross

Postdoctoral Research Associate**,** Louisiana State University, Department of Biological Sciences, Baton Rouge, LA. Jun 2000-Nov 2001. Advisor: Dr. William Platt

PUBLICATIONS *(*indicates non peer reviewed report)*

In Review or Revision

Eppinga, M. B., C. A. Pucko, B. Beckage and J. Molofsky. A new approach to infer vegetation boundary dynamics from 'snapshot' data. In revision.

Beckage, B., W. Platt, L. Gross, and M. Slocum. A conceptual model of climate-fire-vegetation dynamics. In revision.

McCloskey, J., C. Loftin, and B. **Beckage**. The role of fuel accumulation and climatic conditions on the fire regime of the Okefenokee swamp. In revision.

Tang, G., B. **Beckage**, B. Smith, and P. Miller. Projected carbon dynamic in New England forests under nine climate change scenarios. In review.

Published or In Press

Beckage, B., L. Gross, W. Platt, W. Godsoe, and D. Simberloff. 2012. Individual variation and weak neutrality as determinants of species diversity. Frontiers of Biogeography 3(4): 145-155.

Tang, G., B. **Beckage**, and B. Smith. 2012. The potential transient dynamics of forests in New England under historical and projected future climate change. Climatic Change DOI 10.1007/s10584-012-0404-x.

Beckage, B., L. Gross, and S. Kauffman. 2011. The limits to prediction in ecological systems. Ecosphere 2(11):125. doi:10.1890/ES11-00211.1.

Pucko, C., B. **Beckage**, T. Perkins, and W. Keeton. 2011. Species shifts in response to climate change: Individual or shared responses? Journal of the Torrey Botanical Society 138(2): 156-176.

Beckage, B., L. Gross, and W. Platt. 2011. Grass feedbacks on fire stabilize savannas. Ecological Modelling 222: 2227-2233.

Tang, G., B. **Beckage**, B. Smith, and P. Miller. 2010. Estimating potential forest NPP, biomass and their climatic sensitivity in New England using a dynamic ecosystem model. Ecosphere 1(6): 1-20 (Article 18).

Slocum, M.G., W.J. Platt, B. **Beckage**, S.L. Orzell, and W. Taylor. 2010. Accurate quantification of seasonal rainfall and associated climate-wildfire relationships. Journal of Applied Meteorology and Climatology 49: 2559-2573.

Slocum, M., B. **Beckage**, W. Platt, S. Orzell, and W. Taylor. 2010. Effect of climate on wildfire size: A cross-scale analysis. Ecosystems 13: 828-840.

Tang, G., and B. **Beckage**. 2010. Projecting the distribution of forests in New England in response to climate change. Diversity and Distributions 16: 144-158.

Stevens, J., and B. **Beckage**. 2010. Fire effects on demography of the invasive shrub Brazilian pepper (*Schinus terebinthifolius*) in Florida pine savannas. Natural Areas Journal 30: 53-63.

Beckage, B., W. Platt, and L. Gross. 2009. Vegetation, fire and feedbacks: A disturbance-mediated model of savannas. The American Naturalist 174(6): 805-818.

Stevens, J., and B. **Beckage**. 2009. Fire feedbacks facilitate invasion of pine savannas by Brazilian pepper (*Schinus terebinthifolius*). New Phytologist 184: 365-375.

Beckage, B., and C. Ellingwood. 2008. Fire feedbacks with vegetation and alternative stable states. Complex Systems 18: 159-173.

Gavin, D. G., B. **Beckage**, and B. Osborne. 2008. Forest dynamics and the growth decline of red spruce and sugar maple on Bolton Mountain, Vermont: A comparison of modeling methods. Canadian Journal of Forest Research 38(10): 2635-2649.

Beckage, B., B. D. Kloeppel, J. A. Yeakley, S. F. Taylor, and D. C. Coleman. 2008. Differential effects of understory and overstory gaps on tree regeneration. Journal of the Torrey Botanical Society 135(1): 1-11.

Beckage, B., B. Osborne, C. Pucko, D. G. Gavin, T. Siccama, and T. Perkins. 2008. An upward shift of a forest ecotone during 40 years of warming in the Green Mountains of Vermont, USA. Proceedings of the National Academy of Sciences 105(11): 4197-4202.

Beckage, B., L. Joseph, P. Belisle, D. Wolfson, and B. Platt. 2007. Bayesian change-point analyses in ecology. New Phytologist 174: 456-467.

Slocum, M. G., W. J. Platt, B. **Beckage**, R. Panko, and J. B. Lushine. 2007. Decoupling natural and anthropogenic fire regimes: A case study in Everglades National Park. Natural Areas Journal 27: 41-55

*Battaglia, L. L., and B. **Beckage**. Large-Scale Disturbances and Ecological Communities in the Southeast US. White Paper, Department of Defense, Southeast Region Threatened, Endangered, and At-Risk Species (TER-S) Workshop, March 2007.

Platt, W. J., J. M. Huffman, M. G. Slocum and B. **Beckage**. 2006. Fire Regimes and Trees in Florida Dry Prairie Landscapes. Land of Fire and Water: The Florida Dry Prairie Ecosystem. Proceedings of the Florida Dry Prairie Conference. Reed F. Noss, Editor.

Beckage, B., and L. J. Gross. 2006. Overyielding and species diversity: What should we expect? New Phytologist 172: 140-148.

Beckage, B., L. J. Gross, and W. J. Platt. 2006. Modelling responses of pine savannas to climate change and large-scale disturbance. Applied Vegetation Science 9: 75-82.

Beckage, B., M. Lavine, and J. S. Clark. 2005. Survival of tree seedlings across space and time: estimates from long-term count data. Journal of Ecology 93: 1177-1184.

Beckage, B., W. J. Platt, and B. Panko. 2005. A climate-based approach to the restoration of fire dependent ecosystems. Restoration Ecology 13: 429-431.

Beckage, B., and J. S. Clark. 2005. Does predation contribute to tree diversity? Oecologia 143: 458-469.

Beckage, B., J. Comiskey, and S. Duke-Sylvester. 2005. Natural fire regimes in southern Florida. Natural Areas Journal 25: 6-8.

Rock, J. H., **B. Beckage**, and L. J. Gross. 2004. Population Recovery following Differential Harvesting of *Allium tricoccum* Ait. in the Southern Appalachians. Biological Conservation 16: 227-234.

Beckage, B., W. J. Platt, M. G. Slocum, and B. Panko. 2003. Influence of the El Niño-Southern Oscillation on fire regimes in the Florida Everglades. Ecology 84: 3124-3130.

Beckage, B. and J. S. Clark. 2003. Seedling survival and growth of three southern Appalachian forest tree species: the role of spatial heterogeneity. Ecology 84: 1849-1861.

Beckage, B., and W. J. Platt. 2003. Predicting severe wildfire years in the Florida Everglades. Frontiers in Ecology and the Environment 1: 235-239.

HilleRisLambers, J., J. S. Clark, and B. **Beckage**. 2002. Density-dependent mortality and the latitudinal gradient in species diversity. Nature 417: 732-735.

Platt, W., B. **Beckage**, B. Doren, and H. Slater. 2002. Interactions of large-scale disturbances: prior fire regimes and hurricane-induced mortality of savanna pines. Ecology 83(6): 1566-1572.

Lavine, M., B. **Beckage**, and J. S. Clark. 2002. Statistical modeling of seedling mortality. Journal of Agricultural, Biological, and Environmental Statistics 7: 21-41.

Clark, J. S., B. **Beckage**, J. HilleRisLambers, I. Ibanez, S. LaDeau, J. MacLachlan, J. Mohan, and M. Rocca. 2001. The role of dispersal in plant migration. In *Encyclopedia of Global Environmental Change, Vol. 3.* H. A. Mooney and J. Canadell, editors.

Beckage, B., J. S. Clark, B. Clinton, and B. Haines. 2000. A long-term study of tree seedling recruitment in Southern Appalachian forests: the effects of canopy gaps and shrub understories. Canadian Journal of Forest Research 30: 1617-1631.

Beckage, B. and I. J. Stout. 2000. The effects of repeated burning on species richness in Florida sandhills: A test of the intermediate disturbance hypothesis. Journal of Vegetation Science 11: 113-122.

Clark, J. S., B. **Beckage**, P. Camill, B. Cleveland, J. HilleRisLambers, J. Lichter, J. MacLachlan, J. Mohan, and P. Wyckoff. 1999. Interpreting recruitment limitation in forests. American Journal of Botany 86: 1-16.

*__Beckage__, B. and W. S. Gain. 1995. Littoral vegetation. *in* "Water budgets, water quality, and analysis of nutrient loading of the winter park chain of lakes, Central Florida 1989-1992". G. G. Phelps and E. R. German. USGS Water Resources Investigations report 95-4108. Tallahassee, FL. 96pp.

GRANTS AND FELLOWSHIPS (Awarded)

Beckage, B. (Participating scientist). NSF EPSCoR grant: Adaptation to Climate Change in the Champlain Basin: New understanding through complex systems. $20,000,000. 2011-2016.

Beckage, B. (PI). NSF (Award 0950347). $355,000. Linking models to data to investigate patterns and process in savannas. May 2010-May 2013.

Beckage, B. National Institute for Mathematical and Biological Synthesis. $26,900. Using models to investigate patterns, process, and climate change in savannas. Sabbatical fellowship. Jan 2010 to Jul 2010.

Beckage, B. (PI). DOE NICCR. $310,048. Using historical change to predict future distribution of high elevation forests in northern New England. Apr 2008 to Apr 2011.

Beckage, B. (PI). Vermont EPSCoR. $49,894. Investigating the dynamics of savanna communities through computer simulation. Jan 2008 to Jul 2009.

Beckage, B. (PD). USDA Hatch. $60,000. Historical change and functional control of montane forest distribution in northern New England. Oct 2007 to Oct 2010.

Beckage, B. (PI). NSF (DEB 0606801). $50,000. Linking Landscape models of fire, vegetation, and global climate change in the Florida Everglades. Apr 2006 to Apr 2008.

Platt, W. J., M. Slocum, and B. **Beckage**. (Co-PI). DOD. $552,247 ($47,380 to **Beckage**). Landscape fire models for the Avon Park Air Force Range. Sep 2004 to Sep 2009.

Beckage, B. (PD). USDA NRI (05-02250). $100,000. Brazilian pepper, fire and the invasibility of pinelands: exploring nonlinear effects through simulation. Oct 2005 to Oct 2009.

Beckage, B. USDA Hatch. (PD). $60,000. Impact of global climate change on forests in the Green Mountains of Vermont. Oct 2004 to Oct 2007.

Beckage, B. (PI). $100,000. Modeling the effects of hurricane and fire disturbances on the population dynamics of south Florida slash pine. NSF Postdoctoral Research Fellowship in Biological Informatics (DBI 0107553). Jan 2002 to Jan 2004.

Beckage, B. (PI) and W. J. Platt. $150,000. The effects of hurricane-fire interactions on the population dynamics of South Florida Slash Pine. National Park Foundation and Andrew W. Mellon Foundation Research Grant. Jan 2001-Jan 2004.

PRESENTATIONS

Beckage, B. 2011. Theory and dynamics of savannas. Ecological Society of America. Symposium organizer and speaker.

Beckage, B. 2011. Organized oral session on tree migration. Ecological Society of America. Invited presentation.

Beckage, B. 2011. Department of Plant Biology, University of California, Davis. Invitation declined.

Beckage, B. 2011. North American Forest Ecology Workshop. Invited presentation. Declined.

Beckage, B. 2010. Natural Resources Conservation Seminar Series, University of Massachusetts, Amherst. Invitation declined.

Beckage, B. 2010. Fire, feedbacks, and the dynamics of ecological communities. Department of Ecology and Evolutionary Biology, University of Tennessee.

Beckage, B. 2009. Climate change, fire, and the dynamics of ecological communities. Department of Mathematics and Statistics, University of Vermont.

Beckage, B. 2009. Using Mathematica to explore the role of vegetation-fire feedbacks in structuring ecological communities. International Mathematica User Conference.

Beckage, B. and C. Ellingwood. 2009. Fire feedbacks with vegetation and the spatial structure of savannas. International Society for Ecological Modelling.

Beckage, B. 2009. Climate change, fire, and the dynamics of ecological communities. Department of Environmental and Plant Biology, Ohio University.

Beckage, B. 2008. Climate change, fire, and the dynamics of ecological communities. Department of Mathematics and Statistics, University of Massachusetts, Amherst.

Beckage, B. 2008. Climate change, fire, and the dynamics of ecological communities. Department of Plant Biology, UVM.

Beckage, B. and L. Gross. 2008. Modeling ecological responses to climate change. Ecological Society of America. Milwaukee, WI.

Stevens, J.T. and B. **Beckage**. 2008. Fire suppression and invasion by Brazilian pepper (*Schinus terebinthifolius*) in Florida pine savannas. Poster presentation, Ecological Society of America. Milwaukee, WI

Beckage, B. 2008. Fire, climate, and the dynamics of ecological communities: Models to management. Everglades National Park, FL.

Beckage, B. 2008. Investigating the dynamics of savanna communities using models. Poster presentation at the Vermont EPSCoR Annual Meeting. Burlington, VT.

Beckage, B. 2008. Climate change impacts on forests in Vermont. Presentation to the Vermont House Agricultural Committee. Burlington, VT.

Beckage, B., S. Duke-Sylvester, L. Gross, and C. Ellingwood. 2007. Modeling fire in the Florida Everglades using cellular automata, evolutionary algorithms, and empirical likelihood. Ecological Society of America. San Jose, CA.

Beckage, B. and C. Ellingwood. 2007. Brazilian pepper, fire, and the invasibility of pine savannas: Exploring nonlinear effects through simulation. Poster presentation, Weed Science Society of America. San Antonio, TX.

Beckage, B. 2006. A Multifaceted Approach to Investigating Climate Change and Ecological Communities. Department of Plant Biology, UVM.

Beckage, B. 2006. Modeling abrupt ecological responses to climate change. Ecological Society of America. Memphis, TN.

Beckage, B. 2006. Reconstructing historic fire regimes and vegetation patterns by linking landscape models to global climate. Greater Everglades Ecosystem Restoration conference, Orlando, Fl.

Beckage, B. 2005. Why don't pine savannas grow up to forest? Biology Department, UVM.

Beckage, B. 2004. Climate, large-scale disturbance, and the dynamics of pine savannas. Dartmouth College, NH.

Beckage, B. 2004. Climate, large-scale disturbance, and the dynamics of pine savannas. Harvard Forest, MA.

Beckage, B. 2004. Overstory dynamics of pine savannas in response to climate and large-scale disturbance. Pine Rockland Management Symposium, Miami, FL.

Beckage, B. 2003. Modeling overstory dynamics of pine savannas: responses to climate and large-scale disturbance. Ecological Society of America. Savanna, GA.

Beckage, B. 2002. Does tree mortality in fires depend on past hurricanes? Ecological Society of America. Tucson, AZ.

Beckage, B. 2001. Predicting spring fire severity in Everglades National Park. Oral Presentation. Natural Areas Association. Cape Canaveral, FL.

Beckage, B. 2001. Influence of Global Climate on Fire Regimes in Everglades National Park. Oral Presentation. Ecological Society of America. Madison, WI.

Beckage, B. 2000. Tree Seedling Survival and Growth in southern Appalachian Forests: Effects of Canopy Gaps, Understory Removal, Trenching and Fertilization. Oral Presentation. Ecological Society of America. Snowbird, UT.

Beckage, B. 1999. Estimating seedling densities in and out of canopy gaps: A Bayesian change-point analysis. Oral Presentation. Ecological Society of America. Spokane, WA.

Beckage, B. 1998. A seedling success story: estimating transition probabilities in the southern Appalachians Oral Presentation. Ecological Society of America. Baltimore, MD.

Beckage, B. 1997. Canopy gaps, *Rhododendron maximum* and tree recruitment in the southern Appalachians. Oral Presentation. Ecological Society of America. Albuquerque, NM.

Beckage, B. 1997. Understory suppression of seedling recruitment in canopy gaps: evidence from the southern Appalachians. Oral Presentation. Plant Ecology Seminar of the Botany Department, Duke University.

TEACHING

PBIO 275, Climate Change Ecology, University of Vermont.

PBIO 295, Data Modeling in the Environmental Sciences, University of Vermont.

BCOR 102, Ecology and Evolution, University of Vermont.

Teaching Assistant, Duke University, Department of Botany, Durham, NC: 1995-2000 Community Ecology, Diversity of Life, General Ecology, Introductory Biology, Organismal Evolution

Teaching Assistant, University of Central Florida, Department of Biology, Orlando, FL: 1993. General Botany

INVITED WORKSHOPS AND SYMPOSIA

Speaker and symposium organizer: Theory and dynamics of savanna systems. ESA, August 2011.
Speaker in symposium: Static and dynamic approaches to modelling diversity and complexity. ISEM, October 2009.
Speaker and symposium organizer: Forecasting future ecosystem states in a time of global change: from models to management. ESA, August 2008.
Speaker in symposium: Design and analysis of multi-factor experiments. ESA, August 2006
Speaker in workshop: Application of paleoecological information to restoration and management of the Everglades ecosystem. Greater Everglades Ecosystem Restoration Conference, June 2006.
Speaker in workshop on uncertainty in ecology, Mathematical Biosciences Institute, Ohio State University, April 2006
Participant in workshop on spatial ecology, University of Miami, January 2005
Speaker in symposium: Pine savannas and the role of disturbance in a time of global change. ESA, August 2003

Participant in working group: A new synthesis of demography and dispersal, National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara. Fall 2001 and Spring 2002.

PROFESSIONAL SERVICE AND SOCIETIES

Panelist, National Science Foundation. Population and Community Ecology (Apr 2011)
Handling Editor, Oecologia (Jun 2008-Dec 2009); *Panelist*, NSF DDIG (Spring 2007); *Secretary*, Statistical Section of ESA, 2004-06;
Ecological Society of America; Society for Mathematical Biology; American Statistical Association.

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EDUCATION

Doctor of Philosophy in Botany, The University of Vermont, 2003 – 2007.
Master of Science in Forestry, The University of Vermont, 1999 – 2000.
Bachelor of Science in Forest biology, *summa cum laude*, The University of Vermont, 1995 – 1999.

PROFESSIONAL EXPERIENCE

Research Assistant Professor, Proctor Maple Research Center, Department of Plant Biology, The University of Vermont, 2011 – present.
Research Associate, Proctor Maple Research Center, Department of Plant Biology, The University of Vermont, 2006 – 2011.
Lecturer, Department of Plant Biology, The University of Vermont, 2006 – 2008.
Research Technician, Proctor Maple Research Center, The University of Vermont, 2001 – 2006.

PEER-REVIEWED PUBLICATIONS

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2012. Maple syrup production with sap concentrated to high levels by membrane separation: effects on syrup chemical composition and flavor. *International Sugar Journal* 114:572-576.

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2011. Effects of producing maple syrup from concentrated and reconstituted sap of different sugar concentrations. *International Sugar Journal* 113:35-44.

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2009. Air injection into concentrated maple sap during processing: impact on syrup composition and flavor. *Journal of the Science of Food and Agriculture* 89:1770-1774.

van den Berg, A.K., Vogelmann, T.C. and Perkins, T.D. 2009. Anthocyanin influence on light absorption within juvenile and senescing sugar maple leaves – do anthocyanins function as photoprotective visible light screens? *Functional Plant Biology* 36:793-800.

Perkins, T.D. and **van den Berg, A.K.** 2009. Maple syrup – production, composition, chemistry, and sensory characteristics. *In* Advances in Food and Nutrition Research (Ed. S.L. Taylor), 56:103-144. Academic Press, San Diego, CA, USA.

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2009. Effects of air injection during sap processing on maple syrup color, chemical composition and flavor volatiles. *International Sugar Journal* 111(1321):37-42.

van den Berg, A.K. and Perkins, T.D. 2007. Contribution of anthocyanins to the antioxidant capacity of juvenile and senescing sugar maple (*Acer saccharum*) leaves. *Functional Plant Biology* 34:714-719.

van den Berg, A.K. and Perkins, T.D. 2005. Nondestructive estimation of anthocyanin content in autumn sugar maple leaves. *HortScience* 40:685-686.

van den Berg, A.K. and Perkins, T.D. 2004. Evaluation of a portable chlorophyll meter to estimate chlorophyll and nitrogen contents in sugar maple (*Acer saccharum* Marsh.) leaves. *Forest Ecology and Management* 200:113-117.

Schaberg, P.G., **van den Berg, A.K.**, Murakami, P.F., Shane, J.B. and Donnelly, J.R. 2003. Factors influencing red expression in autumn foliage of sugar maple. *Tree Physiology* 23:325-333.

OTHER PUBLICATIONS (NOT PEER-REVIEWED)

van den Berg, A.K. 2012. Defining modern, sustainable tapping guidelines for maple syrup production. Northeastern States Research Cooperative, www.nsrcforest.org. 22p.

Isselhardt, M.L., **van den Berg, A.K.** and Perkins, T.D. 2012. Chemical composition of scale in maple syrup evaporators. *Maple Syrup Digest* 24A(4): 23-28.

Perkins, T.D. and **van den Berg, A.K.** 2012. Tubing cleaning – methods used in the U.S. *Maple Syrup Digest* 24A(3): 11-18.

Perkins, T.D. and **van den Berg, A.K.** 2012. Relationships between tubing system component age and sap yield. *Maple Syrup Digest* 24A(1):11-16.

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2009. Metabolism off-flavor in maple syrup Part II: Remediation of metabolism off-flavor in maple syrup. *Maple Syrup Digest* 21A(3):11-18.

Martin, N., Perkins, T.D., Ramacieri, P., and **van den Berg, A.K.** 2009. Technical position paper on air injection. *Maple Syrup Digest* 21A(2):23-31.

van den Berg, A.K., Perkins, T.D., Godshall, M.A., Lloyd, S.W. and Isselhardt, M.L. 2009. Metabolism off-flavor in maple syrup Part I: Identification of the compound responsible for metabolism off-flavor. *Maple Syrup Digest* 21A(1):15-80.

Godshall, M.A., **van den Berg, A.K.**, Lloyd, S.L., Perkins, T.D. and Isselhardt, M.L. 2008. The influence of processing factors on maple syrup volatiles. *Proceedings of the 2008 Conference on Sugar Processing Research, "Diversifying Research in Sugar Processing"*, Delray Beach, FL, USA, September 28-October 1, 2008.

Isselhardt, M.L., **van den Berg, A.K.** and Perkins, T.D. 2007. Temperature patterns within an oil-fired maple evaporator. *Maple Syrup Digest* 19A(3):20-25.

Wilmot, T.R., Perkins, T.D. and **van den Berg, A.K.** 2007. Vacuum sap collection: how high or low should you go? *Maple Syrup Digest* 19A(3):27-32.

Wilmot, T.R., Perkins, T.D., Stowe, B. and **van den Berg, A.K.** 2007. Comparison of the 'small' spout with the traditional 7/16″ spout. *Maple Syrup Digest* 19:20-26.

van den Berg, A.K., Perkins, T.D. and Isselhardt, M.L. 2006. Sugar profiles of maple syrup grades. *Maple Syrup Digest* 18:12-13.

Perkins, T.D., Morselli, M.F., **van den Berg, A.K.** and Wilmot, T.R. 2006. Maple chemistry and quality. *In* North American Maple Syrup Producers Manual (R.B. Heiligmann, M.R. Koelling, T.D. Perkins, Eds.) pp 294-300. The Ohio State University, Columbus, OH.

van den Berg, A.K., Perkins, T.D. and Marckres, H.J. 2005. Chemical safety in sugaring operations. University of Vermont, Agricultural Experiment Station and Extension Miscellaneous Publication, Burlington, Vermont. 12p.

Murakami, P.F., Turner, M.R., **van den Berg, A.K.** and Schaberg, P.G. 2005. An instructional guide for leaf color analysis using digital imaging software. Gen. Tech. Rep. NE-327. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 33p.

EXTERNAL FUNDING

A.K. van den Berg and T.D. Perkins. Long-term effects of tapping on tree growth. Chittenden County Maple Sugarmakers Association. July 2013 – June 2016. ($21,870)

A.K. van den Berg and T.D. Perkins. Does tubing cleaning increase sap yield? North American Maple Syrup Council. January 2013 – December 2014. ($23,021)

A.K. van den Berg. Birch syrup production to increase the long-term economic sustainability of maple syrup production in the Northern Forest. Northeastern States Research Cooperative. October 2011 – September 2013. ($80,307)

A.K. van den Berg. Growth rates of tapped versus untapped trees. Chittenden County Maple Sugarmakers Association. July 2011 – June 2012. ($7,400)

T.D. Perkins and **A.K. van den Berg.** Predicting maple sap yields in vacuum tubing operations. North American Maple Syrup Council. January 2011 – December 2011. ($22,677)

A.K. van den Berg. Defining modern, sustainable tapping guidelines for maple syrup production. Northeastern States Research Cooperative. July 2010 – June 2012. ($65,010)

T.D. Perkins and **A.K. van den Berg**. Effects of sap preconcentration by reverse osmosis on maple syrup chemical composition and flavor. USDA NIFA Special Grant for Maple Research. October 2010 – September 2011. ($153,560)

A.K. van den Berg and T.D. Perkins. Sustainability of carbohydrate removal from sugar maple for syrup production. Chittenden County Maple Sugarmakers Association. January 2010 – December 2010. ($7,300)

T.D. Perkins and **A.K. van den Berg**. Achieving high sap yields. USDA CSREES Special Grant for Maple Research. October 2009 – September 2010. ($144,505)

T.D. Perkins and **A.K. van den Berg**. Effects of high sap sugar concentration by reverse osmosis on maple syrup attributes. USDA CSREES Special Grant for Maple Research. October 2008 – September 2009. ($144,505)

T.D. Perkins and **A.K. van den Berg**. Energy efficiency in maple operations. USDA CSREES Special Grant on Environmentally Safe Products. September 2008 – August 2010 ($32,000) (A Portion of the Vayda Special Grant).

T.D. Perkins and **A.K. van den Berg**. Identification and remediation of chemical residues from plastic tubing in maple sap and syrup. USDA Hatch Special Grant. October 2007 – September 2008. ($48,826)

T.D. Perkins and **A.K. van den Berg**. Effects of sap pre-concentration by reverse osmosis on maple syrup chemistry and flavor. USDA Hatch Special Grant. October 2007 – September 2008. ($133,362)

M.L. Isselhardt and **A.K. van den Berg**. Chemical characterization of sugar sand in maple syrup evaporators. North American Maple Syrup Council. January 2007 – December 2009. ($1,500)

A.K. van den Berg, T.D. Perkins, and M.L. Isselhardt. Effects of sap processing equipment on maple syrup chemistry and flavor. Chittenden County Maple Sugar Makers Association. December 2006 – November 2011. ($30,000)

T.D. Perkins and **A.K. van den Berg**. Impact of sap processing technology on maple syrup chemistry and quality II. USDA CSREES Special Grant for Maple Research. September 2006 – August 2007. ($128,467)

A.K. van den Berg and T.D. Perkins. Developing sugar profiles of maple syrup grades for use in the detection of adulteration. North American Maple Syrup Council. October 2003 – October 2004. ($3,000)

INTELLECTUAL PROPERTY

Sap collection methods (with T.D. Perkins)

Provisional Patent Application filed with the USPTO March 2012

Antimicrobial spouts, tubing, and fittings (with T.D. Perkins)

Invention disclosure filed with the University of Vermont February 2011

Use of UV light to sterilize maple tapholes and spout (with T.D. Perkins)
Invention disclosure filed with the University of Vermont January 2010
Remediation of 'metabolism' off-flavor in maple syrup (with T.D. Perkins)
Invention Disclosure filed with the University of Vermont October 2007
Released to public domain (lack of commercial potential)

INVITED RESEARCH SEMINARS

"Impacts of modern processing technologies on maple syrup composition and flavor", University of Vermont Department of Plant Biology Marvin Seminar Series, April 2012.

"Effects of reverse osmosis on maple syrup chemistry and flavor", Ontario Maple Producers Conference, Perth, Ontario, July 2009.

"Effects of air injection using RO-concentrated sap on maple syrup chemistry and flavor", Ontario Maple Producers Conference, Owen Sound, Ontario, July 2008.

"Air injection effects on maple syrup chemistry and flavor", Ontario Maple Producers Conference, Richards Landing, Ontario, July 2007.

"Air injection effects on maple syrup chemistry and flavor", New York State Maple Conference, Verona, NY, January 2007.

RESEARCH SEMINARS

"Growth rates of trees tapped with high-yield sap collection practices", The University of Vermont Extension Vermont Maple Conference, Hyde Park, VT, January 2013.

."Effects of reverse osmosis on syrup chemical composition and flavor", North American Maple Syrup Council and International Maple Syrup Institute Conference, Mystic, CT, October 2012.

"Effects of reverse osmosis on syrup chemical composition and flavor", The University of Vermont Extension Vermont Maple Conference, Hyde Park, VT, January 2012.

"Effects of high sugar concentration by reverse osmosis on syrup chemistry and flavor", The University of Vermont Extension Vermont Maple Conference, Hyde Park, VT, January 2010.

"Effects of high sugar concentration by reverse osmosis on syrup chemistry and flavor", Annual meeting of the North American Maple Syrup Council and International Maple Syrup Institute, Bar Harbor, ME, October 2009.

"Effects of reverse osmosis on maple syrup chemistry and flavor", The University of Vermont Extension Vermont Maple Conferences, multiple dates and locations, January 2009.

"Effects of reverse osmosis on maple syrup chemistry and flavor", Annual meeting of the North American Maple Syrup Council and International Maple Syrup Institute, Amherst, MA, October 2008.

"Anthocyanin influence on light absorption within juvenile and senescing sugar maple leaves", Ecological Society of America Annual Meeting, San Jose, CA, August 2007.

"Air injection effects on maple syrup chemistry and flavor", The University of Vermont Extension Vermont Maple Conferences, multiple dates, January 2007.

"Air injection effects on maple syrup chemistry and flavor", Annual meeting of the North American Maple Syrup Council and International Maple Syrup Institute, Green Bay, WI, October 2006.

"Anthocyanins – sunscreens for spring maple leaves?", Department of Plant Biology, The University of Vermont, April 2006.

"Chemical safety in maple sugaring operations", The New England Maple Grading School, Lancaster, NH, December 2005 and 2006.

"Physiological function of anthocyanins in juvenile and senescing sugar maple leaves", Department of Plant Biology, The University of Vermont, September 2006.

"Why leaves turn red – do anthocyanins in senescing sugar maple leaves function as photoprotective light attenuators?", Department of Plant Biology, The University of Vermont, March 2005.

"Chemical safety in maple sugaring operations", The University of Vermont Extension Vermont Maple Conferences, multiple dates, January 2005.

"Do anthocyanins function as photoprotective light screens in senescing sugar maple leaves?" North American Forest Biology Workshop, Houghton, MI, July 2004.

"Adulteration and contamination of maple syrup", The University of Vermont Extension Vermont Maple Conferences, multiple dates, January 2004.

CONFERENCE POSTERS

"Nondestructive estimation of anthocyanin content in autumn sugar maple (*Acer saccharum*) leaves." North American Forest Biology Workshop, Houghton, MI, 2004.

"Relationship between extractable chlorophyll and readings from two types of portable chlorophyll meters in leaves of sugar maple." North American Forest Biology Workshop, Pullman, WA, 2002.

"Seasonal patterns of chlorophyll meter values in leaves of three northern hardwood species." North American Forest Biology Workshop, Pullman, WA, 2002.

"Development of fall foliage color in sugar maple." The 4th International Symposium on The Tree, Montreal, Canada, 2000.

SELECTED GUEST LECTURES

"Maple sugaring and the science of sap flow", The Green World (PBIO 006), The University of Vermont, April 2008 – 2012, June/July 2010 – 2012.

"Maple sugaring and the science of sap flow", Plant Physiology (PBIO 104), The University of Vermont, April 2010 – 2012.

"Plant Nutrition" and "Plant Sense and Response to the Environment", Principles of Biology II (BIOL 002), The University of Vermont, July 2006.

"Physiology of fall color", Plant Physiology (BOT 295), The University of Vermont, May 2006.

"Maple sugaring", Introduction to Botany (BOT 004), The University of Vermont, March 2006.

TEACHING

Graduate Faculty Member, University of Vermont, February 2010 – present.

Graduate Committee Service

Daniel P. Comerford, M.S. 2011 (co-advisors Paul Schaberg and Kimberly Wallin)
Mark L. Isselhardt, M.S. 2012 (advisor Timothy Perkins)
Katherine White, M.S. 2012 (advisor Jennifer Pontius)

Undergraduate Mentoring

Teague Henkle, Undergraduate Research Assistantship in birch syrup production, 2011 – present.

Courses Taught

Plant Physiology (PBIO 104)
Principles of Biology I (BIOL 001)
Principles of Biology II (BIOL 002)
Exploring Biology I (BCOR 011)

Exploring Biology II (BCOR 012)

PROFESSIONAL AWARDS

Golden Maple Leaf Award (Recipient UVM Proctor Maple Research Center & UVM Maple Extension), International Maple Syrup Institute, October 2008.

Association of Natural Resources Extension Professionals Award of Exceptional Merit for "North American Maple Syrup Producers Manual", 2007.

SERVICE

Volunteer staff, Champlain Valley Exposition Maple Education Booth, 2001 – present.

Volunteer judge, Vermont Odyssey of the Mind, 2001 – 2009.

Mentor, Women in Science Program, Essex High School, Essex Junction, VT, 2001 – 2007.

ACADEMIC AWARDS

Holcomb Prize for outstanding achievement in natural resources, The University of Vermont, 1999.

Jones Award for outstanding achievement in plant science, The University of Vermont, 1999.

W.R. Adams Award for outstanding academic achievement in forestry, The University of Vermont, 1999.

OTHER ACTIVITIES

> 50 media interviews, including newspapers, magazines, television and radio.

LAURA HILL BERMINGHAM, PH.D.

Lecturer and Research Associate, University of Vermont Plant Biology Department
63 Carrigan Dr., 111 Jeffords Hall, Burlington VT 05405
Ph: 802-656-1134; FAX: 802-656-0440; Email: lhill@uvm.edu | Website: www.uvm.edu/~lhill

EDUCATION

08/2003 – 12/2008	**Ph.D. Biology, emphasis Ecology and Evolution** "Ecological and evolutionary factors affecting population persistence of a globally threatened wetland plant, *Polemonium vanbruntiae* (Polemoniaceae)," University of Vermont; Burlington, Vermont 05405; Advisor: Dr. Alison K. Brody
08/1998 – 05/2001	**B.S. Environmental Biology, emphasis Humanities** Undergraduate thesis: "Comparative sediment toxicity in 3 Maine estuaries," Unity College; Unity, Maine 04988; Advisor: Dr. Emma Creaser

INSTRUCTED COURSES

2011 – present	**PBIO297/Advanced Undergraduate Research**, upper-level undergraduates gain research experience with a faculty mentor *Topics cover proposal and grant writing, experimental set-up and analysis, reading the peer-reviewed literature, and hands-on research experience in the field and lab.*
2011 – present	**BCOR 101/Genetics**, sophomore-level introductory genetics course for biological science majors *Topics include patterns of inheritance, molecular structure and replication of genetic material, molecular properties of genes, genetic technologies, and genetic analysis of individuals and populations.*
2010 – present	**BIOL001/Principles of Biology**, first-semester introductory biology for non-majors *Topics covered include chemistry of life, cell structure and function, cellular metabolism, cellular reproduction, genes and inheritance, and gene expression.*
2009 – present	**BIOL002/Principles of Biology**, second-semester introductory biology for non-majors *Topics covered include evolution, diversity of life, physiology and ecology.*
2010 – present	**PBIO4/Introduction to Botany**, introductory botany course for non-science majors *Topics covered include plants and people, overview of the plant body, cells and molecules, genetics and evolution, plant diversity, ecological interactions involving plants, and sustainable agriculture.*
2009 – present	**Integrated Biological Sciences BCOR11/Exploring Biology**, first-semester introductory biology for majors *Topics covered in lecture include chemistry of life, cell structure/function/reproduction, the chromosomal basis of inheritance, life cycles, genome organization, and DNA technology.*
2010 – present	**Integrated Biological Sciences BCOR12/Exploring Biology**, second-semester introductory biology for majors *Topics covered in lecture include evolution, diversity of life, physiology, plant and animal development, and ecology.*
2010	**PBIO006/The Green World**, introductory botany course for non-science majors *Topics include how plants live, grow, and reproduce, how humans have used plants for food, medicine, clothing, and shelter, why plant biologists are concerned about invasive species and habitat fragmentation, how plants influence earth's climate, why different plant communities occur where they do.*

TEACHING APPOINTMENTS

2009 – present	Full-time Lecturer, Plant Biology Department, UVM
2009	Adjunct faculty, Lecturer, Principles of Biology, Plant Biology Department, UVM
2004, 2007, 2008	Graduate Teaching Fellow (GTF), Exploring Biology, Biology Department, UVM
2007	Writing Across the Curriculum work group, Integrated Biological Sciences curriculum
2006, 2007	GTF, Ecology and Evolution, Biology Department, UVM
2006	GTF, The Human Body (online course), Biology Department, UVM
2002, 2003	GTF, Environmental Biology, Biology Department, UVM

MENTORING ACTIVITIES

2011 – present	**Vermont Science Initiative (VSI)**, a professional education program for licensed teachers of grades K-8. The program builds a cohort of skilled teachers of science who will serve as teacher-leaders in delivering professional development to colleagues. *Goals: increase their knowledge of content in science, expand critical thinking/problem solving skills, develop a comprehensive understanding of standards-based science and its assessment, and develop leadership skills.*
2001 – present	**High school graduates in science careers & college programs**, McNicholas H.S.
2006 – 2008	**NSF Interdisciplinary Training in Mathematics & Biology Program**
2005 – 2008	**Undergraduate Research Apprenticeships**
2005 – 2008	**Federal workstudy program**

AWARDS, HONORS, FELLOWSHIPS AND SCHOLARSHIPS

2009	Roberto Fabri Fialho Scholarship for dissertation research in the life sciences
2008	Graduate Teaching Assistant of the Year nominee, University of Vermont
2003 – 2008	Graduate Teaching Assistant Fellowship
2004 – 2006	Vermont NSF-EPSCoR Graduate Research Fellowship
2004	Graduate College Summer Research Fellowship
2001	Unity College, Humanities Award
2001	Unity College Dean's Award - Highest Honors
1999 – 2001	Unity College Merit I and Presidential Scholarship

PUBLICATIONS

Peer-reviewed

Hill Bermingham L. and Brody, A.K. 2011. Pollen source affects female reproductive success and early offspring traits in the rare endemic plant *Polemonium vanbruntiae* (Polemoniaceae). *Plant Species Biology* 26, 244–253.

Hill Bermingham, L. 2010. Habitat type and deer herbivory influence long-term population dynamics of a rare wetland plant. *Plant Ecology,* 210, 359 - 378.

Hill, L.M., Brody, A.K., Tedesco, C.L. 2008. Mating strategies & pollen limitation in globally threatened perennial *Polemonium vanbruntiae. Acta Oecologica*, 33, 314-323.

In preparation

Hill Bermingham, L. and Friend, S.A. *In preparation*. Nutrient addition alters the competitive interaction between an invasive grass and rare wetland plant. *Biological Conservation*.

Hill Bermingham, L. *In preparation.* A comparison of ramet and genet population dynamics within clonal plant populations. *Ecology*.

Hill Bermingham, L. *In preparation.* Forest management practices affect population persistence of a globally threatened perennial herb. *Conservation Biology.*

Publications for the lay public

Hill, L.M. 2006. Helping Vermont's Eastern Jacob's ladder. *Natural Heritage Harmonies*, a publication of the Vermont Department of Fish & Wildlife. pp. 6-8.

Governmental Reports

Hill Bermingham, L. 2010. Ecological and anthropogenic factors affecting the distribution and persistence of rare plant *Polemonium vanbruntiae* in the Green Mountain National Forest. Submitted to the USDA Forest Service, Green Mountain National Forest extension.

Hill Bermingham, L. 2009. Appalachian Jacob's ladder Challenge Cost Share Agreement Annual Report. Submitted to the USDA Forest Service, Green Mountain National Forest extension.

Hill Bermingham, L. 2008. Special report addendum to inform conservation management policy for threatened plant, *Polemonium vanbruntiae*. Submitted to the Vermont Nongame and Natural Heritage Program, U.S. Fish and Wildlife Department.

Hill Bermingham, L. 2008. Special Report: Population reintroduction status report for threatened plant *Polemonium vanbruntiae*. Submitted to the USDA Forest Service, Green Mountain National Forest extension and the Vermont Nongame and Natural Heritage Program, U.S. Fish and Wildlife Department.

RESEARCH FUNDING

2012 – present	USDA NESARE Partnership Grant, $14,900
2008 – present	USDA Cooperative Challenge Cost Share Agreement, $62,669
2006 – 2008	NSF Interdisciplinary Training in Mathematics & Biology mentor, $3000
2007	Explorer's Club Explorer's Fund Award, $1200
2007	Graduate College Mini-Grant Travel Support, $300
2005	Vermont NSF-EPSCoR facilities mini-grant, $925
2004 – 2006	Vermont NSF-EPSCoR Graduate Research Fellowship, $50,000
2001	Unity College Travel Grant, $1000

RESEARCH ACTIVITIES

04/2012 – present **The future of growing rice in Vermont: managing for climate change**

USDA Northeast Sustainable Agriculture Research and Education (NESARE) Partnership Grant (PI: Laura Hill Bermingham)

Rice has not been commercially grown on a large-scale in the northeastern US, even with the availability of cold-hardy varieties and the abundance of freshwater resources. Thus, this important grain that feeds 3 billion people worldwide must be imported, although there is an opportunity to grow rice locally. Rice paddies are constructed wetlands that can mitigate the effects of severe weather events, such as flooding and excess soil and nutrient run-off, while increasing on-farm biodiversity. We are studying how variable water supply affects rice plant vigor, survival, panicle formation, maturation date, and total grain yield of 4 temperate rice strains. The project results will inform northeastern farmers how to utilize subprime agricultural land (i.e., on dairy farms) to grow rice and increase farm income in a changing climate.

06/2008 – present **Population viability and distribution of rare plants under forest management**
USDA Forest Service, University of Vermont (PI: Laura Hill Bermingham)
I use a combination of field research and ecological modeling to predict future population growth trends and distribution of a threatened plant species, Eastern Jacob's ladder (*Polemonium vanbruntiae*) in the Green Mountain National Forest under various forest management scenarios, including invasive species, white-tailed deer herbivory, canopy-opening, and forest road maintenance. Spatial habitat modeling pinpoints potentially undiscovered populations of this globally threatened species.

05/2007 – present **Population reintroduction of a globally threatened wetland plant species**
USDA Forest Service, State of VT Fish & Wildlife, VT Nature Conservancy
In collaboration with the University of Vermont, Vermont Nongame and Natural Heritage Program, USDA Forest Service, and the Vermont Nature Conservancy, I reintroduced a population of a globally threatened plant species in the Green Mountain National Forest in Vermont. I utilized a natural wet meadow where we sowed 1700 seeds and planted 40 juvenile and adult plants that were reared in the greenhouse. To-date, I collect annual data on plant survival, growth and fitness to estimate long-term reintroduction success.

06/2007 – present **Effects of invasive species, canopy-cover, and nutrient enhancement on a rare wetland plant**
University of Vermont, Interdisciplinary Program in Mathematics & Biology
I collaborated on 2 research projects at UVM's Horticultural Research Station. Here, we used a common-garden approach to determine how competition with invasive reed canarygrass (*Phalaris arundinacea*) affects the growth and fitness of a rare, native plant. We also used experiments to test how canopy-cover and nutrient addition interact with invasive plant competition.

08/2003 – 12/2008 **Ecological and evolutionary factors affecting rare plant population viability**
University of Vermont Biology Department
For my doctoral dissertation, I used experimental and modeling methods to examine various ecological and evolutionary factors influencing native populations of a globally threatened wetland plant species (i.e., pollinators, mating system evolution, white-tailed deer herbivory, and canopy-closure). I have disseminated my research findings as scientific journal articles, governmental reports, and reports for the lay public (see ***Publications***).

08/2000 – 05/2001 **Sediment toxicity in Maine estuaries**
Unity College in Maine
For my undergraduate senior thesis, I designed and implemented a research project to compare the sediment toxicity of 3 Maine estuaries spanning a range from midcoast Maine south to Portland. I was awarded a grant to travel to the Colorado School of Mines in Golden, CO to analyze my samples in the ecotoxicology lab at the college. I found that sediments in Portland were the most contaminated most likely due to industrial and other forms of run-off into the bay adjacent to Maine's largest city.

RESEARCH PRESENTATIONS

2012 Hill Bermingham, L. Four years of data on how forest management impacts rare plant Appalachian Jacob's ladder (*Polemonium vanbruntiae*): conservation management recommendations. USDA Forest Service Green Mountain National Forest extension, Rutland, VT.

2011 Hill Bermingham, L. Forest management affects rare plant persistence in the Green Mountain National Forest. Plant Biology Department Marvin Seminar series, University of Vermont, Burlington, VT.

2010 Hill Bermingham, L. Ecological and anthropogenic factors affecting the distribution and persistence of rare plant *Polemonium vanbruntiae* in the Green Mountain National Forest. Plant Biology Department Marvin Seminar series, University of Vermont, Burlington, VT.

2009 Hill Bermingham, L. Ecological and anthropogenic factors affecting persistence of rare plant populations in the Green Mountain National Forest. Biology Department Seminar, University of Vermont, Burlington, VT.

2008 Hill Bermingham, L. Ecological and evolutionary factors affecting population persistence of a globally threatened wetland plant, *Polemonium vanbruntiae* (Polemoniaceae). Doctoral Dissertation final presentation, University of Vermont, Burlington, VT.

Hill Bermingham, L., Brody, A.K., and Tedesco, C.L. Mating strategies and pollen limitation in a globally threatened perennial plant, *Polemonium vanbruntiae* (Polemoninaceae). Botany Conference, University of British Columbia, Vancouver, Canada.

Hill, L.M. The effects of an invasive grass on a globally threatened wetland plant. Northeast Natural History Conference, New York State Museum, Albany, NY.

Hill, L.M. Various ecological & evolutionary factors affecting rare plant persistence. EcoLunch. University of Vermont. Burlington, VT.

2007 Hill, L.M. Demographic population viability analysis of a globally threatened wetland plant, *Polemonium vanbruntiae*. Plant Ecology and Evolution Symposium, Student Research in Plant Biology and Conservation. Chicago Botanic Garden, Glencoe, IL.

Hill, L.M. Revisions to conservation management policies for the threatened Eastern Jacob's ladder (*Polemonium vanbruntiae*). Flora Advisory Council, Vermont Nongame and Natural Heritage Program. Pringle Herbarium, Burlington VT.

2006 Hill, L.M. The effect of pollinators and herbivores on rare plant populations. National NSF-EPSCoR Annual Meeting. Lexington KY.

Hill, L.M. Ecology, demography and population genetics of rare plant *Polemonium vanbruntiae* (Eastern Jacob's Ladder). Annual Biology Department Retreat, Burlington, VT.

2005 Hill, L.M. Population persistence of rare perennial plant *Polemonium vanbruntiae* (Eastern Jacob's Ladder). Vermont EPSCoR annual meeting. Burlington, VT.

Hill, L.M. Population persistence of rare perennial plant *Polemonium vanbruntiae*. National NSF-EPSCoR Annual Meeting. Rio Grande, Puerto Rico.

2004 Hill, L.M. Rare–common differences and the persistence of a rare perennial plant. Ecology and Evolution Meeting. University of Vermont. Burlington, VT.

2002 Hill, L.M. A comparative study of sediment toxicity in three Maine estuaries: Belfast Bay, the Penobscot River estuary in Bucksport, and the Back Cove in Casco Bay, Portland. Ecology and Evolution Meeting, University of Vermont. Burlington, VT.

ACADEMIC & COMMUNITY SERVICE

2008 – present	Manuscript reviewer for *Plant Ecology, Biological Conservation, Northeastern Naturalist, Acta Oecologica*, and *American Midland Naturalist*
2011	Teaching First-Year Students: a Faculty Resource Group
2010 – 2011	Sustainability Faculty Fellow, University of Vermont
2008 – present	Member, Huntington Conservation Commission, Huntington, Vermont
2008	Office volunteer, The Nature Conservancy, Montpelier, Vermont
2008	Green Up Day volunteer, Huntington, Vermont
2006 – 2007	Public Relations Committee, Graduate Student Senate, UVM
2006 and 2011	Ronald McDonald House volunteer, Burlington, Vermont
2006	Co-Chair, Graduate Research Day Committee, UVM
2005 – 2006	Grad student representative, Transportation & Parking Services, UVM
2004 – 2005	Grad student representative, Financial & Physical Planning Committee, UVM

Curriculum Vitae
Terrence P. Delaney
March 2012

The University of Vermont
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Burlington, VT 05405

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http://www.uvm.edu/~tpdelane/lab/

EDUCATION

1989	Ph.D.	Botany	University of Washington	Seattle, WA
1979	A.B.	Botany	Duke University	Durham, NC

PROFESSIONAL EXPERIENCE

Year	Experience	Location
Sept 2007-present	Associate Professor	The University of Vermont, Dept. of Plant Biology
2003-2007	Assistant Professor	The University of Vermont, Dept. of Plant Biology
1995-2003	Assistant Professor	Cornell University, Dept. of Plant Pathology, Ithaca, NY
1992-1995	Postdoctoral Fellow	Ciba-Geigy Plant Molecular Genetics Laboratory, Research Triangle Park, NC
1989-1992	Postdoctoral Fellow	The Salk Institute for Biological Studies, Plant Biology Laboratory, La Jolla, CA

TEACHING

Courses Taught at UVM (past year highlighted)

- **BCOR 12 (Spring, 2012):** **Discovering Biology** (4 credits), Two sections, 175 students; semester shared equally with Dr. Don Stratton.
- **PBIO 117/PSS 117 (Fall 2011):** **Plant Pathology** and lab (4 credits)
- **PBIO 195 (Summer, 2011):** "**Fungi**" with lab (4 credits). Eight students. First summer offering of this course at UVM (Cont. Ed). Will adapt to a 4-cr. semester course to be taught Fall, 2012.
- **Guest lectures (2011-2012)**: CLBI302 (4/12/2011), MMG320 (4/21/2011), PBIO 151 (10/13/2011)
- BCOR 12 (Spring 2011): Discovering Biology (4 credits), (190 students); semester shared equally with Dr. Don Stratton.
- PBIO 117/PSS 117 (Summer, 2010): Plant Pathology and lab (4 credits), (Cont. Ed)
- PBIO 117/PSS 117 (Fall 2009): Plant Pathology and lab (4 credits)
- PBIO 006 (Spring 2009): The Green World (3 credits) with Dr. C. Paris

- PBIO 117/PSS 117: Plant Pathology and lab (4 credits), Fall 2007, 2005
- BOT 262 / MMG 262: Nature of Sensing and Response; Signal Transduction in Biological Systems (3 credits), Spring 2007
- BOT 295: Molecular Plant-Microbe Interactions (3 credits), Fall 2006 (with J. Harris).
- BOT 295: Nature of Sensing and Response; Signal Transduction in Biological Systems (3 credits), Spring 2005
- BOT132: Concepts in Genetics (3 credits) (now BCOR101), Fall 2003
- Previously, at Cornell University, developed and taught four courses that were taught for at least three years.

ADVISING (past year)

- Undergraduate Academic Advisor for eleven students (March, 2012).
- Laboratory Research Advisor for four undergraduate students: Sarah Cayea, Cailyn Toomey, Mackenzie Harrington, Mickey Lancto. (MH, CT for credit)
- Graduate: primary advisor for Prince Zogli, Ph.D. track (Sept 2010-present)
- Graduate: secondary advisor for Jonathan Zirkle, PSS (Masters Sci., S. Bosworth lab) (finished spring, 2012);
- Graduate: secondary advisor for Renee Petipas, BIO (Masters Sci., A. Brody lab) (finished Dec. 2012)

SERVICE, National

- North American Mycological Association (NAMA) Mushroom Identification Volunteer; Volunteers assist in the identification of mushrooms involved in animal and human poisonings (http://www.namyco.org/toxicology/identifiers.html). 2011-present.
- NSF Symbiosis, Defense and Self-recognition Program Grant Review Panel, March 31-April 2, 2010.
- American Society of Plant Biologists (ASPB), Women in Plant Biology Committee, 2006-2009.
- NSF Integrative Plant Biology Program Advisory Panel, 2001, 2002, 2003.
- NSF Integrative Plant Biology, Plant Biotic Interactions Program Advisory Panel, 2005.
- USDA NRICGP Biology of Plant-Microbe Associations Advisory Panel, 2005.
- Ad hoc reviews for grants submitted to the NSF, USDA, BARD, others.
- Past Ad hoc reviews for: Science, Plant Cell, Plant Physiology, Plant Journal, Molecular Plant-Microbe Interactions, Molecular Plant Pathology, Planta, Proc. Natl. Acad. Sci., Trends in Genetics, Trends in Plant Science, Plant Cell Reports, Plant Science, Analytical Biochemistry, Journal of Experimental Botany, Plant Molecular Biology.

SERVICE, University of Vermont (active and past year highlighted)

- **Curriculum Committee, UVM CALS**, 2005-2008, 2010-2013.
- **Cell and Molecular Biology Program, Education Committee member**. 2008-present
- **Integrated Biological Sciences Steering Committee**. March, 2007 to present.
- **Depts Plant Biology & Plant and Soil Science Microscope Committee**, 2005-present.
- Vermont Genetics Network, The University of Vermont.
- Curriculum Committee, Department of Plant Biology, 2004-2009.
- Plant Biology Building Design Committee, Department of Plant Biology, 2005-2009.
- Diagnosed cause of dog lethal poisoning, Fall 2010. Culprit: *Amanita bisporigera*

PROFESSIONAL DEVELOPMENT (past year highlighted)

- **Peck Mushroom Foray, Sept 16-18, 2011** Cranberry Lake Biological Station, NY. Brought six UVM undergraduate students to the foray.
- Peck Mushroom Foray, Sept 17-19, 2010. Watson Homestead, Corning NY.
- Fungal forays: UVM Centennial Woods "BioBlitz" (2010), Monitor Barn, Richmond VT with GreenHouse RLC students (Annually, 2007-2011).
- Mentored Mushroom Club with GreenHouse RLC (2007-2011).

MEDIA INTERVIEWS (past year)

- Sept 28, 2011: FOX News interview with Greg Navaro, for a story on the toxic mushroom poisonings
- Oct. 10, 2011: featured on WCAX TV's "The 0:30", where I discussed mushroom identification, collecting, and toxic species.

HONORS

- Awardee, National Science Foundation CAREER (Faculty Early Career Development Program) Grant, 1997-2002
- Invited participant to National Academy of Sciences, Frontiers in Science Symposium, Irvine CA. November 6-8, 2003 (two plant biologists invited, of 74 invitees)

PROFESSIONAL SOCIETIES

- International Society for Molecular Plant-Microbe Interactions
- Genetics Society of America
- American Society of Plant Biologists
- American Association for the Advancement of Science

THESES ADVISED

AS PRIMARY ADVISOR:

Zhen Li, M.Sci. (2010) Mutant phenotype and mapping of the *Arabidopsis thaliana NIP1* gene (*NIM1/NPR1-Independent Resistance to Peronospora*). Master of Science Thesis, The University of Vermont, Department of Plant Biology, Burlington, VT.

Cristiana M. G. T. Argueso, Ph.D. (2004) Molecular and genetic analyses of NIM1/NPR1-independent defense responses in *Arabidopsis thaliana*, Ph.D. Thesis, Cornell University, Department of Plant Biology, Ithaca, NY.

Jong-Hyun Ko, Ph.D. (2003) Analysis of NIM1/NPR1 protein phosphorylation and its function in systemic acquired resistance in *Arabidopsis thaliana*, Ph.D. Thesis, Cornell University, Department of Plant Pathology, Ithaca, NY.

Nicole M. Donofrio, Ph.D. (2002) Identification of host factors potentially involved in susceptible interactions between *Arabidopsis thaliana* and *Peronoposra parasitica*, Ph.D. Thesis, Cornell University, Department of Plant Biology, Ithaca, NY.

Han-Suk Kim, Ph.D. (2002) Molecular and genetic analysis of *NIM1*-dependent and independent induced defense response pathways in *Arabidopsis thaliana*, Ph.D. Thesis, Cornell University, Department of Plant Pathology, Ithaca, NY.

Gregory J. Rairdan, Ph.D. (2002) Analysis of the roles played by salicylic acid and NIM1/NPR1 in *Arabidopsis thaliana* pathogen defense, Ph.D. Thesis, Cornell University Department of Plant Biology, Ithaca, NY.

AS SECONDARY ADVISOR:

Jonathan Zirle, M.Sci., Sid Bosworth lab, PSS, 2009-2012

Renee Petipas, M.Sci., Alison Brody lab, Biology, 2009-2011

Samantha R. Foster, M.Sci., Matthew E. Poynter lab, Immunology (May, 2009) Nitrogen dioxide-induced maturation of pulmonary dendritic cells and its importance during allergic sensitization.

Rachel Sargent, B.S. (2005) Undergraduate Honor's Thesis advisor. The University of Vermont, Department of Botany (J. Harris major advisor).

Adele McLeod, Ph.D. (2003) 1,3-Beta-glucanases in the oomycete *Phytophthora infestans*: the genes and their regulation, Ph.D. Thesis, Cornell University Department of Plant Pathology, Ithaca, NY.

Teresa Golden, Ph.D. (1999) Plant development: a view through the *SHORT INTEGUMENTS 1* gene of *Arabidopsis thaliana*, Ph.D. Thesis, University of Rochester Department of Biology, Rochester, NY.

Diana Miller Parker, Ph.D. (2002) Direct fungitoxic action by a synergistic mixture of cutinase plus Tween 20 protects bean and cabbage leaves from infection, Ph.D. Thesis, Cornell University Department of Plant Pathology, Geneva, NY.

Guy de Capdeville, Ph.D. (2002) Harpin induced resistance for the control of blue mold of apples, Ph.D. Thesis, Cornell University Department of Plant Pathology, Ithaca, NY.

Ali Alan, Ph.D. (2001) Utilization of lytic peptide and avirulence genes for developing plants with broad spectrum disease resistance, Ph.D. Thesis, Cornell University Department of Plant Breeding, Ithaca, NY.

EXTERNAL SUPPORT
Past Awards

Hatch (Delaney) FY11 — $10,300
United States Dept. of Agriculture — 7/1/10-6/30/11
Research Incentive Fund grant, CALS, The Univ. Vermont (ca. $8,000 expended)

Hatch (Delaney) FY10 (VT-HO1615) — $5.000
United States Dept. of Agriculture — 10/1/09-9/30/10
Characterization of NIP, a novel plant gene involved in oomycete resistance

NIH COBRE (Delaney, co-PI) — $150,000 (direct)
P20 RR021905 — 7/1/07-6/30/09
National Institutes of Health
Center of Biomedical Research Excellence (COBRE) in immunology and infectious diseases. Chief PIs Dr.s R. Budd, G. Ward. (ca. $110,000 expended)

Hatch (Delaney) (VT-H01301) — No funds attached
United States Dept. of Agriculture — 10/1/06-9/30/09
Characterization of the Arabidopsis thaliana SON1-regulated plant disease resistance pathway

NSF Integrative Plant Biology (Delaney) — $490,000 (total)
0442081 — 7/1/03-8/31/09
National Science Foundation — (no-cost extension)
Characterization of SAR-Independent Pathogen Induced Defense in Arabidopsis

Hatch-CRIS-VT (Delaney) (VT-HO1114) — $10,000 (total)
US Department of Agriculture — 1/1/05-12/31/05
Molecular Genetic Analysis of Plant Responses to Disease

NSF-Plant Genome — $5,043,864 (total)
(A. Collmer, PI; TPD and 7 other Co-PIs) — (approx $65K TDC to TPD)
National Science Foundation — 7/1/00-6/30/02
Functional Genomics of the Interactions of Tomato and *Pseudomonas syringae* pv *tomato* pv. DC3000.

NRICGP, 98353036484 (Delaney) $190,000 (total)
United States Dept. of Agriculture 8/15/98-8/31/2002
Function of Arabidopsis NIM1 Protein in Plant Systemic Acquired Resistance

NSF-CAREER IBN-9722377 (Delaney) $420,000 (total)
National Science Foundation 8/1/97-7/31/2002
Molecular Genetic Dissection of Plant Induced Resistance to Disease

Hatch-CSREES NYC-153440 (Delaney) $66,000 (direct)
US Department of Agriculture 4/18/96-9/30/2001
Molecular Genetic Analysis of Plant Responses to Pathogens and Resistance to Disease

PUBLICATIONS

Submitted: To Plant Physiology and received reviews but no acceptance; now in revision:
St-Pierre, B., Zogli, P.K. and Delaney, T.P. *SON1* is a regulator of glucose responses during early seedling development in *Arabidopsis thaliana*
Synopsis: Describes expression pattern of SON1 gene, the sugar-insensitive phenotype of the son1-2 allele, and two proteins that interact physically with SON1. One of these, called SIF1, is a conserved, plant-kingdom-specific protein that is expressed highly in guard cells.

To prepare (three papers):

To prepare: Argueso, C.T., Olarte, R., and Delaney, T. P. The SON1-regulated defense pathway in Arabidopsis does not rely on salicylate, jasmonate or ethylene defense pathways and is associated with altered expression of genes.

Study examines the role of known defense pathways in resistance expressed in son1 plants. We show that neither jasmonic acid not ethylene responses are required for son1-mediated resistance. We also will describe the transcriptome of son1 plants, and identify genes associated with resistance. Had contributions from Nik Muenke's DUR project.

To prepare: Argueso, C.T., Li, Z. and Delaney, T. P. The arabidopsis *NIP1* gene is required for full expression of race-specific resistance against *Hyaloperonospora parasitica* (formerly *Peronospora parasitica*).

In a mutant screen to discover disease resistance pathway components that are required for race-specific resistance against Hyaloperonospora parasitica*, yet function independently of NIM1/NPR1, several mutants were obtained, including new alleles of the previously identified* EDS1 *gene. We will describe a novel gene, tentatively called* NIP1*, that maps to a 17 cM region of chromosome III, and is involved in resistance conferred by multiple* RPP *(*Resistance to [Hyalo-]Peronospora parasitica*)* Resistance *genes. We describe the resistance-compromised phenotype of* nip1 *plants, document the independence of* NIP1 *from ethylene and jasmonate resistance pathways, and show epistasis and mapping data to demonstrate that* NIP1 *is a novel gene.*

To prepare: Ko, J.-H. and Delaney, T. P. Role for phosphorylation in regulation of NPR1/NIM1 function to regulate systemic acquired resistance in arabidopsis.

Study of in vitro *phosphorylation of NPR1/NIM1; site-directed mutation of (four) putative phosphorylation sites;* in vivo *(protoplast) testing of mutant NPR1/NIM1 alleles;* in planta *testing of mutant NPR1/NIM1 alleles; show evidence for phosphorylation as an important regulatory mechanism for NPR1/NIM1 activity. May need follow-up phosphoproteomics work at UVM before submission.*

Published (*Peer-reviewed):

Delaney, T. P. (2005, 2011). Salicylic Acid. Book Chapter *In:* Plant Hormones: Biosynthesis, Signal Transduction, Action! P. J. Davies (ed.) Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 635-653.

Delaney, T.P. (2008) Plant Defense Against Pathogens. *In* Yearbook of Science and Technology, McGraw-Hill. pp. 289-292.

St.-Pierre, B. and Delaney, T. P. (2008) Molecular and cellular characterization of the Arabidopsis SON1 F-box factor. Phytopathology 98: Supp. 195.

Delaney, T.P., St.-Pierre, B., Li, Z. and Argueso, C., (2006) Identification and analysis of multi-layered disease resistance pathways in Arabidopsis. *In* Biology of Plant-Microbe Interactions, Vol. 5. F. Sánchez, C. Quinto, I.M. López-Lara, and O. Geiger (eds.) Intl. Soc. for Molec. Plant-Microbe Interactions. Merìda, Mexico, pp. 247-253.

Delaney, T.P., Argueso, C., Kim H. S. and Ko, J.-H. (2004). Identification of disease resistance in *Arabidopsis* independent of systemic acquired resistance. *In* Biology of Plant-Microbe Interactions, Vol. 4. I. Tikhonovich, B. Lugtenberg and N. Provorov (eds.) Intl. Soc. for Molec. Plant-Microbe Interactions. St.-Petersburg, Russia, pp. 196-198.

*Buell, C. R., et al. *(44 authors)* (2003). The complete genome sequence of the Arabidopsis and tomato pathogen *Pseudomonas syringae* pv. *tomato* DC3000. **Proc Natl Acad Sci USA** 100, 10181-10186..

*Peng, J.-L., Dong, H.-S., Dong, H.-P., Delaney, T. P., Bonasera, J. M., and Beer, S. V. (2003). Harpin-elicited hypersensitive cell death and pathogen resistance require the *NDR1* and *EDS1* genes. **Physiol Molec Plant Pathol** 62, 317-326.

*Kim, H.S. and Delaney, T.P. (2002) Arabidopsis SON1 is an F-box protein that regulates a novel induced-defense response independent of both salicylic acid and systemic acquired resistance. **Plant Cell** 14: 1469-82.

*Kim, H.S. and Delaney, T.P. (2002) Over-expression of *TGA5*, which encodes a bZIP transcription factor that interacts with NIM1/NPR1, confers resistance in *Arabidopsis thaliana* to *Peronospora parasitica*. **The Plant Journal** 32: 151-63.

*Rairdan, G.J. and Delaney, T.P. (2002) Role of salicylic acid and NIM1/NPR1 in race-specific resistance in Arabidopsis. **Genetics** 161(2): 803-11.

Delaney, T. P., Argueso, C., Donofrio, N. M., Kim, H. S., Ko, J.-H., Malamy, J., and Rairdan, G. (2002). Analysis of SAR and identification of other pathogen-induced defense responses in

Arabidopsis. In **Biology of Plant-Microbe Interactions**, S. A. Leong, C. Allen and E. W. Triplett, eds. (St. Paul, MI), pp. 99-106.

*Rairdan, G.J., Donofrio, N.M. and Delaney, T.P. (2001) Salicylic acid and NIM1/NPR1-independent gene induction by incompatible *Peronospora parasitica* in Arabidopsis. **Molec. Plant-Microbe Interact.** 14: 1235-46.

*Donofrio, N.M. and Delaney, T.P. (2001) Abnormal callose response phenotype and hypersusceptibility to *Peronospora parasitica* in defense-compromised Arabidopsis *nim1-1* and salicylate hydroxylase plants **Molec. Plant-Microbe Interact.** 14: 439-50. Journal cover micrograph provided by NMD/TPD.

Delaney, T. P., (2000) New mutants provide clues into regulation of systemic acquired resistance. **Trends in Plant Science** 5:2:49-51.

*Dong, H., Delaney, T.P., Bauer, D.W. and Beer, S.V. (1999) Harpin induces systemic acquired resistance in Arabidopsis through the salicylic acid and NIM1-mediated signal transduction pathway. **Plant J.** 20: 207-15.

Delaney, T. P. (1997) Genetic Dissection of Acquired Resistance to Disease. **Plant Physiology** 113: 5-12.

*Ryals, J., Weymann, K., Lawton, K., A., Friedrich, L., Ellis, D., Steiner, H. -Y., Johnson, J., Delaney, T., P., Jesse, T., Vos, P. and Uknes, S. (1997) The Arabidopsis NIM1 protein shows homology to the mammalian transcription factor inhibitor Ik B. **Plant Cell** 9: 425-39.

*Hunt, M. D., Delaney, T. P., Dietrich, R., Weymann, K., Dangl, J. and Ryals, J. A. (1997) Salicylate-independent lesion formation in Arabidopsis *lsd* mutants. **Molec. Plant-Microbe Interact.** 10: 531-16.

*Alfano, J. R., Kim, H. S., Delaney, T. P. and Collmer A. (1997) Evidence that the *Pseudomonas syringae* pv. *syringae* hrp-linked *hrmA* gene encodes and AVR-like protein that acts in a hrp-dependent manner within tobacco cells. **Molec. Plant Microbe Interact.** 10: 580-88.

Hunt, M. D., Neuenschwander, U. H., Delaney, T. P., Weymann, K. B., Friedrich, L. B., Lawton, K. A., Steiner, H-. Y. and Ryals, J. A. (1996) Recent advances in systemic acquired resistance research. **Gene** 179: 89-95.

*Lawton, K., Friedrich, L., Hunt, M., Weymann, K., Delaney, T. P., Kessmann, H., Staub, T. and Ryals, J. (1996) Benzothiadiazole induces disease resistance in Arabidopsis by activation of the systemic acquired resistance signal transduction pathway. **Plant J.** 10: 71-82.

*Delaney, T.P., Friedrich, L. and Ryals, J. (1995) *Arabidopsis* signal transduction mutant defective in chemically and biologically induced disease resistance. **Proc. Natl. Acad. Sci. USA** 92: 6602-6606.

Neuenschwander, U., Friedrich, L., Delaney, T., Vernooij, B., Kessmann, H., and Ryals, J. (1995) Activation of plant disease resistance. **Aspects Appl. Biol.** 42: 217-225.

Ryals, J., Lawton, K., Delaney, T.P., Friedrich, L., Kessmann, H., Neuenschwander, U., Uknes, S., Vernooij, B. and Weymann, K. (1995) Signal transduction in systemic acquired resistance. **Proc. Natl. Acad. Sci. USA** 92: 4202-4205.

Uknes, S., Vernooij, B., Williams, S., Chandler, D., Lawton, K., Delaney, T., Friedrich, L., Weymann, K., Negrotto, D., Gaffney, T., Gut-Rella, M., Kessmann, H., Alexander, D., Ward, E. and Ryals, J. (1995) Systemic acquired resistance. **HortScience** 30: 962-963.

*Delaney, T.P., Uknes, S., Vernooij, B., Friedrich, L., Weymann, K., Negrotto, D., Gaffney, T., Gut-Rella, M., Kessmann, H., Ward, E. and Ryals, J. (1994a) A central role of salicylic acid in plant disease resistance. **Science** 266: 1247-1250 (TPD and SU co-first-authors).

*Dietrich, R.A., Delaney, T.P., Uknes, S.J., Ward, E.R., Ryals, J.A. and Dangl, J.L. (1994) *Arabidopsis* mutants simulating disease resistance response. **Cell** 77: 565-577 (RAD and TPD co-first-authors).

*Pepper, A., Delaney, T. P., Washburn, T., Poole, D. and Chory, J. (1994) *DET1*, a negative regulator of light-mediated development and gene expression in *Arabidopsis*, encodes a novel protein that is localized to the nucleus. **Cell** 78: 109-116.

Delaney, T.P., Friedrich, L., Kessmann, H., Uknes, S., Vernooij, B., Ward, E., Weymann, K. and Ryals, J. (1994b) The molecular biology of systemic acquired resistance. *In:* Advances in Molecular Genetics of Plant-Microbe Interactions, Vol. 3, M. J. Daniels, J. A. Downie and Anne E. Osbourn, (eds.). Kluwer Academic Publishers, Dordrecht, Netherlands, pp. 339-47.

Delaney, T.P., Hardison, L.K. and Cattolico, R.A. (1994c) Evolution of plastid genomes: inferences from discordant molecular phylogenies *In:* Chrysophyte Algae: Ecology, Physiology, and Phylogeny, C.G Sandgren, R.A. Anderson and J. Kristiansen, (eds.). Cambridge Univ. Press, Cambridge, UK, pp. 25-45.

*Uknes, S., Winter, A., Delaney, T., Vernooij, B., Morse, A., Friedrich, L., Nye, G., Potter, S., Ward, E. and Ryals, J. (1993) Biological induction of systemic acquired resistance in Arabidopsis. **Molec. Plant Microbe Interact**. 6: 692-698. Journal Cover photo by TPD.

Pepper, A., Delaney, T.P. and Chory, J. (1993) Genetic interactions in plant photomorphogenesis. **Seminars in Develop. Biol**. 4: 15-22.

*Delaney, T.P. and Cattolico, R.A. (1991) Sequence and secondary structure of chloroplast 16S ribosomal RNA from *Olisthodiscus luteus*, as inferred from the gene sequence. **Nucleic Acids Res**. 19: 6328.

*Delaney, T.P. and Cattolico, R.A. (1989) Chloroplast ribosomal DNA organization in the chromophytic alga *Olisthodiscus luteus*. **Current Genetics** 15: 221-229.

*Boczar, B., Delaney, T.P. and Cattolico, R.A. (1989) Gene for the ribulose-1,5-bisphosphate carboxylase small subunit protein of the marine chromophyte *Olisthodiscus luteus* is similar to that of a chemoautotrophic bacterium. **Proc. Natl. Acad. Sci. USA** 86: 4996-4999.

PATENTS

Ryals, J.A., Delaney, T.P. Friedrich, L.B., Weymann, K.B. Lawton, K.A., Ellis, D.M., Uknes; S.J., Jesse, T.P. and Vos, P. (2000) Gene encoding a protein involved in the signal transduction cascade leading to systemic acquired resistance in plants. Number 06091004.

Ryals, J.A., Uknes, S.J., Delaney, T.P., Ward, E. and Steiner, H. (1998) Method for breeding disease resistance into plants. Number 05792904.

Ryals, J., Delaney, T. Friedrich, L. B., Baldwin, K. B. Johnson, E. J. (Pending) Gene conferring disease resistance in plants and uses thereof. Filed Dec. 13, 1996, Number 60/033,177.

WEBPAGES

Plant Biology Department home: http://www.uvm.edu/~plantbio/

Delaney Laboratory: http://www.uvm.edu/~tpdelane/lab/

PRESENTATIONS

Univ. of Vermont, Department of Biochemistry, "Genetic and Biochemical Dissection of the Plant Immune System," Feb 22, 2008 (Invited departmental seminar speaker)

Protein modification/turnover session at the American Society of Plant Biology (ASPB) Annual Meeting; Chicago IL, July 7-11, 2007 (Invited speaker)

American Society of Plant Biology, Women in Plant Biology Committee (ASPB-WIPB) career guidance workshop, Chicago IL, July 7-11, 2007; Panelist (ca. 80 attendees).

GCN-Northeast Regional IDeA Meeting; August 15 – 17, 2007; Sheraton, Burlington (Invited speaker)

American Society of Plant Biologists Northeastern Sectional Meeting, Northampton, MA. Dismantling the panoply of defenses that protect plants from pathogen attack., April 8-9, 2006 (invited speaker).

XII International Congress on Molecular Plant-Microbe Interactions. Merìda, Mexico. Identification and analysis of multi-layered disease resistance pathways in Arabidopsis. Dec 14-19, 2005 (invited speaker).

American Phytopathological Society Annual Meeting, Austin TX July 30-Aug 3, 2005 (Graduate student-invited speaker).

23rd Fungal Genetics Conference at Asilomar, Pacific Grove, CA. March 15-20, 2005 (invited speaker).

Beckman Frontiers in Science Symposium (National Academy of Sciences), Irvine CA. November 6-8, 2003 (invited presenter).

XI International Congress on Molecular Plant-Microbe Interactions. St. Petersburg Russia - July 18-26, 2003 (invited speaker and session chair).

Mid-Atlantic Plant Molecular Biology Society Meeting. August 7-8, 2003. Patuxent Wildlife Refuge Visitors Center, MD (invited speaker).

Seminar: "Molecular Genetic Dissection of the Plant Immune System") The University of Vermont Department of Botany. February 11, 2003 (job candidate's talk).

Seminar: "Molecular Genetic Dissection of the Plant Immune System") Dartmouth College, Department of Biology. December 9, 2002 (job candidate's talk).

International Symposium on Molecular Plant-Microbe Interactions, Madison. WI "Analysis of SAR and identification of other pathogen-induced defense. July 11-14, 2001 (invited speaker).

Scientific tour and seminars at five universities in China: The Chinese University of Hong Kong, Jiaotong University in Shanghai, Zhejiang University in Hangzhou, Nanjing Agricultural University and China Agricultural University in Beijing. May 30-June 12, 2001 (invited scientist).

University of Washington, Seattle, WA. Departmental seminar: March 19, 2001.

University of British Columbia, Canada. Interdepartmental Genetics Program Invited Speaker. "Dissection of Pathogen-Induced Disease Resistance in Arabidopsis" March 15, 2001.

Rutgers University, NJ, "Dissection of Pathogen-Induced Disease Resistance in Arabidopsis." April 16, 1999 (Invited departmental seminar speaker).

International Congress of Plant Pathology; Edinburgh, Scotland, UK, "NIM1, a Mediator of Salicylic Acid Signaling in Induced Resistance to Disease." August 10-14, 1998 (Invited speaker).

Center for Applied Biotechnology (CAB); The University of Maryland. July 22, 1998 (Invited seminar speaker).

Mid-Atlantic Plant Molecular Biology Society (MAPMBS) symposium; Patuxent Wildlife Research Center, Beltsville, Maryland. July 20-21, 1998 (Invited speaker).

Plant Biotechnology Institute (PBI); Saskatoon, Saskatchewan. June 12, 1998 (Invited departmental seminar speaker).

Agricultural Biotechnology International Conference '98 (ABIC); Saskatoon, Saskatchewan, "Molecular Genetic Analysis of Pathogen-Induced Disease Resistance in Plants." June 11, 1998 (Invited speaker).

Texas A&M University, Departments of Plant Pathology and Plant Physiology; College Station, TX. March 27-28, 1997 (Invited speaker).

UC, Davis Spring Symposium: "Information Processing Systems in Plants: Their Evolution and Function." March 21-26, 1997 (Speaker).

American Phytopathological Society meeting; Pittsburgh, PA. July 1995 (Invited speaker).

6th International Conference on Arabidopsis Research; Madison, Wisconsin. June 7-11, 1995 (Invited speaker).

POSTERS PRESENTED AT PROFESSIONAL MEETINGS

St. Pierre, B., Argueso, C., Heim, J., Matthews, D.E. and Delaney, Terrence P. (2007) Analysis of the *Arabidopsis thaliana* SON1 F-Box Protein and Putative Substrates. American Society of Plant Biology (ASPB) Annual Meeting; Chicago IL, July 7-11, 2007.

St. Pierre, B., Argueso, C., Heim, J., Matthews, D.E. and Delaney, Terrence P. (2007) Analysis of the *Arabidopsis thaliana* SON1 F-Box Protein and Putative Substrates. Annual meeting of the NE-Division of the ASPB, Syracuse, NY, June 1-2, 2007.

Delaney, T. P., St-Pierre, B., Li, Z., Argueso, C., and Kim, H.S. (2006). Pathogen-resistant, *suppressor of nim1-1* (*son*) mutants in Arabidopsis. Gordon Research Conference on Plant Molecular Biology, Holderness, NH. July 16-20, 2006.

St-Pierre, B. and Delaney, T. P. (2006) Molecular and biological characterization of the SON1 disease resistance f-box factor in arabidopsis. American Society of Plant Biologists NE Sectional Meeting, Northampton, MA. April 8-9, 2006.

Li, Z. and Delaney, T. P. (2006) The arabidopsis *nim1/npr1-independent resistance to peronospora 1 (NIP1)* gene contributes to resistance against downy mildew (*Peronospora parasitica*). American Society of Plant Biologists NE Sectional Meeting, Northampton, MA. April 8-9, 2006.

Delaney, T. P., Argueso, C., Brutsaert, E., Donofrio, N. M., Kim, H. S., Ko, J.-H., Malamy, J., and Rairdan, G. (2002). Identification of Systemic Acquired Resistance-Independent Disease Resistance. XIII International Conferance on Arabidopsis Research. Seville, Spain. June 28-July 2, 2002.

Argueso, C. and Delaney, T.P. (2001) SAR-independent resistance mutants in Arabidopsis. 10th Intl. Symp. Molec. Plant-Microbe Interact., University of Wisconsin, Madison.

Donofrio, N., Li, Y.K. and Delaney, T.P. (2001) Towards the identification of plant host genes which contribute to compatible Arabidopsis- *Peronospora parasitica* interaction. 12th Intl. Conference on Arabidopsis Research, University of Wisconsin, Madison.

Kim, H. S., Malamy, J.I. and Delaney, T. P. (2001) Identification and Characterization of extragenic suppressors of the Arabidopsis *nim1-1* mutant. 10th Intl. Symp. Molec. Plant-Microbe Interact., University of Wisconsin, Madison.

Ko, J.H. and Delaney, T.P. (2001) Examination of NIM1/NPR1 protein phosphorylation and function in systemic acquired resistance. 10th Intl. Symp. Molec. Plant-Microbe Interact., University of Wisconsin, Madison.

Rairdan G. and Delaney, T.P. (2001) Requirements for Salicylic Acid and NIM1/NPR1 in Resistance-gene Signaling. 12th Intl. Conference on Arabidopsis Research, University of Wisconsin, Madison.

Collmer, A., Alfano, J.R., Buell, C.R., Cartinhour, S., Chatterjee, A.K., Delaney, T.P., Lazarowitz, S.G., Martin, G.B. and Tang, X. (2001) Functional Genomic Analysis of the Interactions of Tomato and *Pseudomonas syringae* pv tomato DC3000. 10th Intl. Symp. Molec. Plant-Microbe Interact., University of Wisconsin, Madison.

Rairdan G., Donofrio, N., Iyer A. and Delaney, T.P. (2000) Pathogen-induced genes reveal novel SA-dependent, NIM1/NPR1-independent signaling pathways in Arabidopsis. NATO Advanced Study Institute on Plant Responses to Biotic and Abiotic Stress: Molecular Mechanisms and Implications for Agriculture. May 15-27 2000. Roscoff, France.

Kim H.S. and Delaney T.P. (1999) Isolation and characterization of NIM1–interacting proteins from *Arabidopsis thaliana*. 9th International Congress on Molecular Plant-Microbe Interactions. Amsterdam, The Netherlands.

Dong H., Delaney T.P. and Beer, S.V. (1999) Harpin elicits concomitant micro-hypersensitive response and systemic acquired resistance in plants. 9th International Congress on Molecular Plant-Microbe Interactions. Amsterdam, The Netherlands.

Donofrio N.M. and Delaney T.P. (1999) Molecular and genetic approaches to identify plant factors required for growth of *Peronospora parasitica* in *Arabidopsis thaliana*. 9th International Congress on Molecular Plant-Microbe Interactions. Amsterdam, The Netherlands.

Rairdan G., Donofrio N., Hankinson J., and Delaney T.P. (1999) Isolation and expression analysis of novel pathogen-induced genes in *Arabidopsis thaliana*. 9th International Congress on Molecular Plant-Microbe Interactions. Amsterdam, The Netherlands.

Delaney, T.P. (1999) Using Research Seminars in an Undergraduate Course. National Science Foundation National Meeting for NSF-CAREER awardees. Jan 10-12, 1999, Washington, D.C.

Rairdan G. and Delaney T.P. (1998) Genetic evidence for divergent signal transduction pathways for race-specific resistance to *Peronospora parasitica* in *Arabidopsis thaliana*. 9th International Conference on Arabidopsis Research. University of Wisconsin, Madison.

Donofrio N.M. and Delaney T.P. (1997) Identifying host factors from *Arabidopsis thaliana* required for triggering development of *Peronospora parasitica*. 8th International Meeting on Arabidopsis Research. Madison, WI.

Kim H.S. and Delaney T.P. (1997) NIM1 and salicylic acid-dependent response pathways limit disease progression in Arabidopsis. 8th International Meeting on Arabidopsis Research. Madison, WI.

Dong, H., Bauer, D.W., Delaney, T.P. and Beer, S.V. (1997) Effect of harpin on *Arabidopsis thaliana*. **Phytopathology** 87: S24-S25. Proceedings of the Annual Meeting of the Phytopathological Society, Aug. 9-13, 1997, Rochester, NY.

Friedrich L,. Lawton K., Weymann K., Ellis D., Steiner H.Y., Johnson J., Delaney T. and Jesse T. (1997) The *Arabidopsis thaliana* NIM1 protein is homologous to the mammalian transcription factor inhibitor I kappa B. **Plant Physiol.** 114: 1504.

Ryals J., Delaney T., Neuenschwander, U., Friedrich L., Weymann K., Lawton K., Kessmann, H. (1995) Systemic acquired-resistance signaling in plants. **J. Cell. Biochem.** 21A: 472

Ryals, J., Kessmann, H., Delaney, T., Neuenschwander, U., Friedrich, L., Weymann, K., and Lawton, K. 1995. Systemic acquired resistance as a strategy for disease control. Keystone Symposium on Host-Fungus Pathogenic Interactions, Taos, New Mexico, February 25-March 3, 1995. **J. Cell. Biochem. Suppl**. 0 (19B): 147.

Ryals J., Alexander D., Chandler D; Delaney T., Friedrich L., Gut Rella M., Kessmann H., Lawton K., Potter S., Uknes S., Vernooij B., Ward E., Weymann K. (1994) The molecular-biology of systematic acquired-resistance. **J. Cell. Biochem.** 18A: 75

Weymann K., Chandler D., Delaney T., Ward E., Uknes S., Ryals J. (1994) Dissection of signal-transduction leading to disease resistance in Arabidopsis. **J. Cell. Biochem.** 18A: 95

Pepper A., Delaney T., Poole D., Washburn T., Chory J. (1993) Genetic and molecular analysis of the *de-etiolated*-1, (*det1*) mutant of *Arabidopsis thaliana*. **J. Cell. Biochem.** 17B: 34. Keystone Symposium on Evolution and Plant Development, January 26-February 1, 1993. Taos, New Mexico

Chory, J. Altschmied, L. Delaney, T. Nagpal, P. Pepper, A. Susek, R. (1991) Genetic analysis of light-regulated seedling development in Arabidopsis. **J. Cell. Biochem. Suppl**.: 28. Symposium on the Genetic Dissection of Plant Cell Processes, 20th Annual Meeting of the Keystone Symposia on Molecular and Cellular Biology, Keystone, Colorado. Jan. 10-17, 1991

Pepper, A., Delaney, T., Nagpal, P., Reed, J., Poole, D., Furuya, M., and Chory, J. (1993) Molecular Genetic Approaches to Plant Photomorphogenesis. International Congress Series, No. 1021. **Frontiers of Photobiology**, Shima, A., et al Eds.; Xxviii+568p. Proceedings of the 11th International Congress on Photobiology, September 7-12, 1992. Kyoto, Japan

Delaney T.P. and Chory J. (1990) A regulatory gene that exerts negative control over light-regulated development in Arabidopsis. **Photochemistry & Photobiology** 51 46S. Proceedings of the 18th Annual Meeting of the American Society for Photobiology, Vancouver, British Columbia. June 16-20, 1990

Cattolico, R. A., Boczar, B., and Delaney, T. (1988) Analysis of chloroplast encoded Rubisco small subunit. **J. Phycol.** 24: 23. Proceedings of the Annual Meeting Of the Phycological Society Of America, July 24-29, 1988. Pacific Grove, California

MEDIA INTERVIEWS (most recent listed first)

WCAX TV "The 0:30" Discussed mushroom identification, collecting, and toxic species. Oct. 10, 2011.

FOX News interview with Greg Navaro, for a story on the toxic mushroom poisonings Sept 28, 2011.

Channel 7 Television News, Lyndon State College. Discussed for the air, issues surrounding genetically modified alfalfa and its effect on organic crop production. Dan Hollis interviewer, March 11, 2010.

Science Magazine, News of the Week: Plant Biology: At Long Last, Pathologists Hear Plants' Cry For Help. Science. Published 5 October 2007. Interviewed and quoted by Dr. Mitch Leslie, for a News of the Week piece he authored about an upcoming article. http://www.sciencemag.org/cgi/content/full/sci;318/5847/31a

Science On-Line feature, an Electronic magazine sponsored by the AAAS. Writer: Kate O'Rourke; Topic: Thermal detection of plant disease. Published Aug 14, 2000

On-air interview with Arun Rath, National Public Radio. Topic: Role of salicylic acid in plant disease resistance. Aired Oct 24, 1998

Cornell Focus, Vol. 7, No. 1, 1998; a publication of Cornell University's College of Agriculture and Life Sciences. Article by Mike Powers, 'The Secret Wars of Plants.'

UNIVERSITY OF VERMONT GUEST LECTURES

PBIO151- Plant Anatomy. Lectured on Fungal Anatomy, 2009, 2011 (Phil Lintilhac, instructor)

MMG 320, "Microbial Pathogenesis." Discussed plant pathogens and virulence strategies; Dr. Gary Ward, coordinator. Lectured in: 2004, 2006, 2009, 2010, 2011.

CLBI 295, "Innate Immunity and Antigen Presentation," discussed plant innate immunity; Dr. Matt Pointer, coordinator. April, 2006.

BCOR012, "Exploring Biology," two lectures, April, 2005.

Vermont Genetics Network Annual Retreat. Invited speaker. August 2005.

The Cell and Molecular Biology Program Annual Retreat, The University of Vermont. Speaker, August, 2003; August 2005.

BOT 295, Jasmonic Acid Colloquium, Lecture, with Dr. J. Harris, Fall 2003.

Curriculum Vitae

Jeanne M. Harris

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Professional Experience

2006 – present	Associate Professor – Department of Plant Biology, University of Vermont
2000 – 2006	Assistant Professor – Department of Botany and Agricultural Biochemistry, University of Vermont
1996-2000	Research Associate, Department of Biological Sciences, Stanford University and Howard Hughes Medical Institute; Laboratory of Dr. Sharon Long.
1986 – 1988	Research Technician – Whitehead Institute, Cambridge, MA; Laboratory of Dr. Keith Mostov

Awards

Joseph E. Carrigan Award for Excellence in Teaching and Undergraduate Education, 2007, awarded by the College of Agriculture and Life Science, University of Vermont.

Education

1996 Ph.D., Cell Biology, Department of Biochemistry and Biophysics, University of California, San Francisco

1986 B.A., Biology, Swarthmore College, Swarthmore, PA

Grant Support

Current Support

VT-AES Postdoctoral Scientist Support
PI: Jeanne M. Harris 8/1/12 – 7/31/2014 $88,000
Title: Regulation of Abscisic Acid Distribution in plant roots by genetic and

environmental factors.

USDA-Hatch
PI: Jeanne M. Harris 10/1/11 – 9/30/2014 $45,000
Title: Characterization of the role of the *Medicago truncatula GIRAFFE* gene in oxidative stress.

Pending Grants

National Science Foundation
PI: Jeanne M. Harris
Title: IOS preproposal: ABA as a potential regulatory node to integrate environmental inputs and modulate development of symbiotic root nodules.

National Science Foundation
PI: Jeanne M. Harris
Title: IOS preproposal: Functional Characterization of Transcription Factors regulated by Abscisic Acid and the LATD/NIP transporter in growing roots.

National Science Foundation
Co-PI: Jeanne M. Harris; PI: Alison Brody, Co-PI: Taylor Ricketts
Title: DEB preproposal 0328204: Preliminary Proposal: Effects of native pollinators and mycorrhizae on reproductive success in high-bush blueberry, *Vaccinium corymbosum*.

Previous Support

National Science Foundation Grant #: IOS-0920096
PI: Jeanne M. Harris 7/15/2009 – 6/30/12 $400,000
Title: Characterization of a *LATD*-dependent ABA signaling pathway.

USDA-Hatch
PI: Jeanne M. Harris 10/1/08 – 9/30/2011 $45,000
Title: A nodule regulatory network involving light, ethylene and jasmonic acid.

National Science Foundation Grant #: IOB-0615822
PI: Jeanne M. Harris 7/15/06 – 6/30/09 $390,000
Title: Regulation of root and nodule meristems by the *LATD* gene and the hormone Abscisic Acid in the model legume, *Medicago truncatula*.
REU supplement, summer 2008 to support one undergraduate: $5,850

USDA-Hatch Grant #: VT-H01202
PI: Jeanne M. Harris 10/1/05 – 9/30/08 $58,500
Title: Role of Jasmonic Acid signaling during formation of nitrogen-fixing root nodules.

USDA-CSREES Grant #: 2007-01520
PI: Jeanne M. Harris 7/15/07 – 5/30/08 $33,900
USDA Research Career Enhancement Award (Sabbatical Award)

Title: Characterization of the effect of light signaling on the formation of nitrogen-fixing nodules in *Medicago truncatula* and *Pisum sativum*.

Vermont EPSCOR
PI: Jeanne M. Harris 5/1/06 – 4/30/07 $2,000
2006 UVM Pilot Research Award
Title: Hormonal and genetic characterization of *MtASR* expression

National Science Foundation Grant #: IBN-0212992
PI: Jeanne M. Harris 8/1/02 – 7/31/05 $359,951
(extension through 7/31/06)
Title: A genetic and molecular approach to investigating the relationship between root and nodule development in the model legume, *Medicago truncatula*.

Vermont EPSCOR Grant #: EPS0236976
PI: Jeanne M. Harris 4/1/04 – 3/31/06 $35,000 plus fringe
Teaching Post Doctoral Award for Dr. Vinitha Cardoza
Title: Gene expression during Jasmonic acid inhibition of nitrogen-fixing legume nodulation in *Medicago truncatula*

USDA-Hatch Grant #: VT-BO-00804 $60,000
PI: Jeanne M. Harris 10/1/01 – 9/30/04 (No-cost extension through 9/05)
Title: A molecular approach to the visualization of lateral root development in the model legume, *Medicago truncatula*.

Vermont Genetics Network
June 2-7, 2002 $1,000
Travel to the First International Conference on Legume Genetics and Genomics, Minneapolis-St. Paul, MN

Vermont Genetics Network
7/1/02 – 6/30/03 $22,000
Graduate Assistantship for Liang Yan
Title: Molecular mapping of the *LAT1* gene of *Medicago truncatula*.

Professional Organizations

Member, International Society for Plant-Microbe Interactions, since 2001
Member, American Society for Plant Biology, since 2003

Publications

Harris, Jeanne Marie* and Dickstein, Rebecca*. (2010). Review: Control of root architecture and nodulation by the *LATD/NIP* transporter. *Joint corresponding authors. Plant Signaling and Behavior, 5(11): 1386 – 1390.

Yendrek, C. †, Yi-Ching Lee†, Viktoriya Morris†, Yan Liang, Catalina I. Pislariu, Graham Burkart, Matthew H. Meckfessel, Mohammad Salehin, Hilary Kessler, Heath Wessler, Melanie Lloyd, Heather Lutton, Alice Teillet, D. Janine Sherrier, Etienne-Pascal Journet, **Harris, J. M***. and R. Dickstein*. (2010). A putative transporter is essential for integrating nutrient and hormone signaling with lateral root growth and nodule development in *Medicago truncatula*. †Co-first authors *Joint corresponding authors. The Plant Journal, 62(1): 100-112. (Cover photo of journal accompanies article.)

Ding, Y., Kalo, P., Yendrek, C., Sun, J., Liang, Y., Marsh, J., **Harris, J. M.** and Oldroyd, G. E. D. (2008). Abscisic acid coordinates Nod factor and cytokinin signaling during the regulation of nodulation. The Plant Cell, 20: 2681-2695.

Liang, Yan, Mitchell, David M. and **Jeanne M. Harris**. (2007). Abscisic Acid rescues the root meristem defects of the *Medicago truncatula latd* mutant. Developmental Biology, 304 (1): 297-307

Jongho Sun, Vinitha Cardoza, David M. Mitchell, Lydia Bright, Giles Oldroyd and **Jeanne M. Harris**. (2006). Crosstalk between Jasmonic acid, ethylene and Nod factor signaling allows integration of diverse inputs for regulation of nodulation. The Plant Journal, 46: 961-970.

Liang, Y. and **J. M. Harris**. (2005). Response of root branching to Abscisic Acid is correlated with nodule formation both in legumes and non-legumes. American Journal of Botany, 92: 1675-1683.

Bright, L. J., Liang, Y., Mitchell, D. M. and **J. M. Harris**. (2005). The *LATD* gene of *Medicago truncatula* is required both for nodule and root development. Molecular Plant-Microbe Interactions 18(6): 521-532.

Harris, J. M., Wais, R. J. and S. R. Long. (2003). Rhizobium-induced calcium spiking in *Lotus japonicus*. Molecular Plant-Microbe Interactions 16(4): 335-341.

Harris, J. M. (2002). Commentary: Shedding light on an underground problem. PNAS. 99:14616-14618.

Frugoli, J. and **J. M. Harris** (2001). *Medicago truncatula* on the move! The Plant Cell 13: 458-463.

Whangbo, J., **Harris, J. M.,** and C. J. Kenyon. (2000). Multiple Levels of Regulation Specify the Polarity of an Asymmetric Cell Division in *C. elegans.* Development 127(21): 4587-4598.

Hunter, C., **Harris, J. M**., Maloof, J. N., and C. J. Kenyon. (1999). Hox gene expression in a single Caenorhabditis elegans cell is regulated by a caudal homolog and intercellular signals that inhibit Wnt signaling. Development, 126(4): 805-814.

Maloof, J. †, Whangbo, J. †, **Harris, J.M.**, Jongeward, G., and C. Kenyon (1999). A Wnt Signaling Pathway Controls Hox Gene Expression and Neuroblast Migration in *C. elegans*. Development, 126(1):37-49. †Co-first authors.

Kenyon, C., Austin, J., Costa, M., Cowing, D. W., **Harris, J. M.**, Honigberg, L., Hunter, C. P., Maloof, J. N., Muller-Immergluck, M. M., Salser, S. J., Waring, D. A., Wang, B. B. and Wrischnik, L. A. (1997). The dance of the Hox genes: patterning the anteroposterior body axis of *C. elegans*. Cold Spring Harbor Symp. Quant. Biol. 62:293-305.

Harris, J.M., Honigberg, L.A., Robinson, N.T., and C. J. Kenyon (1996). Neuronal Cell Migration in *C. elegans*: Regulation of Hox Gene Expression and Cell Position. Development 122: 3117-3131.

Breitfeld P.P., **Harris J.M.** and K.E. Mostov (1989). Postendocytotic sorting of the ligand for the polymeric immunoglobulin receptor in Madin-Darby canine kidney cells. Journal of Cell Biology 109(2):475-86.

Breitfeld P.P., Casanova J.E., **Harris J.M.**, Simister N.E. and K.E. Mostov (1989). Expression and analysis of the polymeric immunoglobulin receptor in Madin-Darby canine kidney cells using retroviral vectors. Methods in Cell Biology 32:329-37.

Breitfeld P.P., **Harris J.M.** and K.E. Mostov (1988). Cell biology of the IgA receptor in polarized epithelia. Monographs in Allergy 24:66-70.

Mostov K.E., Breitfeld P. and **J.M. Harris** (1987). An anchor-minus form of the polymeric immunoglobulin receptor is secreted predominantly apically in Madin-Darby canine kidney cells. Journal of Cell Biology 105(5):2031-6.

Abstracts

Chang Zhang and **Jeanne M. Harris.** ABA-mediated regulation of root development via ROS and the nitrate transporter LATD/NIP. Plant Molecular Biology Gordon Conference, Holderness, NH, July 2012.

Jeanne M. Harris, Yucan Zhang, Rachel Sargent, Beck Powers, Meghan O'Connor, Melanie Lloyd, David Mitchell, Holly Gorton and Jim Weller. Red, Far Red and Blue light modulate legume nodulation via an abscisic acid/ethylene signaling network. Plant Molecular Biology Gordon Conference, Holderness, NH, July 2012.

Parna Ghosh and **Jeanne M. Harris**. Role of Heme Oxygenase in LATD/NIP-regulated ROS homeostasis in *Medicago truncatula*. ASPB Meeting, Austin, TX, July 2012.

Christine Ondzighi-Assoume and **Jeanne M. Harris**. The LATD/NIP Transporter is Required for Normal ABA Localization at the Root Tip as well as for Cell Wall Formation. ASPB Meeting, Austin, TX, July 2012. **Abstract selected for talk**.

Chang Zhang and **Jeanne M. Harris.** ABA-mediated regulation of root meristem and cell expansion via ROS and the LATD/NIP, a nitrate transporter. ASPB Meeting, Minneapolis, Minnesota, August 2011. **Abstract selected for talk**.

Jeanne M. Harris and Chang Zhang. The LATD/NIP transporter and Abscisic Acid regulate cell elongation and Reactive Oxygen Species accumulation in growing roots. Model Legume Meeting, Saint-Maxime, France, May 2011.

Jeanne M. Harris, Yucan Zhang, Rachel Sargent, David Mitchell, Ellen Slade and Jim Weller. Far Red light inhibits legume nodule formation via ethylene signaling. FASEB Plant Development Meeting, Saxton's River, VT, August 2010.

Yucan Zhang, Rachel Sargent, David Mitchell, Alison Fisher, Jim Weller and **Jeanne M. Harris**. Far-red light inhibits nodulation of *Medicago truncatula* through ethylene signaling. ASPB Meeting, Montreal, Canada, July 2010.

Chang Zhang and **Jeanne M. Harris**. Abscisic Acid and Reactive Oxygen Species signaling in the *latd* mutant of *Medicago truncatula*. ASPB Meeting, Montreal, Canada, July 2010.

Craig R. Yendrek, Rebecca Dickstein and **Jeanne M. Harris**. Altered ABA transport in the *Medicago truncatula latd* mutant. Model Legume Meeting, Asilomar, California, July, 2009. **Abstract selected for talk**.

Yucan Zhang, Rachel Sargent, David Mitchell, Alison Fisher, Jim Weller and **Jeanne Harris**. Far-red light inhibits nodulation of *Medicago truncatula* by stimulating ethylene production. Model Legume Meeting, Asilomar, California, July, 2009.

Chang Zhang and **Jeanne Harris**. Role of Reactive Oxygen Species in the *latd* mutant. Model Legume Meeting, Asilomar, California, July, 2009.

Craig R. Yendrek, Rebecca Dickstein and **Jeanne M. Harris**. Altered ABA transport in the *Medicago truncatula latd* mutant. International Conference on Nitrogen Fixation, Bozeman, MT. June, 2009. **Abstract selected for talk**.

Craig R. Yendrek[1], Yan Liang[1], Yi-Ching Lee[2], Viktoriya Morris[2], Catalina I. Pislariu[2], Graham Burkhart[1], Heath Wessler[2], Matthew H. Meckfessel[2], Rebecca Dickstein[2] and **Jeanne M. Harris[1]**. The *LATD/NIP* locus of *Medicago truncatula* is a putative component of nutrient signaling that is responsible for root meristem function and lateral root elongation. International Congress on Legume Genetics and Genomics IV, Puerto Vallarta, Mexico. December, 2008. **Abstract selected for talk**.

Craig Yendrek, Yiliang Ding, Peter Kalo, Jongho Sun, Yan Liang, John F. Marsh, and Giles E. D. Oldroyd and Jeanne **M. Harris**. Dissecting the roles of ABA, JA and ethylene in early Nod factor signaling events in *Medicago truncatula.* FASEB Meeting: Mechanisms in Plant Development, Saxtons River, VT. August, 2008.

Giovanna Sassi, Graham Burkhart and **Jeanne M. Harris**. Phenotypic and genetic characterization of *Medicago truncatula* abscisic acid-insensitive mutants. FASEB Meeting: Mechanisms in Plant Development, Saxtons River, VT. August, 2008.

Jeanne M. Harris, and Yan Liang. Abscisic Acid rescues the root meristem defect of *M. truncatula latd* mutants. ASPB National Meeting, Chicago, IL. July, 2007. **Abstract selected for talk**.

Melanie Lloyd, and **Jeanne M. Harris**. The characterization of *eve*, a novel *Medicago truncatula* mutant affecting both nodulation and root and shoot architecture. ASPB National Meeting, Chicago, IL. July, 2007.

Jeanne M. Harris, and Yan Liang. An altered response of root architecture to Abscisic Acid is associated with nodulation in both legumes and non-legumes. FASEB Meeting: Mechanisms in Plant Development, Saxtons River, VT. August, 2006. **Abstract selected for talk.**

Yan Liang and **Jeanne M. Harris**. Abscisic Acid Rescues the root meristem defects of the *Medicago truncatula latd* mutant. FASEB Meeting: Mechanisms in Plant Development, Saxtons River, VT. August, 2006.

Jeanne M. Harris and Yan Liang. Abscisic Acid Rescues the root meristem defects of the *Medicago truncatula latd* mutant. Missouri Plant Biochemistry Symposium: Plant Roots: From Genes to Form & Function, University of Missouri. May, 2006

Jeanne M. Harris, Yan Liang and Lydia Bright. Rescue of the *Medicago truncatula* root meristem mutant, *latd*, by Abscisic Acid. Plant Science Symposium: Meristem 2005, Iowa State University. June, 2005 **Abstract selected for talk**.

Jeanne M. Harris and Yan Liang. Increased responsiveness of root branching to ABA is correlated with nodule formation both in legumes and non-legumes. Model Legume Congress, Asilomar, CA. June, 2005

Lydia Bright and **Jeanne M. Harris**. *LATD:* a gene required for both nodule and root development. Model Legume Congress, Asilomar, CA. June, 2005

Vinitha Cardoza, David Mitchell and **Jeanne M. Harris**. Effect of jasmonic acid (JA) on nodulation of *Medicago truncatula* by *Sinorhizobium meliloti.* Model Legume Congress, Asilomar, CA. June, 2005

Yan Liang and **Jeanne M. Harris.** Characterization of the role of the *LATD* gene in Abscisic acid signaling in *Medicago truncatula.* Model Legume Congress, Asilomar, CA. June, 2005

Jeanne M. Harris, Yan Liang and Lydia Bright**.** The *Medicago truncatula LATD* gene has a dual function in nodule formation and root development. FASEB Meeting: Plant Developmental Biology, Saxtons River, VT. Aug., 2004

Yan Liang and **Jeanne M. Harris.** *LATD*: a gene required both for nodulation and root development. American Society for Plant Biology – Annual Meeting, Orlando, FL. July, 2004

Vinitha Cardoza, David Mitchell and **Jeanne M. Harris.** Effect of jasmonic acid (JA) on nodulation of *Medicago truncatula* by *Sinorhizobium meliloti*. American Society for Plant Biology – Annual Meeting, Orlando, FL. July, 2004

David Mitchell, Yan Liang, Rachel Sargent, Michelle Crowder and **Jeanne Harris**. Genes required both for normal plant development and formation of legume root nodules. Second International Conference on Legume Genetics and Genomics, Dijon, France. June, 2004

David Mitchell, Yan Liang, Michelle Crowder, Jennifer Pfeiffer and **Jeanne M. Harris**. Genes required both for normal plant development and formation of legume root nodules. American Society for Plant Biology – Annual Meeting, Honolulu, HI. July, 2003

Harris, J. M. *LAT1*: a gene required both for nodulation and root development. First International Conference on Legume Genetics and Genomics. Minneapolis, MN. June, 2002

Jeanne Harris, Rebecca Wais and Sharon Long. Nod factor-induced calcium spiking is a conserved response of the determinate nodulator, *Lotus japonicus*, to its rhizobial partner, *M. loti*. - International MPMI meeting, Madison, WI. July, 2001

<u>Invited seminars and lectures</u>

Shedding light on an underground problem: Light regulation of nitrogen-fixing nodules. Herbarium Seminar, Harvard University, Cambridge, MA, October 2012.

Shedding light on an underground problem: Light regulation of nitrogen-fixing nodules. Department of Genetics & Biochemistry, Clemson University, Clemson, SC, January 2012.

Shedding light on an underground problem: Light regulation of nitrogen-fixing nodules. Dept. of Molecular and Cell Biology, University of Connecticut, Storrs, CT, November 2011.

The LATD/NIP transporter: Regulation of cell expansion and cell division via an Abscisic Acid/ROS signaling pathway**.** IFR40 INRA, Toulouse, France, May 2011.

The LATD/NIP transporter: Regulation of nodulation and root architecture via ROS and Cell Shape**.** Department of Biological Sciences, University of Wisconsin at Milwaukee, Milwaukee, Wisconsin, March 2011.

The LATD/NIP transporter regulates Reactive Oxygen Species and Cell Shape. North American Symbiotic Nitrogen Fixation Conference, Columbia, MO, June 2010.

Underground Architecture: coordinating root development with symbiotic nodule formation in legumes. Department of Biochemistry and Cell Biology, SUNY, Stony Brook, November, 2009.

Altered ABA transport in the *Medicago truncatula latd* mutant. Model Legume Meeting, Asilomar, California, July, 2009. Abstract selected for talk.

Altered ABA transport in the *Medicago truncatula latd* mutant. International Conference on Nitrogen Fixation, Bozeman, MT. June, 2009. Abstract selected for talk.

Underground Architecture: coordinating root development with symbiotic nodule formation in legumes. Department of Microbiology and Molecular Genetics, University of Vermont, April, 2009

Underground Architecture: Abscisic Acid control of root and nodule meristems in legumes. BASF Plant Science, Research Triangle, NC, October, 2008.

The regulation of legume nodulation by light. Plant Biology Dept., University of Vermont, September, 2008.

Underground Architecture: Abscisic Acid control of root and nodule meristems in legumes. Australian National University, Canberra, October 2007.

Abscisic Acid rescues the root meristem defect of *M. truncatula latd* mutants. ASPB National Meeting, Chicago, IL. July, 2007. Abstract selected for talk.

Underground Architecture: Signal networks modulating root branching and nodule formation in *Medicago truncatula*. Plant Biology Program, University of Massachusetts Amherst, March, 2007.

Underground Architecture: Signal networks modulating root branching and nodule formation in Medicago truncatula. Biology Dept., University of North Texas, November, 2006.

An altered response of root architecture to Abscisic Acid is associated with nodulation in both legumes and non-legumes. FASEB Meeting: Mechanisms in Plant Development, Saxtons River, VT. August, 2006. Abstract selected for talk.

Signaling networks that regulate root architecture and nodule formation. Biochemistry Dept., University of Vermont Medical School, March, 2006.

Signaling networks that regulate root architecture and nodule formation. Marvin Lecture series, Botany Dept., University of Vermont, November, 2005.

Rescue of the *Medicago truncatula* root meristem mutant, *latd*, by Abscisic Acid. Plant Science Symposium: Meristem 2005, Iowa State University, June 2005. Abstract selected for talk.

The role of Abscisic Acid in root architecture and legume nodule formation: an evolutionary perspective. Biology Department, Dartmouth College, March, 2005.

The role of Abscisic Acid in root architecture and legume nodule formation: an evolutionary perspective. Department of Natural Resource Sciences, McGill University, October, 2004.

Evolution and Development of the Rhizobium-legume symbiosis. Biology Dept., University of Pittsburgh, March, 2004.

Evolution and Development of the Rhizobium-legume symbiosis. Marvin Lecture series, Botany Dept., University of Vermont, November, 2003.

The development of the Rhizobium-legume symbiosis. – University of New Hampshire, November, 2003.

The development of the Rhizobium-legume symbiosis. – CMB retreat, University of Vermont, 2003.

The development of the Rhizobium-legume symbiosis. – Marvin Lecture series, Botany Dept., University of Vermont, 2002.

The development of the Rhizobium-legume symbiosis. – CMB retreat, University of Vermont, 2002.

Role of plant development genes during nodule formation. – Bacterial Signals and Plant Development, Sequoia National Park, California 2002.

The development of the Rhizobium-legume symbiosis. – CMB retreat, University of Vermont, 2001.

A tale of two kingdoms: the development of the rhizobium-legume symbiosis. - Biology Dept., University of Vermont, 2001.

Calcium spiking in a plant cell in response to a bacterial signal. - Ion Channel Journal Club, Dept. of Pharmacology, University of Vermont, 2000.

A tale of two kingdoms: the development of the rhizobium-legume symbiosis. University of Nebraska, 2000.

A tale of two kingdoms: the development of the rhizobium-legume symbiosis. University of Arizona, 2000.

A tale of two kingdoms: the development of the rhizobium-legume symbiosis. University of British Columbia, 2000.

A tale of two kingdoms: the development of the rhizobium-legume symbiosis. University of Vermont, 2000.

Teaching

PBIO104 – Plant Physiology (with lab): 2002- 2007, 2009-2012 (cotaught with T. Vogelmann 2003, 2004)

PBIO197/PBIO297 – Undergraduate Research.

Beck Powers (2 credits, Fall 2011; 2 credits Spring 2012, 2 credits Fall 2012)
Ellen Slade (1 credit, Fall 2010; 1 credit Spring 2011)
Amanda Bousquet (2 credits, Fall 2009, Spring 2010, Fall 2010)
Derrick Deming (1 credit, Fall 2009; 2 credits Spring 2010; 3 credits Spring 2011)
Hilary Kessler (1 credit, Spring 2008; 1 credit spring 2009)
Melanie Lloyd (1 credit, Fall 2007; 1 credit Spring 2008)
Graham Burkhart (2 credits, Spring 2006)
Stacy Jorgensen (2 credits, Fall 2002)
Rob O'Brien (1 credit, Fall 2003; 4 credits Spring 2004)

PBIO295 – Plant Developmental Genetics, 2009, 2012

PBIO295 – Plant Symbioses: Evolution of Signaling, 2011

PBIO295 – Environmental, Hormonal and Genetic control of Plant Architecture, 2010

BOT295 – Advanced Plant Physiology. 2004, 2005

BOT295 – Molecular Plant-Microbe Interactions. 2006

BOT295 – Jasmonic Acid: Synthesis and Signaling. 2003

BOT295 - Molecular models of symbiosis and pathogenesis in plants. 2001

Guest Lectures:

Genetically Modified Organisms

PBIO6/BOT6 – The Green World (2004-2013)
PBIO4 – Introduction to Botany (2011)

Plant Symbioses

MMG320 – Cellular Microbiology (2013)

Symbiosis

CLBI302 – Cell and Molecular Biology (2010): 2 lectures
CLBI302 – Cell and Molecular Biology (2011, 2012): 3 lectures/Discussions

Genetics of Nodulation:

BOT132 - Principles of Genetics (2002, 2006)

Plant Biotechnology

BMED281 – Molecular Applications (2002, 2004, 2005, 2006)

Plant Genetics
MMG312 – Eukaryote Molecular Genetics (2003, 2005)

Rhizobium-legume symbiosis:
PBIO104/BOT104 - Plant Physiology (2001)
MMG220 – Environmental Microbiology (2001, 2003)

Principles of Genetics: three lectures (2001)
- The chromosome theory of heredity
- Interacting genes, Part 1
- Interacting genes, Part 2

Postdoctoral Associates

Christine Ondzighi-Assoume: 2011-present
Craig Yendrek: 2006-2009, Currently a postdoc with Lisa Ainsworth at USDA-ARS, Urbana, IL.
Vinitha Cardoza: 2004-2006, Currently a Scientist at BASF, North Carolina

Graduate Students

Parna Ghosh, Cell and Molecular Biology, MS: 2011-present
Yucan Zhang, Plant Biology, Ph.D.: 2008-present
Chang Zhang, Plant Biology, Ph.D.: 2008-present
Giovanna Sassi, Plant Biology, Ph.D.: Summer 2007- May 2009; Jan 2010-May 2010. Currently on a leave of absence.
Yan Liang, Botany, Ph.D.: 2002-2007. Currently a postdoc with Gary Stacey, University of Missouri, Columbia.

Undergraduate students

Current:

Alex Miller, Plant Biology: Fall 2010 to Fall 2011 (including summer) and Fall 2012 to Spring 2013.
Beck Power, Biological Sciences: Summer 2011 to Spring 2013. Received Sproston undergraduate Research Award 4/2012, UVM Undergraduate Research Summer Internship, Summer 2012.
Matt Clayton, Medical Technology: Fall 2012-present

Former:

Jon Gonzalez, Plant Biology: Summer 2012 – present. McNair Summer Scholar, Summer 2012

Amanda Bousquet, Plant Biology: Fall 2008 to May 2012. Received Sproston undergraduate Research Award 4/2011, Award for Superior Performance in Plant Biology, 4/2012. Currently a Ph.D. student in the U Mass Amherst Plant Biology Program.

Claire LaFontaine, Biological Sciences, August 2011 to May 2012.

Ellen Slade, Microbiology: Fall 2009 to Fall 2011

Derrick Deming, Plant Biology: Fall 2009 to May 2011. Received R.L. Jones award 4/2010, Superior Performance in Plant Biology Award 4/2011. Currently applying to Ph.D. programs in Biochemistry.

Hilary Kessler, Plant Biology: Spring 2008-Spring 2009. Supported by an NSF REU, Summer, 2008; HELiX minigrant, Fall, 2008. Currently a Ph.D. student at Penn State.

Melanie Lloyd, Environmental Sciences: Fall 2005-Spring 2008. Supported by an American Society of Plant Biologists SURF fellowship, Summer 2006 and a HELiX grant, Fall 2007. Received Sproston undergraduate Research Award 4/2008 Worked in my lab as a technician, July-December 2009. Currently a Ph.D. student at the University of Otago, New Zealand.

Heather Lutton, Biological Sciences: Spring – Fall 2007 (including summer). Currently a medical student at the University of Vermont.

Graham Burkart, Botany: Fall 2005 – December 2006. Worked in my lab as a technician January–August, 2007. Currently Ph.D. student at U Mass, Amherst.

Rachel Sargent, Biology: 2004 – Jan. 2006
Supported by a HELiX grant for undergraduate research, Summer 2004; conducted Honors Research (Arts & Sciences). Currently a technician, applying for grad school.

Callie Lawson, High School senior (home schooled): Spring-Summer 2005. Attended Dartmouth for college.

Stacy Jorgensen, Plant and Soil Sciences: 2002-2005
Supported by an NSF REU fellowship Summer 2003. Currently a Masters student at UVM in Plant Biology.

Meghan O'Connor, Wildlife Biology: 2002-2005. Currently runs a native plant nursery and high school environmental outreach program in San Francisco.

Rob O'Brien, Biological Sciences: 2003- 2004.
Supported by a HELiX grant for undergraduate research, Summer 2003, conducted Honors Research (CALS), received his Ph.D. from UC- San Diego with Steve Briggs. Now a postdoc at the Buck Institute (Novata, CA) with Lisa Ellerby.

Jennifer Pfeiffer, Botany: Summer, 2003.

David Mitchell, Plant and Soil Sciences: 2001. Stayed on to do research project after graduation, subsequently a technician in my lab 2001-2003. No longer in science.

Graduate student committees

Current:

Prince Zogli, Plant Biology, Ph.D.	in progress
Meghan McKeown, Plant Biology, Ph.D.	in progress
Parna Ghosh, CMB, M.S.	in progress
Yucan Zhang, Plant Biology, Ph.D.	in progress
Chang Zhang, Plant Biology, Ph.D.	in progress
Giovanna Sassi, Plant Biology, Ph.D.	in progress
Emily Larson, CMB, Ph.D.	in progress

Completed:

Xu Zhang, Botany, Ph.D., 2004
Eddie Suvarnapunya, MMG, Ph.D., 2004
Daniel Zurawski, CMB, Ph.D., 2004
Sandra Menasha, PSS, M.S., 2005
Karen Hills, PSS, M.S., 2006
Yan Liang, Botany, Ph.D., 2007
Josh Hallman, Forestry, M.S. 2007
Manisha Patel, Botany, M.S. 2007
Mindy Farris, MMG, Ph.D. 2007
Craig Broderson, Botany, Ph.D., 2008
Amalthiya Prasad, MMG, Ph.D., 2008
Zhen Li, Botany, MS, 2010
Jamie Carter, MMG, Ph.D., 2011
Monique McHenry, Plant Biology, Ph.D., 2012
Stacy Jorgensen, Plant Biology, M.S., 2012
John Midkiff, MMG, M.S., 2012

Andy Burtt, PSS, M.S. (Withdrew from program)
Charlie Johnson, CMB, Ph.D. (Withdrew from program)
Vivekanand Sharma, Plant Biology, Ph.D. (Withdrew from program)

Service

Service beyond the University

Journal Editor

Senior Editor, Molecular Plant-Microbe Interactions; January 2013 to December 2015

Review Editorial Board, Frontiers in Plant Development, Open Access Journal; January 2011-present.

Conferences

Chair, Development Session; Model Legume Congress, Sainte-Maxime, France; May 2011
Member, Program Committee; *Medicago truncatula* Model Legume Congress, Asilomar, California; July, 2009.
Member, Program Committee; 16th International Congress on Nitrogen Fixation, Big Sky, Montana; June, 2009.
Chair, Development Session; 4th International Conference on Legume Genetics and Genomics, Peurto Vallarta, Mexico. December, 2008.

Review Panels

Panel Member, USDA Understanding Plant-Associated Microbes Panel, Nov., 2011
Panel Member, USDA Plant Growth and Development Panel, Sept., 2009
Panel Member, NSF Symbiosis, Defense and Self-Recognition Panel, April, 2008
Panel Member, NSF Plant and Microbial Development Panel, October, 2006
Panel Member, NSF Graduate Research Fellowships, Genetics and Cell Biology, March, 2006

Manuscript/Grant/Thesis/Book Review

Manuscript Review: Plant Cell, Planta, Functional Biology, Plant Molecular Biology, Plant Physiology, Symbiosis, BMC Plant Biology, Journal of Experimental Botany
Ad hoc grant reviewer: NSF, USDA,
External reviewer for Ph.D. theses: Australian National University, University of Tasmania, Australia.
Chapter Review: Soil and Plant Nutrition Chapter for *Biology*, 8th Edition, by Campbell and Reese.
External reviewer for research grants for University funding from: Clemson University, University of Wisconsin, Milwaukee, Jeffress Trust (Virginia)

Mentoring Activities and Outreach

Initiated and supervised inquiry-based science projects in local elementary and middle school classrooms.
Panel Member, Career workshop: Participated in Career Workshop aimed at early-career scientists (National ASPB Meeting, 2003, sponsored by Women in Plant Biology.)
Research Mentor through the Vermont Genetics Network to a junior faculty member at Norwich University.
Mentor to high school research students for independent science projects

***Medicago truncatula* community activities**

Participated in an *M. truncatula* community genetic screen at the John Innes Institute for Plant Biology, Norwich, England. Sept. 2003

Service at the University of Vermont

University of Vermont:

Member, Research Advisory Board: 2008-2009
Reviewer, EPSCOR Graduate Research Assistantship Applications: 2004

College of Agriculture and Life Sciences (CALS):
Member, Greenhouse Faculty Advisory Committee: 2000- present
Panel Member, Food System Spires Panel on GMO labeling, April 2012
Participated in College annual reception for the State Legislature, Feb 2012
Member, College Alumni Awards committee: 2010.
Member, Faculty Standards Committee: 2006-2009 (elected position)
Member, Plant Biology Chair Review Committee: Spring, 2006
Member, CALS Studies Committee: 2001- 2004 (elected position)

Cell and Molecular Biology Program:
Member, Recruitment committee, Cell and Molecular Biology Graduate Program: 2006-2009 (on sabbatical for 2007-2008)
Member, Education committee, Cell and Molecular Biology Graduate Program: 2003-2006

Plant Biology Department:
Organizer, Department seminar series (Marvin seminar): Jan. 2010 - present
Chair, Search Committee for Plant Evo-Devo Assistant Professor, 2010-2011
Member, Graduate student admissions committee: 2008- 2009
Member, Graduate student affairs committee: 2006, 2010
Member, Graduate student education/admissions committee: 2001-2005
Member, Search Committee, Plant Molecular Biologist: 2002
Member, Search Committee, Community Ecologist: 2001
Member, Undergraduate Curriculum Committee: 2000

Designed and created brochure promoting the Plant Biology Ph.D. program. 1/2003; updated 1/2004, 9/2004.

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EDUCATION

Cornell University	Ph.D. (1987)	Forest Ecology
Miami University	M.S. (1982)	Plant Systematics
University of Alaska	(1978-80)	Botany
University of Massachusetts	B.A. (1973)	French
University of Grenoble, France	1er Degre	French

POSITIONS

Director: Field Naturalist Master's Degree Program, Department of Botany, University of Vermont (1988-present)
Associate Professor: School of Natural Resources, University of Vermont (1996-present)
Research Associate: Hubbard Brook Experimental Forest (1987-88)
Chief Naturalist: Exploration Cruise Line, Southeast Alaska (part-time, 1980-86)
Environmental Consultant: Miami University (1981-82)
Naturalist/Ranger: Glacier Bay National Park, Alaska (1980-82)
Naturalist/Ranger: Denali National Park, Alaska (1978-79)
Environmental Consultant: Geophysical Institute, Univ. Alaska (1979)
Teacher: Tanana Valley Community College, Alaska (1978-79)
Peace Corps Volunteer: United Nations College of Science and Agriculture, Mauritania, West Africa (1976-77)
Teacher/Advisor: Bridgton Academy (1973-75)
Fishing and Hunting Guide: self-employed (1975-76)

RESEARCH AND TEACHING SUPPORT (unfunded proposals not listed)

Hughes, J. W. 2012. Cooperative research agreements for graduate students to work with conservation organizations ($28,000).
Hughes, J. W. 2011. Cooperative research agreements for graduate students to work with conservation organizations ($32,100).
Hughes, J. W. 2010. Cooperative research agreements for graduate students to work with conservation organizations ($37,500).
Hughes, J. W. and D. Wang. 2009. Cooperative research agreements for graduate students to work with conservation organizations ($31,800).
Hughes, J. W. (PI) 2008-2009. Beyond multi-disciplinary decision-making on military landscapes. US Army Reserve ($246,100)
Hughes, J. W. and D. Wang. 2007-2008. Cooperative research agreements for graduate students to work with conservation organizations ($24,600).
Hughes, J. W. (PI) 2006-2007. Integrating ecological, cultural and historical features of the Fort Greene landscape into the military's management plan. 94th Regional Readiness Command, US Army Reserve ($165,000)
Hughes, J. W. (PI) 2006-2007. Cooperative research agreements for graduate students to work with conservation organizations ($30,000).

Hughes, J. W. (PI) 2005-2006. Beyond environmental compliance: conserving wetland function through ecologically targeted restoration. 94th Regional Readiness Command, US Army Reserve ($180,000)

Hughes, J. W. (PI) 2005-2006. Inventory and assessment of protected riparian zones along the Winooski River. (Winooski Valley Park District, $5,000)

Hughes, J. W. (PI) 2003-2005. Conservation strategies for US Army properties: a cooperative case study at Fort Greene, Rhode Island. 94th Regional Readiness Command, US Army Reserve ($80,690)

Hughes, J. W. (PI) 2003-2005. Cooperative research agreements with The National Park Service, The Nature Conservancy, the Green Mountain Club and The Appalachian Mountain Club. ($36,000).

Hughes, J. W. (PI). 2001-2002. Using marginal tree populations to detect and differentiate climatic and biogeochemical change. EPA EPSCoR ($9,690)

Hughes, J. W. (PI) and W. Poleman. 2002-2003. Cooperative research agreements with The Nature Conservancy ($25,000).

Hughes, J. W. (PI). 2000-2001. Ecological evaluation of wild and scenic rivers in the Green Mountains of Vermont. US Forest Service ($12,600)

Hughes, J. W. (PI) and W. Poleman. 2000-2001. Cooperative graduate student internship agreement with Vermont Nature Conservancy, Andrews Experimental Forest, Colorado Nature Conservancy, Connecticut Nature Conservancy, and River Conservancy ($23,500)

Hughes, J.W. (PI). 1997-2000. Integrating science and environmental decision making: the Field Naturalist Graduate Program. Lintilhac Foundation ($161,000)

Jokela, W. (PI) and J. W. Hughes. 1996-2000. Managed riparian buffers zones and cover crops to minimize phosphorus and nitrogen losses from cornfields. USDA SARE ($142,448)

Hughes, J.W. (PI). 1997-1999. The effects of roads on the sustainability of Vermont's Northern Forest. USDA CSRS Hatch ($48,628)

Hughes, J.W. (PI). 1997-1998. A handbook of techniques for conservationists and field scientists. Conservation and Research Foundation ($5,000)

Hughes, J. W. (PI). 1996-97. Restoring ecological integrity to a working landscape. Lintilhac Foundation ($40,000)

Hughes, J. W. (PI). 1996-97. Ecological assessment of the Marsh Billings landscape mosaic. Nature Conservancy ($10,520)

Hughes, J. W. (PI). 1996-97 Restoring integrity to an Industrial Forest Landscape Conservation and Research Foundation ($5,000)

Hughes, J. W. (PI), W. Jokela, and D. Wang. 1995-96. Determination and quantification of factors controlling pollutant delivery from agricultural land to streams in the Lake Champlain Basin. EPA ($74,816)

Hughes, J. W. (PI). 1995-96 Large woody debris and its relation to conditions increasing the survival and growth of Atlantic salmon fry and parr. US Forest Service ($45,488)

Hughes, J. W. (PI). 1995-96 Beyond multidisciplinary instruction: reconfiguring the introductory course for natural resources undergraduates. UVM Instuctional Incentive Grant Program ($3,030)

Hughes, J. W. (PI), W. Jokela, and D. Meals. 1994-96. Phosphorus retention in managed riparian zones and impacts on water quality USDA NRICG

($110,000)
Hughes, J. W. (PI). 1994-96 Effectiveness of riparian buffers at retaining agricultural pollutants. USDA CSRS Hatch ($7,000)
DeHayes, D. (PI), D. Wang, J. W. Hughes, and J. Cumming. 1994-96. Structure, function, and the development of northeastern forest ecosystems: the role of biotic-abiotic interactions. A. W. Mellon Foundation ($326,148)
Scherbatskoy, T. (PI), D. Wang, and J. W. Hughes. 1994-95. Evaluation of disturbance effects and temporal stability in forest health monitoring plots. US Forest Service ($30,000)
Hughes, J. W. (PI). 1993-94. Biodiversity and the regional landscape mosaic. US Forest Service ($29,801)
Hughes, J. W. (PI). 1993-94. Reducing South Lake eutrophication with phosphorus traps. South Lake Champlain Trust ($8,711)
Ross, D. (PI), W. Jokela, D. Wang, J. W. Hughes, T. Scherbatskoy, and S. Levine. 1993. Equipment grant for a Lachat QuickChem AE Automated Ion Analyzer. USDA ($34,780)
Hughes, J. W. (PI). 1992-93. Regeneration dynamics of red spruce and balsam fir at the Hubbard Brook Experimental Forest, New Hampshire. US Forest Service Data Management Program ($2,856)
Vogelmann, H. (PI) and J. W. Hughes. 1991-96. The Field Naturalist Graduate Program: a new approach to training field ecologists. A. W. Mellon Foundation ($450,000)
Hughes, J. W. (PI). 1990-91. Seed banks and the structure of wetland plant communities on Lake Champlain in the Mississquoi National Wildlife Refuge. UCRS ($4,225)
Johnson, A. (PI), T. J. Fahey and J. W. Hughes. 1988-90. Reorganization of nutrient capital in a northern hardwood forest after whole-tree harvest. National Science Foundation ($200,110)
Fahey, T. J. (PI) and J. W. Hughes. 1987-90. Response of early successional forest stands to change in resource availability. USDA NRICG ($282,560)
Hughes, J. W. (PI). 1989. Primary succession following glacial retreat in Southeast Alaska. University of Minnesota subcontract ($3,500)
Hughes, J. W. (PI). 1983-86. Four separate awards from Sigma Xi, Grants-in-Aid of Research ($1,200)
Hughes, J. W. (PI). 1982. Morphological variation in Platanthera and Habenaria (orchids), Southeast Alaska. Willard Turrell Foundation for Systematics Research. ($2,700)
Hughes, J. W. (PI). 1982. Morphological variation in disjunct populations of Alaskan herbs. Alaskan Natural History Association ($5,000)
Hughes, J. W. (PI). 1981. Relict herb populations in glacial Southeast Alaska. Explorer's Club ($1,200)

PUBLICATIONS

Books:

Hughes, J. W. 201x. Professional Skills for Mountain Movers. 167 pp. (in review)
Hughes, J. W. and A. P. Devine. 201X. How to Build a Grizzly Bear (a slightly

unorthodox guide to ecological principles). 185 pp. (in review, Ten Speed Press)

Hughes, J. W. 2007. Environmental Problem-Solving: A How-To Guide. University of Vermont Press, University Press of New England. 226 pp.

Hughes, J. W. and W. H. Blackwell. 1987. Wildflowers (and other plant life) of Southeast Alaska -- a layperson's guide to identification. Kendall-Hunt Publishing Co., 143 pp.

Journal Articles (peer reviewed):

Hughes, J. W., W.E. Jokela, D. Wang, and C. Borer. 1999. Determination and Quantification of Factors Controlling Pollutant Delivery from Agricultural Land to Streams in the Lake Champlain Basin. Lake Champlain Basin Technical Report.

Meiklejohn, B. A. and J. W. Hughes. 1999. Bird communities in riparian buffer strips of industrial forests. The American Midland Naturalist 141:172-184.

Hughes, J. W. and D. Bechtel. 1997. Effect of clearcut size on revegetation patterns in spruce-fir forests. Canadian Journal of Forest Research 27: 2088-2096.

Hughes, J. W. and W. B. Cass. 1997. Pattern and process of a floodplain forest, Vermont, USA: predicted responses of vegetation to perturbation. Journal of Applied Ecology 34:594-612.

Hughes, J. W. and F. K. Hudson. 1997. Songbird nest placement in Vermont Christmas tree plantations. Canadian Field Naturalist 11:580-585.

Spackman, S. C. and J. W. Hughes. 1995. Assessment of minimum stream corridor width for biological conservation: species richness and distribution along mid-order streams in Vermont, USA. Biological Conservation 71: 325-332.

Hughes, J. W. and T. J. Fahey. 1994. Litterfall dynamics and ecosystem recovery during forest development. Forest Ecology and Management 63: 181-198.

Fahey, T. J. and J. W. Hughes. 1994. Fine root dynamics in a northern hardwood forest ecosystem, Hubbard Brook Experimental Forest, NH. Journal of Ecology 82: 533-548.

Mou, P., T. J. Fahey, and J. W. Hughes. 1993. Effects of soil disturbance on vegetation recovery and nutrient accumulation following large-scale disturbance of a northern hardwood ecosystem. Journal of Applied Ecology 30: 661-675.

Hughes, J. W. 1992. Effect of removal of co-occurring species on distribution and abundance of a spring ephemeral, Erythronium americanum. American Journal of Botany 79: 1329-1336.

Hughes, J. W. and T. J. Fahey. 1991. Colonization dynamics of herbs and shrubs in a disturbed northern hardwood forest. Journal of Ecology 79: 605-616.

Hughes, J. W. and T. J. Fahey. 1991. Availability, quality and selection of browse by white-tailed deer after clearcutting. Forest Science 37: 261-270.

**The above paper was selected by editors to be reprinted in The Journal of Forestry 89: 31-36.

Hughes, J. W. and T. J. Fahey. 1988. Seed dispersal and colonization of a

disturbed northern hardwood forest. Bulletin Torrey Botanical Club 115: 89-99.

Hughes, J. W., T. J. Fahey and F. H. Bormann. 1988. Population persistence and reproductive ecology of a forest herb: Aster acuminatus Michx. American Journal of Botany 75: 1057-1064.

Fahey, T. J., J. W. Hughes and P. Mou. 1988. Root decomposition and nutrient flux following whole-tree harvest of a northern hardwood-conifer watershed, Hubbard Brook, New Hampshire. Forest Science 34: 744-768.

Mou, P., T. J. Fahey, and J. W. Hughes. 1988. The Hubbard Brook Ecosystem Study: a biogeochemical approach to forest dynamics. Acta Phytoecologica et Geobotanica Sinica 12: 482-497.

Hughes, J. W., T. J. Fahey and B. Browne. 1987. A better seed and litter trap. Canadian Journal of Forest Research 17: 1623-1624.

Hughes, J. W. 1981. Alaskan beekeeping: problems and solutions. American Bee Journal 121: 337-339.

Project Reports (not peer-reviewed) – a couple dozen (not counting graduate student theses)

Graduate Students: I typically advise seven M.S. students (Field Naturalists and Ecological Planners) each year, serve on a half dozen M.S. graduate studies committees, and two PhD committees.

Other Stuff

Fulbright Senior Specialist
Kroepsch-Maurice Award for Teaching Excellence
Commencement Speaker, UVM Honors College
Invited Speaker (Miami Univ., Univ. of Montana, Western Washington Univ., Michigan State, St. Lawrence Univ., Univ. of Mississippi)

PHILIP M. LINTILHAC

Department of Plant Biology
The University of Vermont, Burlington, Vermont, 05405-0086

EDUCATIONAL BACKGROUND

Ph.D. Department of Botany, University of California at Berkeley, 1971.
B.Sc. Department of Botany, University of Vermont, 1963.

EMPLOYMENT HISTORY

Department of Plant Biology, University of Vermont
Research Associate Professor, - 1988- present,
Research Assistant Professor, - 1976-1988,

Dept of Biology Stanford University, Stanford, CA
Post-doctoral Fellow, - 1974-76,

Botany Department U. C. Berkeley, Berkeley, CA,
Post-doctoral Fellow, - 1972-73

AWARDS

Botanical Society of America Centennial Award, August 2006, for ongoing research and contributions to the plant sciences.

PUBLICATIONS (last 10 years)

Lintilhac, Philip M. (In preparation) Morphogenesis in Theory and Experiment: The evolution of biophysical control systems in plants. Pre-accepted for publication in **Protoplasma (2013).**

Lintilhac, Philip M., 2012, Review article: Plant Physics by Karl Niklas and Hans-Christof Spatz. Am. Jnl Physics. 80:842

Lintilhac, Philip M. and Chunfang Wei, 2009, A new Interpretation of Plant cell Growth Mechanics: Loss of stability and cell wall stress-relaxation. Proceedings of the Sixth Plant Biomechanics Conference. **Bernard Thibaut, Ed.**

Peter Schopfer, Chunfang Wei, and Philip M. Lintilhac, 2008, Is the Loss of Stability Theory a Realistic Concept for Stress Relaxation-Mediated Cell Wall Expansion during Plant Growth? *Plant Physiol*. 2008 147: 935-938.

Wei, C. and P. M. Lintilhac, 2007, Loss of Stability: A New Look at the Physics of Cell Wall Behavior during Plant Cell Growth. *Plant Physiology,* 145:763-772.

Wei**, C., L. S. Lintilhac, P. M. Lintilhac**, 2006. Loss of Stability, pH, and the anisotropic extensibility of *Chara* Cell Walls. *Planta* 223: 1058-1067

Wei, C and P. M. Lintilhac. 2003. Loss of Stability – A New Model for Stress Relaxation in Plant Cell Walls. *Journal of Theoretical Biology*. 224: 305-312.

PATENTS

Patent No. 6,277,637 Method and Apparatus for Determining the Contact Area between a Probe and a Specimen. Granted August 21, 2001

US Patent entitled "Sterilizable tissue squeezing device and method" was submitted and the patent was granted (US Pat. No. 4456683, June 26. l984).

Canadian patent application entitled "Sterilizable tissue squeezing device and method" was submitted and the patent was granted December 16th, 1986. Canadian Patent No. 1215228

European Patent Application entitled "Sterilizable tissue squeezing device and method" was submitted and the patent was granted May 16th, 1990. Patent serial No. 83201662.0

U.S. Patent application # 07/477,332 entitled "Instrument for the application of controlled mechanical loads to tissues in sterile culture. Granted May 1995.

GRADUATE AND POST-GRADUATE ADVISING

Tang, Xiaowei, .**MS**. 2006, Thesis topic: Directional modulus measurements of split-thickness *Chara* cell wall peels.

Paul Kuzeja, MS, 1999. Thesis topic: Root elongation against a constant force: experiment with a computerized feedback-controlled device. (Kuzeja, P. S., P. M. Lintilhac, C. Wei, 2001. *Journal of Plant Physiology* 158: 673-676).

Timothy Lynch Ph.D., 1998. Thesis Topic: Mechanotransduction molecules in the plant gravisensory response: amyloplast/statolith membranes contain a 1 integrin-like protein. (Lynch, Timothy M. and Philip Lintilhac, 1998. *Protoplasma* 201:92-100).

Timothy Lynch, MS, 1994. Thesis topic: Mechanical signals in plant development: A new method for single cell studies. (Lynch, T.M., and P. Lintilhac, 1997.*Developmental Biology* 181:246-256).

Jane Molofsky

March 2013

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Burlington, Vermont 05405

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(802) 656-0440 (fax)
Jane.Molofsky@uvm.edu
http:/www.uvm.edu/~pbio/jmolofsk

EDUCATION

1993	Ph.D.	Botany	Duke University	Durham, NC
1988	M.S.	Plant Biology	Univ. of Illinois	Urbana, IL
1983	B.S.	Biology	Cornell Univ.	Ithaca, NY

PROFESSIONAL EXPERIENCE

Year	Experience	Location
2008-present	Professor	Univ. Vermont, Dept. Plant Biology
2001-present	Associate Professor	Univ. Vermont, Dept. Plant Biology
1995-2001	Assistant Professor	Univ. Vermont, Dept. Botany
1993-1995	Visiting Research Fellow	Princeton University

ADDITIONAL TRAINING

Year	Experience	Location
2011	Visiting Scientist	Center for Invasion Biology, University of Stellenbosch, Stellenbosch, South Africa
2007	Participant	NKS Summer School Burlington, Vermont
2003	Visiting Scientist	University of Montpellier, Montpellier, France

PROFESSIONAL AWARDS

National Science Foundation Post-doctoral Fellow
Alexander Hollaender Distinguished Post-doctoral Fellowship Dept. of Energy
American Association of University Women Dissertation Fellowship

EXTERNAL SUPPORT

2011-2014 USDA Hatch Eco-evolutionary dynamics of invasion in the invasive grass, *Phalaris*

arundinacea $30,000

2009-2010 NIFA New England Center for the study of ecologically invasive species (subaward form UCONN), $20,000

2008-2009 USDA New England Center for the study of ecologically Invasive species (SubAward from UCONN), $20,000

2008-2011. USDA Hatch Predicting the spread of invasive plant species using theoretical models. $30,000

2008 Vermont EPSCOR Graduate Research Assistantship for Kerensa Alley $15,000

2007-2008 New England Center for the study of Ecologically Invasive Species ($53,000) Co-PI with Dr. Yi Li, University of Connecticut and others)

2006-2009 USDA NRI Ecological and evolutionary consequences of invasion. $323,000

2006-2007. New England Center for the Study of Economic and Ecologically Invasive Species ($393,000 Co-PI with Dr. Yi Li, University of Connecticut, and others)

2005-2008 USDA-Hatch Genetic variance in life history traits across an ecological gradient. $42,000.

2003-2006 USDA NRI-Comparison of putative invasive traits in native and invasive populations of *Phalaris arundinacea,* $196,000.

2002-2004. Disentangling the mechanisms responsible for species diversity in landscapes. DOE-EPSCOR $30,000.

1999-2001. USDA-NRI- Phenotypic plasticity or genetic specialization in an invasive grass $50,000

1998-2000. USDA-Hatch The relative importance of genotypic versus environmental factors in the invasiveness of reed canary grass, *Phalaris arundinacea*, $60,000

1998. SUGR/FAME Award to support undergraduate research $ 2,000
1996-2001. National Science Foundation Mathematically general predictions and plant population dynamics, $205,000

1997.National Sea Grant Habitat and Population effects on the early survival of the invasive species, *Lythrum salicaria*, Purple loosestrife $20,000

1993-1995. National Science Foundation Post-doctoral Fellowship Spatial Models of Coexistence $52,000

1991. National Science Foundation Doctoral Dissertation Improvement Grant Population dynamics and Pattern Formation in plants: theoretical models and empirical tests using *Cardamine pensylvanica* $9800.

INVITED SYMPOSIA

Molofsky, J, Keller, S.R. Lavergne, S. and Eppinga, M. Eco-evolutionary dynamics of invasion: NEOBIOTA 2012 Seventh European Conference on Invasions. Sep 12-14, Pontevedra, Spain.

Molofsky, J. A. R. Collins, E. Imbert, and S. Lavergne, 2010 Are novel genotypes superior: An intercontinental comparison: NEOBIOTA 2010 Biological Invasions in a Changing World, Sept 14-18, 2010,University of Copenhagen; Copenhagen Switzerland

10th International Conference on the Ecology and Management of Alien Plant Invasions, Stellenbosch, South Africa, August 2009)

Soil Ecology Society Meeting. The Two Faces of Soil Community Ecology – Interactions Within and Among Trophic Groups. July 2009

International Symposium on Invasive Species of Eastern North America and Asia. Trading places, Trading solutions. Storrs, Ct, August 2009.

Weed Society of America Symposium. Biology of weedy and invasive species in agroecosystems: competitive grants case studies. Denver, Co, February 2010

Molofsky, J., S. Lavergne and Eppstein. 2007. Understanding the evolutionary and ecological consequences of invasiveness using the invasive grass, *Phalaris arundinacea* ETH Swiss Science Foundation,Monte Verita Swizterland, February 25-March 1, 2007.

Lavergne and Molofsky 2006. Genome size and the evolution of plant invasiveness. An Evolutionary Perspective on Plant Invasions. Fribourg, Swizterland, October 2-3, 2006.

Eppstein and Molofsky 2007. Predicting invasiveness in plant communities. New Kind of Science, Burlington, Vermont July 13-15, 2007.

Molofsky, J. 2006. Cellular automata models: Null models for ecology. New Kind of Science Conference, Washington DC.

Molofsky, J. 2006. Extinction dynamics in experimental metapopulations. Sponsored by European Union, Montpellier Montpellier, France December 6-10, 2006.

Molofsky, J. and J. B. Ferdy. 2001 Conference on Evolution in Metapopulations, Sponsored by European Research Training Network ModLife at Turku, Finland.

Molofsky, J. 2001. Coexistence in spatial models of communities. American Society of Mathematics. Columbia, South Carolina.

Molofsky, J. J. D. Bever , J. Antonovics and T. J. Newman 2000. Negative frequency dependence and the importance of spatial scale. British Ecological Society 14th Special Symposium. August 30-September 4th, 2000. London, England.

Bever, J. D., **J. Molofsky** and J. Antonovics. 2000. Frequency-dependence and coexistence: the importance of spatial scale CEA-CREST Regional Conference on Spatially structured Dynamics, Los Angeles.

Molofsky, J. 1999. Genetic and environmental effects on invasions: A case study using the invasive grass, *Phalaris arundinacea*. Yale University, New Haven, Connecticut

INVITED WORKSHOP PARTICIPANT

EU sponsored workshop Linking above- and belowground species and processes, empiricists and modelers, Egmond aan Zee, The Netherlands July 2007.

NSF Collaboratory on the Population Biology of Invasive Species, Washington, DC October 1999.

PUBLICATIONS

In review:

Geartner, M. O. Biggs, M. te Beest, J.Molofsky, and D. R. Richardson. 2013. Invasive plants as drivers of regime shifts: Identifying high priority invaders that alter feedback relationships Invited review submitted to Ecology Letters.

Molofsky, J. M. Patel and A. R. Collins. 2013 Phenotypic plasticity and invasion: Evidence for Jack and Master Strategy in invasive but not native genotypes submitted to PLOS One.

Molofsky, J. C. Danforth and E.E. Crone.2013 Nutrient enrichment alters dynamics in experimental plant populations. Population Ecology Accepted pending revisions.

Molofsky, J. A. R. Collins, E. Imbert, and S. Lavergne. Are novel genotypes superior:A cross continental comparisons. Submitted to Plant Ecology

Published:

Eppinga, M. B. and J. Molofsky 2013. Eco-evolutionary litter feedback as a driver of exotic plant invasion. Perspectives in Plant Ecology, Evolution and Systematics http://dx.doi.org/10.1016/j.bbr.2011.03.031.

Kaproth, M. A.,M.B. Eppinga and J. Molofsky 2013. Leaf litter variation influences invasion dynamics in the invasive wetland grass Phalaris arundinacea. Biological Invasions1 DOI: 0.1007/s10530-013-0411-5

M. B. Eppinga, C. A. Pucko, M. Baudena, B. Beckage, and J. Molofsky.2013 A new method to infer vegetation boundary movement from ?snapshot? data. Ecography.

Collins, A.R. and Molofsky, J. 2012. From species coexistence to genotype coexistence: What can we learn from invasive plants. In: S. Jose (ed.), Invasive Plant Ecology. CRC Press

Calsbeek, B. S. Lavergne, M. Patel and **J. Molofsky**. 2011.Comparing the genetic architecture and potential response to selection of native and invasive populations of reed canarygrass. Evolutionary Applications 4:726-735.

Collins, R, E. Harte and **J. Molofsky**. 2010 Empirical estimates of frequency dependence in natural populations. Oecologia.

Eppinga M, M. A. Kaproth, A. R. Collins and **J. Molofsky.**2011. Litter feedbacks, evolutionary change and exotic plant invasion Journal of Ecology doi: 10.1111/j.1365-2745.2010.01781.x

Lavergne, S., N.J. Muenke and J. Molofsky 2010. Genome size and the evolution of plant invasiveness.Annals of Botany 105:109-116

Van der Putten, W.H., R.D. Bardgett, P.C. De Ruiter, W.H.G. Hol, T.M. Bezemer, M.A. Bradford, S. Christensen, M.B. Eppinga, T. Fukami, L. Hemerik, J. Molofsky, M. Schädler, C. Scherber, S.Y. Strauss, M. Vos and D.A. Wardle. 2009. Empirical and theoretical challenges in aboveground-belowground ecology. Oecologia 161: 1-14.

Brodersen, C. S. Lavergne and **J. Molofsky** 2008. Genetic variation in photosynthetic characteristics among invasive and native populations of reedcanary grass. Biological Invasions. DOI.

Lavergne, S. and **J. Molofsky** 2007. Increased genetic variation and evolutionary potential drive the success of an invasive grass. Proceedings of the National Academy of Sciences. 104:3883-3888.

Eppstein, M. J. and **J. Molofsky** 2007. Invasiveness in plant communities with feedbacks. Ecology Letters 10:253-263.

Eppstein, M. J., J. D. Bever and **J. Molofsky** 2006. Spatio-temporal community dynamics induced by frequency dependent interactions. Ecological Modeling 197: 133-147.

Lavergne, S. and **J. Molofsky** 2006. Control strategies for the invasive reed canarygrass (Phalaris arundinacea L) in North American wetlands: the need for an integrated management plan. Natural Areas Journal 26:208-214.

Molofsky, J. and J.B. Ferdy. 2005. Extinction dynamics in experimental metapopulations. Proceedings of the National Academy of Sciences 102:3726-3731.

Molofsky, J. and J. D. Bever.2004 A new kind of ecology? Bioscience: 54: 440-446.

Ferdy,J.B. and **Molofsky, J.** (2002) Allee effect, spatial structure and species coexistence. Journal of Theoretical Biology 217:413-424.

Shadel, W. P. and **J. Molofsky.**2002. Habitat and population effects on the germination and early survival of the invasive weed, *Lythrum salicaria* L. (purple loosestrife). Biological Invasions 4:413-423.

Gifford, A.L.S., Ferdy, J-B., and **Molofsky, J.** (2002) Genetic composition and morphological variation among populations of the invasive grass, *Phalaris arundinacea.* Canadian Journal of Botany 80:779-785.

Molofsky, J. and J. D. Bever. 2002 A novel mechanism to maintain biodiversity in landscapes.Proceedings of the Royal Society of London.269: 2389-2393.

Lavergne, S. and **J. Molofsky** 2004. Reed canary grass (*Phalaris arundinacea* L.), as a biological model in the study of plant invasions. Critical Reviews in Plant Sciences. 23:415-429.

Molofsky, J., J. D. Bever, J. Antonovics and T. J. Newman. 2002. Inferring process from pattern: negative frequency dependence and the importance of spatial scale. Ecology 83:21-27.

Molofsky, J., J. Bever, and J. Antonovics 2001. Coexistence under positive frequency dependence. Proceedings of Royal Society of London B 268: 273-277.

Molofsky, J. 1994. Population dynamics and pattern formation in theoretical populations. Ecology 75:30-39.
Molofsky, J., R. Durrett, J. Dushoff, D. Griffeath, and S. Levin.1999. Local frequency dependence and global coexistence. Theoretical Population Biology 55: 270-282.

Sakai, A. K., S. G. Weller, F. Allendorf, J. Holt, D. Lodge, **J. Molofsky**, K. With, S. Baughman, R. J. Cabin, J. E. Cohen, N. C. Ellstrand, D. McCauley, P. O'Neill, I. Parker and J. Thompson.2001. The population biology of invasive species. Annual Review of Ecology and Systematics 32:305-332.

Molofsky, J, J. Lanza, and E. E. Crone.2000. Plant litter feedback and population dynamics in an annual plant, *Cardamine pensylvanica*. Oecologia 124:522-528.

Molofsky, J., R. Durrett, J. Dushoff, D. Griffeath, and S. Levin.1999. Local frequency dependence and global coexistence. Theoretical Population Biology 55: 270-282.

Molofsky, J. 1999. The effect of nutrients and spacing on neighbor relations in Cardamine pensylvanica. Oikos 84:506-514.

Crone, E. E. and **J. Molofsky** 1999. Message in a bottle? Utility and limitations of ecological bottle experiments. Integrative Biology 1: 209-214.

Molofsky, J., S. L. Morrison, and C. J. Goodnight.1999. Genetic and environmental controls on the establishment of the invasive grass, *Phalaris arundincaea*.. Biological Invasions 1:1-8.

Morrison, S. L. and **J. Molofsky**. 1999. Interactions of genotypes and competition on the growth of an invasive grass, *Phalaris arundinacea,* L. (reed canary grass). Canadian Journal of Botany 77:1447-1453.

Morrison, S. L. and **J. Molofsky** 1998. Effects of genotypes, soil moisture and competition on the growth of an invasive grass, *Phalaris arundinacea* L. (reed canary grass). Canadian Journal of Botany 76:1939-1946.

Molofsky, J. and B. L. Fisher. 1993. The effect of habitat and predation on seedling survival and growth of three shade-tolerant tree species in Panama. Ecology 74: 261-264.

Molofsky, J. and C. K. Augspurger. 1992. The effect of litterfall on the germination and early establishment of tree seedlings in a tropical seasonal forest. Ecology 73:68-77.

Molofsky, J., C. A. S. Hall, and N. Myers. 1986. A comparison of tropical forest surveys. DOE/ NBB-0078.

Armentano, T. V. and **J. Molofsky**. 1986. Patterns of development in tropical montane areas and consequences for the carbon cycle. INTECOL Bulletin 13:19-23.

Molofsky, J., E. S. Menges, C. A. S. Hall, T. V. Armentano and K. A. Ault. 1984. The effects of land use alteration on tropical carbon exchange. pp. 181-194. In: The Biosphere Problems and Solutions, Elsevier Science Publishers B. V., T. N. Veziroglu (ed). Amsterdam, The Netherlands.

PRESENTATIONS

Kaproth M and J. Molofsky 2012. Variation in explosive seed dispersal: Comparing introduced populations to their native counterparts under competition Ecological Society of America Portland, Oregon August 5-10, 2012

Kaproth, M and J. Molofsky 2011 Investigating litter feedbacks Ecological Society of America, Austin, Texas, August 7-12, 2011

Eppinga M and J. Molofsky 2011. The ecology and evolution of reed canary grass, Ecological Society of America, Austin, Texas, August 7-12, 2011

Kaproth,M. and J. Molofsky 2010 Has a weedy lifestyle evolved? Comparing variation in life history traits between invasive populations compared to their native counterparts. Ecological

Society of America Pittsburgh, PA, August 5-10, 2010

Eppinga, M., C. Pucko, B. Beckage, and J. Molofsky 2010. A new approach to infer vegetation boundary dynamics from snapshot data. Ecological Society of America, Pittsburgh, PA. August 5-10, 2010

Molofsky J. and A. R. Collins. Evolutionary processes potential of invasive species on the range margin USDA NRI Project Director meeting August 7th, 2008, Milwaukee, WI

Collins, A. R. and J. Molofsky. Evolutionary processes that influence invasion: A central marginal comparison with the invasive grass, *Phalaris arundinacea* Ecological Society of America August 3-8 2008, Milwaukee, WI

Molofsky, J. E. Crone and C. Danforth 2008. Nutrient enrichment enhances instability in experimental plant populations Ecological Society of America, August 3-8,2008, Milwaukee, WI.

Alley K. and J. Molofsky 2008. Species coexistence along an environmental gradient. Vermont EPSCOR NSF meeting Burlington, Vermont June 2008.

Molofsky, J. Competition and persistence in a multi-rule Cellular Automata. NKS Summer School July 15, 2007, Burlington, Vermont.

Molofsky, J. and M. J. Eppstein. Understanding naturalization versus invasion in plant communities. Ecological Society of America August 4-8, 2006 Memphis Tennessee.

Lavergne, S. and **J. Molofsky**. Genome size and the evolution of invasiveness. An evolutionary perspective on plant invasions. October 2-3, 2006, Fribourg Switzerland.

Molofsky, J. and S. Lavergne. Evolution of invasiveness in *Phalaris arundinacea* Weed Society of America Meeting February 6-8th, 2007 San Antonio Texas.

Molofsky, J. and M. J. Eppstein. Naturalization versus invasion: how propagule supply, competitive relationships, and differences in feedbacks alter invasion success. Ecological Society of America. August 6-10th, Memphis, Tennessee

Molofsky, J. and J. B. Ferdy. Extinction dynamics in experimental metapopulatons. Ecological Society of America Meeting August 7-12 2005, Montreal, Canada

. Lavergne, S, and **J. Molofsky** Genetic stucture and morphological variation of introduced and native populations of the invasive grass *Phalaris arundinacea* , reed canary grass. Ecological Society of America August 7-12 2005, Montreal, Canada

Eppstein, M. J. and **J. Molofsky**. Modeling non-competitive and competitive ecological interactions: Implications for coexistence, and the importance of spatial scale of interactions. Ecological Society of America. August 7-12, 2005. Montreal, Canada.

Molofsky, J. and S. Lavergne. Ecological genetics of plant invasion. USDA NRI PI meeting. October 2-3 2005, Washington, DC.

Molofsky, J. and J. D. Bever. Coexistence under positive frequency dependence. Ecological Society of America, August 4-8th, 2002, Tuscon, Arizona

Molofsky, J. J.D. Bever, and J. Antonovics and T. J. Newman. 2000. Negative frequency-dependence and the importance of spatial scale. Ecological Society of America. August 4-8th, Snowbird, Utah.
Ferdy, J. B. and **J. Molofsky**. Allee effects, spatial structure and species coexistence. Ecological Society of America. August 4-8th, 2000.Snowbird, Utah.

Molofsky, J., J. Bever and J. Antonovics. Coexistence under positive frequency dependence. Ecological Society of America, August 3-7th,1999, Spokane, Washington.

Molofsky, J. S. Morrison and C. J. Goodnight. The dynamics of invasions: the importance of clonal, neighbor species, community and environmental factors on the invasion of *Phalaris arundiancea*, Ecological Society of America. August 2-6th, 1997. Providence, Rhode Island.

Molofsky, J. S. Morrison and C. J. Goodnight. 1997. The dynamics of invasions: the importance of clonal, neighbor species, community and environmental factors on the invasion of *Phalaris arundiancea*, Northeast Conference on Non-Indigenous Aquatic Nuiscance Species, South Burlington, Vemont.

Molofsky, J. R. Durrett and S. Levin. 1995. Two species models of frequency dependence in a spatial context. Society for the Study of Evolution, Montreal, Canada.

Molofsky, J. 1993. The development of patterns in experimental plant populations. Ecological Society of America.
Molofsky, J. 1992. From local to global in population regulation. Ecological Society of America.

Molofsky,J. 1991. Population dynamics and pattern formation in theoretical plant populations. Ecological Society of America.

Molofsky, J. and B. L. Fisher. 1989. The effect of habitat and predation on seedling survival and growth of three shade tolerant tree species in Panama. Ecological Society of America.

Molofsky, J. and C. K. Augspurger. 1988. The effect of litterfall on the germination and early establishment of tree seedlings in a tropical seasonal forest . Ecological Society of America.

INVITED SEMINARS
Virginia Tech, Blacksburg, VA
University of Fribourg, Fribourg, Switzerland

University Joseph Fourier, Grenoble France
University of Georgia
University of Toledo,
Center for Plant Biodiversity, CSIRO, Canberra, Australia,
Duke University,
University of Montepellier, Montpellier, France,
McGill University,
Archbold Biological Station

SERVICE

University

CALS Professional Standards committee 2012
Chair, TRI- Environment Committee 2009
University of Vermont, Ecosystem Ecologist Search Committee 2008
University of Vermont, Plant and Soil Science Search Committee for Vegetable Crop Assistant Professor, 2006-2007
University of Vermont Professional Standards Committee 2004-2008
University of Vermont, Chair, Ecology Search, Committee, Department of Botany 2002
University of Vermont, Co-Chair CALS Honors Committee 1999-2001
University of Vermont,Co-Chair, Department of Botany Graduate Admissions Committee 2003-2005

National

NSF Preproposal panel member 2012, 2013
Associate Editor, Methods in Ecology and Evolution
Associate Editor, NEOBIOTA
Associate Editor, Biological Invasions
NSF Panel member Environmental Synthesis Center 2010
USDA Weedy and Invasive species Panel Member 2008
NSF Panel member Frontiers in Biological Sciences 2007
NSF Panel member Evolutionary Ecology 2003, 2006
NSF Panel member Dissertation Improvement grants 2001
Ad-Hoc Reviewer National Science Foundation, USDA, Cannon Fellowship Awards
Reviewer for : American Naturalist, Proceedings of the National Academy of Sciences, Ecology, Ecological Monographs, American Journal of Botany, Ecology Letters
1997 - 2009 present Member of the Vermont Exotic Plant Pest Council which meets regularly to discuss invasive species in the state of Vermont.

Outreach:

Established a native and invasive plant educational garden on campus
Taught second graders about plant biology, Union Memorial School 2012
Taught third grade experimental science, Malletts Bay School 2012

TEACHING AND ADVISING

Courses Taught

Plant Ecology, Global Change Biology, The Green World, Invasion Ecology, Evolutionary and

Ecological Implications of Space, Grant writing in ecology and evolutionary biology, Honors college seminar on Global Change, Sophomore required class for biology majors BCOR102

Research Supervision
30 undergraduate students, Fall 1995- to present
10 graduate students (5 MS., 5 PhD)
3 Post-doctoral fellows

Catherine A. Paris
University of Vermont
Burlington, VT 05405-0086
phone: 802-656-0426
e-mail:cparis@uvm.edu
http://www.uvm.edu/~plantbio/?Page=faculty/paris.html

EDUCATION

Ph. D. in Botany, University of Vermont, 1991. Dissertation: "Molecular systematics of the *Adiantum pedatum* complex: phylogeny, biogeography, and a taxonomic revision of the group in North America."

Visiting Graduate Student, Harvard University, Spring, 1987.

M. S. in Botany, University of Vermont, 1986. Thesis: "A biosystematic investigation of the *Adiantum pedatum* complex in eastern North America."

B. S. in Environmental Science, Lyndon State College, Lyndonville, Vermont, 1982.

PROFESSIONAL EXPERIENCE

University of Vermont Plant Biology Department, Burlington, VT 05405-0086

Senior Lecturer, 2009 - present
Lecturer, 1991 - 1993; 1998 - 2009
Assistant Professor, July 1993 - July 1998
Graduate Teaching Fellow, 1982 - 1990
Graduate Research Fellow, 1984, 1987, 1989

AWARDS AND HONORS

Merritt Lyndon Fernald Award for the best paper published in the current volume of *Rhodora*, the Journal of the New England Botanical Club, 2008
Joseph E. Carrigan Award for Excellence in Undergraduate Teaching, 2003
Selected for Participation in the UVM Center for Teaching and Learning Laptop Computer Workshop, June 2000
Botany Department nomination for the Outstanding Graduate Teaching Fellow of the Year Award, University of Vermont, 1990
Edgar T. Wherry Award, presented by the Botanical Society of America (Pteridological Section), 1989
Governor's Citation (Hon. Madeleine M. Kunin) for discovery of a new fern species in Vermont's flora, 1988

GRANT SUPPORT

1999: Genetic variation in *Lathyrus maritimus* Bigel., a wild legume with significant agronomic potential. $2,000 from the Vermont Agricultural Experiment Station (with D. Barrington).

1996: Genetic variation in *Ammophila*, a grass with under-utilized agronomic potential. $37,728 from the Vermont Agricultural Experiment Station (with D. Barrington).

1995: Genetic diversity in *Ammophila champlainensis*, the Champlain beachgrass. $1700 from the Vermont Nongame and Natural Heritage Program (with P. Walker).

1994: Speciation in *Ammophila* Host: Sequence variation in the internal transcribed spacer region of nuclear ribosomal DNA. $5,000 from the University Committee on Research and Scholarship, University of Vermont.

1994: Habitat analysis of the rare fern species *Adiantum viridimontanum* and its diploid progenitors. $800 from the Nature Conservancy, Vermont Office (with K. Reilly).

1988: Evolutionary genetics of the *Adiantum pedatum* complex: phylogeny and biogeography. $11,930 from the National Science Foundation (Doctoral Dissertation Improvement Grant, with D. Barrington).

REFEREED PUBLICATIONS

Barrington, D. S. and C. A. Paris. 2008. Refugia and migration in the Quaternary history of the New England flora. Rhodora 109: 369-386. *(Though this contribution was not co-authored by graduate students, its draws heavily on work of students in the lab.)*

Paris, C. A. 1991. *Adiantum viridimontanum* a new species of maidenhair fern in eastern North America. Rhodora 93:105-122.

Paris, C. A. and D. S. Barrington. 1990. William Jackson Hooker and the generic classification of ferns. Ann. Missouri Bot. Gard. 77:228-238.

Paris, C. A., F. S. Wagner, and W. H. Wagner, Jr. 1989. Cryptic species, species delimitation, and taxonomic practice in the homosporous ferns. Amer. Fern J. 79:46-54.

Paris, C. A., and M. D. Windham. 1988. A biosystematic investigation of the *Adiantum pedatum* complex in eastern North America. Syst. Bot. 13:240-255.

Barrington, D. S., C. A. Paris, and T. A. Ranker. 1986. Systematic inferences from spore and stomate size in the ferns. Amer. Fern J. 76:149-159.

SELECT PUBLISHED ABSTRACTS

Walker, P. J., C. A. Paris, and D. S. Barrington. 1998. Taxonomy and phylogeography of the North American beachgrasses. Amer. J. Bot. 85:.

Schmitz, S., C. A. Paris, and D. S. Barrington. 1997. Assessment of genetic variation in beachpea (*Lathyrus maritimus*) populations on Lake Champlain, Vermont. Amer. J. Bot. 84:230.

Walker, P. J. and C. A. Paris. 1997. Biogeography, speciation, and concerted evolution in American beachgrass (*Ammophila* Host): infraspecific sequence variation in the internal transcribed spacer of nuclear ribosomal DNA. Amer. J. Bot. 84:241.

OTHER PUBLICATIONS

Barrington, D. S. and C. A. Paris. 2011. Vascular plant morphology: a laboratory manual for PBIO 108. (published electronically)

Thompson, E. H. and C. A. Paris. 2004. *Carex lupuliformis* (false hop sedge*)* – a conservation plan prepared for the New England Plant Conservation Program, Framingham, MA.

Thompson, E. H. and C. A. Paris. 2004**.** *Juncus torreyi* (Torrey's rush) – a conservation plan prepared for the New England Plant Conservation Program, Framingham, MA.

Paris, C. A. 1997. Wetland warriors. The Seedling, Newsletter of the Vermont Association of Conservation Commissions. 5(3):1, 4-5.

Paris, C. A. 1993. *Adiantum* (generic treatment). In Flora of North America, Volume 2, ed. Flora of North America Editorial Committee. New York: Oxford University Press.

INVITED PAPERS

Paris, C. A. 2000. Isolation and divergence in the North American beachgrasses (*Ammophila*): insights from the ITS region of nuclear ribosomal DNA. Presented as part of a symposium honoring Dr. Diana Stein on the occasion of her retirement from Mt. Holyoke College, South Hadley, MA April 15, 2000.

Walker, P. J., C. A. Paris, and D. S. Barrington. 1998. Taxonomy and phylogeography of the North American beachgrasses. Presented as part of a symposium entitled "American beachgrass (*Ammophila breviligulata*)."American Institute of Biological Sciences annual meeting, Baltimore, Maryland, August, 1998.

Paris, C A. 1995. The cryptic species problem. Smithsonian Conference on Biosystematics of Tropical Pteridophytes, Washington, D.C. April 2-4, 1995.

Paris, C. A. and C. H. Haufler. 1994. Geographic isolation and allopatric speciation in ferns with a disjunct distribution in eastern Asia and eastern North America. Presented as part of a symposium entitled "Relationships Between Plants of Eastern Asia and Eastern North America." American Institute of Biological Sciences annual meeting, Knoxville, Tennessee, August, 1994.

Paris, C. A., C. H. Haufler, and D. B. Stein. 1993. Systematics and biogeography of ferns with a disjunct distribution in eastern Asia and eastern North America. Presented as part of a symposium entitled "Systematics and Biogeography of Asian Pteridophytes." XV International Botanical Congress, Tokyo, Japan, August, 1993.

Paris, C. A. 1991. Fernald's Gaspé refugium hypothesis revisited: phylogeny and biogeography of the *Adiantum pedatum* complex in North America. International Conference on Serpentine Ecology, Davis, California, June,1991.

Paris, C. A., N. Nakato, and D. B. Stein. 1990. Divergent speciation in the *Adiantum pedatum* complex: evidence from chloroplast DNA variation, cytology, and isozyme electrophoresis. Presented as part of a symposium entitled "Nucleic acids: application to pteridophyte phylogeny." International Association of Pteridologists Conference, Ann Arbor, Michigan, June,1990.

TEACHING EXPERIENCE

Graduate Courses in Plant Biology

Field Botany for Natural Resource Professionals (Fall 1999 - present, with Elizabeth Thompson)
Biology of Ferns (Spring 2004, 2006, with David Barrington)
Vermont Forests and their Native Plants (Summer 1999, 2001, 2002, with Elizabeth Thompson)
Aquatic Botany of the Champlain Basin (Summer 1993 - 1997, 1999, with James Hoffmann)
Plant Systematics Journal Club (weekly discussion of the current research literature for graduate and advanced undergraduate students, 1995 – 2000, with David Barrington)
Colloquium: History of Plant Systematics (Spring 1998, with David Barrington)

Undergraduate Courses in Plant Biology

The Green World (Fall 1994; Spring 2001 – 2004, with James Hoffmann; 2006, with Thomas Vogelmann; 2008; 2009, with Terry Delaney; 2010; 2012; 2011 and 2013 with Laura Hill-Bermingham)
Morphology and Evolution of Vascular Plants (Spring 1992 – present, alt. years)
Plant Systematics (Fall 1991-1996; 1998 - present)
Elementary Genetics (Fall 1992)

Undergraduate Courses in Biology

Exploring Biology (Spring 2005 - 2010)

Graduate Research Directed

Isaac Nadeau. M.S. 2011 - A Landscape Inventory and Management Plan for Abraham's Woods
Kristen Sharpless, M.S. 2007 – Think local: Place-based education for public school teachers.
Dan Farrell, M.S. 2004 – Vascular plant and landscape diversity in the northern Green Mountains of Vermont.
Jens Hilke, M.S. 2003 – A site conservation plan for the rock bald natural communities of Shenandoah National Park, Virginia.
Cynthia Riegel, M.S. 2002 – West Bank Wildlife habitat inventory and linkage assessment, Teton County, WY.
John McPhedran, M. S. 1998 - Natural community mapping within a proposed ecological reserve in central Maine.
Adriana Ruesink, M.S. 1998 - Physical and biological factors affecting the distribution of Morrow's honeysuckle (*Lonicera morrowii*) on Mt. Equinox, Vermont.
Peter Walker, M.S. 1998 - Biogeography, speciation, and concerted evolution in the North American beachgrasses (*Ammophila* Host).
Mary Plummer, M.S. 1997 - A test of the postulated relationship between water hyacinth (*Eichornia crassipes*) and *Biomphalaria sudanica*, a vector of schistosomiasis, on Lake Victoria, Tanzania.
Jeffrey Meyers, M.S. 1995 - Size-duration parameters and invertebrate predators in woodland vernal pools: implications for Ambystomid populations.
David Campbell, M.S. 1993 - Long term changes in the hydrology, water chemistry, and vegetation in a peatland after road construction.

Graduate Studies Committees

Elizabeth Brownlee, M.S. *(in progress)*
Claire Polfus, M.S. *(in progress)*
Monique McHenry, Ph.D. 2012
Stacy Jorgenson, M.S. 2012
Rose Graves, M.S. 2011
Neahga Leonard, M.S. 2011
David Asmussen, M.S. 2011
Lisa Dunaway, M.S. 2011
Emily Stone, M.S. 2010
Kim Hoffmann, M.S. 2010
Aman Kaur, Ph.D. 2009
Quincy Campbell, M.S. 2009
S'ra DeSantis, M.S. 2009
Marc Eisenhower, M.S. 2008
Trevor Manendo, M.S. 2008
Sara Mulford, M.S. 2008
Erin Sigel, M.S. 2008
Brendan Weiner, M.S. 2007
Christopher Nytch, M.S. 2007
Corrie Miller, M.S. 2007
Katie Pindell, M.S. 2007
Kimberly Smith, M.S. 2007
Shana Stewart, M.S. 2007
Michelle Crowder M.S. 2006
Julie Dragon, Ph.D. 2006
Heather Driscoll, M.S. 2006
Jennifer Cramer, M.S 2005
Jane Moscowitch, M.S. 2005
Dan Wells, M.S. 2005
Kendra Schmeideskamp, M.S. 2004
Brooke Wilkerson, M.S. 2004
Claire Dacey, M.S. 2003
Kerstin Lange, M.S. 2003
Joshua Rapp, M.S. 2003
Julie Dragon, M.S. 2002
Heather Fitzgerald, M.S. 2002
Mary T. O'Sullivan, M.S. 2002
Diane Wells, M.S. 2002
Brian Carlson, M.S. 2001
Jillian Butler, M.S. 2001

Holly Taylor, M.S. 2001
Shelley Gustaffson, M.S. 1999
Christina Scharf, M.S. 1999
Mark Ward, M.S. 1999
Susan Young, M.S. 1999
Beth Nadeau Astley, M.S. 1998
Thomas Dippel, M.A.T. 1998
James Bove, M.S. 1997
Lynn Baldwin, M.S. 1996
Peter Williams, M.S. 1996
Jessica Rykken, M.S. 1995
Anya Schwartz, M.S. 1995
Heidi Terrell, M.S.T. 1995
Peter Neitlich, M.S. 1993

Undergraduate Research Directed

Marissa Santillo, B.S. 1999 - Electrophoretic and morphological investigation of the dwarf chinquapin oak, a candidate for listing as an endangered species in the State of Vermont (supported by a $735 grant from the Helix Program).
Rachel Ehrenberg, B.A. 1998 - Genetic variation in *Ammophila champlainensis* (Poaceae), a species endangered in the state of Vermont (supported by a $400 grant from the Helix Program).
Kara O'Connor, B.S. 1996 - Geography and ecology of *Adiantum viridimontanum*, a rare fern species in Vermont (supported by a $400 grant from the Helix Program).
Heather Pembrook, B.S. 1993 - Genetic relationships of *Acer saccharum* Marsh. and *Acer nigrum* Michx.

Advisees in the Self-Designed Major Program

Anna Wiens, B.S. *(in progress)* – Complementary and Alternative Health Care
Clayton Sulak, B.S. 2011 – Plant Pharmacognosy
Allison Willenbrink, B.S. 2004 - Ethnobotany
Katherine Armstrong, B.S. 1998 - Ethnobotany

Undergraduate Internships Directed

Robin Cheney, B.S. 1999
Katherine Armstrong, B.S. 1998
Molly Mueller, B.S. 1998

Outreach

"Geology of Shelburne, Vermont" – A three-week curriculum block in local geology offered to the sixth-grade class at the Lake Champlain Waldorf School, June 2006, 2008.

"Across the Fence" (with David Barrington) – Interview on our lab's research program on the disjunct maritime species of the Champlain Valley, July 19, 1999

"Digging Deeper – a Year of Change in and Around Water," A Workshop for K-12 Science Teachers, co-sponsored by Shelburne Farms and the Lake Champlain Basin Science Center, September 24, 1999
Governor's Institute on Science and Technology, Faculty Member, Summer 1996 – 1999

SERVICE AND OTHER PROFESSIONAL ACTIVITIES

University of Vermont

General Education Diversity Outcome Workgroup, 2012 - present
Curricular Affairs Committee of the Faculty Senate, 1998 - present
Chair, 2010 – present
Diversity Curriculum Review Committee, 2010 - present
Co-chair (with Susan Kasser), 2012 - present
Academic Program Review Coordinator, 2007 - 2010
Strategic Initiatives Project, Gen. Ed./S3 Workgroup, 2011- 2012
General Education Workgroup, a joint committee of the Faculty Senate; 2009 - 2010
Representative to the Writing in Disciplines Steering Committee, 2006 - present
Selection Committee, Mariafranca Morselli Leadership Award, 2003 - present

University of Vermont College of Agriculture and Life Sciences

Curriculum Committee, 1994 – 1997; 2006 - 2012
Co-chair (with Brenda Tessman), 2006 – 2008; 2009 - 2012
Co-chair (with Amy Trubek), 2008 - 2009
Chair, 1996 - 1997
Co-chair (with Jane Petrillo), 1995 - 1996
Carrigan Award Selection Committee, 2012 - present
Self-Designed Major Committee, 2002 – present
Selection Committee, CALS Outstanding Alumni and Outstanding New Achiever Awards, 2008
Ad-Hoc Committee on the CALS Core Curriculum, 2006
Honors Committee, 1998 – 2001; 2003-2006
Search Committee, Director of the Justin Morrill Honors Program, 2003
Studies Committee, 1995 –1998; 2003
Representative to the USDA NE-9 Technical Committee, 1996
Ad-Hoc Committee on the College-Wide Curriculum,
Chair, 1994 -1995

University of Vermont Plant Biology Department

Search Committee, Evolutionary Developmental Biologist, 2011
Graduate Affairs Committee, 2005 - 2009
Graduate Program Coordinator, 1993 - 1997; 1998 - 2005
Undergraduate Affairs Committee, 1993 - 1994
Search Committee, Plant Molecular Biologist, 1992 - 1993

University of Vermont Graduate College

Award Committee, Graduate Teaching Fellow of the Year Award, 1992

Service to Professional Societies and Non-Profits

Lakes Environmental Organization
Field Trip and Workshop Organizer, 2010
Lower Kennebec Land Trust
Field Trip and Workshop Organizer, 2004
Josselyn Botanical Society
Field Trip and Workshop Organizer, 2001
New England Botanical Club
Fernald Award Selection Committee, 2009 – present
Back Issues Manager, Rhodora, 1992 - 2004
Assistant Curator of Vascular Plants, 1992 - 1994
Graduate Student Member of the Council, 1988 - 1990
American Fern Society
Judge of Elections, 1985, 1986, 1988, 1990
Nominating Committee, 1987
Co-Leader (with D. S. Barrington and D. S. Conant) of the field trip in conjunction with the annual meeting of the Society, 1986
New England Fern Conference
Co-Organizer, 1989, 1992
Association for Women in Science, Lake Champlain Chapter
Secretary, 1992 - 1993
New England Graduate Student Botany Meeting
Organizer, 1989
Co-Organizer, 1988

Manuscript and Proposal Reviewer

American Fern Journal, American Journal of Botany, Annals of the Missouri Botanical Garden, National Science Foundation, Plant Species and Evolution, Rhodora, Systematic Botany

Consultantships

New England Wildflower Society – reviewed the treatment of *Adiantum* for the revised edition of Peterson's Field Guide to the Ferns.
New England Plant Conservation Program – reviewed a conservation plan for *Adiantum viridimontanum*, a rare fern in the state of Vermont, 2001
National Gardening Assoc. – reviewed a web course on Botany for Gardeners, 1998

Service to Community and State

Scientific Advisory Group on Vascular Plants, Vermont Endangered Species Committee
Member, 1991 - present
Vice-Chair, 1991 - 1997
Jericho Wastewater Management Plan Working Group
Member, 1999

Jericho Conservation Commission
Member, 1991 – 1998
Chair, 1992 – 1994

Community Service

Camp For Me Board Member and Secretary, 2011-present

Membership in Professional Societies

American Fern Society
American Society of Plant Taxonomists
Botanical Society of America
New England Botanical Club
Sigma Xi: The Scientific Research Society

CURRICULUM VITAE

Timothy David Perkins

ADDRESS:

Office/Laboratory	Home
Proctor Maple Research Center	274 Hidden Pines Circle
University of Vermont	Richmond, VT 05477
P.O. Box 233, Harvey Road	Email: vtootm@accessvt.com
Underhill Center, VT 05490	
Phone: (802) 899-9926	Phone: (802) 434-4738
FAX (802) 899-5007	E-mail: Timothy.Perkins@uvm.edu

EDUCATION:

Student Science Training Program - CENTER FOR NORTHERN STUDIES, Wolcott, Vermont, Sponsored by National Science Foundation. September 1978 - May 1979. Instructor: Dr. Charles Racine.

Bachelor of Arts. Double Major - Environmental Studies (Self-Designed in Field Ecology) and Geology, UNIVERSITY OF VERMONT, September 1979 - May 1984. Undergraduate Research Thesis: *Survey of Potential Cirques in the Green Mountains of Vermont.* Advisor: Dr. Ian Worley.

Master of Science - Department of Botany, UNIVERSITY OF VERMONT, September 1985 - May 1988. Thesis: *Alterations in Microclimate, Herb Distribution, and Seedling Establishment in Response to Forest Decline.* Advisors: Dr. Richard Klein & Dr. Hubert Vogelmann.

Doctor of Philosophy - Department of Botany, UNIVERSITY OF VERMONT, June 1988 - March 1991. Dissertation: *Gap Expansion, Seedling Regeneration, and Microclimate in a Disturbed Montane Red Spruce - Balsam Fir Forest in Northern Vermont.* Advisors: Dr. Richard Klein & Dr. Hubert Vogelmann.

FACULTY POSITIONS:

Research Associate. Department of Botany, UNIVERSITY OF VERMONT, February 1991 - June 1994. Research Supervisors: Dr. Richard Klein, Dr. Melvin Tyree.

Research Assistant Professor. UVM Proctor Maple Research Center, Department of Botany & Agricultural Biochemistry, UNIVERSITY OF VERMONT. July 1994 – June 2004.

Research Associate Professor. UVM Proctor Maple Research Center, Department of Plant Biology, UNIVERSITY OF VERMONT. July 2004 – June 2010.

Research Professor. UVM Proctor Maple Research Center, Department of Plant Biology, UNIVERSITY OF VERMONT. July 2010 – present.

Interim Director. UVM Proctor Maple Research Center. Department of Botany & Agricultural Biochemistry, UNIVERSITY OF VERMONT. July 1996 – September 2000.

Director. UVM Proctor Maple Research Center. Department of Plant Biology, UNIVERSITY OF VERMONT. October 2000 - present.

RESEARCH:

Physiological-ecology of northern forests. Chemistry of maple sap and syrup. Physiology of maple sap flow and sap production. Factors affecting maple sap yield. Chlorophyll fluorescence as an indicator of health and photosystem function in red spruce and sugar maple. Effects of air pollution, global change and nutrition on physiology and growth of trees. Winter physiology and survival in conifers.

TEACHING:

Graduate Faculty Member. UNIVERSITY OF VERMONT. January 1992 - present.

Instructor. JOHNSON STATE COLLEGE, Johnson, Vermont. Department of Biology and Environmental Studies. *ENS 100*--Introduction to Environ. Problems. Spring 1993, Summer 1993.

Instructor. UNIVERSITY OF VERMONT

BOT 160 — Plant Ecology. Fall 1998.
BOT 104 — Plant Physiology. Spring 2000, Spring 2001.
BOT 295 — Plant Physiological Ecology. Fall 2000.
BOT 295 (Co-Instr.) — Plant Biol. for Secondary School Teachers. Summer 1998, 1999, 2000.

Graduate Research Advisor/ Graduate Studies Committees. UNIVERSITY OF VERMONT.
Supervised 3 M.S. Students (Adams, Zando, Cate) and 1 PhD. Student (van den Berg)
Currently serve on 1 M.S. (Isselhardt) and 1 Ph.D. committees (Pucko)
Served on 5 M.S. and 2 Ph.D. Committees (Schaberg, Broderson)

PROFESSIONAL PUBLICATIONS (Peer-Reviewed):

Klein, R.M. and **T.D. Perkins**. 1987. Cascades of causes and effects in forest decline. Ambio **16**: 86-93.

Perkins, T.D., H.W. Vogelmann, and R.M. Klein. 1987. Changes in light intensity and soil temperature as a result of forest decline on Camels Hump, Vermont. Canadian Journal of Forest Research **17**: 565-568.

Klein, R.M. and **T.D. Perkins**. 1988. Primary and secondary causes and consequences of contemporary forest decline. The Botanical Review **54**: 1-43.

Klein, R.M., S. Adamowicz, **T.D. Perkins**, and H. Liedeker. 1988. Precipitation as a source of assimilable nitrogen: a historical survey. American Journal of Botany **75**: 928-937.

Vogelmann, H.W., **T.D. Perkins**, G.J. Badger, and R.M. Klein. 1988. A 21-year record of forest decline on Camels Hump, Vermont. European Journal of Forest Pathology **18**: 240-249.

Perkins, T.D., R.M. Klein, H.W. Vogelmann, and G.J. Badger. 1988. *Betula* seedling response to forest canopy degeneration. European Journal of Forest Pathology **18**: 250-252.

Klein, R.M., **T.D. Perkins**, and H.L. Myers. 1989. Nutrient status and winter hardiness in red spruce foliage. Canadian Journal of Forest Research **19**: 754-758.

Klein, R.M., **T.D. Perkins**, J. Tricou, A. Oates, and K. Cutler. 1991. Factors affecting red spruce regeneration in declining areas of Camels Hump mountain, Vermont. American Journal of Botany **78**: 1191-1198.

Adams, G.T., **T.D. Perkins**, and R.M. Klein. 1991. Anatomical studies on first-year winter injured red spruce foliage. American Journal of Botany **78**: 1199-1206.

Perkins, T.D., G.T. Adams, and R.M. Klein. 1991. Desiccation or freezing? Mechanisms of winter injury to red spruce foliage. American Journal of Botany **78**: 1207-1217.

Perkins, T.D., R.M. Klein, G.J. Badger, and M.J. Easter. 1992. Spruce-fir decline and gap dynamics on Camels Hump, Vermont. Canadian Journal of Forest Research **22**: 413-422.

Jennings, M.M., **T.D. Perkins**, M.T. Hemmerlein, and R.M. Klein. 1992. Techniques for pollution monitoring in remote sites: I. Near real-time rainfall pH and depth. Water, Air, & Soil Pollution **65**: 237-244.

Adams, G.T. and **T.D. Perkins**. 1993. Assessing cold tolerance in *Picea* using chlorophyll fluorescence. Environmental and Experimental Botany **33**: 377-382.

Perkins, T.D., G.T. Adams, S. Lawson, and M.T. Hemmerlein. 1993. Cold tolerance and water content of current-year red spruce (*Picea rubens* Sarg.) foliage over two winter seasons. Tree Physiology **13**: 119-144.

Perkins, T.D., M.T. Hemmerlein, and H.W. Vogelmann. 1993. Techniques for pollution monitoring in remote sites: II. Ozone. Water, Air, & Soil Pollution **68**: 391-397.

Hemmerlein, M.T. and **T.D. Perkins**. 1993. Techniques for pollution monitoring in remote sites: III. Near real-time monitoring of cloud water conductivity and pH. Water, Air, & Soil Pollution **71**: 43-50.

Klein, R.M., G.T. Adams, H. Liedeker, and **T.D. Perkins**. 1994. Characterization of the short needle phenomenon in red spruce. American Journal of Botany **81:** 461-465.

Perkins, T.D. and G.T. Adams. 1995. Rapid freezing induces winter injury symptomatology in red spruce foliage. Tree Physiology **15:** 259-266.

Schaberg, P.G., **T.D. Perkins**, and S.G. McNulty. 1997. Effects of chronic low-level N additions on gas exchange, shoot growth and foliar elemental concentrations of mature montane red spruce. Canadian Journal of Forest Research **27**: 1622-1629.

Perkins, T.D., G.T. Adams, S.T. Lawson, P.G. Schaberg, and S.G. McNulty. 2000. Long-term nitrogen fertilization increases winter injury in montane red spruce *(Picea rubens)* foliage. Journal of Sustainable Forestry **10**:165-172.

Lawson, S.T., **T.D. Perkins**, and G.T. Adams. 2000. Winter-time patterns of chlorophyll fluorescence in red spruce (*Picea rubens*) foliage. Journal of Sustainable Forestry **10**: 149-153.

Schaberg, P.G.,G.R. Strimbeck, G.J. Hawley, D.H. DeHayes, J.B. Shane, P.F. Murakami, **T.D. Perkins**, and B.I. Wong. 2000. Natural variation in foliar cold tolerance, carbohydrate concentration and photosystem function of mature montane red spruce in midwinter. Journal of Sustainable Forestry **10**:173-180.

Boyce, R.L., A.J. Friedland, C.B. Vostral, and **T.D. Perkins**. 2003. Effects of a major ice storm on the foliage of four New England conifers. Ecoscience **10**: 342-350.

Cate, T.M. and **T.D. Perkins**. 2003. Chlorophyll content monitoring of sugar maple (*Acer saccharum* Marsh). Tree Physiology **23**: 1077-1079.

van den Berg, A.K. and **T.D. Perkins**. 2004. Evaluation of a portable chlorophyll meter to estimate chlorophyll and nitrogen contents in sugar maple (*Acer saccharum* Marsh) leaves. Forest Ecol. & Mgmt. **200**:113-117.

van den Berg, A.K. and **T.D. Perkins**. 2005. Nondestructive estimation of anthocyanin content in autumn sugar maple leaves. HortScience **40**: 685-686.

van den Berg, A.K. and **T.D. Perkins**. 2007. Contribution of anthocyanins to the antioxidant capacity of juvenile and senescing sugar maple (*Acer saccharum*) leaves. Functional Plant Biology **34**: 714-719.

Beckage, B., B. Osborne, D. Gavin, C. Pucko, T. Siccama and **T. Perkins**. 2008. An upward shift of a forest ecotone during 40 years of warming in the Green Mountains of Vermont, USA. Proc. Nat. Acad. Sci. **105**: 4197-4202.

van den Berg, A.K., **T.D. Perkins**, M.L. Isselhardt, M.A. Godshall and S.W. Lloyd. 2009. Effects of air injection during sap processing on maple syrup color, chemical composition and flavor volatiles. Int. Sugar J. **111**: 37-42.

Perkins, T.D. and A.K. van den Berg. 2009. Maple Syrup – Production, Composition, Chemistry, and Sensory Characteristics. pp. 102-144. *In:* S.L. Taylor *(Ed.)* Advances in Food and Nutrition Research. Volume 56. Elsevier, New York.

van den Berg A.K., **Perkins, T**., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2009. Air injection into concentrated maple sap during processing: impact on syrup composition and flavor. Journal of the Science of Food and Agriculture **89**: 1770-1774.

van den Berg A.K., Vogelmann, T.C. and **Perkins, T.D**. 2009. Anthocyanin influence on light absorption within juvenile and senescing sugar maple leaves – do anthocyanins function as photoprotective visible light screens? Functional Plant Biology **36**: 793-800.

van den Berg A.K., **Perkins, T.D.**, Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2011. Effects of producing maple syrup from concentrated and reconstituted sap of different sugar concentrations. Int. Sugar J. **113**: 35-44.

van den Berg, A.K., **Perkins, T.D.**, Isselhardt, M.L., Godshall, M.A., and Lloyd, S.W. 2012. Maple syrup production with sap concentrated to high levels by membrane separation: effects on syrup chemical composition and flavor. Int. Sugar J. (revised manuscript submitted).

Pucko, C., B. Beckage, **T. Perkins**, and W.S. Keeton. 2011. Species shifts in response to climate change: Individual or shared responses? J. Torrey Bot. Soc. **138**(2): 156-176.

van den Berg, A.K. **T. D. Perkins** and M.L. Isselhardt. Chemical composition of five standard grades of pure maple syrup. J. Agric. Food Chem. (in preparation).

Perkins, T.D. and G.J. Badger. Changes in timing and duration of the maple sap production season in the northeast over the past 50 years. Global Change Biol. (in preparation).

FUNDED GRANTS:

Ozone Monitoring to Support Studies of Forest Decline. H.W. Vogelmann, R.M. Klein, and **T.D. Perkins**. University of Vermont, Research Advisory Council. March 1990 - March 1991 ($10,000).

National Atmospheric Deposition Program -- A Long-Term Monitoring Program in Support of Research on Effects of Atmospheric Chemical Deposition. **T.D. Perkins** (U.V.M. Representative). U.S. Dept. Agriculture, Cooperative State Research Service. October 1992 - September 1997.

Mechanisms of Winter Injury to Red Spruce Foliage. M.T. Tyree and **T.D. Perkins**. National Council for the Paper Industry for Air and Stream Improvement. April 1993 - May 1995 ($20,000).

Role of Calcium and Nitrogen in Winter Injury to Red Spruce Due to Rapid Freezing. **T.D. Perkins**. U.S.D.A. Forest Service (Northeast Forest Experiment Station), Cooperative Research Agreement (with M.T. Tyree). May 1993 - June 1995 ($40,000).

Nutrient-Mediated Susceptibility of Red Spruce to Winter Injury. **T.D. Perkins**, U.S.D.A. National Research Initiative Competitive Grants Program. September 1993 - August 1996 ($120,000).

Effects of Altitute on Cold Tolerance and Bud and Needle Mortality in Red Spruce. D.R. Foster and J.L. Hadley. U.S.D.A. National Research Initiative Competitive Grants Program. November 1994 - October 1996 (**T.D. Perkins,** Subcontract with Harvard Forest for Rapid Freezing Study $2,180).

Inventory of Forest Condition on Camels Hump, Vermont. **T.D. Perkins**, The Conservation and Research Foundation. January 1995 - January 1996 ($3,000).

Maple Sap Exudation and the Fate of Heavy Metals in Syrup. M.T. Tyree and **T.D. Perkins**. U.S.D.A. CSREES Special Grant for Maple Research. July 1994 - June 1997 ($163,500).

The Fate of Heavy Metals in Maple Sap and Syrup. **T.D. Perkins**. U.S.D.A. CSREES Special Grant for Maple Research. July 1997 - June 2000 ($265,544).

Proctor Maple Research Center: Fertilization Effects on Maple Sap Volume Production and Sugar Content. **T.D. Perkins**. The Freeman Foundation. July 1997 - June 2004 ($285,000).

Genetic Markers for Sap Sweetness in Sugar Maple. W.W. Currier, **T.D. Perkins**, and T.J. Baribault. U.S.D.A. Hatch Grant, Vermont Agricultural Experiment Station. October 1997 - September 2000 ($16,500).

Diagnostic Nutrition of Sugar Maple. **T.D. Perkins** and T.R. Wilmot. North American Maple Syrup Council. November 1997 - October 1998 ($3,000).

A Re-evaluation of Taphole Diameter and Depth on Sap Volume and Wound Size in Sugar Maple. **T.D. Perkins** and S.H. Williams. Chittenden County Maple Sugarmakers Assoc. January 1998 - December 2000 ($4,500).

Effects of Spout Diameter and Depth on Sap Production and Wounding in Sugar Maple. **T.D. Perkins**, S.H. Williams, and TR. Wilmot. North American Maple Syrup Council. November 1998 - October 1999 ($5,000).

Ice Storm Effects on Growth and Survival in Sugar Maple. **T.D. Perkins** and B. Wong. Vermont Monitoring Cooperative/Vermont Agency of Natural Conservation, Department of Forests, Parks & Recreation. January 1999- August 2000 ($4,000).

Environmental Education for Schoolchildren at the Proctor Maple Research Center. **T.D. Perkins**. Shad Foundation of Huskey Injection Molding Systems. February 1999-January 2000 ($6,000).

Genetic Markers for Sap Sweetness in Sugar Maple. W.W. Currier, T.J. Baribault, and **T.D. Perkins**. Vermont Agricultural Experiment Station - Hatch. October 1999-September 2002 ($15,000).

Acidic Deposition Effects on Forest Ecosystems in Vermont. D. DeHayes and **T.D. Perkins** (Principal Investigators). Environmental Protection Agency . July 2000-June 2003. ($500,000).

Aquisition of a Research Spectrophotometer for Studies at the Proctor Maple Res. Ctr. **T.D. Perkins** and W.W. Currier. North American Maple Syrup Council. November 1999-October 2000 ($2,500).

An Investigation of Methods for Detecting Adulturation in Maple Syrup. H. Chen, T. Baribault, and **T.D. Perkins.** North American Maple Syrup Council. November 1999 - October 2000 ($3,500).

Ice Storm Effects on Growth and Survival in Sugar Maple. **T.D. Perkins** and B. Wong. Vermont Monitoring Cooperative/Vermont Agency of Natural Conservation, Department of Forests, Parks & Recreation. September 2000- August 2002 ($6,500).

The Fate of Heavy Metals and Other Contaminants of Maple Sap and Syrup. **T.D. Perkins**. U.S.D.A. CSREES Special Grant for Maple Research. July 2001 - June 2005 ($488,301).

Evaluating the Impacts of Atmospheric Deposition on Tree Health and Forest Ecosystem Stability in the Northeastern United States. D.H. DeHayes, **T.D. Perkins**, and P.G. Schaberg**.** Environmental Protection Agency. August 2002 – September 2007 ($770,000).

Global Change Effects on Timing and Physiology of Maple Sap Exudation. **T.D. Perkins** and T.R. Wilmot. U.S.D.A. Hatch. October 2002 – September 2005 ($46,249).

Modernization of the Research/Demonstration Sugarbush at the UVM Proctor Maple Research Center. **T.D. Perkins** and B. Stowe. Chittenden County Maple Sugar Makers Association, North American Maple Syrup Council, Franklin County Maple Sugar Makers Association. August 2002 – June 2004 ($14,500).

Effects of Global Change on Maple Production in the Northeast. **T.D. Perkins.** North American Maple Syrup Council. November 2002 - October 2004 ($3,000).

Modifying the Genetic Programming Algorithm for Discovery of Novel Process Models of Biological systems. J.P. Hoffmann, S. Levine, and **T.D. Perkins**. DOE EPSCoR. July 2003-June 2005 ($40,000).

Developing Sugar Profiles of Maple Syrup Grades for Use in the Detection of Adulteration. A.K. van den Berg and T.D. Perkins. North American Maple Syrup Council. October 2003 – October 2004. (3,000).

Characterizing "Metabolic" Off-Flavors in Maple Syrup. **T.D. Perkins.** U.S.D.A. CSREES Special Grant on Environmentally Safe Products. July 2004 – June 2008 ($186,412) (A Portion of the Vayda Special Grant).

Impact of Sap Processing Technology on Maple Syrup Chemistry and Quality **T.D. Perkins**. U.S.D.A. CSREES Special Grant for Maple Research. July 2005 - June 2006 ($123,158).

Strategies to Limit Reductions in Maple Sap Yield in Vacuum Installations. **T.D. Perkins**, T.R. Wilmot, and B. Stowe. October 2005 – September 2010. U.S.D.A. Hatch ($62,500).

Impact of Sap Processing Technology on Maple Syrup Chemistry and Quality II. **T.D. Perkins**. U.S.D.A. CSREES Special Grant for Maple Research. September 2006 – August 2007 ($128,467).

Development of Environmentally Safe Maple Evaporator Cleaning Methods. **T.D. Perkins.** U.S.D.A. CSREES Special Grant on Environmentally Safe Products. September 2007 – August 2009 ($90,000) (A Portion of the Vayda Special Grant).

Effects of Sap Processing Equipment on Maple Syrup Chemistry And Flavor. A.K. van den Berg, **T.D. Perkins**, and M. Isselhardt. 2006. Chittenden County Maple Sugar Makers Association. December 2006 – November 2011 ($30,000).

Identification and Remediation of Chemical Residues from Plastic Tubing in Maple Sap and Syrup. **T.D. Perkins** and A.K. van den Berg. U.S.D.A. Hatch Special Grant. October 2007 – September 2008 ($48,826).

Effects of Sap Pre-concentration by Reverse Osmosis on Maple Syrup Chemistry and Flavor. **T.D. Perkins** and A.K. van den Berg. U.S.D.A. Hatch Special Grant. October 2007 – September 2008 ($133,632).

Effects of High Sap Sugar Concentration by Reverse Osmosis on Maple Syrup Attributes. **T.D. Perkins** and A.K. van den Berg. U.S.D.A. Special Grant. September 2008 – August 2009 ($90,746).

Energy Efficiency in Maple Operations. **T.D. Perkins** and A.K. van den Berg U.S.D.A. CSREES Special Grant on Environmentally Safe Products. September 2008 – August 2010 ($32,000) (A Portion of the Vayda Special Grant).

Improved Spout for Maple Production. **T.D. Perkins**. University of Vermont Ventures Pre-Seed Fund. September 2008 – June 2009 ($12,500).

Potential Impacts of Global Warming on Autumn Coloration in Maple. T.C. Vogelmann and **T.D. Perkins.** U.S.D.A. Hatch. October 2008 – September 2011 ($45,000).

Maximizing Vacuum Transfer and Sap Yields in Maple Tubing Operations: Evaluation of a New Method to Increase Production. **T.D. Perkins**, T.R. Wilmot, and B.W. Stowe. North American Maple Syrup Council. July 2009 – June 2011 ($24,581).

Achieving High Sap Yields. **Perkins, T.D.** and A.K. van den Berg. U.S.D.A. Special Grant. September 2009 – August 2010 ($144,505).

Predicting maple sap yields in vacuum tubing operations. **T.D. Perkins** and A.K. van den Berg. North American Maple Syrup Council. January 2011 – December 2011. ($22,677)

Effects of sap preconcentration by reverse osmosis on maple syrup chemical composition and flavor. **T.D. Perkins** and A.K. van den Berg. USDA NIFA Special Grant for Maple Research. October 2010 – September 2011. ($153,560).

A.K. van den Berg. Birch syrup production to increase the long-term economic sustainability of maple syrup production in the Northern Forest. Northeastern States Research Cooperative. October 2011 – September 2013. ($80,307). **T.D. Perkins** – Cooperator.

A.K. van den Berg. Defining modern, sustainable tapping guidelines for maple syrup production. Northeastern States Research Cooperative. July 2010 – June 2012. ($65,010). **T.D. Perkins** – Cooperator.

SELECTED REPORTS, BOOK CHAPTERS, AND MAPLE INDUSTRY RELATED PUBLICATIONS (Last Ten Years – Not Peer-Reviewed)

Perkins, T.D. *Abies balsamea* [L] Mill. 2001. *In:* P. Schütt, H.J. Schuck, B. Stimm (Eds). Enzyklopädie der Holzegewächse (Encyclopedia of Woody Plants). Ecomed, Landsberg, Germany.

Lauten, G., B. Rock, S. Spencer, **T. Perkins**, and L. Ireland. 2001. Climate Impacts on Regional Forests. *In:* Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change. New England Regional Overview, U.S. Global Change Research Program, 96 pp. University of New Hampshire.

Chen, H., J. Li, and **T. Perkins**. 2001. Rheological and Colorimetry Properties of Maple Syrup. Proceedings of the American Society of Agricultural Engineers Annual International Meeting, July 30-August 1, 2001, Sacramento, CA.

Perkins, T.D., T.R. Wilmot, K. Baggett, and B. Wong. 2003. Effects of the January 1998 Ice Storm on Stem and Root Carbohydrate Reserves in Two Vermont Sugarbushes. In: S. Guay. (Ed.) Ice Storm and Forests: Where Do We Stand Five Years Later? Proceedings of the Ice Storm Conference, January 28-31, 2003, Sherbrooke, Quebec, Canada.

Wilmot, T. M. Isselhardt, and **T. Perkins**. 2003. Managing a Small Lead-Soldered Evaporator to Keep Lead Out of Maple Syrup. Maple Syrup Digest **15A**:20-23.

Isselhardt, M., S. Williams, B. Stowe and **T. Perkins**. 2003. Recommendations for Proper Plate Filter Press Operation. University of Vermont, Agricultural Experiment Station and Extension Miscellaneous Publication, Burlington, Vermont.

Perkins, T., T. Wilmot, and M. Zando. 2004. Fertilization of Sugarbushes – Part I. Physiological Effects. Maple Syrup Digest **16A(3)**:23-27.

Perkins, T., T. Wilmot, and M. Zando. 2004. Fertilization of Sugarbushes – Part II. Sap Volume and Sweetness. Maple Syrup Digest **16A(4)**:15-18.

Wilmot, T.R. and T.D. Perkins. 2004. Fertilization of Sugarbushes. University of Vermont, Agricultural Experiment Station and Extension Miscellaneous Publication, Burlington, Vermont.

van den Berg, A.K, **T.D. Perkins** and H. Marckres. 2005. Chemical Safety in Sugaring Operations. University of Vermont, Agricultural Experiment Station and Extension Miscellaneous Publication, Burlington, Vermont.

Perkins, T.D. 2006. Maple Research at the University of Vermont. p. 80-82. *In:* L.C. Irland, A.E. Camp, J.C. Brissette, and Z.R. Donohew. Long-term Silvicultural & Ecological Studies. Yale University GISF Paper 005, New Haven, CT.

Wilmot, T.R. and **T.D. Perkins**. 2006. Keeping Lead Out of Maple Syrup: A Guide to the Use of Sap Collecting and Syrup Making Equipment. University of Vermont, Agricultural Experiment Station Miscellaneous Publication, Burlington, Vermont (Reprinted from 2000).

Chapeskie, D., T.R. Wilmot, B. Chabot, and **T.D. Perkins**. 2006. Chapter 6. Maple Sap Production: Tapping, Collection, and Storage. p. 81-117. *In:* R.B. Heiligmann, M.R. Koelling, and T.D. Perkins (*Eds*). North American Maple Syrup Producers Manual. Ohio State University Extension Bulletin 856.

Stowe, B., T.R. Wilmot, G. Cook, and **T.D. Perkins**. 2006. Chapter 7. Maple Syrup Production. p. 119-156. *In:* R.B. Heiligmann, M.R. Koelling, and T.D. Perkins (*Eds*). North American Maple Syrup Producers Manual. Ohio State University Extension Bulletin 856.

Perkins, T.D., M.F. Morselli, A.K. van den Berg, and T.R. Wilmot. 2006. Appendix 2. Maple Sap and Syrup Chemistry. p. 291-299. *In:* R.B. Heiligmann, M.R. Koelling, and T.D. Perkins (*Eds*). North American Maple Syrup Producers Manual. Ohio State University Extension Bulletin 856.

Heiligmann, R.B., M.R. Koelling, and **T.D. Perkins** (Editors). 2006. North American Maple Syrup Producers Manual. Ohio State University Extension Bulletin 856. 329pp.

Stowe, B., **T.D. Perkins**, and T.R. Wilmot. 2006. Should Lateral Lines Be Vented? Maple Syrup Digest 18A(3):13-15.

van den Berg, A., **T. Perkins**, and M. Isselhardt. 2006. Sugar Profiles of Maple Syrup Grades. Maple Syrup Digest. 18A(4):12-13.

Perkins, T.D. 2007. Impacts of Global Change on the Maple Industry of the Northeastern United States. Statement to the House Select Committee on Energy Independence and Global Warming. Global Warming Mountaintop 'Summit': Economic Impacts on New England. June 4, 2007, New Hampshire.

Wilmot, T.R., **T.D. Perkins**, B. Stowe, and A.K. van den Berg. 2007. Comparison of the "Small" Spout with the Traditional 7/16" Spout. Maple Syrup Digest 19A(2): 20-26.

Isselhardt, M.L., A.K. van den Berg, and **T.D. Perkins**. 2007. Temperature Patterns within an Oil-Fired Maple Evaporator. Maple Syrup Digest 19A(3): 20-25.

Wilmot, T.R., **T.D. Perkins**, and A.K. van den Berg. 2007. Vacuum Sap Collection – How High – or Low – Should You Go? Maple Syrup Digest 19A(3): 27-32.

Chabot, B.F. T. Perkins, and P. Ramacieri. 2008. Can Maple Sugar Producers Succeed Without Research Maple Syrup Digest 20A(3): 20-21.

Godshall, M.A., A.K. van den Berg, S. Lloyd, **T.D. Perkins** and M. Isselhardt. 2008. The Influence of Processing Factors on Maple Syrup Volatiles (abstract). Sugar Journal 70(9): 10

van den Berg, A.K., **T.D. Perkins**, M.A. Godshall, S.W. Lloyd, and M.L. Isselhardt. 2009. Metabolism off-flavor in maple syrup Part I: Identification of the compound responsible for metabolism off-flavor. Maple Syrup Digest 21A(1): 15-18.

Martin, N., **T.D. Perkins**, P. Ramacieri, and A.K. van den Berg. 2009. Technical Position Paper on Air Injection. Maple Syrup Digest 21A(2):23-31.

Perkins, T.D., P. Ramacieri, N. Martin, and A.K. van den Berg. 2009. Technical Position Paper – Air Injection. Final Report to the International Maple Syrup Institute. St. Hyacinthe, Quebec, Canada

van den Berg, A.K., **T.D. Perkins**, M.L. Isselhardt, M.A. Godshall, and S.W. Lloyd. 2009. Metabolism off-flavor in maple syrup. Part II: Remediation of metabolism off-flavor in maple syrup. Maple Syrup Digest 21A: 11-18.

Perkins, T.D. 2009. Development and Testing of the Check-Valve Spout. Maple Syrup Digest 21A: 21-29.

Perkins, T.D. 2010. Anti-microbial silver in maple sap collection. Maple Syrup Digest 22: 11-20.

Perkins, T.D. 2010. Excerpts of Postings about Leader Check-Valve Adapters on www.MapleTrader.com Maple Syrup Digest 22A: 11-14.

Perkins, T.D., B. Stowe, and T.R. Wilmot. 2010. Changes in Sap Yields From Tubing Systems Under Vacuum Due to System Aging. Maple Syrup Digest 22A: 20-27.

Perkins, T.D. and A.K. van den Berg. 2012. Relationships Between Tubing System Age and Sap Yield. Maple Syrup Digest 24A(1): 11-16.

Perkins, T.D. and A.K. van den Berg. 2012. Tubing Cleaning – Methods Used in the U.S.. Maple Syrup Digest 24A(3): 11-18.

Isselhardt, M.L, A.K. van den Berg, and **T.D. Perkins**. Chemical Composition of Scale in Maple Syrup Evaporators. Maple Syrup Digest (in press).

Stowe, B., T.R. Wilmot, and **T.D. Perkins**. Lateral lines: how long and how many spouts per line? Maple Digest (in preparation).

Isselhardt, M.L., **T.D. Perkins**, and B. Stowe. Comparison of maple tubing I: System installation. Maple Syrup Digest (in preparation).

Perkins, T.D., B. Stowe, and M.L. Isselhardt. Comparison of maple tubing II: Sap yield. Maple Syrup Digest (in preparation).

Stowe, B., **T.D. Perkins**, and M.L. Isselhardt. Comparison of maple tubing III: Maintenance. Maple Syrup Digest (in preparation).

Perkins, **T.D.**, B. Stowe, and M.L. Isselhardt. Comparison of maple tubing IV: Economics. Maple Syrup Digest (in preparation).

Perkins, T.D. and M.L. Isselhardt. Using Plate Heat Exchangers to Increase System Efficiency in Maple Evaporators. Maple Syrup Digest (in preparation).

OTHER PUBLICATIONS:

Popular Press Articles – 22
Invited Lectures > 157 (scientific and maple industry)
Volunteer Presentations at Scientific Meetings- 17
Poster Presentations – 35
Webpages – 55
Press Interviews – 270+

SERVICE AND AWARDS:

Bausch & Lomb Honorary Science Award. Lake Region U.H.S. June 1979.

National and State

North American Maple Project - U.S. Forest Service, External Project Review Panel 1992
U.S.D.A. NRI Competitive Grants Program - Proposal Reviewer (1994, 1995, 1997, 1998, 2000, 2001)
Camels Hump Forest Ecology Research Area Scientific Advisory Committee
U.S.D.A. Forest Service. Research Work Unit NE4103 Technical Advisory Review Committee (2001).

University

College of Agriculture and Life Sciences, Information Technology Committee (1996 - 1997)
College of Agriculture & Life Sciences, Center Food Sciences Committee (1999 - 2000)
Proctor Maple Research Center Endowment Committee (1998 - 2000)
College of Agriculture and Life Sciences, Hatch Proposal Review Committee (2003)

Maple Industry

Vermont Department of Agriculture, Commissioner's Task Force on Maple Equipment Issues (1997 - 2000)
Chittenden County Maple Sugar Makers Association -
Champlain Valley Exposition, Sugarhouse Education Volunteer (1996 - 1999)
Champlain Valley Exposition, Sugarhouse Education Coordinator (2000-2009)
North American Maple Syrup Council "*Vermont Maple 2000"* Planning Committee (1999 - 2000)
Education Subcommittee Chair
Vermont Maple Industry Council/Vermont Maple Sugar Makers Association Joint Task Force (Chair).
Review of Vermont Maple Syrup Labeling Laws and Regulations (2002-2003)
Vermont Maple Industry Council/Vermont Maple Sugar Makers Association Joint Task Force (Chair).
Review of Vermont Maple Syrup Industry Organizational Structure (2004)
Vermont Maple Industry Council Vice Chair (2002 – 2004), Secretary/Treasurer (2005 – 2008)

"*Maple Person of the Year – 2003*" Vermont Maple Industry Council

North American Maple Syrup Council, 47th Annual Meeting, Green Bay, Wisconsin. October 2006. In recognition of many years of service as editor of the North American Maple Syrup Producers Manual and other contributions.

Association of Natural Resources Extension Professionals. Award of Exceptional Merit 2007. "North American Maple Syrup Producers Manual"

Golden Maple Leaf Award (Recipient UVM Proctor Maple Research Center & UVM Maple Extension), International Maple Syrup Institute, October 2008.

Northeast Organic Farmers Association. July 2009 – present. Organic Maple Guidelines Technical Review Committee.

North American Maple Syrup Council. 50th Annual Meeting, Bar Harbor, Maine. October 2009. Distinguished Service Award for Leading Research Professional.

Sumner H. Williams Award (President's Cup). Vermont Maple Industry Council – Vermont Maple Sugar Makers Asssociation – Vermont Maple Foundation, January 2011.

Volunteer Activities

Community Odyssey of the Mind
Coach, Richmond Elementary School (1996/1997) - World Finalists
Coach, Camels Hump Middle School (1997/1998, 1999/2000, 2003/2004) – World Finalists
Vermont Odyssey of the Mind (Vermont Creativity Quest, Inc)
Board of Directors (1998 - present)
State Membership Coordinator (1999 – 2005)
Tournament Director (1999 – present)
Association Director (2005 – present)
International Odyssey of the Mind
Press Room (2001)
World Finals Tournament VIP Coordinator (2002-2004, 2006 - present)
OdysseyWorld, Inc. Founding Member and Board of Directors (1999 – 2006). Chair (2002 – 2005)
Creative Opportunities Unlimited, Inc. Board of Directors (2003- 2006) Team Grant Chair

University of Vermont, College of Engineering and Mathematics, Design TASC Judge (1998- 2007)

United Way of Chittenden County "Hometown Hero" Nominee (2007).

Max Mansfield Memorial Award (Vermont) for sustained Program Growth (2010).

Vermont Countil of Gifted Education "Friend of the Gifted Award" (2010)

Manuscript Reviews:

Journal of Biogeography	*Vegetatio*	*Forest Science*
Ecology	*Water, Air and Soil Pollution*	*Tree Physiology*
Journal of Sustainable Forestry	*New Phytologist*	*New Forests*
Ecological Applications	*Canadian Journal of Forest Research*	*Canadian Journal of Botany*
Physiologia Plantarum	*Global Change Biology*	*Climatic Change*
Canadian Journal of Earth Sciences	*Northern Journal of Forestry*	*Nor. J. of Applied Forestry*
Journal of Agriculture, Food Systems, and Community Development		

Editorial Review Board *Tree Physiology* 1998 – 2000

Textbook Feasibility Reviews

Chlorophyll Fluorescence: Practical Applications and Methodology. Jennifer DeEll. Kluwer Publishers

Introduction to Plant Physiology. Third Edition. William G. Hopkins. John Wiley & Sons.

INVENTIONS / PATENTS

1. *Remediation of "Metabolism" Off-flavor in Maple Syrup* (with A.K. van den Berg).
    a. Invention Disclosure Filed with University of Vermont October 2007.
    b. Released to Public Domain (lack of commercial potential).
2. *Check-valve Spout for Maple Sap Production*
    a. Invention Disclosure Filed with University of Vermont October 2007.
    b. Development and Testing Spring 2008 and Spring 2009
    c. Patent Application Submitted September 2008.
    d. Under License to *Leader Evaporator Co., Inc.*, April 2009.
    e. Sold over 5.5 million units 2009-2011.
3. *Dual-line Spout Base for Maple Sap Production*
    a. Invention Disclosure Filed with University of Vermont October 2007
    b. UVM Venture Funding Approved September 2008
    c. Updated Disclosure Filed September 2009
    d. Patent Application Submitted January 2010.
    e. Further Development and Field Testing in Progress in conjunction with IPL.
4. *Chamber Spout-base for Maple Sap Production*
    a. Invention Disclosure Filed with University of Vermont November 2008.
    b. Updated Disclosure Filed September 2009.
    c. Patent Application Submitted January 2010
    d. Further Development and Field Testing in Progress.
5. *Oversized Line System and Fittings for Maple Production*
    a. Invention Disclosure Filed with University of Vermont November 2009.
    b. Patent Application Submitted January 2010
    c. Further Development and Large-Scale Field Testing Scheduled for Spring 2011
6. *Anti-germicidal UV Spout Base (van den Berg & Perkins)*
    a. Invention Disclosure Filed with University of Vermont August 2010
    b. Further Development and Testing Scheduled for Spring 2013
7. *Automated Mechanical Defoamer for Maple Evaporators*
    a. Invention Disclosure Filed with University of Vermont June 2008
    b. Development and Testing in Spring 2009, Spring 2011
    c. Further Development and Testing Scheduled for Spring 2013
8. *Plantation Maple Sap Collection (Perkins & van den Berg)*
    a. Invention Disclosure Filed with University of Vermont Aug 2010
    b. Development and Testing Spring 2010, Spring 2011
    c. Continued Development and Testing Spring 2012
    d. Provisional Patent Application Submitted February 2012

PROFESSIONAL MEMBERSHIPS & ASSOCIATIONS:

Society of American Foresters
Associate Member (1986 – 2009).
Full Member (2009 – present).

Sigma Xi (1991 – present).

Chittenden County Maple Sugar Makers Association (1997 – present).

Vermont Maple Sugar Makers Association (1997 – present). Board of Directors (2011 – present).

Vermont Maple Industry Council
Member (1997 – present).
Secretary / Treasurer (2004 – 2008).

North American Maple Syrup Council
Associate Member / Research (1997 – present).

International Maple Syrup Institute
Associate Member / Research (1997 – present).
Advisory Board (2004 – present)
Air Injection Technical Review Committee (2007 – 2009)

United Academics
Member (2010 – present)
Departmental Representative – Plant Biology (2011 – present)

CURRICULUM VITAE

JILL C. PRESTON
Assistant Professor
Department of Plant Biology
University of Vermont
301/311 Jeffords Hall
Burlington, VT 05405

Email: Jill.Preston@uvm.edu
Office: 802-656-0637

Website: http://www.uvm.edu/~plantbio/preston.php

EDUCATION

University of Missouri –St. Louis	Ecology, Evolution and Systematics	Ph.D 2007
Missouri Botanical Garden	Internship in Conservation Biology	2006
Cold Spring Harbor, NY	Cereal Genomics Workshop	2005
University of Nottingham	Plant Genetic Manipulation	MSc. 2000
Edinburgh Napier University	Biological Sciences	BSc. 1994

RESEARCH INTERESTS

Evolutionary genetics of inflorescence and flower development
Adaptations to cold seasonal climates
Role of gene duplications and divergence in plant morphological diversification
Conservation of flowering genetic pathways in angiosperms
Molecular evolution of gene families

PROFESSIONAL EXPERIENCE

Assistant Professor, University of Vermont, Department of Plant Biology, 2012 onward
Postdoctoral Fellow with Dr. Lena Hileman, University of Kansas, Department of Ecology and Evolutionary Biology, 2007-2012
Invited speaker for David Barrington's Tropical Plant Systematics (PBIO 241), University of Vermont, 2012
Invited speaker for Allison Brody's Biology Seminar (BIOL 385), University of Vermont, 2012
Invited instructor for the Plant Evo-Devo lab, Developmental Biology Lab Course, University of Kansas, Department of Ecology and Evolutionary Biology, 2010 and 2011
Teaching Assistant with Dr. Lori Paul, University of Missouri – St. Louis, Department of Biology, Instruction in Anatomy and Physiology, 2006
Graduate Research Assistant with Dr. Elizabeth Kellogg – University of Missouri – St. Louis, Department of Biology, 2002-2007
Research Assistant, Biogemma, Cambridge (UK), 2000-2002
Molecular Laboratory Manager, Royal Botanic Gardens Edinburgh (UK), 1998-1999
Research Technician, Royal Botanic Gardens Edinburgh (UK), 1996-1998

FUNDING

Determining the genetic basis of sympetaly in *Petunia* and other asterids. Craighead Foundation, J. C. Preston (PI), $137,913, 2012-2015.

Determining the evolutionary consequences of gene duplications in the *SPL* family of transcription factors. National Science Foundation, L. C. Hileman (PI) and J. C. Preston (co-PI), $240,000, 2011-2013.

Raju Mehra award for an outstanding foreign graduate student, University of Missouri – St. Louis, $500, 2007

Travel grant for Plant Genetics 2005 Conference, Snowbird, UT, Department of Biology and International Center for Tropical Ecology, University of Missouri – St. Louis, 2005

Studentship for Cereal Genomics Workshop, Cold Spring Harbor, NY, 2005

Research Grant for "Duplication and diversification of *APETALA1/FRUITFULL*-like genes in grasses (Poaceae)", Sigma Xi Grant-in-Aid of Research, JC Preston, PI, $500, 2005

Travel grant for Evolution 2004 Conference, Fort Collins, CO, Graduate School and Department of Biology, University of Missouri-St. Louis, 2004

Travel grant for Evolution 2003 Conference, Chico, CA, Graduate School and Department of Biology, University of Missouri-St. Louis, 2003

Graduate scholarship, Plant Science Division, University of Nottingham, £1000, 1999

PUBLICATIONS

2012

Preston, J. C., Baldridge, L. L., Kost, M. A., Oborny, N. J. and Hileman, L. C. (In press) Optimization of virus-induced gene silencing to facilitate evo-devo studies in the emerging model species *Mimulus guttatus* DC. (Phrymaceae). *Annals of the Missouri Botanical Garden*.

Preston, J. C., Hileman, L. C. (2012) Parallel evolution of TCP and B-class genes in Commelinaceae flower bilateral symmetry. *EvoDevo*. 3: 6.

Preston, J. C., Wang, H., Kursel, L., Doebley, J., Kellogg, E. A. (2012) The role of *teosinte glume architecture* (*tga1*) in coordinated regulation and evolution of grass glumes and inflorescence axes. *New Phytologist*. 193: 204-215.

2011

Preston, J. C., Hileman, L. C., Cubas, P. (2011) Reduce, reuse and recycle: evo-devo and trait diversity. *American Journal of Botany*. 98: 1-7.

Preston, J. C., Martinez, C. C., Hileman, L. C. (2011) Gradual disintegration of the floral symmetry genetic network is implicated in the evolution of a wind-pollination syndrome. *Proceedings of the National Academy of Sciences USA*. 108: 2343-2348. Faculty of 1000 selected.

2010

Preston, J. C. (2010) Evolutionary genetics of core eudicot inflorescence and flower development. *International Journal of Plant Developmental Biology*. 4: 17-29.

Preston, J. C. and Hileman, L. C. (2010) SQUAMOSA-PROMOTER BINDING PROTEIN1 initiates flowering in *Antirrhinum majus* through the activation of meristem identity genes. *The Plant Journal*. 62: 704-712.

Ronse, A. C., Popper, Z. A., **Preston, J. C.**, Watson, M. F. (2010) Taxonomic revision of European *Apium* L. s.l.: *Helosciadium* W.D.J.Koch restored. *Plant Systematics and Evolution*. 287: 1-17.

2009

Preston, J. C., Christensen, A., Malcomber, S. T. and Kellogg, E. A. (2009) MADS-box gene expression suggests a floral origin for sterile organs of the grass spikelet. *American Journal of Botany*. 96(8): 1-11.

Preston, J. C. and Hileman, L. C. (2009) Developmental genetics of floral symmetry evolution. *Trends in Plant Science*. 14(3): 147-154.

Preston, J. C., Kost, M. and Hileman, L. C. (2009) Conservation and diversification of the symmetry developmental program among close relatives of snapdragon with divergent floral morphologies. *New Phytologist*. 182(3): 751-762.

2008

Preston, J. C. and Kellogg, E. A. (2008) Discrete developmental roles for temperate cereal grass *VERNALIZATION1/FRUITFULL*-like genes in flowering competency and the transition to flowering. *Plant Physiology*. 146: 1-12.

2007

Preston, J. C. and Kellogg, E. A. (2007) Conservation and divergence of *APETALA1/FRUITFULL*-like gene function in grasses: evidence from gene expression analyses. *The Plant Journal*. 52(1): 69-81.

2006

Malcomber, S. T., **Preston, J. C**., Reinheimer, R., Kossuth, J. and Kellogg, E. A. (2006). Developmental gene evolution and the origin of grass inflorescence diversity. *Advances in Botanical Research*. 44: 426-481.

Preston, J. C. and Kellogg, E. A. (2006) Reconstructing the evolutionary history of paralagous *APETALA1/FRUITFULL*-like genes in grasses (Poaceae). *Genetics*. 174: 421-437.

2004

Sales, F., Hedge, I. C., Eddie, W., **Preston, J**. and Moeller, M. (2004) Jasione L. taxonomy and phylogeny. *Turkish Journal of Botany*. 28(1-2): 253-259.

2003

Bateman, R. M., Hollingsworth, P. M., **Preston, J**., Yi-Bo, L., Pridgeon, A. M. and Chase, M. W. (2003) Molecular phylogenetics and evolution of Orchidinae and selected Habenariinae (Orchidaceae). *Botanical Journal of the Linnean Society*. 142(1): 1-40.

2002

Sinclair, W. T., Mill, R. R., Gardner, M. F., Woltz, P., Jaffre, T., **Preston, J**., Hollingsworth, M. L., Ponge, A. and Moller, M. (2002) Evolutionary relationships of the New Caledonian heterotrophic conifer, *Parasitaxus usta* (Podocarpaceae), inferred from chloroplast *trn*L-F intron/spacer and nuclear rRNA ITS2 sequences. *Plant Systematics and Evolution*. 233(1-2): 79-104.

2001

Atkins, H., **Preston, J**. and Cronk, Q. C. B. (2001) A molecular test of Huxley's line: *Cyrtandra* (Gesneriaceae) in Borneo and the Philippines. *Biological Journal of the Linnean Society*. 72(1): 143-159.

Pennington, R. T., Lavin, M., Ireland, H., Klitgaard, B., **Preston, J**., and Hu, J. M. (2001) Phylogenetic relationships of basal papilionoid legumes based upon sequences of the chloroplast *trn*L intron. *Systematic Botany*. 26(3): 537-556.

Radford, E. A., Watson, M. F., and **Preston, J**. (2001) Phylogenetic relationships of species of *Aciphylla* (Apiaceae, subfamily Apioideae) and related genera using molecular morphological, and combined data sets. *New Zealand Journal of Botany*. 39(2): 183-208.

2000

Harris, D. J., Poulsen, A. D., Frimodt-Moller, C., **Preston, J**., and Cronk, Q. C. B. (2000) Rapid radiation in *Aframomum* (Zingiberaceae): Evidence from nuclear ribosomal DNA internal transcribed spacer (ITS) sequences. *Edinburgh Journal of Botany*. 57(3): 377-395.

Ireland, H., Pennington, R. T., **Preston, J**. (2000) Molecular systematics of the Swartzieae. In: P. Herendeen & A. Bruneau (editors). Advances in Legume Systematics. Part 9. pp.217-232. Royal Botanic Gardens, Kew.

Long, D. G., Moller, M. and **Preston, J**. (2000) Phylogenetic relationships of *Asterella* (Aytoniaceae, Marchantiopsida) inferred from chloroplast DNA sequences. *Bryologist*. 103(4): 625-644.

MANUSCRIPTS SUBMITTED OR IN PREPARATION

Preston, J. C. and Hileman, L. C. Functional evolution of the plant SBP-box family. *In preparation for Molecular Phylogenetics and Evolution*.

Preston, J. C. and Sandve, S. R. Adaptation to seasonality and the winter freeze. *In preparation for Frontiers in Evolution and Development*.

INVITED SYMPOSIA

Preston, J. C. Evolutionary genetics of plant growth habit and phase change. Harvard University Herbaria Seminar, Harvard University, December 2012 (oral presentation)

Preston, J. C. Evolutionary genetics of plant growth habit and phase change. Marvin Seminar, University of Vermont, November 2012 (oral presentation)

Preston, J. C. Evo-devo of flower symmetry: recent advances and future directions. Missouri Botanical Gardens Annual Systematics Symposium, St. Louis, October 2010 (oral presentation)

Preston, J. C. Evolutionary developmental genetics of floral morphology in the Lamiales. Biological Sciences Departmental Seminar Series, Universidad de Los Andes, Bogotá, Colombia, August 2009 (oral presentation)

Preston, J. C. Importance of multigene transcription factor families for flower development and its diversification. Smithsonian Botanical Symposium on Genes, Genomics, and Genome Evolution in Plants, Washington D.C., March 2009 (oral presentation)

Preston, J. C. and Kellogg, E. A. Conservation and divergence of *APETALA1/FRUITFULL*-like gene function in grasses: evidence from gene expression analyses. Botany 2007, Chicago, Illinois, July 2007 (oral presentation)

Preston, J. C., Consiglio, T., Davidse, G., Jiménez, I. Future climate change and habitat tracking by highland grasses endemic to Central America. Botany 2007, Chicago, Illinois, July 2007 (oral presentation)

CONTRIBUTED PRESENTATIONS

Preston, J. C., Orozco, R., and Hileman, L. C. Evolution of *SQUAMOSA-PROMOTER BINDING PROTEIN LIKE* (*SPL*) genes in the core eudicot flowering time and branching pathways. Botany Meeting 2012, Columbus, Ohio, July 2012 (oral presentation)

Preston, J. C. and Hileman, L. C. Flower symmetry evolution in the spiderwort family (Commelinaceae). Botany Meeting 2011, St. Louis, Missouri, July 2011 (oral

presentation)

Preston, J. C. and Hileman, L. C. Evolution of the floral symmetry gene network following independent gene duplications in *Antirrhinum majus* and *Mimulus guttatus*. Evolution 2010, Portland, Oregon, June 2010 (oral presentation)

Preston, J. C. and Hileman, L. C. A putative regulator of the *AP1/FUL* floral meristem identity genes initiates flowering in *Antirrhinum majus*. Botany and Mycology Meeting 2009, Snowbird, Utah, July 2009 (oral presentation)

Martinez, C. C., Preston, J. C. and Hileman, L. C. Duplication and divergence of Veronicaceae floral symmetry genes: implications for the reduction/loss of floral zygomorphy and stamens. 25th Symposium in Plant Biology on The Evolution of Plant Development, Riverside, California, January 2009 (poster presentation)

Preston, J. C., Kost, M. and Hileman, L. C. Determining the role of candidate TCP and MYB genes in Veronicaceae petal symmetry and stamen number evolution. Botany 2008, Vancouver, British Columbia, July 2008 (oral presentation)

Preston, J. C., Kost, M. and Hileman, L. C. Investigating the role of *CYCLOIDEA*-, *RADIALIS*-, and *DIVARICATA*-like genes in evolution of Veronicaceae stamen and petal developmental patterning. Evolution 2008, Minneapolis, Minnesota, June 2008 (oral presentation)

Kost, M., Preston, J. C., Baldridge, L. and Hileman, L. C. Combining studies of gene expression and protein function to determine the role of symmetry genes in the evolution of stamen number. Ecological Genomics Symposium. Kansas City, Missouri, November 2007 (poster presentation)

Preston, J. C. and Kellogg, E. A. Complex patterns of *APETALA1/FRUITFULL*-like gene expression in grasses: implications for spikelet development. Maize Genetics Conference 2007, St. Charles, Illinois, March 2007 (poster presentation)

Preston, J. C. and Kellogg, E. A. Diverse roles of *APETALA1/FRUITFULL*-like genes in cereal grasses. Botany 2005, Houston, Texas, July 2005 (poster presentation)

Preston, J. C. and Kellogg, E. A. Diverse roles of *APETALA1/FRUITFULL*-like genes in cereal grasses. Plant Genetics 2005, Snowbird, Utah, October 2005 (poster presentation)

Preston, J. C. and Kellogg, E. A. Duplication and diversification of *APETALA1/FRUITFULL*-like genes in grasses (Poaceae). Evolution 2004, Fort Collins, Colorado, June 2004 (oral presentation)

Preston, J. C. and Kellogg, E. A. Evolution of *AP2*-like genes in grasses (Poaceae). Evolution 2003, Chico, California, June 2003 (poster presentation)

PROFESSIONAL SERVICE

Journal reviews: American Journal of Botany, Annals of Botany, BMC Plant Biology, Current Proteomics, Development Genes and Evolution, Frontiers in Plant Biology, International Journal of Plant Science, Journal of Experimental Botany, Journal of Molecular Biology, Molecular Biology and Evolution, Molecular Phylogenetics and Evolution, Plant Physiology, Plant Science, PLoS Genetics, PLos One, Tree Physiology

Editor for Frontiers in Plant Evolution and Development

Grant proposal reviews: National Science Foundation, Research Foundation - Flanders

Graduate Student Admissions Committee Student Representative, Department of Biology, University of Missouri – St. Louis, 2006

Biology Graduate Student Association President, University of Missouri – St. Louis, 2005-

2006

UNIVERSITY SERVICE

Plant biology representative on the Institutional Biosafety Committee, Fall 2012

Invited Marvin seminar speakers: Jannice Friedman, University of Syracuse, Nov 2012, Erika Edwards, Brown University, March 2013.

UNIVERSITY ADVISING

Rotation student advisor, Meghan McKeown, PhD candidate, University of Vermont, 2012-present

Rotation student advisor, Suryatapa Jha, PhD candidate, University of Vermont, 2012

Rotation student advisor, Sanhita Chakraborty, PhD candidate, University of Vermont, 2012-2013

PhD thesis committee member, Jinshun Zhong, University of Missouri – St. Louis, 2010 onwards

PROFESSIONAL SOCIETY MEMBERSHIP

American Society of Plant Biologists, Botanical Society of America, Society for the Advancement of Chicanos and Native American Students

OUTREACH ACTIVITIES

Ecology and Evolutionary Biology, UMSL. Lab assistant in the STARS (Students and Teachers As Research Scientists). 2006-2007

Office of Diversity Enhancement, KU. Undergraduate and Postgraduate mentor for the PREP and BRIDGE programs (Ciera Martinez; currently a PhD student at UC Davis; Ashley Stiffarm; Haskell Indian Nations University). 2008-2010

Donald Arthur Stratton
Curriculum Vitae

Department of Plant Biology
University of Vermont
Burlington, VT 05405
802-656-9371 (office) 802-453-2856 (home)
email: Donald.Stratton@uvm.edu; fax 802-656-0440

Born: 13 January 1959, Delaware, Ohio, USA

Education:

PhD 1988 State University of New York, Stony Brook
Department of Ecology and Evolution
Dissertation: "Life-cycle components of selection in *Erigeron annuus*".
Advisor: Dr. James Thomson

BA 1981 Earlham College, Richmond, Indiana.
with Honors in Biology and Honors in Philosophy

Employment:

2005- - Lecturer, University of Vermont
2008- Co-Director, Integrated Biological Science Program, University of Vermont
2003-2006 Director, Justin Morrill Honors Program, University of Vermont
1998-2005 Research Assistant Professor, University of Vermont
2002-2005 National Panel Manager, USDA Biology of Weedy and Invasive Plants Program
1999 Visiting Assistant Professor, Middlebury College
1990-1998 Assistant Professor, Princeton University
1988-1989 Post-doctoral Research Associate, Duke University
Sponsor: Dr. Janis Antonovics
1986-1988 Visiting Research Associate, University of California, Davis
Sponsor: Dr. Maureen Stanton
1984-1986 Graduate teaching assistant, S.U.N.Y. Stony Brook
1982 National Park Service Southeast Region / University of Georgia.
1981-1982 Uplands Research Lab Great Smoky Mountains National Park

Honors and Awards

2011 Carrigan Award for Outstanding Teaching and Advising, University of Vermont

Grants:

2000-2005 U. S. Department of Agriculture. "QTL analysis of traits that limit ecological range expansion of cattails" $247,650.
1999-2001 U. S. Department of Agriculture. "Genetic limits to ecological range expansion of cattails" $49,994.
1999 National Science Foundation. REU supplement award. $5,000

1997-2001 National Science Foundation "Genetics of Niche Evolution in *Arabidopsis*" $158,000
1994-6 National Science Foundation. REU supplement awards $12,750
1993-97 National Science Foundation. "Spatial and temporal heterogeneity of selection in an early successional field: patterns and processes" $160,000.
1990-91 National Science Foundation. "Spatial analysis of selection and environmental heterogeneity in plant populations".$15,000

Grants with Students:
1997 National Science Foundation. Dissertation research: Evolution of serpentine tolerance in Platystemon californicus (for Todd Vision)
1996 National Science Foundation. Dissertation research: The evolution of autogamy in Arenaria uniflora (for Lila Fishman).
1995 National Science Foundation. Dissertation research: Snowmelt gradients and the distribution of *Potentilla* species (for Kristina Stinson).
1991 National Science Foundation. Dissertation research: The adaptive significance of andromonoecy in *Zigadenu*s lilies (for Simon Emms)

Publications
2004 Fishman, L. and D. A. Stratton. The genetics of floral divergence and postzygotic barriers between outcrossing and selfing populations of Arenaria uniflora (Caryophyllaceae). Evolution 58: 296-307.
2001 White, P. S., S. Wilds, and D. A. Stratton.. The distribution of heath balds in the Great Smoky Mountains. Journal of Vegetation Science. 12:453-466.
1998 Stratton, D. A. Reaction norm functions and QTL-environment interactions for flowering time in *Arabidopsis thaliana*.. Heredity 81:144-155
1998 Stratton, D. A. and C. C. Bennington. Spatial and temporal variation in selection are too fine-grained to maintain genetic variation in *Erigeron annuus*. Evolution 52:678-691
1998 Bennington, C. C. and D. A. Stratton. Field tests of density- and frequency-dependent selection in *Erigeron annuus*. Am. Journal of Botany. 85:540-545.
1997 Emms, S. K, D. A. Stratton and A. A. Snow. The effect of inflorescence size on male fitness: experimental tests in the andromonoecious lily *Zigadenus paniculatus*. Evolution 51: 1481-1489
1996 Stratton, D. A. and C. C. Bennington. Measuring spatial variation in fitness of *Arabidopsis thaliana* using randomly sown seeds. Journal of Evolutionary Biology 9:215-228.
1996 Antonovics, J., D. A. Stratton, P. H. Thrall and A. M. Jarosz. An anther-smut disease (*Ustilago violacea*) of fire-pink (*Silene virginica*): its biology and relationship to the anther-smut disease of white campion (*Silene alba*). American Midland Naturalist 135: 130-143.
1995 Stratton, D. A. Spatial scale of variation in fitness of *Erigeron annuus*. American Naturalist 146:608-624.
1994 Stratton, D. A. Genotype-environment interactions for fitness of *Erigeron annuus* show fine-grained heterogeneity of selection. Evolution 48:1607-1618.

1994 Morris, W. F., M. V. Price, N. M. Waser, J. D. Thomson, B. Thomson, and D. A. Stratton. Systematic increase in pollen carryover and its consequences for geitonogamy in plant populations. Oikos 71:431-440.

1994 Antonovics, J., P. Thrall, A. Jarosz, and D. Stratton. Ecological genetics of metapopulations: the *Silene-Ustilago* plant pathogen system. *in* L. Real, ed. Ecological Genetics. pp. 146-170.

1992 Stratton, D. A. Life cycle components of selection in *Erigeron annuus* I. Phenotypic selection. Evolution 46: 92-106.

1992 Stratton, D. A. Life cycle components of selection in *Erigeron annuus* II. Genetic variation. Evolution 46: 107-120.

1991 Stratton, D. A. Genetics of life history variation in an asexual plant, *Erigeron annuus*. Am. J. Bot. 78:723-728.

1989 Stratton, D. A. Longevity of individual flowers in a Costa Rican cloud forest: ecological correlates and phylogenetic constraints. Biotropica 21:308-318

1989 Stratton, D. A. Competition prolongs the expression of maternal effects in seedlings of *Erigeron annuus* (Asteraceae). Am. J. Bot 76:1646-1653

1986 Thomson, J. D., M. V. Price, N. M. Waser, and D. A. Stratton. Comparative studies of pollen and fluorescent dye transport by bumble bees visiting *Erythronium grandiflorum*. Oecologia 69:561-566.

1985 Thomson, J. D. and D. A. Stratton. Floral morphology and cross-pollination in *Erythronium grandiflorum* (Liliaceae). Am. J. Bot. 72:433-437

Books: "*Case Studies in Ecology and Evolution*" Under contract, to be published by Pearson/Benjamin Cummings.]

Invited Seminars:

Florida State University, University of Kentucky, Princeton University (Statistics), Rutgers University, SUNY Stony Brook, Michigan State University, University of Rochester, University of Maryland, Washington State University, Brown University, University of Pittsburgh, Louisiana State University, University of Kentucky, University of Vermont, Simon Fraser University, University of Nevada, Middlebury College. McGill University, UNAM, Mexico

Teaching Experience:

University of Vermont: BCOR 11, Exploring Biology
BCOR 12, Exploring Biology
BCOR 101, Genetics
BCOR 102, Ecology and Evolutionary Biology
BOT 160, Plant Ecology
PBIO 004, Introduction to Botany
AGRI 195, Justin Morrill Honors seminar

Princeton University: Plant Biology, Population Genetics, Quantitative Genetics, Experimental Design

Middlebury College: Plant Ecology

University of Virginia (Mountain Lake Biological Station): Plant Population Biology

Professional Service:

NSF Panel member: Evolutionary Ecology
NSF Panel member: Population Biology;
NSF Panel member: Dissertation Improvement Grants;
USDA Panel Manager: Biology of Weedy and Invasive Plants Program
USDA Panel member: Biology of Weedy and Invasive Plants Program
Reviewer for Evolution, Ecology, American Naturalist, Genetics, American Journal of Botany, Journal of Ecology, Journal of Evolutionary Biology, Acta Oecologia, Botanical Gazette, National Science Foundation, USDA

University and Departmental Service

Vermont co-Director, Integrated Biological Science Program
Faculty Senate
Director, Justin Morrill Honors Program
Honors College Council, Honors College Admissions committee;
Princeton: Director of Undergraduate Studies: Ecology and Evolutionary Biology dept.
Committee on Course of Study; Committee on Committees
Undergraduate Advisor, Butler College

Graduate Students and Post-doctoral trainees:

Post-doctoral associates:

Cynthia Bennington 1994-1996

Graduate Students:

Simon Emms	PhD	1993	Adaptive significance of andromonoecy in *Zigadenus* lilies.
Karen Masters	PhD	1997	Behavioral and ecological aspects of inbreeding in natural animal populations: inferences from *Umbonia* treehoppers (Homoptera: Membracidae).
Kristina Stinson	PhD	1998	Snow melt gradients and the distribution of *Potentilla* species.
Lila Fishman	PhD	1998	Mating system evolution in *Arenaria uniflora*.
Todd Vision	PhD	1998	Evolution of serpentine tolerance in *Platystemon californicus*.
Christine Yankel	MS	2004	Genetic variation and mating system of *Cystopteris bulbifera*..
Michelle Crowder	MS	2006	Genetics and reproductive isolation in *Arabis lyrata*.

Professional Affiliations:

Society for the Study of Evolution, American Society of Naturalists, Botanical Society of America, Sigma Xi,
Phi Beta Kappa

Curriculum vitae

Mary L. Tierney
Department of Plant Biology
University of Vermont
(802) 656-0434
Mary.Tierney@uvm.edu

Education

B.S., Biology, 1976	Marywood College, Scranton, PA
Ph.D., Genetics, 1983	Michigan State University, E. Lansing, MI

Professional experience

2009 – present	Director, Cell and Molecular Biology Graduate Program
1995 - present	Associate Professor - Department of Plant Biology and Department of Microbiology and Molecular Genetics, University of Vermont
1994 - 1995	Assistant Professor - Department of Microbiology and Molecular Genetics, University of Vermont
1993 - 1995	Assistant Professor - Department of Plant Biology, University of Vermont
1987 - 1993	Assistant Professor - Biotechnology Center, Department of Agronomy and Ohio Agricultural Research Development Center, Ohio State University
1983-1987	Research Associate, Department of Biology, Washington University; Laboratories of Drs. Roger Beachy and Joseph Varner

Professional Societies

American Society of Plant Biologists

Awards

ASPB Fellow

Grant support (current and pending)

Current:
Agency: University of Vermont (Hatch) – Bridge funds

Period Covered: 10/11 – 9/12
Amount: $8,000
Title: Identification of genes regulating the polar secretion of cell wall proteins in arabidopsis.

Pending: NSF preproposal, submitted January 12, 2012

Refereed publications (last 5 years)

1. Mohnen D, ML Tierney (2011) Plants get Hyp to O-glycosylation. Science. 332: 1393-1394.
2. Bernhardt C, ML Tierney (2006) Proline-rich cell wall proteins – building blocks for an expanding cell wall? In Hayashi T (ed):The Science and Lore of the Plant Cell Wall: Biosynthesis, Structure and Function. Universal Publishers, BrownWalker Press.
3. Hu, J, Zhang, Xu, Tierney, ML ATPRP3 is a cell wall protein required for root hair shape and function (in preparation)
4. Trott, T, Carter, J, Burton R, Fincher, G, Barrington, D, Tierney, ML ATPRP2 and ATPRP4 are cell wall proteins that are secreted into the stomatal cell wall. (in preparation)
5. Carter, J, Trott, T, Tierney, ML Mutations in *Atprp2* and *AtPRP4* result in plants defective in stomatal signaling. (in preparation)

Invited seminars and lectures (last 5 years)

Department of Biochemistry and Molecular Biology, University of Georgia, 2011
Department of Biochemistry, UVM, 2011
Department of Biology, University of Massachusetts, 2011
Department of Biology, Brookhaven Laboratories, 2008
Department of Biology, University of Rhode Island, 2008
11th International cell wall meeting, Copenhagen, Denmark, 2007
American Society of Plant biologists. Cell Wall minisymposium, 2007.
Donald Danforth Plant Science Center, St. Louis, MO 2006.

Teaching experience (last 2 years)

University of Vermont

PBIO295: Intracellular trafficking and polarized growth in plants, 2010
MMG295/PBIO295: Ethics in graduate research, 2010 (co-taught with Markus Thali)
PBIO4: Plant Biology, 2011, 2012 (co-taught with Laura Bermingham)

Current Students

Graduate students

Emily Larson, CMB, PhD: 2008 – present
Emmanuel Tergemina, University of Grenoble: January 2012 – June, 2012

Undergraduate Students

Jordan Humble – Honors College senior

Undergraduate Advisees:

Colin Caissie (Plant Biology)
Meredith Hardy (Biological Sciences)
Nathaniel Keefe (Environmental Sciences/Plant Biology)
John Kozel (Biological Sciences)
Andrew Masson (Biological Sciences)
Nicholas McDermott (Plant Biology)
Lon Montuori (Biological Sciences)
Owen Rachampbell (Biological Sciences)
Hannah Supplee (Biological Sciences)
Samantha Westbrook (Biological Sciences

Graduate student committees

Current:

Yucan Zhang, Plant Biology, Ph.D.
Chang Zhang, Plant Biology, Ph.D.
Qing Tang, Microbiology and Molecular Genetics, Ph.D

First year student advisor for CMB: (2006 – present): Andrew Dunn, Kheng Newick, Jane Tully, Jimmy Nolan, Chloe Adams, Joyce Thompson

Service

National:
Chair, Plant Cell Wall Gordon Conference, 2015
Vice-Chair, Plant Cell Wall Gordon Conference, August 4-10, 2012
Panel Member: NSF Integrative Organismal Systems, Fall, 2011.
Member, Organizing committee for ASPB sponsored lab leadership conference, August, 2011
Scientific Organizing Committee, Cell Wall XII Meeting, Porto Portugal, 2010
Panel Member: DOE Biological and Environmental Research Panel for Biofuel Centers reverse site visit: 2010.
University of Vermont: (current)

Plant Biology Department: (current)

Co-chair (with David Barrington): Graduate Admissions Committee.
Graduate coordinator for Plant Biology

Other University Service: (current)

Ex officio member, Cell and Molecular Biology Graduate Admissions Committee, 2008, 2010 - 2012
Member, Graduate Executive Committee, 2010 -present

2.4 Publications and Citations for Faculty

Faculty Member	Publications 2007-present	Citations since 2008
Almstead	4	73
Barrington	11	214
Beckage	18	902
van den Berg	6	105
Bermingham	3	5
Delaney	0	1421
Harris	4	397
Hughes	0	
Lintilhac	4	155
Molofsky	11	1762
Paris	1	46
Perkins	8	305
Preston	14	392
Stratton	0	197
Tierney	1	207
Totals	**85**	**6181**
Average per faculty member	**5.67**	**441.5**

2.5 Plant Biology Department Financial Profile

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
General Fund Base Budget	$1,001,351	$1,137,944	NA	$953,539	$1,003,296	$911,122
Operating (included in base)	$53,910	$54,988	NA	$63,227	$63,227	$63,227
# Sponsored Grant Awards	9	9	11	10	6	NA
Dollars Awarded	$1,257,597	$793,927	$892,794	$1,028,581	$110,496	NA

2.6 Research Mentoring

Graduate Students

- 50 graduate students have done independent research 2007-2012
- 25 peer-reviewed publications were co-authored by graduate students 2007-2012
- 37 presentations have been given by graduate students at professional meetings 2007-2012

Undergraduate Students

- 39 undergraduate students have done independent research 2007-2012
- 3 peer-reviewed publications were co-authored by undergraduate students 2007-2012
- 3 presentations have been given by undergraduate students at professional meetings 2007-2012

2.7 Faculty Service Details

Service to the University of Vermont

- 8 faculty members have served on 28 university-level committees.
- 5 faculty members have served on 12 college-level committees.
- 4 faculty members have served on 15 department- or program-level committees.
- 2 faculty members have directed cross-college programs (Integrated Biological Sciences and Cell and Molecular Biology)

Service to professional organizations

- 7 faculty members have served on 10 NSF panels.
- 2 faculty members have served on 3 USDA panels.
- 4 faculty members have served as editors for 6 peer-reviewed journals.
- 6 faculty members have served as reviewers for a total of 42 peer-reviewed journals.
- 3 faculty members have served on 8 national/international conference committees.

Service to the community

- 3 faculty members serve as mentors for budding scientists elementary through high-school age.
- 3 faculty members regularly provide plant and fungi identification for the community.
- A faculty member organized a symposium on growing rice in Vermont, with participation from farmers, community and governmental organizations, and scientists.

2.8 Staff Job Descriptions

Sarah Goodrich, Communications Coordinator and Administrative Assistant

The communications coordinator creates and manages the public face of the department through website design and maintenance, newsletter design and distribution, creation of promotional materials for student recruitment as well as posters and power point presentations for disseminating information to legislators, donors and the public. Other important functions include editorial and administrative support for the department chair and faculty, assisting

faculty with grant proposal preparation and submission, scheduling courses, and coordinating of course and curriculum changes. The communications coordinator is supervised by the department chair.

20% Design and maintain department website

15% Assist faculty with writing and editing grant proposals
Insure that grant proposal guidelines are met, particularly with new interfaces such as grants.gov and NSF Fastlane
Submit grant proposals through the UVM Office of Sponsored Programs (OSP) using grants.gov when required
Submit grant budget information through NSF Fastlane

5% Write, publish and disseminate the department newsletter

10% Create promotional materials for student recruitment
Design posters for disseminating information to legislators, donors and public

20% Assist chair with administrative and organizational tasks
Faculty recruitment support
Plan faculty meetings and attend to take minutes
Coordinating the faculty reappointment and tenure process

5% Coordinate curriculum related activities
Manage curriculum changes preparing and submit course action forms, track course actions
Review UVMS catalogue and directory and submit changes as needed
Schedule courses and laboratories

5% Graduate student recruitment activity management
Graduate student candidate interview schedule development

5% Supervise and evaluate work study and part time student interns

Lillian Reade, Office Program Support Generalist

Provide general office and operational support for chair, faculty, staff and students in the Plant Biology Department. Provide general receptionist duties for department. Assist Department Chair with faculty, staff and student recordkeeping. Participate in student recruitment and advising activities.

20% Reception
Serve as first point of contact for students, parents, faculty, staff and general public
Handle routine questions providing information about the department and programs.
Mail Activities - Sort Departmental Mail, coordinate overseas and overnight mailing, provide parcel delivery to labs and tracking of lost packages.
Provide clerical support to faculty including copying exam and lecture materials

Expedite interview visits and tours, coordinate faculty recruitment activities.

20% Student Service
Schedule interviews and tours, Advisor assignment coordination, Advise students of enrollment issues, Assist with transfers and change of status, Provide assistance with change of advisor and change of major requests, coordinates admitted students days, develop honors day awards and certificates.

15% Graduate Student Support
Manage application process including communicating with students about process.
Liaison with Graduate College
Provide complete applications for faculty review.
Prepare and disseminate letters to all Graduate Student applicants communicating decisions.
Assist with Health Insurance and Financial matters relating to tuition credits
Assist with graduation requirements including committee meetings, intent to graduate forms, annual seminar

15% Seminar Series Support
Plan visits, publicize seminars including preparation of notices and distribution
Order refreshments

15% Field Naturalist Program Support
Coordinate annual applicant open house, solicit sponsors
Communicate committed sponsor expectations to FN Director (activity expectations, calendar, funding commitment)
Publicize sponsor information to students, provide sponsors with interested student applications.
Generate MOU for sponsor/student contracts, manage funding transactions from sponsor to UVM

5% Work Study/Student Employee Management
Position advertising and hiring
New hire paperwork and set up
Review and approve hours

5% Manage Key Inventory and CatCard access priviledges for departmental students and faculty

5% Manage department van scheduling, repair and maintenance

Karyn McGovern, Business Support Generalist

Direct business, human resources and accounting aspects of the Plant Biology Department. Under the supervision of the Department Chair, serve as main contact for the Plant Biology Faculty and Staff for financial management needs. Interact with the Dean's Office and Central Administration (Grant and Contract Accounting, General Accounting, Purchasing). Meet UVM and Federal Fiscal year deadlines.

25% Manage 50 budgets including general fund, external grants, federal experiment station (on separate fiscal year), Extension (separate fiscal year), Income/Expense & gift and endowment fund accounts. Provide chair and faculty with monthly budget reports; ensuring accuracy and integrity of data as well as compliance with UVM and regulatory provisions.

20% Reconcile budgets monthly. Annual preparation of budget/rate calculations. Prepare journal entries that correspond with these accounts. Implement self-designed databases that monitor and analyze the many different budgets involved in fund accounting. Ensure compliance with Federal, University and College policies and procedures.

20% Analyze and interpret award requirements and budgets, monitor and resolve exceptions and errors, notify Dean's Office for any necessary budget change orders and expense transactions. Provide guidance and training to faculty and staff in determining allowable expenses investigate problems and facilitate resolution. Work with Office of Sponsored Programs and Grant and Contract Administration to implement budget changes and monitor closing dates. Interpret and explain financial policies as needed.

10% Manage departmental payroll distributions, Personnel Action forms. Monitor attendance records and maintain departmental personnel files (~for 14 faculty, 10 staff and 20 graduate students).

8% Interpret and communicate all accounting, budgeting and human resource policies, rules, regulations and business process to faculty and staff. Keep Department Chair aware of any changes and change workflow in department if called for by changes in these areas.

10% Check travel forms for accuracy and prepare payment approval vouchers. Implement and maintain purchasing systems to include online purchase orders and purchasing card allocations and associated recordkeeping. Create necessary journal entries. Responsible for departmental cash handling and deposits.

5% Design and implement van usage database billing system. Process quarterly inter-departmental transfers and enter charges on UVM's Financial Record System.

2% Gathers information for annual reports of the department requested for internal and external program reviews.

Associates Degree in a related field with one to three years experience in business/accounting or an equivalent combination of training and experience from which comparable knowledge and abilities can be acquired.

Ability to analyze complex budgetary matters, problem solve, maintain accuracy with a heavy workload, learn new computer software and train others on its use required.

Preference will be given to candidates with experience in fund accounting. Working knowledge of Access, Excel, and web based programs and survey software desirable.

APPENDICES SECTION 3: UNDERGRADUATE TEACHING ACTIVITIES

3.1 Science and Engineering Degree Patterns: NSF Data

Field	2003	2004	2005	2006	2007	2008	2009
All fields	1,365,694	1,417,421	1,456,401	1,502,922	1,541,704	1,580,413	1,619,028
S&E	442,755	458,658	470,214	478,858	485,772	496,168	505,435
Science	378,966	393,978	404,062	410,631	417,498	426,260	434,835
Natural sciences	170,068	173,633	173,460	173,966	176,275	177,601	181,914
Agricultural sciences	17,703	17,058	17,120	17,307	17,696	18,474	19,152
Biological sciences	63,517	64,750	67,972	72,972	79,348	82,398	85,574
Biosci % increase	0	2	7	7	9	4	4

source: http://www.nsf.gov/statistics/seind12/c2/c2s2.htm

3.2 Life Science Enrollments and FTEs at UVM

Program	Contribution	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
BCOR	Ugrad SCH Taught to Majors	722	807	893	961	1023	1005
BCOR	Ugrad SCH Taught to Non-Majors	3361	3753	3750	4413	4521	4556
PBIO	Ugrad SCH Taught to Majors	97	108	185	115	204	162
PBIO	Ugrad SCH Taught to Non-Majors	1133	1163	1334	1454	1615	1649
BCOR-CAS	Undergraduate FTE	87.0	97.8	96.6	94.6	96.1	133.9
BCOR-CALS	Undergraduate FTE	49.1	54.2	58.1	84.6	88.7	51.5
PBIO	Total FTE	51.4	53.3	60.5	60.8	68.0	66.5
						Department Grand Total	251.9
						FTE/Faculty on Paper	18.65925926
						FTE/Faculty Available	22.9

3.3 Plant Biology Undergraduate Student Profile

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Majors	17	22	24	25	11	29
Second Majors	1	0	1	0	1	1
Minors	2	4	3	6	11	9
Applicants	13	14	4	11	6	5
Admits	10	14	4	11	6	5
Admit Rate	76.9%	100.0%	100.0%	100.0%	100.0%	100.0%
Enrolls	3	4	1	8	4	2
Yield Rate	30.0%	28.6%	25.0%	72.7%	66.7%	40.0%
Average SAT (combined)	1687	1705	1850	1869	1794	1980
Bachelor's Degrees Awarded	4	0	8	8	2	0

3.4 Plant Biology Course Enrollments

Course number	Course Title	2007	2008	2009	2010	2011	2012	2013
PBIO 004	Intro to Botany	95	91	80	80	111	77	78
PBIO 006	The Green World	207	221	147	179	138	147	106
PBIO 104	Plant Physiology	24	29	26	28	37	36	33
PBIO 108	Morph. & Evol. Of Vascular Plants	7		13		21		9
PBIO 109	Plant Systematics	28	26	30	28	46	42	47
PBIO 117	Plant Pathology		7		12		13	
PBIO 151	Plant Anatomy	9			24	13	14	13
PBIO 185	Biochemistry			119	101	125	137	130
PBIO 195	Special Topics	10	37	13	23	33	40	45
PBIO 209	Biology Of Ferns		8		8		15	
PBIO 213	Plant Communities						19	
PBIO 223	Fund. of Field Science		5	3	8	3	6	5
PBIO 241	Tropical Plant Systematics	9		14		8		13
PBIO 275	Global Change Ecology					12	13	
PBIO 295	Special Topics	31	29	30	23	18	23	19
PBIO 369	Field Botany	16		17	13	10	16	7

3.5 Chart of Requirements for the Plant Biology Major and its Concentrations

UVM Plant Biology B.S. (CALS) or B.A. (CAS) Degree Requirements

A) FULFILL UVM (120 Credits; D1 & D2), and <u>COLLEGE</u> CORE REQUIREMENTS (CALS or CAS*)				
B) FULFILL <u>PLANT BIOLOGY MAJOR CORE</u> COURSE REQUIREMENTS (45-48 Credits)				
COURSE	**TITLE (Credits)**	**PLANT BIOLOGY MAJOR-CORE COURSES**		
BCOR 011	Exploring Biology (4)	X		
BCOR 012	Exploring Biology (4)	X		
BCOR 101	Genetics (3)	X		
PBIO 104	Plant Physiology (4)	X		
CHEM 031**	Introductory Chemistry (4)	X		
CHEM 032**	Introductory Chemistry (4)	X		
CHEM 141**	Organic Chemistry (4)	X		
CHEM 142**	Organic Chemistry (4)	X		
MATH 019 & MATH 020, *or* MATH 021 & MATH 022	Fundamentals of Calculus I and II (3+3); Calculus I and II (4+4)	X X X X	<Either pair> <of courses>	
PHYS 011 or PHYS 031	Physics (4)	One Physics lecture course		
PHYS 021 (lab)	Physics Lab (1)	Physics lab to accompany		
STAT 141, STAT 211, or NR 140	Basic Stat. Methods (3) Statistical Methods I (3) Applied Environ. Stats. (4)	One Statistics course		
C) *FULFILL <u>SPECIALIZED COURSEWORK</u>* IN THE CONCENTRATION AREA OF YOUR CHOOSING:				
COURSE	CONCENTRATION: **TITLE (Credits)**	GENERAL PLANT BIOL (26 credits)	ECOLOGY & EVOL BIOL of PLANTS (27 credits)	PLANT MOLECULAR BIOLOGY (28 credits)
PBIO 108	Morph & Evol Vasc Pl (4)	Either	X	Either
PBIO 109	Systemat & Phylogeny (4)	Course	X	Course
BCOR 102	Ecology and Evolution (4)	X	X	
BCOR 103	Molecular and Cell Biol (4)			X
BIOC 205***	Biochemistry I (3)			X
BIOC 206***	Biochemistry II (3)			X
BIOC 207***	Biochemistry lab (2)			X
D) ELECTIVES REQUIRED BY CONCENTRATION		18 credits	15 credits	12 credits

GENERAL PLANT BIOLOGY ≥18 additional credits	ECOLOGY & EVOLUT BIOLOGY ≥15 additional credits	PLANT MOLECULAR BIOLOGY ≥12 additional credits
Including at least <u>two</u> 200-level **PBIO** courses selected in consultation with your advisor. Coursework may include undergraduate research for credit.	Including at least <u>two</u> 200-level **PBIO** courses selected in consultation with your advisor. Coursework may include undergraduate research for credit.	Including at least <u>two</u> 100- or 200-level **PBIO** courses selected in consultation with your advisor. Coursework may include undergraduate research for credit.

* List of B.S. and A.B. Plant Biology Degree Requirements: http://www.uvm.edu/~plantbio/undergraddegrees.php

** Students who want to double major in chemistry or who want an especially strong foundation in chemistry may instead enroll in the courses for Chemistry majors: CHEM 035, 036, 143, 144.

*** The BIOC 205, 206, 207 set may be substituted with both PBIO 185 (General Biochemistry; 3 credits) and PBIO 187 (Biochemistry Lab; 1 credit), with advisor's permission.

Updated February 27, 2013 (T. Delaney); Includes changes to PMB Concentration approved by vote on 4/27/2012

3.6 Teaching Evaluations of Plant Biology Faculty by Course

Service Courses in the Life Sciences (questions 1-8 of 14)

Course Number	Course Title	Instructor	Q1 enthusiastic about subject	Q2 prepared for class	Q3 explains unfamiliar concepts	Q4 encourages questions	Q5 defines course objectives	Q6 defines criteria for grading	Q7 stimulates students to think	Q8 emphasizes important topics	Questions 9-10 and averages on next table
BIOL 001B	Principles of Biology	Higgins	4.56	4.48	3.14	3.92	3.84	3.90	3.61	3.57	
BIOL 002 B	Principles of Biology	Almstead	4.93	4.86	4.35	4.68	4.66	4.55	4.38	4.62	
BCOR 011B	Exploring Biology	Stratton	5.00	4.91	4.74	4.65	4.76	4.59	4.68	4.79	
BCOR 011C	Exploring Biology	Almstead	4.43	4.84	3.93	4.41	4.13	3.81	3.96	4.26	
BCOR 011D	Exploring Biology	Stratton	4.89	4.95	4.54	4.72	4.63	4.53	4.61	4.77	
BCOR 011E	Exploring Biology	Almstead	4.44	4.77	3.84	4.10	4.34	4.27	3.96	4.30	
BCOR 012B	Exploring Biology	Stratton	4.91	4.83	4.67	4.73	4.64	4.40	4.71	4.61	
BCOR 012B	Exploring Biology	Delaney	4.62	4.35	3.55	3.76	3.82	3.80	3.68	3.79	
BCOR 012D	Exploring Biology	Stratton	4.98	4.98	4.85	4.75	4.82	4.78	4.83	4.78	
BCOR 012D	Exploring Biology	Delaney	4.59	4.71	4.17	4.20	4.40	4.41	4.10	4.37	
BCOR 012F	Exploring Biology	Hill Bermingham	4.83	4.89	4.57	4.86	4.83	4.49	4.80	4.74	
BCOR 101	Genetics	Hill Bermingham	4.44	4.66	3.95	4.47	4.48	4.07	4.17	4.17	
BCOR 102	Ecology and Evolution	Molofsky	3.70	3.45	2.48	3.12	3.16	3.55	2.73	3.12	
BCOR 102	Ecology and Evolution	Stratton	4.81	4.61	4.44	4.69	4.54	4.31	4.64	4.64	

Service Courses in the Life Sciences (questions 9-14 of 14 and averages)

Course Number	Course Title	Instructor	Q9 appropriate readings and assignments	Q10 exams fair	Q11 willing to help outside of class	Q12 sensitive to gender, race, religion	Q13 overall effectiveness as a teacher	Q14 compared to other UVM courses	Average Questions 1-12	Average Questions 13-14
BIOL 001B	Principles of Biology	Higgins	3.54	2.86	4.23	4.41	2.83	2.65	3.84	2.74
BIOL 002 B	Principles of Biology	Almstead	4.45	4.27	4.65	4.68	4.15	3.44	4.59	3.80
BCOR 011B	Exploring Biology	Stratton	4.53	4.45	4.84	4.94	4.52	4.16	4.74	4.34
BCOR 011C	Exploring Biology	Almstead	4.39	3.94	4.15	4.67	3.70	3.56	4.24	3.63
BCOR 011D	Exploring Biology	Stratton	4.71	4.11	4.68	4.86	4.48	3.88	4.67	4.18
BCOR 011E	Exploring Biology	Almstead	4.36	4.03	4.28	4.62	3.57	3.52	4.28	3.55
BCOR 012B	Exploring Biology	Stratton	4.54	4.48	4.67	4.85	4.53	3.68	4.67	4.11
BCOR 012B	Exploring Biology	Delaney	4.16	3.35	4.30	4.69	3.33	3.27	3.99	3.30
BCOR 012D	Exploring Biology	Stratton	4.70	4.70	4.79	4.89	4.70	4.09	4.82	4.40
BCOR 012D	Exploring Biology	Delaney	4.52	3.76	4.64	4.74	3.80	3.87	4.38	3.84
BCOR 012F	Exploring Biology	Hill Bermingham	4.46	4.40	4.62	4.83	4.70	4.18	4.69	4.44
BCOR 101	Genetics	Hill Bermingham	4.28	3.54	4.41	4.81	3.73	3.46	4.29	3.60
BCOR 102	Ecology and Evolution	Molofsky	3.58	3.42	3.34	4.41	2.28	2.81	3.34	2.55
BCOR 102	Ecology and Evolution	Stratton	4.69	4.39	4.56	4.84	4.33	3.59	4.60	3.96

Plant Biology Courses (questions 1-8 of 14)

Course Number	Course Title	Instructor	Q1 enthusiastic about subject	Q2 prepared for class	Q3 explains unfamiliar concepts	Q4 encourages questions	Q5 defines course objectives	Q6 defines criteria for grading	Q7 stimulates students to think	Q8 emphasizes important topics	Questions 9-10 and averages on next table
PBIO 004	Intro to Botany	Tierney	4.08	4.67	3.54	3.88	4.04	3.67	3.50	4.21	
PBIO 004	Intro to Botany	Hill Bermingham	4.76	5.00	4.70	4.70	4.70	4.35	4.46	4.70	
PBIO 185	Survey of Biochemistry	Almstead	4.84	4.48	3.95	4.48	4.54	4.49	4.25	4.50	
PBIO 104	Plant Physiology	Harris	4.87	4.72	4.59	4.59	4.72	4.59	4.66	4.72	
PBIO 109	Plant Systematics	Paris	5.00	5.00	4.84	4.87	4.87	4.77	4.77	4.84	
PBIO 117	Plant Pathology	Delaney	4.81	4.61	3.64	3.78	4.19	4.22	3.81	3.97	
PBIO 151	Plant Anatomy	Lintilhac	5.00	4.86	4.07	4.43	4.07	3.79	4.57	4.29	
PBIO 223	Field Science	Hughes	4.70	3.90	4.00	4.70	3.30	2.44	4.70	4.00	
PBIO 275	Global Change Ecology	Molofsky	4.42	4.17	4.00	4.42	4.00	3.25	4.08	4.08	
PBIO 295A	Ecological Modeling	Beckage	5.00	4.00	4.00	4.75	4.50	5.00	5.00	4.75	
PBIO 295B	Plant Symbioses	Harris	5.00	4.92	4.85	5.00	4.85	4.69	4.92	4.85	
PBIO 311	Field Naturalist Practicum	Daniel	5.00	5.00	5.00	5.00	5.00	4.33	5.00	5.00	

Plant Biology Courses (questions 9-14 of 14 and averages)

Course Number	Course Title	Instructor	Q9 appropriate readings and assignments	Q10 exams fair	Q11 willing to help outside of class	Q12 sensitive to gender, race, religion	Q13 overall effectiveness as a teacher	Q14 compared to other UVM courses	Average Questions 1-12	Average Questions 13-14
PBIO 004	Intro to Botany	Tierney	4.25	3.96	4.71	4.62	3.46	3.04	4.09	3.25
PBIO 004	Intro to Botany	Hill Bermingham	4.70	4.78	4.51	4.76	4.36	3.78	4.68	4.07
PBIO 185	Survey of Biochemistry	Almstead	4.39	4.45	4.75	4.91	3.71	3.33	4.50	3.52
PBIO 104	Plant Physiology	Harris	4.63	4.44	4.77	4.85	4.47	4.37	4.68	4.42
PBIO 109	Plant Systematics	Paris	4.50	4.65	4.87	4.82	4.75	4.32	4.82	4.54
PBIO 117	Plant Pathology	Delaney	4.00	3.75	4.13	4.76	3.67	3.53	4.14	3.60
PBIO 151	Plant Anatomy	Lintilhac	3.92	4.14	4.38	4.67	4.31	4.08	4.35	4.20
PBIO 223	Field Science	Hughes	3.40	3.00	4.56	4.78	3.90	3.60	3.96	3.75
PBIO 275	Global Change Ecology	Molofsky	4.42	4.42	3.78	4.44	3.27	3.36	4.12	3.32
PBIO 295A	Ecological Modeling	Beckage	4.25	5.00	4.75	5.00	4.00	4.00	4.67	4.00
PBIO 295B	Plant Symbioses	Harris	4.92	5.00	5.00	5.00	5.00	4.30	4.92	4.65
PBIO 311	Field Naturalist Practicum	Daniel	4.86	5.00	5.00	5.00	5.00	5.00	4.93	5.00

3.7 Advising Evaluations of Plant Biology Faculty (average for Department)
(Note that questions 1-6 pertain to the student, so only questions 7-17 are presented here.)

Question	Answer	% of Respondents		
		2012	2011	2009
Q7. My advisor is accessible	Never	7.4	3.3	0.0
	Seldom	7.4	10.0	0.0
	Sometimes	11.1	13.3	13.3
	Frequently	25.9	13.3	33.3
	Almost always	48.1	56.7	46.7
Q8. My advisor shows concern and respect for me	Never	3.7	10.0	0.0
	Seldom	0.0	3.3	6.7
	Sometimes	14.8	3.3	0.0
	Frequently	11.1	20.0	26.7
	Almost always	59.3	63.3	66.7
Q9. My advisor helps me make responsible decisions	Never	7.4	10.0	0.0
	Seldom	0.0	0.0	0.0
	Sometimes	11.1	10.0	20.0
	Frequently	29.6	16.7	26.7
	Almost always	44.4	60.0	53.3
Q10. My advisor is knowledgeable about my academic progress, has current transcript available	Never	11.1	13.3	0.0
	Seldom	0.0	3.3	13.3
	Sometimes	14.8	10.0	13.3
	Frequently	22.2	13.3	20.0
	Almost always	44.4	60.0	53.3
Q11. My advisor is knowledgeable about degree requirements for the college	Never	0.0	0.0	0.0
	Seldom	11.1	6.7	0.0
	Sometimes	14.8	6.7	13.3
	Frequently	25.9	20.0	20.0
	Almost always	40.7	56.7	66.7
Q12. My advisor is knowledgeable about degree requirements for my major	Never	0.0	0.0	0.0
	Seldom	7.4	0.0	0.0
	Sometimes	14.8	16.7	20.0
	Frequently	25.9	16.7	13.3
	Almost always	40.7	53.3	66.7

Question	Answer	% of Respondents		
		2012	2011	2009
Q13. My advisor is knowledgeable about career possibilities	Never	3.7	0.0	0.0
	Seldom	7.4	3.3	0.0
	Sometimes	14.8	16.7	46.7
	Frequently	37.0	23.3	6.7
	Almost always	14.8	33.3	20.0
Q14. My advisor is informed about UVM services	Never	0.0	0.0	6.7
	Seldom	3.7	3.3	0.0
	Sometimes	18.5	10.0	20.0
	Frequently	29.6	23.3	33.3
	Almost always	25.9	50.0	20.0
Q15. My advisor is informed about UVM policies and procedures	Never	0.0	0.0	0.0
	Seldom	3.7	0.0	0.0
	Sometimes	11.1	13.3	20.0
	Frequently	25.9	26.7	33.3
	Almost always	29.6	43.3	26.7
Q16. OVERALL, I would rate the quality of my academic advising as:	Poor	7.4	10.0	6.7
	Fair	11.1	6.7	6.7
	Good	22.2	33.3	13.3
	Very good	22.2	13.3	46.7
	Excellent	29.6	36.7	26.7
Q17. I would recommend my advisor to another student	Yes	59.3	73.0	80.0
	No	18.5	20.0	13.3

4.1 Graduate Degree Requirements

Overview of Graduate Programs in the Plant Biology Dept (Expanded Catalog Text)

The Department of Plant Biology has ongoing research programs in: ecology and evolution including physiological ecology of aquatic plants, effects of acid depositions on forest ecosystems, physiological ecology of acid depositions, systematics and evolution of vascular plants, biogeography; physiology including morphogenesis and developmental biology of embryonic plant systems, mineral nutrition, growth and development, translocation, cellular electrophysiology, membrane function, amino acid transport, aluminum effects on cell membranes; and cell and molecular biology including molecular genetics, recombinant DNA of fungi and plant molecular development.

The department participates actively in the Cell and Molecular Biology Program, which provides opportunities for interdisciplinary research with other life science departments.

Doctor of Philosophy

The Department offers a Ph.D. program in which students conduct research with mentors and defend a dissertation. Students typically finish this program in 6 years.

Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy
The equivalent of a UVM major or minor in a natural or physical science. Satisfactory scores on the Verbal and Math sections of the Graduate Record Examination.

Minimum Degree Requirements
A total of seventy-five credits of course work and dissertation research. A minimum of thirty credits of course work should be in botany, other natural sciences and supporting fields, and at least twenty credits should be in dissertation research. In addition, each candidate must participate in six semester hours of supervised teaching.

Master of Science, Thesis Option

The Department also offers a master's program in which students conduct research with mentors and defend a thesis, in structure like a shortened, simpler version of the Ph.D. Students typically finish this program in 2.5 years.

Requirements for Admission to Graduate Studies for the Degree of Master of Science
The equivalent of a UVM major or minor in a natural or physical science. Satisfactory scores on the Verbal and Math sections of the Graduate Record Examination.

Minimum Degree Requirements
A total of thirty credits of course work and thesis research. A minimum of fifteen credits of course work should be in botany, other natural sciences, and supporting fields, and at least nine credits should be in thesis research.

Master of Science, Field Naturalist Option

The department offers a multidisciplinary non-thesis program leading to the degree of Master of Science, Field Naturalist Option. Enrollment is limited to a small number of mature, highly talented individuals who have demonstrated sustained interest in field aspects of the natural sciences. The program is designed to provide students with: (1) a solid grounding in field-related sciences; (2) the ability to integrate scientific disciplines into a coherent whole at the landscape level; (3) the ability to evaluate sites from a number of perspectives and/or criteria; (4) the ability to translate scientific insights into ecologically sound decisions; and (5) the ability to communicate effectively to a wide range of audiences. Students typically finish this program in two years.

Requirements for Admission to Graduate Studies for the Degree of Master of Science, Field Naturalist Option

An undergraduate or graduate degree in earth or life sciences is expected; additionally, a demonstrated commitment to field sciences (e.g., participation in environmental and conservation organizations, workshops, field trips, research); strong scores on the Graduate Record Examination. A subject (advanced) test in biology or geology is advised for students who lack an undergraduate degree in natural sciences. Recent college graduates are encouraged to pursue interests outside academe before application to the Field Naturalist program.

Minimum Degree Requirements, Field Naturalist Option

Thirty credit hours of courses to include at least two courses in each of three core areas: (1) life science; (2) earth science; and (3) ecology, the course selection to be determined by the student's studies committee. Enrollment in the Field Naturalist Practicum (PBIO 311) each semester; oral comprehensive examination the fourth semester; written field research project (PBIO 392) at the end of the fourth semester.

4.2 FAEIS Trends in Graduate Enrollment

Masters and Doctorate Enrollment in Agriculture, Agriculture Operations, and Related Sciences at Land Grant and Non-Land Grant Institutions

Fields	2007	2008	2009	2010	2011
Plant Sciences	3193	3338	3332	3466	3606
Natural Resources Conservation and Management	2253	2469	2532	2664	2592
Biochemistry, Biophysics and Molecular Biology	984	1007	948	961	836
Ecology, Evolution, Systematics and Population Biology	655	633	651	658	686
Botany	365	403	505	476	456
Biology, General	182	181	234	211	172
Cell/Cellular Biology	147	162	170	167	167

4.3 Graduate Program Admissions, Enrollment, and Degrees

Masters	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
Students Enrolled	13	12	10	13	14	12
Applicants	17	24	19	24	28	30
Admits	5	6	6	6	7	7
Admit Rate	29.4%	25.0%	31.6%	25.0%	25.0%	23.3%
Enrolls	5	6	4	6	5	5
Yield Rate	100.0%	100.0%	66.7%	100.0%	71.4%	71.4%
Average GRE (combined)	1348	1302	1363	1348	1290	1368
Degrees Awarded	6	3	5	4	7	0
% Graduate within 5 yrs.	83.3%	100.0%	100.0%	100.0%	100.0%	0.0%

PhD	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
Students Enrolled	9	11	10	8	7	8
Applicants	25	20	25	14	12	8
Admits	7	11	6	2	3	1
Admit Rate	28.0%	55.0%	24.0%	14.3%	25.0%	12.5%
Enrolls						
Yield Rate	28.6%	54.5%	16.7%	0.0%	33.3%	100.0%
Average GRE (combined)	1210	1233	1390	n/a	820	1120
Degrees Awarded	2	1	0	1	0	0
% Graduate within 7 yrs.	50.0%	0.0%	100.0%	33.3%	33.3%	0.0%

5.1 Alumni Career Development

Current Positions of Plant Biology Program Graduates

UVM degree	UVM degree year	Current Position Category
BS	2003	environmental education
BS	1997	environmental science technician
BS	2005	environmental science technician
BS	2011	environmental science technician
BS	2012	environmental science technician
BS	2007	lab technician
BS	2010	lab technician
BS	2001	lab technician
BS	2008	lab technician
BS	2009	lab technician
BS	2010	lab Technician
BS	2012	MS candidate, lab technician
BS	2012	MD candidate
BS	2006	MS candidate
BS	2005	MS candidate, nursing
BS	2010	non-professional employment
BS	2000	non-professional employment
BS	2003	PhD candidate
BS	2006	PhD candidate
BS	2009	PhD candidate
BS	2009	PhD candidate
BS	2011	PhD candidate
BS	2009	PhD candidate
BS	2012	PhD candidate
BS	2009	plant-related enterprise
BS	2010	plant-related enterprise
BS	2003	plant-related enterprise
BS	2006	plant-related enterprise
BS	2010	plant-related enterprise
BS	2010	research assistant
BS	2006	MS candidate, research assistant
BS	2000	research associate
BS	2003	service professional
BS	2000	staff scientist
BS	2002	staff scientist
BS	2009	staff scientist

UVM degree	UVM degree year	Current Position Category
BS, MS	2001, 2007	research technician
MS	2004	environmental science technician
MS	2000	environmental services
MS	2002	environmental services
MS	2004	environmental services
MS	2007	lab manager
MS	2006	medical intern
MS	2008	PhD candidate
MS	2008	PhD candidate
MS	2012	research technician
MS		research technician
MS	2000	secondary education
MS	2001	small business owner
MS	1998	staff scientist
MS	2001	staff scientist
MS	2003	staff scientist
MS (FN)	2006	environmental education
MS (FN)	2002	environmental services
MS (FN)	2002	executive director of nonprofit
MS (FN)	2009	MS candidate, nursing
MS (FN)	2011	environmental education
MS (FN)	2002	environmental scientist
MS (FN)	2006	naturalist/author
BS, MS, PhD	1999, 2000, 2006	research assistant professor
MS, PhD	2002, 2006	research associate
PhD	2004	assistant professor
PhD	2002	college instructor
PhD	2007	postdoctoral researcher
PhD		secondary education
PhD	2010	college instructor

5.2 Alumni Evaluation of the Program

The following comments were given in response to a questionnaire sent out to all Plant Biology alumni.

Greatest *Satisfaction* with UVM Plant Biology (Botany) Education/Experience (Most common theme: Quality and accessibility of faculty)

I loved all of my PBIO classes and professors and the opportunity to take grad classes and med school classes as an undergraduate.

I really appreciate the diversity of plant courses available to me as an undergraduate student. After comparing with the students in my graduate program, not everyone was able to accumulate the breadth of knowledge that I acquired at UVM.

I really appreciated the accessibility of all my plant biology professors. It was very easy to meet and talk with my professors outside of the classroom and I feel that I learned more because of this.

My greatest satisfaction with the PBIO dept. was the availability of faculty

Costa Rica trip, the herbarium, dave barrington & jeanne harris

Educational and personal connections w/ faculty. Cathy Paris as an excellent advisor--very open to providing new experiences for students.

FN program provided new approaches to understanding the landscape. Good plant ID skills. Dr. Barrington--My fern ID skills are still used today. Thanks!

Love the people and collaboration among groups

Great professors; formed lasting friendships and professional connections with fellow students
Field travel, Costa Rica

Field Science

Everything was great. I had fun. I was challenged. At times it was hard but it builds character.

Small cohort, independent and group problem solving, supportive faculty, field time, interdisciplinary integrative thinking

Field class with Cathy: Botany for NR professionals

Engaging professors, opportunity to work within multiple departments

I noticed that almost all of my colleagues in molecular and cellular biology at Berkeley have very little understanding or thought about organisms in their natural environment. I love that my undergraduate training gave me an appreciation for organismal biology and how molecular processes affected organisms as a whole existing in the natural environment. I am really thrilled at how my undergraduate training prepared me for graduate school with a broad foundation in all areas of biology as well as a deep knowledge of the specific areas that I studied. I really couldn't have been happier with my undergraduate education and mentorship I received at UVM in the botany department. It has set me up to pursue all of my goals after graduation.

Greatest *Frustration* with UVM Plant Biology (Botany) Education/Experience (Most common theme: Lack of interaction with other students)

The greatest frustration was not knowing other botany students and a lack of classes regrading non-vascular plants, or plant ecology-at least for undergraduates.

not many. Too many required classes. Not enough time for research

More undergrad research opportunities in botany and applied plant science.

Little integration b/t FN Program and rest of Dept.

Limited course offerings; would really value a intro course on "R"

Marvin lectures were often not relevant to my interests as an FN

Being able to connect with students in same major.

I wish I had more time to focus on Plant Biology

Being a TA for BCOR, because the last time I had taken biology was in grade 10. I was unqualified!

Lack of clarity with program vs. department requirements

Lack of career counseling and guidance

I really tried hard to think of some. When I was at UVM the undergraduate laboratory space was really sub standard compared to what I have seen at other institutions. I know that new buildings have been built since I left, so I am not sure this criticism is still valid. Any frustrations that I had at UVM were a result of having to deal with issues outside of the Botany department.

I feel like I wasn't prepared to face the challenges of today's job market.

Lack of grad student interaction; department so small, only cohesive cohort was Field Naturalists. Other students more or less isolated in respective lab groups with little overlap.

Being interested in the cellular biology of plants, I would have loved it if there had been a course like that available for undergraduate students.

I wish that I had taken more plant biology-specific electives earlier in my major. I was mostly filling general requirements for my first couple years and I feel that I missed out on some really great plant electives because of this. I also wish that there had been more emphasis on bringing together plant biology undergrads early in the program. I didn't meet a lot of the other people in my program until I started doing smaller elective classes my senior year.