BULLETIN

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PLANT SCIENCE

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THE BOTANICAL SOCIETY OF AMERICA
Leading Scientists
and
Educators
since 1893

BOTANICAL SOCIETY OF AMERICA

ISSN 0032-0919

Welcome to 2009 – The Year of Science in the United States.

The BSA contribution to the celebration already has begun with the special first issue of 2009 of the *American Journal of Botany* dedicated to the botanical works of Darwin. *Plant Science Bulletin* adds to this effort with an article on Darwin's science, presented as three case studies that can be incorporated into teaching introductory-level students. Darwin is an icon for evolution, and rightly so, but his contributions to botany and the scientific way of knowing are too often overlooked.

Also featured in this issue is an article based on one of the Botany 2008 workshops last year in Vancouver. The SEEDS program (Social, Ecological, Economic Development Studies) at UBC is a model for interdisciplinary collaboration to promote sustainability on university campuses. "Green" is the rage on many campuses today, but examples of bottom-up commitment and innovation are rare. The authors provide a snapshot of what has become a very popular and productive program on their campus.

Finally, you may have noticed a slight change in format with this issue of PSB. For the past nine years, contributed (or solicited) articles have had prominent placement at the front of each issue with the intention of luring readers into perusing the issue. Whether or not this was a successful strategy is inconclusive, but it has not stimulated increased article contributions. One reason must be that articles generally are not reviewed (on occasion they have been) and for many of us only peer-reviewed papers "count" as scholarship. We are considering some changes in *PSB* to include peer-reviewed Reports and Reviews, which will follow the informational News from the Society. Let us know what you think.

– the Editor.

News from the Society

Botany & Mycology 2009

Dear Members of the Botanical Community,
Plans for Botany & Mycology 2009 are well under way!

Botany & Mycology 2009 is the one conference you can't afford to miss this summer!

The days are growing longer, and although most of us are in a deep freeze, we are all starting to think about this coming summer and our annual conference. We are very excited about the location, the exploration and the scientific research that will be shared with this global community of scientists and scholars. If you have never attended our annual joint conference, this is the year!

This year we will be meeting with a new partner, the Mycological Society of America, as well as our traditional partners: the American Fern Society, the American Bryological and Lichenological Society, the America Society of Plant Taxonomists, and the Botanical Society of America.

The conference will include some events that have taken place at past meetings such as field trips, workshops, discussion sessions, social events and plenty of time for networking and catching up with old friends—all in the beautiful setting of the Wasatch Mountains at the Snowbird Conference Center in Snowbird, Utah.

In light of the current global economic situation, we have been working hard to make this conference affordable to all and especially to all students. We've kept registration rates as low as possible for 2009; in fact, we have rolled back the early registration rates to the Botany 2006 level! We have contracted great room rates for the conference, including condo units with full kitchens that can

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sleep up to six, and we have negotiated special dining options each day for all attendees to help keep costs of attending the conference affordable. At Snowbird there are seven different restaurants ranging from "get-it-quick pizza" to full-service fine dining options opening early and staying open late! There is also a General Store on site if you wish to eat in your room…or stop and stock up before you come up the Mountain. There will be several ticketed-event lunches as well as kiosks to grab a quick sandwich and sit out in the sunshine between scientific presentations.

Again this year there is special pricing for students to attend society banquets and other social events—so spread the word and bring your students with you! Students can also invite their non-member friends to register and come along.

Plan now to arrive early to take advantage of the variety of field trips being offered. Each offering is designed to show off the botany of the Salt Lake City area. Highlights include a trip to the Stanley Welsh Herbarium at Brigham Young University; a visit to the Milford Flat Restoration Project, an area being restored after a devastating wildfire; or join with our mycological friends on their annual foray!

Sunday's schedule will include FREE workshops and more field trips. Be sure to attend the Plenary Lecture with noted ethnobotanist Nancy Turner on Sunday evening. Following the lecture, come to the All Society Mixer where you can connect with your friends and colleagues as the conference officially begins.

Monday morning kicks off a week of Scientific Presentations including a full line-up of compelling symposia. Times and information can be found on the conference website: www.2009.botanyconference.org

Something new this year—poster presentations will take place in the Exhibit Hall both Monday and Tuesday late afternoons. This time has been selected to be sure attendees and presenters have enough time to view all the posters and not feel rushed! Posters, Mixers and Exhibits…it doesn't get any better!

Monday evening attendees can choose from the Paleobotanical Section Banquet or a Bar-B-Que on the Mountain. Everyone is invited to catch up with friends and colleagues and dance to the music of *Hearts Gone Wild!* (Again, we offer special pricing for students)

On Tuesday evening, plan to attend the ASPT Banquet, and on Wednesday, come to the All Society Banquet & Auction for dinner, award presentations and joint auction fun supporting programs of the MSA and ASPT.

With its relevant and groundbreaking scientific presentations, the incredible field trip opportunities, all the networking and mingling, Botany & Mycology 2009 is the one conference you can't afford to miss this summer!

Submit your abstracts now.

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Conference Registration and Housing are also open and ready for you! All available at www.2009.botanyconference.org.

Abstract Submissions:
www.2009.botanyconference.org/engine/login.php?next=abstract

Registration: -https://payments.botany.org/engine/login.php?next=registration

Housing Information:
www.2009.botanyconference.org/Lodging/index.php

We look forward to seeing you at Snowbird!

The Conference Team
Botanical Society of America
www.2009.botanyconference.org

P.S. Remember the beautiful mountain setting for this meeting and bring your family. Camp Snowbird will be open for your kids to enjoy. For the adventurous—daily wildflower hikes up the Mountain, the great climbing wall, the historical city of Salt Lake—lots to do and see!

Membership News.

January 1st kicked off a new year for Botanical Society of America and for *American Journal of Botany* subscriptions. There has been so much to get excited about this year at the BSA. The Society is growing and evolving with record membership achieved in 2008. We continue to remain THE home for ALL plant scientists, educators, students and plant enthusiasts. New to the Society is **AJB** Advance Access, which allows us to post your finalized articles in advance of print, providing everyone with faster access to the latest research and potentially higher citation rates. We are also very excited about the enthusiastic response to the *American Journal of Botany's* special Darwin issue, published in January 2009. Individual issues of the special issue are available for purchase at the special member price of $50. Please visit https://payments.botany.org/bsamisc/specialajb.php or contact the BSA office in order to purchase an issue. If you have not done so, please renew your membership in the Society today. Please go to https://payments.botany.org/joinbsa/. If you have any questions regarding your memberhip, please contact me at hcacanindin@botany.org.

This year, we again offer you the opportunity to provide $10 student gift memberships to the current crop of potential botanists gracing your classes, offices and labs through the online membership renewal system. We understand that the best way to grow support for botany and the BSA is to replicate the experience most of us shared early in our careers, when a professor or mentor took the time to ensure we joined the right organizations. With just an extra click, you can add to our ranks and introduce an aspiring plant scientist to this supportive botanical community.

We also invite you to take advantage of the opportunity of giving gift associate memberships to colleagues from developing countries at the special rate of $10. Last year we extended this "botanical hand of friendship" to a number of botanists who may not have had the opportunity to join the BSA. Use this web address to renew your membership and/or give a gift securely online in just a few minutes. https://payments.botany.org/joinbsa/

During the renewal process, you can volunteer to get involved in BSA Committee work as well as sign up to be a mentor in the BSA-led PlantingScience program. We value your contributions in time and effort to support Botany!

The BSA is such a wonderful community of scholars and scientists serving the science of Botany. Please consider renewing your membership today and spread the word…….BSA is THE home for ALL plant scientists! Thank you for your dedication and loyalty to the Botanical Society of America, and for the work you do every day. You really are part of the "greening" of this planet.

Remember, think sunshine and mountains and we'll see you in Snowbird at Botany & Mycology 2009!

Vision and Change in Biology Undergraduate Education: A View for the 21ST Century

Scientific Societies are being asked to step forward as leaders, and to participate in providing meaningful change in undergraduate education by: setting new standards for how we view the scholarship of teaching and learning in all of our activities; holding conferences on education; serve as stewards of our disciplines by acting as repositories of content knowledge, developers and stewards of educational materials, and providers of professional development activities for our disciplines; provide membership for educators; and collaborate with other societies.

In November of 2008, BSA representatives--BSA Past-president Dr. Christopher Haufler, BSA Student Representative James Cohen, and I (Executive Director, Bill Dahl) - attended a meeting of biological societies organized and hosted by the American Association for the Advancement of Science (AAAS) and the Howard Hughes Medical Institute (HHMI) with support from the National Science Foundation (NSF) Division of Undergraduate Education (DUE) and the Directorate of Biological Sciences (BIO). The meeting was the second in a series to explore how professional Scientific Societies might be engaged as leaders in supporting needed changes

in undergraduate education as it pertains to biology. The meeting organizers hope that this series of meetings will give the biological community and the community at large some insight into the changes that need to take place, how best to effect those changes, and how best to support evolving efforts for change.

The premise of the organizers was that the disciplines of biology and of science education have undergone a revolution. The major focus of the biological sciences – understanding life – remains unchanged; but, breakthrough discoveries of the second half of the 20th century have changed the basic nature of the questions asked, while new and emerging technologies are changing the ways key questions are addressed.

It was noted that in undergraduate science, technology, engineering and math (STEM) education, new approaches and new technologies are emerging based on evolving theories of learning. New developments in the nature of institutions of higher education have changed the manner in which people pursue higher education and there is a growing appreciation of the need to broaden participation within the sciences by advancing the education of all students including those from underrepresented groups and those who will enter careers other than those related to science. There is also a growing realization of the necessity to fully inform and educate all students about the wealth of professions available to those who study the sciences and about the way science is done.

BIO2010 was quoted to rouse interest in the need for reform of undergraduate biological education raising many important issues and giving suggested approaches, mostly applied to those students preparing for a career in biomedical research. It could serve as a base for a broader approach that would encompass all the sub-disciplines within the biological sciences.

Snapshot Presentation from Societies - Sharing Our Experience

Each of the societies present at the meeting was asked to share their experiences contributing to undergraduate education. I presented what the BSA group felt were the most relevant activities in conjunction with the discussion. They included:

Membership - getting young scientists involved in the Society and encouraging participation/ networking at all levels with a focus on getting people to join the BSA as a first step. It is important to note that the BSA acknowledge student members as an investment in the future, not an income stream.

- New student members - BSA opened the opportunity for gift memberships from professors/ peers ($10) as well as reduced the cost of new student memberships ($15 early in the year) in 2007.

- Renewing student members rates were reduced to $15 to coincide with the new student & gift membership program as noted above.

- Dramatically reduced the student costs for all society related activities, including conference registrations.

- Inclusion of teachers as a membership group, including K-12 and Community College involvement.

Resources Student Research Profiles - sharing the young scientist experience - www.botany.org/students_corner/profiles/

- Undergraduate Research Awards - rewarding those who take the time to share their experience (new this year).

- Materials/activities for teachers/students - what we provide at present teaching awards, slides/ images, scientist profiles, teaching aids, job fair, web networking, educational forum.

Outreach

- PlantingScience, a collaborative approach - science is as cool as we make it! www.plantingscience.org/

Other groups presenting included: American Association for the Advancement of Science, American Institute for Biological Sciences, American Physiological Society, American Society for Biochemistry & Molecular Biology, American Society for Cell Biology, American Society for Microbiology, American Society for Plant Biologists, Biophysical Society, Botanical Society of America, Ecological Society of America, Genetics Society of America, NAS/NRC, Society for Integrative and Comparative Biology, Society for Neuroscience, Society for the Study of Evolution, and the National Association of Biology Teachers.

Actions & Commitments Moving Forward

Recognizing the wealth of expertise and diversity of experience represented amongst the attendees, organizers structured the meeting into discussions orchestrated to generate ideas designed to shape individual society and the collective biological community agendas for action. The core questions

being:
(1) What are biological sciences professional societies currently doing to foster change in undergraduate biological sciences education?

(2) What else can biological sciences professional societies do to foster change in undergraduate biological sciences education?

Meeting attendees were broken into discussion groups and asked to review the program in conjunction with a series of background questions and in light of the various activities other participants had shared with the group. The first group meeting was designed to provide exposure to as broad a grouping as possible, mixing up attendees in a manner that separated the individual society representatives. The second was by sphere of responsibility in society - Presidents, Board Members, Executive Directors and Senior Staff and Colleagues. The charge was to explore possible "best ideas" for collective action by the community of biological sciences societies. The "best ideas" were required to be a specific strategy that could be implemented. Strategies were to involve all units of professional societies, including governance, programs, meetings, communications, and journals and publications.We then regrouped in our specific organizations to develop plans specific to our Society to share with the meeting.

As you may be aware, the BSA is undergoing a number of activities that coincide well with the call for support - specifically our bylaws review (which passed) and the BSA strategic planning process (still underway). Given education is key component in our mission and appears to be one of the planks in our strategic plan, we were pleased to take part in the discussions. Chris Haufler presented the BSA action plan to the group. He articulated our need to complete our internal strategic planning process before providing an in-depth response. With this complete, he ensured the meeting the BSA would move forward in requesting BSA members to engage in a solution, with our initial response being to:

Identify the core knowledge and concepts in Botany/Plant Biology

-Networking to establish a common vision and understanding of the core knowledge and concepts one needs to have when entering and leaving an undergraduate biology program.

-Across sections within the BSA (topical disciplines)

-Across ALL Plant Societies

Compile the available resources required to meet the agreed core knowledge and concepts in Botany/Plant Biology and share these with the broader biology education and learning community

- Solicit & Network amongst BSA Sections and Members, asking for the sharing of our best resources covering the agreed core knowledge and concepts in Botany/Plant Biology

-Evaluate and review submitted resources (stamp of approval)

-Link with textbooks/learning materials

-Integrate with other biological/science societies

As your representatives, we were aware of the depth of the commitment and the reality that, as a Society, our true resources are you, the BSA members and the materials you have collected and designed over the years, be it through teaching, learning or research activities. With that in mind, central to our participation moving forward, our request to you is to engage in helping the Society to deliver on our stated objectives. Please consider this a pre-emptive "**Call to Action**", asking members to participate through providing the needed time and resources to complete the task. We will make more information available as we conclude the strategic planning process on the BSA web site at www.botany.org.

It is likely AAAS/NSF will call for a broader meeting of biological societies sometime in the coming year as they move to engage the broad spectrum of Scientific Societies in the challenge to upgrade the undergraduate biology as never before.

BSA Science Education News and Notes

BSA Science Education News and Notes is a quarterly update about the BSA's education efforts and the broader education scene. We invite you to submit news items or ideas for future features. Contact: Claire Hemingway, BSA Education Director, at chemingway@botany.org or Marshall Sundberg, PSB Editor, at psb@botany.org.

Call for Education Workshops at Botany & Mycology 2009 — submit by Feb. 15

Have you hit on an effective way of providing students in your classroom or lab section an authentic science experience? Do you have career development strategies you would like to share? Are you engaged

in an innovative outreach effort? Your colleagues would like to hear about new ideas for teaching, outreach, or training activities. What better place to share with them than Snowbird, Utah. Join us on Sunday, July 26. Workshops are typically hands-on sessions; they are free to participants and can be two-hour, half-day or full-day in length. Submit your workshop abstract online by February 15. http://www.2009.botanyconference.org/2009Calls/2009ls_Workshops.php

PlantingScience — BSA-led student research and science mentoring program

The winter break is a busy time for the PlantingScience project, as we review the past Fall session and prepare for the Spring session of online mentored inquiry projects.

Special thanks to Antonio Arroyo, Robyn Darbyshire, David Giblin, Tony Haigh and his son Andrew, and Melissa Islam for assistance preparing for the Spring Session by testing new website features. The Spring Session will run from Feb. 2 to Mar. 31. Check out some of the student team plant investigations and their conversations with online scientist mentors at www.plantingscience.org. You can search student projects in the Research Gallery.

Approximately 100 new mentors were welcomed to the program over the winter break. What a thrill to see such commitment from BSA members at various stages of their careers as well as from scientists representing diverse societies. We deeply appreciate the time you are volunteering to share your passion for plants and understanding of science with middle school and high school students.

The next call for new mentors and an announcement inviting graduate students to join the 2009-2010 Master Plant Science Team, a special set of mentors with a greater time commitment, will go out late spring/early summer.

Since the 2005 proof-of-concept forerunner to PlantingScience, the project has changed as well as grown. Originally, middle school, high school, and college students shared the same website platform and pool of scientist mentors. To encourage peer-to-peer mentoring, we restructured college participation to College Collaborations http://college.plantingscience.org/. A handful of 2-year and 4-year professors are dedicated to providing their students with online science collaboration experiences. Are you interested in joining them? Or organizing sister-school interactions?

As you see there are a wide variety of opportunities in addition to mentoring in PlantingScience, including authoring new inquiries and reviewing curricular modules. Please feel free to contact chemingway@botany.org if you are interested in these.

Summer Opportunities for High School Teachers — apply by Mar. 9

We invite high school teachers to apply for two residential NSF-funded Summer Institutes held at Texas A&M University. Brochures and applications are available online. Apply by March 9 for guaranteed consideration.

PlantingScience Summer Institute (June 8-16). Collaborate with plant scientists on plant genetics and pollination investigations. Explore strategies for supporting student inquiries in your classroom and online communication with scientist mentors. The Summer Institute is designed especially for high school teachers to integrate plant biology content with authentic science learning experiences that allow students to think and work like scientists. Participants have opportunities to work with Paul Williams, Larry Griffing, and Beverly Brown, who authored PlantingScience units. http://www.plantingscience.org/

Plant IT Careers, Cases and Collaborations Summer Institute (July 6-17). Plants and people, one of today's critical interdisciplinary areas, is the content focus of this workshop for high school teachers. Participants will explore investigative cases on ethnobotany and seed technology and learn ways to customize collaborative, active learning cases that are rich in data, tools, and real world applications, and practice new investigative case skills with students who participate in summer camps. http://www.myPlantIT.org/

Spotlight on BSA Member Contributions to Science Education

Announcing an innovative Research Coordination Network in the Undergraduate Biology Education Track to mobilize undergraduate faculty and reform biology courses: "Preparing to Prepare the 21st Century Biology Student: Using Scientific Societies as Change Agents for the Introductory Biology Experience."

Gordon Uno of The University of Oklahoma and the American Institute of Biological Sciences (AIBS), in collaboration with key national scientific and biological societies, will establish a coordinated network involving the full spectrum of biologists and undergraduate faculty to articulate a shared vision of biology education of the future, to outline a model of introductory biology experiences focusing on how best to prepare biology students to meet that future, and to coordinate a permanent network that connects individuals, projects, and societies actively

engaged in the reform of undergraduate biology education to increase capacity in the reform movement.

Over the next 5 years, the RCN-UBE will host 1) small face-to-face meetings to promote innovation in reform activities aimed at the Introductory Biology experience; 2) larger face-to-face meetings to coordinate disparate approaches in Introductory Biology and to increase the use of existing best practices throughout scientific societies; and 3) a communication network linking scientific societies and their members to promote widely both innovation and adaptation of best practices and research in biology education.

Science Education in the News

U.S. Science Scores Stagnant in International Study—Recently released results of the 2007 Trends in International Mathematics and Science Study (TIMSS) show no change in U.S. fourth and eighth graders average science scores since the 1995 study. Among the countries assessed, the US ranked 8th in average science scores for 4th graders, but dropped to 11th place among scores for 8th graders.
http://nces.ed.gov/timss/results07.asp

Slow but Steady Progress of Women on College Boards—The critical mass of women representation needed to make an impact is gaining ground in more institutions, with at least three women now serving on 90% of boards, according to a national survey conducted by the Cornell Higher Education Research Institute. Since the 1980s women have garnered more positions as trustees (up from 20% to 31%) and chairs (up from 10% to 18%) on college boards.
http://www.ilr.cornell.edu/cheri/surveys/2008surveyResults.html

Career Development Tips and Resources—Whether you are crafting your first job cover letter, considering choices between academia and industry, or learning to manage a lab, the new version of Science Careers' Career Basics Booklet Science/AAAS offers sound advice for early career scientists. Individual chapters or the entire booklet is available as free downloads.
http://sciencecareers.sciencemag.org/tools_tips/outreach/career_basics_2009

National Plant Genome Initiative Spreads Message to the Public—"New Horizons in Plant Sciences for Human Heath and the Environment" is an educational booklet for general audiences derived from the 2007 National Research Council report *Achievements of the National Plant Genome Initiative and New Horizons in Plant Biology.* The role of plant genomics in food crops, biofuels, environmental stewardship, and biomedical advances are showcased in an easily accessible, visually appealing booklet available as a free download.
http://dels.nas.edu/plant_genome/report.shtml

National Science Foundation Focuses Attention on Cyberlearning—The potential to transform STEM education through cyberlearning is immense, according to a recent report "Fostering Learning in the Networked World: The Cyberlearning Opportunity and Challenge." The Task Force responsible for reviewing the opportunities and challenges offered five broad recommendations to NSF, including promoting open educational resources and promoting cross-disciplinary communities of cyberlearning scientists and educators.
http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf

Education and Technology Raising Profile in Science—You might already be accustomed to looking for the monthly Education Forum piece published in *Science.* Beginning with a Special Section on Education and Technology, *Science* will increase its commitment to education coverage. Don't miss the Special Section in the 2 January 2009 issue.
http://www.sciencemag.org/content/vol323/issue5910/index.dtl

Editor's Choice

Crane, Lucy and Mark Winterbottom. 2008. Plants and photosynthesis: Peer assessment to help students learn. *Journal of Biological Education* 42(4): 150-156.
This study, geared to H.S. students, chose photosynthesis as a "conceptually challenging" topic to investigate the effectiveness of peer assessment at promoting a richer understanding of the material. Can peer assessment help students learn? The results were equivocal, but it was clear that students learned the material as well, if not better, than with traditional instruction. It was also clear that as a result of their experience with peer assessment, students felt more confident in their ability to be autonomous learners.

D'Avanzo, Charlene. 2008. Biology Concept Inventories: Overview, Status, and Next Steps. *BioScience* 58: 1079-1085.
Concept inventories, made famous more than a decade ago by the Force Concept Inventory in Physics, are tests developed to measure student understanding of particularly difficult topics. Biologists are finally getting there. This article

provides an introduction to what they are and references the few available or in preparation dealing with biological concepts.

Firooznia, Fardad. 2009. An Ode to PSII. *American Biology Teacher* 71: 27-30.
A scripted play to actively engage students in performing steps of the photochemical reactions of photosystem II, inspired by a photosynthesis play filmed at Cornell University.

Frisch, Jennifer Kreps and Gerald Sanders. 2008. Using stories in an introductory college biology course. *Journal of Biological Education* 42(4):164-169.
This article presents case studies of four college professors who effectively use different kinds of stories either to engage students at the beginning of class or to anchor difficult concepts covered in class.

Miller, Sarah, Christine Pfund, Christine Maidl Pribbenow, and **Jo Handelsman**. 2008. Scientific teaching in practice. *Science* 322:1329-1330.
The authors describe a graduate student training program and the University of Wisconsin-Madison, that teaches graduate students and post-docs how to practice scientific teaching. Scientific teaching creates a classroom that reflects the true nature of science, engages student-active learning, and promotes teaching as a scholarly endeavor. Less than half of a typical 50-minute class period employs traditional lecture (broken up into several 5-10 minute segments). Other techniques employed include: brainstorming, data interpretation, case study and discussion, think-pair-share, and minute paper sessions. Significant gains in skill or knowledge were demonstrated for all categories tested.

Smith, M.K., W.B. Wood, W.K. Adams, C. Wieman, J.K. Knight, N. Guild, and **T.T. Su**. 2009. Why peer discussion improves student performance on in-class concept questions. *Science* 323:122-124.
"When students answer an in-class conceptual question individually using clickers, discuss it with their neighbors, and then revote on the same question, the percentage of correct answers typically increases. This outcome could result from gains in understanding during discussion, or simply from peer influence of knowledgeable students on their neighbors." The authors designed their experiment to distinguish between these alternatives and found that peer discussion enhances student understanding even when no member of the group originally knew the answer.

Panijpan, Bhinyo, Pintip Ruenwongsa and **Namkang Sriwattanarothai**. 2008. Problems encountered in teaching/learning integrated photosynthesis: A case of ineffective pedagogical practice? *Bioscience Education e journal*. 12: December. www.bioscience.heacademy.ac.uk/journal/vol12/beej-12-1.pdf
The authors present a number of conceptual questions they used to evaluate understanding of photosynthesis by secondary students and teachers, college undergraduates and postgraduates in Thailand. The country is different, but the results are the same - - lecture and rote learning is not very effective.

Applications Solicited, Editor, *Plant Science Bulletin*, 2010 – 2014

Are you looking for a meaningful way to serve the Botanical Society of America? Are you interested in desktop publishing? Would you like to correspond with botanical colleagues in many disciplines about books, articles, and matters of interest to the BSA? The BSA is soliciting applications for the 5-year position as Editor of the *Plant Science Bulletin.*
If your answer to ANY of these questions is yes, please communicate your interest to Dr. Pat Herendeen (Chair, BSA Publication Committee). PATRICK HERENDEEN, Chicago Botanic Garden, 1000 Lake Cook Road, Glencoe, 60022 **Phone:** 202/994-5828, 847-835-6956. E-mail pherendeen@chicagobotanic.org

Applications are welcome any time and no later than July 1, 2009. The BSA Publication Committee will begin reviewing interested candidates during summer of 2009.

For a description of the *Plant Science Bulletin* see: http://www.botany.org/plantsciencebulletin/

BOTANICAL SOCIETY OF AMERICA

In Memoriam:

Dr. Steven Clemants 1954-2008

A passion for plants came early for Steve Clemants, who went on to become one of the leading botanists of the day. Born in Minnesota and raised in the towns of Edina and Minnetonka, Minnesota, and Chicago and Normal, Illinois, Steve developed a love of nature as a young boy. He had an affection for the flowers that grew in his family's garden, particularly tulips, but he especially admired wildflowers. Throughout his childhood, his mother, Doris, nurtured his interest, teaching him about local wildflowers and where they grew.

After completing high school in Minnetonka, Steve attended the University of Minnesota. He initially majored in computer science, but he missed the out-of-doors and his nature studies. This led him to change his undergraduate major to botany, his childhood love. His dual interests of botany and computer science served Steve very well later in his career; he was instrumental in developing a number of important databases for plant location records. Steve graduated from the University of Minnesota in 1976 but remained there to pursue a master's degree in botany with a minor in horticulture, which he obtained in 1979.

Steve's botanical pursuits took him to the City University of New York (CUNY) where, working at the New York Botanical Garden with curator James Luteyn, he pursued a doctorate in botany. His graduate work focused on New World members of the blueberry family in the genus Bejaria, and this allowed him to conduct field trips in the tropics. He obtained his doctorate in botany from CUNY in 1984. It was during his graduate studies that his friend and fellow graduate student Brian Boom introduced Steve to Grace Markman, then a volunteer tour guide at the New York Botanical Garden. They later married.

After a brief teaching appointment at Bard College in Annandale-on-Hudson, Steve accepted a position as a botanist with the New York Natural Heritage Program, and he and Grace moved to the Albany area in 1985. Utilizing his skills in botany and computer science, Steve developed a database of rare plant occurrences in New York State. He also conducted extensive fieldwork in search of rare plants. During this time his interests in plant research expanded beyond the blueberry family to other families, including the rush family and goosefoot family.

In 1989, Steve accepted a position as a research taxonomist at Brooklyn Botanic Garden, where he later served as director of Science; vice president of Science, Publications, and Library; and senior research scientist. As Steve continued his botanical research, he developed additional interests in urban ecology and conservation. Shortly after arriving at the Garden, he founded the New York Metropolitan Flora program, which has become an international model for studying plants in urban environments. Data from this pioneering project are now yielding important information on how human-caused phenomena, such as global warming and development, are affecting the region's plants.

During his time at BBG, Steve published dozens of research papers. In 2006 he coauthored Wildflowers in the Field and Forest: A Field Guide to the Northeastern United States (Oxford University Press) with New York Botanic Garden researcher and photographer Carol Gracie. This book has become one of most popular field guides for the Northeast. It is also used as a college textbook for field botany, enabling people to learn more about the wild plants Steve had admired since he was a boy. Steve also furthered botanical education by serving on the faculty at Rutgers University and the City University of New York.

Steve recognized the need to protect the plants he loved so much and served on numerous committees and boards of organizations active in local, national,

and international conservation efforts. During his career he was president of the Nature Network; chair of the Invasive Plant Council of New York State; president of the board of Botanic Gardens Conservation International's U.S. office; historian of the Torrey Botanical Society; chairman of the Long Island Botanical Society; and member of the Woodland Advisory Board of Prospect Park. He was also codirector of the Center for Urban Restoration Ecology (CURE), a collaboration between Brooklyn Botanic Garden and Rutgers University, the first scientific initiative in the U.S. established to study and restore human-dominated lands. He served as editor-in-chief of Urban Habitats, a peer-reviewed scientific e-journal on the biology of urban areas around the world, which was launched in 2003.

In 2008, Dr. Clemants was instrumental in developing an agreement between the NYC Parks Department and Brooklyn Botanic Garden committing the resources of the two institutions to the conservation of plants native to New York City, the first comprehensive conservation initiative targeting the City's native plants. "Steve was a colleague and the leader of our mutual efforts to discover, preserve, and publicize local botanical biodiversity," said Adrian Benepe, NYC Parks Commissioner. "He will be deeply missed by all who care about natural New York and the great beauty of its parks and wild spaces."

Steve was a remarkably kind, giving, and patient man, who always found time to assist students and other members of the public who came to the Garden with questions and requests. Shortly before Steve's passing, his extraordinary kindness was displayed when he learned that a Ukrainian colleague and his wife -- who had never before been to New York -- would briefly be in town during a flight layover. Steve picked them up, took them on a whirlwind tour of Brooklyn, and returned them to the airport in time for their flight. Gerry Moore, director of Science at Brooklyn Botanic Garden, said, "Steve's extensive knowledge of botany and willingness to help all who came to him with questions was a combination that served the Garden and the public well. His example inspires us to continue our research in the plant sciences, while always finding time to share our knowledge and our curiosity with individuals, from kindergartners to international researchers."

As news of his passing has spread, BBG science staff received messages from around the world from colleagues who admired Steve and his work. Peter H. Raven, president of the Missouri Botanical Garden, said, "Steve Clemants was a bright light in the field of botany, a lovely man who was utterly fascinated with plants, loved people, and made a marvelous contribution by combining his passions into every facet of his life. No one has done a better job in involving the public in the joy of learning about plants, finding them, thrilling in new discoveries, and understanding their traits. Steve's contributions to science were deep and numerous, and his contributions to development of the Brooklyn Botanic Garden over the years, through good times and difficult ones, were of fundamental importance in keeping that fine institution on an even keel.

His bright, friendly, pleasant personality will be missed as much as his outstanding professional skills, not only in research and in administration but in education and in his ability to uplift the spirit of everyone who knew him."

The Dr. Steven Clemants Wildflower Fund has been established to honor our late colleague and friend. Steve's widow, Grace Markman, is working with the Greenbelt Native Plant Center to plan a living memorial that will foster the planting of native wildflower species in New York City parks.

Donations in his memory should be made out to "City Parks Foundation, Dr. Steven Clemants Wildflower Fund," and mailed to City Parks Foundation, c/o Greenbelt Native Plant Center, 3808 Victory Blvd., Staten Island, NY 10314.

Personalia

Warren Abrahamson Selected Fellow of the American Association for the Advancement of Science

Warren Abrahamson, David Burpee Professor of Biology at Bucknell University, has spent 36 years studying the interaction of goldenrods and gall flies and received more than $2 million from the National Science Foundation and other sources for his laboratory at Bucknell. He is recognized for "distinguished contributions to the field of biology, particularly for discoveries about evolutionary ecology and plant-insect interactions."

Abrahamson has published more than 142 papers; nearly a third of the papers are co-authored by post-doctoral fellows, masters-level and undergraduate students, giving them exposure to "science in the real world," he said. "To me, this is really neat, because I think it crystallizes the significance of having endowed chairs and of supporting young faculty. We have successfully competed with higher level research institutions for grants. The fact that this has been done with students is significant."

"We are using a multitude of approaches, including genetics, behavior and ecology, to study how the interaction works and how the plant defends itself, how insects find plants and how natural enemies have evolved in respect to the gall fly," he said. "All of that helps us to understand evolutionary ecology of the interaction. We're looking at ecological interactions and how they evolve, how specialization occurs, how biodiversity is created on this earth. We mammals are a tiny part of the diversity, but insects and plants represent the vast majority of the biodiversity described on earth." Abrahamson and his collaborators discovered that some goldenrod plants develop a higher tolerance to their predators while others produce terpenes, an odor that is toxic to insects that feed on them.

Abrahamson is co-author of the book, *Evolutionary Ecology Across Three Tropic Levels: Goldenrods, Gallmakers & Natural Enemies*, (Princeton University Press, 1997) and edited, *Plant-animal Interactions*, (Macmillan, 1987).

Randy Moore Wins National Evolution Education Award

Randy Moore, a professor in the University of Minnesota's College of Biological Sciences, has been named winner of the National Association of Biology Teachers Evolution Education Award. Moore will receive the award, given to one K-16 biology teacher annually, at the association's annual meeting on Oct. 17 in Memphis, Tenn.

For nearly 30 years, Moore has taught biology based on evolution, incorporating it as the unifying theme of biology as well as his classes. "There is no controversy among biologists over whether evolution occurs, nor are there science-based alternative theories," Moore said. "Teaching evolution as a unifying theme is the best way to show students what biology is all about and to help them understand our world. It's one of the most important, useful and liberating ideas in science."

Moore has also worked outside the classroom to improve public understanding of science by advising states on science education guidelines, conducting teacher workshops and media interviews and building dialogue between scientists and religious groups.

"I was raised to understand and respect religious traditions, but I strongly oppose the teaching of creationism in science classes," Moore said.

Moore has authored four books on evolution, most recently "More Than Darwin: An Encyclopedia of the People and Places of the Evolution-Creationism Controversy," which he wrote with his colleague, Mark Decker.

As a professor in the biology program, which is run by the College of Biological Sciences, Moore teaches introductory biology, a popular class entitled "The Evolution-Creationism Controversy," and a learning abroad course called ""Biology of the Galapagos," which takes students on a research-based trip to see "evolution's workshop."

To view a multimedia presentation on "Biology of the Galapagos," go to http://www.cbs.umn.edu/main/multimedia/galapagos/

The education award, which is given for innovation in classroom teaching and community education efforts to promote the understanding of evolution, is co-sponsored by the American Institute for Biological Sciences and the Biological Sciences Curriculum Study.

Moore, who has earned numerous other teaching awards from local and national organizations, holds a doctorate in biology from the University of California, Los Angeles. He is available for interviews about evolution in the classroom and the evolution-creationism controversy.

Dr. Gregory Mueller named Vice President, Science and Academic Programs at the Chicago Botanical Garden

Dr. Mueller joined the Garden in January 2009. As Vice President, Science and Academic Programs, Dr. Mueller will lead the development of academic programs of the Chicago Botanic Garden, including plant science conservation and research; graduate student training programs; the Lenhardt Library and the Joseph Regenstein, Jr. School of the Botanic Garden. Dr. Mueller will play a critical role in guiding the expansion of the Garden plant science and

conservation efforts, as the Garden grows in its role as an international center for research in rare and endangered plant biology, ecological restoration, horticultural ecology and soil science.

Dr. Mueller has served as the President of the Mycological Society of America and as International Coordinator for Fungal Programs at the Costa Rican National Biodiversity Institute. He is a member of the International Union for the Conservation of Nature, Species Survival Commission, Fungal Specialist Group; and the Science Advisory Council for the Illinois Chapter of the Nature Conservancy. He also serves as Associate Chair and Lecturer, Committee on Evolutionary Biology at the University of Chicago; and as Adjunct Professor, Department of Biological Sciences at the University of Illinois at Chicago.

Dr. Mueller's research focuses on the biology and ecology of fungi, especially mushrooms, providing vital information for the management and conservation of temperate and tropical forests, particularly in the Chicago region, Costa Rica, Guatemala, and China. He has authored six books and nearly 100 journal articles.

Dr. Mueller worked for more than 23 years at the Field Museum, most recently as the Curator of Mycology in the Department of Botany. He was Chair of the Field Museum's Department of Botany from 1996 to 2005, during which time the Department renovated its collections facilities, added lab and research space, and significantly increased the size of its curatorial and professional staff.

"My work will focus on expanding an already outstanding science program that will continue to address the critical needs of the 21st century. I would like to build capacity, make connections with other organizations and botanic gardens engaged in similar work and enhance people's ability to study the world around them," Mueller said.

"Greg's many years of work with the Field Museum, the University of Illinois at Chicago, the University of Chicago and Chicago Wilderness offers the Chicago Botanic Garden a unique opportunity to combine the complementary strengths of each organization to solve the complex issues facing the plant life of the Chicago area, the nation, and the world. Bringing these organizations together in a unified effort to enhance knowledge and understanding of plant life holds the promise of making Chicago an international center of plant conservation biology and education," said Sophia Siskel, president and CEO of the Chicago Botanic Garden. Mueller holds B. A. and M. S. degrees in Botany from Southern Illinois University and a Ph.D. in Botany from the University of Tennessee.

Peter Raven Receives Lifetime Achievement Award from the National Council for Science and the Environment

Peter Raven, president of the Missouri Botanical Garden, has received the National Council for Science and the Environment (NCSE) Lifetime Achievement Award. The award, "For a Distinguished Career as an Innovative Leader Advancing Scientific and Public Understanding and Conservation of Biological Diversity," was presented at a special ceremony in Washington D.C. on Dec. 8, during the 9th National Conference on Science, Policy and the Environment: Biodiversity in a Rapidly Changing World.

Peter Raven is one of the world's leading botanists and advocates of conservation, biodiversity, and a sustainable environment. For three decades, he has headed the Missouri Botanical Garden, an institution he nurtured into a world-class center for botanical research and education, and horticultural display. Described by Time magazine as a "Hero for the Planet," Raven champions research around the world to preserve endangered plants.

Raven is the recipient of numerous prizes and awards, including the prestigious International Prize for Biology from the government of Japan and the U.S. National Medal of Science. He has held Guggenheim and John D. and Catherine T. MacArthur Foundation fellowships. Raven was a member of President Bill Clinton's Committee of Advisors on Science and Technology. He also served for 12 years as the home secretary of the National Academy of Science and is a member of the academies of science in Argentina, Brazil, China, Denmark, India, Italy, Mexico, Russia, Sweden, the U.K., and several other countries.

"Peter Raven has demonstrated how to be both a world-class scientist and a world-class conservationist," noted NCSE Senior Scientist David Blockstein. "His career has combined scientific research on plant evolution and diversity, leadership on multi-national collaborative scientific and conservation endeavors, education and outreach at the beautiful Missouri Botanical Garden, and passionate advocacy for humanity to care for our planet and all its inhabitants."

Raven received the distinguished award alongside fellow biodiversity pioneers George Rabb and Edward O. Wilson.

Bringing Modern Roots to a Traditional Collection

After 10 years in New York City, Ken Cameron was Ready for a Change.

As the director of the primary molecular research lab at the New York Botanical Garden, Cameron had been working at a world-renowned institution with a first-rate team of botanists and had access to some of the finest resources available. But something was missing.

Ken Cameron, director of the Wisconsin State Herbarium and associate professor of botany, searches through the catalogued plant specimens inside Birge Hall.
Photo: Bryce Richter

"I had one of the greatest jobs in my field … But in the back of my mind I always felt a little unfulfilled, because I like to teach, and I like to interact with students, and I like the academic environment of a university," he says.

"There were maybe three or four places that if they ever came knocking or if a position opened up I might consider it. And the University of Wisconsin in Madison was one of those places."

Cameron joined the faculty earlier this year as an associate professor of botany and director of the Wisconsin State Herbarium. He cites the botany department — one of a relatively few remaining university botany departments, since most have folded into larger biology departments — as a strong draw, along with the mix of teaching, research and administrative duties offered by his joint appointment.

He brought many of his research interests with him, including a specialization in the study and classification of Vanilla and related orchids. He finds this appealing because of their unusual mix of complex and primitive characteristics. While his roots lie in using genetic techniques to decipher plants' evolutionary relationships, he also has extensive experience working in the field and a deep appreciation of the importance of traditional natural history collections like the herbarium.

A herbarium is a collection of preserved and catalogued plant specimens, usually pressed and dried, used for research and teaching. "The main purpose is to document plant variation and diversity," Cameron says. "People often are surprised to find that we don't just collect one of everything, but in many cases we might have dozens or up to 100 specimens of the same species. The main reason for that is obvious if you considered the human species as an example. You couldn't define Homo sapiens by one human, you'd have to see the whole range of variation. We do the same with plants — and you'd be surprised how variable [they are]."

UW–Madison's collection is one of the largest at any public university. Established in 1849, shortly after the university was founded, the Wisconsin State Herbarium contains more than one million specimens of everything from fungi and mosses to grasses and flowering plants — each carefully labeled, mounted in a paper folder, and filed in one of the hundreds of cabinets that fill the herbarium's home in Birge Hall. The herbarium also has an extensive collection of maps, field notes and botanical literature.

Herbaria hearken back to a time when scientific study emphasized natural history collections, which are now largely overshadowed by modern laboratory-based techniques like genetics and molecular biology. But Cameron stresses the importance of combining the modern with the traditional to answer basic questions about plant diversity, relationships and evolution.

"There is a notion that a herbarium is kind of an old-fashioned, dusty-museum kind of a place that maybe doesnt have relevance in this new, modern, molecular age. But I would strongly say that is a false impression," he says. "The old techniques and tools are just as relevant as the new."

The historical context offered by the herbarium is also helping studies of contemporary issues such as climate change and the spread of invasive species. "What we've done, without thinking about it, is to establish a historical record of which plants were growing where, when they were flowering, and what the land features were like," Cameron says. "For example, herbarium specimens have been used in the last few years to document climate change. Plants are usually collected when they're in flower, and by plotting the flowering dates of

certain species, especially spring-blooming plants, researchers have been able to show that a lot of our spring wildflowers are blooming progressively earlier and earlier."

As the herbarium's uses grow, he is also hoping to expand its audience on campus, throughout the state and even worldwide, by moving many of its resources into a digital domain. As of this summer, the Wisconsin Botanical Information System (WBIS), an online repository of information about the state's plants, fungi, algae and lichen, now contains data on the herbarium's entire collection of Wisconsin vascular plants — more than a quarter-million records — plus an additional 87,000 specimens from other herbaria in the state.

With the vascular plant database virtually complete, Cameron and the other herbarium staff are now developing a similar database of their impressive lichen collection. The Wisconsin State Herbarium is also part of a large, multi-institutional project to scan and digitize many of the world's most valuable plant samples, those known as "type specimens" — the individual physical specimens chosen by scientists to represent their species. Wisconsin's type images will be combined with those from other institutions to create a standardized online library. "When I got here, there was already a foot into the 21st century with these databases. My hope is that my legacy will be to expand that online presence and our public presence," Cameron says. "We're this gem of an incredible resource tucked away in Birge Hall that very few people in the state realize exists."

by Jill Sakai

Courses/Workshops

National Tropical Botanical Garden Fellowship for College Biology Professors

Program Operation: June 1-12, 2009

Deadline to Apply: March 13, 2009

Notification of Acceptance: March 20, 2009

COURSE DESCRIPTION

The National Tropical Botanical Garden (NTBG) will conduct another exciting Fellowship for College Professors of Introductory Biology at The Kampong, Coconut Grove, Florida.

The goal of the Fellowship is to improve the quality of teaching in introductory biology classes at the undergraduate level. Facilitated by Professor P. Barry Tomlinson of Harvard University and Dr. Paul Alan Cox, CEO/Director of the Institute for Ethnomedicine, the course is designed to show instructors how to use examples from tropical plants in discussing issues of form and function, evolution, and conservation. Fellows will develop teaching modules to be shared and implemented in the introductory biology classroom. Basically, we are looking for the very best biology faculty, those who can fire the imagination of major and non-major biology students. Although botanists will be considered, we also welcome applications from faculty who lack previous botanical experiences, as well as those who have not previously worked in the tropics. The Fellowship will be limited to 12 Professors.

Applications must include:

• Two letters of recommendation.

• Complete curriculum vitae.

• Copy of the most recent teacher evaluation.

• A non-refundable $40 USD application fee in the form of a check or money order made payable to the National Tropical Botanical Garden.

The Fellowship will cover the most economical roundtrip airfare to The Kampong, Florida, accommodation and meals, tuition and fees, texts, equipment, and ground transportation.

Requests regarding the Fellowship for College Biology Professors must be directed to:

Director of Education
National Tropical Botanical Garden
3530 Papalina Road
Kalaheo, HI 96741 USA

Tel: (808) 332-7324, ext. 225 or 226
Fax: (808) 332-9765
Email: education@ntbg.org
Website: www.ntbg.org

The mission of the National Tropical Botanical Garden is to enrich life through discovery, scientific research, conservation, and education by perpetuating the survival of plants, ecosystems, and cultural knowledge of tropical regions.

Symposia, Conferences, Meetings

13th Natural History Conference Celebrating 25 years of Annual Conferences at the Gerace Research Center, Bahamas

When: June 18-22, 2009

Where: Gerace Research Centre, located on San Salvador Island, one of the outermost of a chain of some 700 islands that comprise The Bahamas

Description: Since 1984, scientists utilizing the Gerace Research Centre have taken part in biennial meetings to promote a better understanding of the investigations being conducted on San Salvador, the Bahamas, and the wider Western Atlantic. The material presented at these meetings covers a broad range of topics, including marine conservation, archaeology, invasive species, and plant-insect interaction.

Keynote Speaker: Fiorenza Micheli, Hopkins Marine Station, Stanford University

Keynote Title: TBA

Co-Chairs: Eric Cole, Biology Department, St. Olaf College; and Jane Baxter, Department of Anthropology, DePaul University

Organizer: Thomas Rothfus, Gerace Research Centre

Estimated Cost:
Registration, including Proceedings Volume $110.00

Airfare: Ft. Lauderdale-San Salvador $510.00

Room and Board at the GRC $296.00

Total $916.00

Student Room and Board $240.00

Deadlines: The deadline for Registration is March 31, 2009. The deadline for Abstract submission is April 16, 2009.

ICPHB 2009
International Conference on Polyploidy, Hybridization and Biodiversity

May 17 – 20, 2009 – Palais du Grand Large
Saint Malo – FRANCE

The International Conference on Polyploidy, Hybridization and Biodiversity aims at promoting knowledge exchanges and discussions on the latest developments concerning these major drivers of genome shaping and speciation. A wide range of topics will be covered such as the consequences of polyploidy on biodiversity, hybrid and polyploid speciation, meiosis and fertility in polyploid species, genome evolution and structure, transposable elements and DNA methylation, epigenetics and gene regulation, heterosis, phenotypic variation ... The conference will focus sessions on all these areas and therefore illuminate mechanistic and evolutionary insights into many fundamental phenomena in biology. This undertanding is critical for management and conservation of Biodiversity as well as for breeding programs as most important crop species are relatively recent polyploids.

Deadlines
• February 28, 2009 : abstract submission deadline.
• March 10, 2009 : registration fees are cheaper before this date.
• April 10, 2009 : refund for cancellation deadline

Preliminary program
The following scientific sessions are planned:

• S1 - Polyploidy and hybridisation as a source for genetic and phenotypic novelties
• S2 - Long-term polyploid evolution: Comparative genomics, gene retention-loss, diploidization
• S3 - Polyploidy: Effects on genome organization and structure
• S4 - Mechanisms for gene expression in plant polyploids (transcriptome, proteome)
• S5 - Hybridization, polypoidy and epigenetics
• S6 - Meiosis, reproduction in polyploids
• S7 - Heterosis, gene dosage
• S8 - Reticulate evolution, history of Polyploids, phylogeny
• S9 - Ecological consequences of hybridisation and polyploidy, invasion, diversification

For more information see: http://www.icphb2009.univ-rennes1.fr/index.php

Positions Available

Director, Sternberg Museum of Natural History

STERNBERG MUSEUM OF NATURAL HISTORY:
The Sternberg Museum of Natural History occupies a completely renovated (completed in 1999), unique building adjacent to Interstate-70 Highway in Hays, Kansas. Its 101,000 square feet of floor space accommodates both public areas and collection management space. The collection space houses extensive research collections representing the disciplines of mammalogy, ornithology, herpetology, ichthyology, entomology, botany, vertebrate paleontology, and paleobotany. The total number of specimens in these collections is in excess of 3 million, and the Museum thus serves as a major research resource for the academic departments of Biological Sciences and Geosciences. Public exhibits of the Museum are internationally known and focus on animals of the Cretaceous time period. These are supplemented with a program of temporary exhibitions, both leased and prepared in-house, relating to a broad spectrum of natural history topics. Educational programming for adults and especially for children is designed to instill a fascination for plants and animals in their environment. The new Kansas Wetlands Education Center, located 70 miles away at the largest wetland area in the central United States, is a branch of the Sternberg Museum of Natural History that functions to educate the public about the importance, history, plant and animal inhabitants, and conservation of wetlands.

RESPONSIBILITIES OF THE DIRECTOR:
The Director of the Sternberg Museum of Natural History reports to the University's Vice President for Administration and Finance, who reports directly to the University President. The Director is responsible for leadership and day-to-day operations of the Museum. It is preferred but not required that the Director be qualified to be the scientific authority for the Museum. Specific duties include the following.

· Administer the various Museum budgets, including State appropriations, grants and contracts, Museum endowments, Sternberg Store revenue, gate receipts, and any others that may exist.
· Plan and participate in fundraising activities of the Museum.
· Formulate, implement, monitor, and evaluate strategic and long-range plans.
· Establish and implement Museum policy.
· Recruit, supervise, and evaluate Museum staff.
· Approve and oversee plans for permanent and temporary exhibits, educational programs, and public service activities of the Museum.
· Develop and administer plans to market the Museum to the public and scientific community.
· Serve as spokesperson and advocate for the Museum both within and outside the University.
· Oversee curation of the collections of the Museum, ensuring that they are maintained according to acceptable professional standards.
· Oversee the functions of the Kansas Wetlands Education Center, the day-to-day operations of which are performed under the supervision of a Site Manager.
· Conduct and publish scholarly research.
· Participate in professional activities designed to promote the scholarly reputations of the Museum and the University.
· Provide service to the Museum, the University, and the community.

QUALIFICATIONS:
Minimal qualifications include an earned PhD degree in one of the academic disciplines represented by research collections in the Museum, preferably biology or paleontology. Experience in museum administration is preferred. Exceptional candidates with only an M.S. degree but having extensive experience in museum administration will be considered. Applicants should provide evidence of scholarship and must demonstrate aptitude for administration. Other qualifications include strong communication skills and the ability to interact with diverse constituents.

SALARY: Commensurate with qualifications.

STARTING DATE: 1 May 2009

CONTACT:
Dr Elmer Finck, Search Committee Chair
Department of Biology
Fort Hays State University
302A Albertson Hall
Hays, KS 67601
Phone 785-628-4214
Email efinck@fhsu.edu

APPLICATION:
Electronic applications are encouraged. Applications will be accepted until the position is filled and must include at a minimum:
1. *Letter of application*
2. *Curriculum vitae or resume*
3. *Statement of professional interests and aspirations*
4. *Copies of representative scholarly work, if available*
5. *Names, mailing addresses, email addresses, and telephone numbers of 4 references*

Other News

Missouri Botanical Garden Celebrates 150TH Anniverary in 2009

The Missouri Botanical Garden (MBG), a renowned center for horticultural display and scientific research in the heart of St. Louis, celebrates its sesquicentennial anniversary in 2009. The Garden opened to the public on June 15, 1859, making it the oldest botanical garden in continuous operation in the nation. The Garden will honor the occasion with activities and events throughout the year to celebrate the institution's heritage and champion a sustainable future. The anniversary theme, "Missouri Botanical Garden: Green for 150 Years," acknowledges the institution's past and present leadership in sustainability. Emerson, a global manufacturing and technology company based in St. Louis, is the presenting sponsor of the sesquicentennial celebration.

Celebrating the Garden's Heritage

Henry Shaw, a native of Sheffield, England, came to St. Louis in 1819 and established a business selling hardware and cutlery on the Mississippi River. Thanks to the great westward expansion, his business boomed, and Shaw retired a wealthy man before he was 40 years old. He spent retirement touring the world, and was especially taken with the great gardens of Europe. Inspired, he set about creating a gift for his beloved City of St. Louis: the Missouri Botanical Garden. Today, the Garden showcases 79 acres of landscaped displays and historic structures.

In 2009, "Shaw's Garden" will pay tribute to both its Victorian and St. Louis roots with a custom created 20-foot-by-20-foot **floral clock**. Floral clocks date back to 1903 in England, when they were popularized as a form of carpet bedding garden displays. In 1904, St. Louis was the site of a famous floral clock at the World's Fair. The Garden's floral clock showcases seasonal flowers of varying colors and textures, moving clock hands, and a working cuckoo bird chirping every quarter hour. The living spectacle is on display from April through October near the historic reflecting pools. Shaw kept hand-written journals of his European travels in the 1850s, documenting the places he saw, foods he ate, books he read, and more. These never-before-seen travelogues are one of the few personal documents written by Shaw that exist today, and will be made public for the first time in 2009.

Glimpse history and experience **Travels with Henry** throughout the year by visiting the Garden's Web site www.mobot.org for regular postings of Shaw's journal entries.

When Shaw established the Missouri Botanical Garden "for all time for public good," he could scarcely have imagined how the institution would change and grow over time. Take a cell phone audio tour of the Garden grounds to hear what he might say about his beloved Garden today. Listen as "Shaw" describes the landscape in 1859 to discover how the grounds have been enhanced over the past 150 years. Gardens and plants may grow and change, but heirloom plants have stood the test of time. "Heirloom" plants have maintained their original traits for 50 years or more through open pollination by birds, wind, or other natural methods. The William T. Kemper Center for Home Gardening will display several heirloom vegetables from the second half of the 19th century in its Family Vegetable Garden. Beets, cabbage, beans, eggplants, tomatoes and squash varieties grown from seed will reach peak bloom from late spring through summer.

The annual Orchid Show and Holiday Flower and Train Show will also look to the past for inspiration in 2009. Jan. 31 through Mar. 15, "Henry's Garden" will feature 800 orchids from the Garden's premier collection displayed in a formal Victorian setting. Stroll through lush greenery and past a courtyard fountain, admiring the Phalaenopsis, Cattleyas, Cymbidiums and more. Wrought iron lamp posts, urns, and benches will adorn the scene. The "Gardenland Express" will bid farewell to the sesquicentennial year with a tribute to150 years of MBG. Colorful holiday blooms will surround G scale model trains, traveling around mini-scenes of notable Garden structures surfaced with natural materials. The show chugs into town on Nov. 25, 2009 and ends Jan. 3, 2010.

Championing a Sustainable Future

Pledge to "Grow Green with the Garden" in 2009 by resolving to make sustainable lifestyle choices. Sustainability is meeting the needs of the current generation without compromising the resources available to future generations. Pick up a pledge card on-site or visit www.mobot.org to select one or more environmentally-friendly choices with quantifiable benefits to Earth. Monitor the program's universal progress throughout the year inside the Ridgway Visitor Center. Learn more about sustainable living at the **green living expo**. Visit the Brookings Interpretive Center from May 1 through Oct. 31 to peruse select booths showcasing goods, services and information with an environmental edge. The expo is an extension of a Garden-sponsored green living weekend at the Saint Louis Science Center in early spring 2009.

Learning to care for the planet isn't just for grown-ups. Earth's plants form the basis of life as we know it, providing oxygen, food, medicine, fuel, beauty, and much more. Children in kindergarten through twelfth grades can join the Garden to creatively spread the word about plant "superheroes" through the "Power of Plants" contest. Students are challenged to pick a plant that does great things for people and tell its story through a two- or three-dimensional work of art. Entries are due Jan. 31. Winning projects will be on display at the Garden through June 15. Visit www.mobot.org/power for contest information.

In 2009, the Garden will also offer a first-of-its-kind lecture series, "The Global Garden." Six prominent experts will address today's important issues impacting people, plants and the planet. The series eflects the Garden's core objective to help people throughout the world conserve and manage Earth's resources and ecosystems.

Experiencing the "Unseen Garden"

The Missouri Botanical Garden (MBG) spans the globe in support of its mission "to discover and share knowledge about plants and their environment, in order to preserve and enrich life." It operates one of the three largest plant science programs in the world, with researchers in 36 countries on six continents. Learn more about this "Unseen Garden" of science and conservation efforts with new display panels illustrating the countries in the world where Garden programs are active. New signage on the grounds also informs visitors about plants that heal and help humankind, including species that are medicinal in nature or have other useful properties.

The Garden joins forces with the Siteman Cancer Center at Barnes-Jewish Hospital and Washington University to present a two-day community celebration of plants on July 17 and 18. Business leaders and interested individuals are invited to attend a plant science symposium on Friday, focusing on the science, study, and business of plants in St. Louis's "BioBelt" region. On Saturday, visitors can pay tribute to the healing power of plants like the rosy periwinkle (used to treat childhood leukemia) with engaging activities and informative offerings.

Several photographic exhibits in 2009 document the wide world of plants that the Garden works to conserve. Jan. 9 through Mar. 29, fine art **orchid photography** by Charles Rowden highlights the world's largest flowering plant family. Apr. 3 through June 28, *National Geographic's* **"Through the Eyes of the Condor"** features images from Latin America by renowned aerial photographer Robert B. Haas. July 3 through Sept. 30, "Madagascar," showcases works by famed *National Geographic* nature photographer Frans Lanting. Oct. 1 through Nov. 15, "Losing Paradise? Endangered Plants Here and Around the World," an exhibition of original artworks and illustrations by The American Society of Botanical Artists, reinforces the Garden's work through the Center for Plant Conservation.

Commemorating 150 Years

The Garden's commemoration of its sesquicentennial kicked off on Jan. 1 at the Tournament of Roses Parade in Pasadena, Ca. The City of St. Louis float, made possible by Anheuser-Busch, honors the 75th anniversary of the Budweiser Clydesdales and the 150th anniversary of the Missouri Botanical Garden.

The Garden's historic Linnean House conservatory, famous tropical water lilies, and a young Henry Shaw are surrounded by flowers on the Clydesdale-drawn display. The Missouri History Museum in Forest Park will present a historical exhibit of archival Garden images and artifacts from February through November. Download the exhibit podcast to an mp3 player to hear interpretive commentary about the Garden's 150 years. MBG will host the 2009 American Public Gardens Association (APGA) annual conference in St. Louis, June 23 through 27. The gathering of public garden professionals from throughout North America will celebrate "The Global Garden" to honor 250 years of the Royal Botanic Gardens, Kew; 150 years of the Singapore Botanic Gardens; and 150 years of the Missouri Botanical Garden. From Memorial Day through Labor Day, the Garden will keep its doors open late on Thursdays from 5 to 9 p.m. for sesquicentennial summer nights. Enjoy entertainment for all ages, or take a scenic stroll through blooming display gardens. Plan a daytime visit earlier in the year to see over 150,000 bulbs in springtime bloom to honor the historic anniversary.

For more information, visit www.mobot.org or call the 24-hour recorded hotline at (314) 577 9400 or toll-free, 1 (800) 642-8842.

Reports and Reviews

JSTOR Expands Free Access in Developing Nations

In 2006 JSTOR, which includes the *American Journal of Botany*, announced the African Access Initiative in which not-for-profit institutions across the continent of Africa receive free access to the archive. Since the launch of this initiative, nearly 400 institutions are participating in 37 African countries. In November JSTOR launched the Developing Nations Access Initiative, extending their efforts well beyond Africa. Under this initiative, not-for-profit institutions in 41 additional countries may gain access to the archive free of charge or at very low costs. This new initiative further complements JSTOR's Developing Nations Fee Model – in place since 2005 – and eliminates or further reduces fees for institutions in many nations. As a result, all of the collections in JSTOR and Aluka, an initiative uniting with JSTOR, are now free in 64 countries and available at low cost in 30 others.

Bruce Lyons
Associate Director, Publisher Relations

National Tropical Botanical Garden earns LEED Gold

The National Tropical Botanical Garden was recently awarded "Leadership in Energy and Environmental Design (LEED) Gold Certification" by the U.S. Green Building Council for their new Botanical Research Center at the Kalaheo headquarters.

"The implications go far beyond the building itself and have the potential to influence people in all spheres. Conservation of natural resources and protection of the environment is integral to NTBG's mission, so building green just made perfect sense to us," said NTBG Director and Chief Executive Officer Chipper Wichman .

Among the features that set this building apart from others in terms of being green are its rooftop photovoltaic system, which allows natural light to flow through the upper floor, and a rain catchment system that feeds into a 25-gallon underground storage tank which is then used to irrigate native plant sections of the McBryde garden adjacent to the NTGB headquarters. Other features are its clerestory windows, motion sensor lighting and high efficiency plumbing. Builders used certified sustainable reclaimed tropical hardwoods from Southeast Asia that would otherwise have gone into landfills and gravelpave permeable-surface walkways. The surrounding landscape was designed toward conservation of resources, and native plants, by using drought-tolerant species.

Growing SEEDS of Sustainability at UBC
Social, Ecological, Economic Development Studies (SEEDS) Program at the University of British Columbia

This article is based on an educational workshop, entitled "**Growing Sustainability through Undergraduate and Graduate Research-UBC Social, Ecological, Economic Development Studies (SEEDS)**", contributed/presented by Carolina Chanis, Davis Chiu, Kelly Coulson, David Grigg, Brenda Sawada and Santokh Singh at the BOTANY 2008 conference on July 27th, 2008 in Vancouver, Canada.

Brenda Sawada, Manager of the UBC SEEDS program, discussing a SEEDS project with student, Maira Avila

On the west coast of Canada, individuals, businesses, and institutions are scrambling to get green. At the University of British Columbia (UBC) in Vancouver, British Columbia, the SEEDS (Social, Ecological, Economic Development Studies) Program is already in its eighth year, promoting sustainability with students, faculty, and staff on campus. SEEDS brings together these groups in an academic setting, imagining and implementing projects to promote a more socially, ecologically, and economically sustainable campus.

Sustainability at UBC: A Historical Perspective

While SEEDS is the first academic program of its kind in Western Canada, UBC's commitment to

sustainability did not begin at its inception. In fact, UBC has been a leader in sustainable issues in a variety of ways. In 1990, UBC, with over a hundred other universities, signed the Talloires Declaration, an official statement adopted by university administrations of commitment to sustainability issues on campus. As well as encouraging individuals – staff, students, and faculty – to consider sustainable issues in all facets of their work, UBC also continued to develop programs and initiatives to keep sustainable issues at the forefront of life on campus. UBC became Canada's first university to adopt a sustainable development policy in 1997, and in 1998, continued to lead the country in green issues by opening the doors of Canada's first on-campus Sustainability Office. These developments provided both a rich context and a demand for a program that would bring together students, staff, and faculty to work toward sustainability on campus. SEEDS was born, and since its beginning in 2001, UBC has become Canada's leading university in sustainable issues, with sustainability consultation processes involving 20 faculties, 89 specific targets for sustainability, and over 300 sustainability-related courses.

An Introduction to the SEEDS Program

UBC's "Policy on Sustainable Development," or "Policy 5," when adopted in 1997, called for the establishment of a Sustainability Advisory Committee, consisting of faculty, students, and staff. This committee advised on the development of programs and initiatives to reach the goals set out by Policy 5, including a program to focus on campus sustainability. Out of this goal, the SEEDS program was developed.

The SEEDS program invites campus staff, faculty, and students to share their ideas for sustainable improvements in their area of work or study. Staff members supply the ideas and students research solutions with the help of a faculty advisor. The benefits are multitudinous: students gain credit for their work, while gaining experience with directed studies, and feeling that they are making a personal contribution to campus life; faculty become involved in sustainable issues often relating to other faculties or departments; staff are able to see their ideas implemented, often improving their own jobs or workplaces; and the university community benefits from cost-effective solutions that create a more sustainable UBC campus.

The primary goal of the SEEDS program is to bring together and build relationships between members of the university community who would normally not find themselves sitting around the same table, working toward a common goal. Through working together, and learning from each other, SEEDS participants not only help develop campus sustainability, but also improve research, applied learning and project development skills. SEEDS encourages its participants to continue to be involved with on-campus sustainability after their projects are completed, and to become ambassadors of sustainability in the university community.

SEEDS Projects

The first SEEDS project, completed in the first year of the program, brought together a landscape architect and a master's student in the School of Community and Regional Planning, to map the network of heritage sites that are situated all through the campus landscape. This project, "Place-making at UBC: Planning a Heritage Trail," set the stage for relating sustainability to place – the buildings,

Fourth-year mechanical engineering students design locally sourced bollard for UBC campus

landscape and plant resources, infrastructure, and art on campus. Since this inaugural project, SEEDS has facilitated numerous projects in a wide variety of faculties, from engineering to sciences to arts, for example, a plan for can and bottle collection, a sociological analysis of graffiti, and research on local food.

The development of a stormwater management stream on campus has also served as the basis for many SEEDS projects: Sauder School of Business students provided a cost-benefit analysis, a Biological Engineering student researched the feasibility of using the stream as a fish habitat, and a Civil Engineering student laid the foundations for the detailed design of the stream itself. Because the stormwater management system has yet to be built, the options for future SEEDS projects are numerous.

SEEDS has also facilitated a number of botany-related projects. Some examples of such projects are: UBC Farm: Plans for Sustainable Organic Growth; The Effectiveness of an Infra-red Weeder Applied at Varying Speeds and Time Intervals in Controlling Weeds at Two Sites on the UBC Campus; Macmillan Precinct Oak Management Plan; Roundup at UBC: The Road to a Pesticide Free Campus at UBC, and Examination of *Quercus rurba* Along Main Mall at the University of British Columbia. Recently, a number of Botany students have been working on a SEEDS project involving gas exchange measurements in trees and shrubs growing on Sustainability Street in University of British Columbia.

This year, a panel of UBC faculty, staff and students presented an overview of the SEEDS program as a workshop, entitled "Growing Sustainability through Undergraduate and Graduate Research-UBC Social, Ecological, Economic Development Studies (SEEDS)" at the BOTANY 2008 conference held at UBC. SEEDS student Carolina Chanis recently presented the details of her project on physiology and sustainability of ferns. Through the SEEDS program, she was able to use her knowledge and interest in both plant science and sustainability to monitor ferns on UBC's Sustainability Street for photosynthesis and transpiration rates, as well as conduct hormone and red/blue light experiments on the plants. SEEDS connected her with faculty and staff advisors who helped facilitate the project, but also allowed her unprecedented freedoms in learning, highly valued and unusual in undergraduate-level courses.

Contributions to Learning

The SEEDS program significantly contributes to the education of students, and to the ongoing experiences of faculty and staff; however, its influence stretches beyond those directly involved with the program. The analyses conducted by students for SEEDS add to the rich body of research on sustainability at UBC. Research by SEEDS students has led to 20% biodiesel usage in Plant Operations vehicles, UBC as a pesticide-free campus, the development of seven new gardens, and sustainable seafood consumption by UBC Food Services. SEEDS participants are given a unique opportunity in their studies to not only conduct research on sustainability, but to actually put their ideas into action, for the benefit of the university community as a whole. All projects are available for public viewing on the SEEDS website <www.sustain.ubc.ca/seeds> so that research can be shared within both the UBC and the greater community, and drawn upon for future sustainability efforts.

As well as contributing to research efforts, SEEDS has also spread its influence to the classroom. Projects have been adapted from the original model of a student, faculty member, and staff-person involved in a student directed studies course, to fit within the teaching curriculum. In the 2007-8 school year alone, two departments incorporated SEEDS into entire undergraduate courses. A Food Systems project assessing food services on campus allowed 210 fourth-year students, five teaching assistants, and 22 staff members to participate in campus sustainability. In Civil Engineering, 117 second-year students under the direction of four instructors and three staff members collected data first-hand in order to create a water balance model for South Campus. SEEDS projects in the classroom provide students with a focus their learning, through local, sustainable, relevant projects rather than abstract examples.

Economic Savings to the University

UBC's leadership in sustainability stems from a commitment to creating unique opportunities for students, faculty, and staff to participate in programs like SEEDS, which provide the opportunity for environmental, social, and economic innovation throughout the university. Continuing to advance sustainability at UBC has had positive impact on all levels. The Sustainability Office website www.sustain.ubc.ca tracks resources saved at UBC's Vancouver campus in real-time, so viewers can watch the numbers increase with each passing second. As of September 2008, savings to UBC include: nearly 200 million sheets of printing paper, almost 200 million kWh of electricity, over 20 billion liters of water, nearly 80,000 tonnes of greenhouse gases reduced, and over 33 million dollars. The SEEDS program specifically, has saved the university untold resources in the forms of pesticides and unsustainable fuels and food. SEEDS research has also lead to an increase in composting, thereby reducing the amount of garbage produced on campus. In addition, SEEDS has saved the university more than $187,000 in consulting fees between 2003 and Spring 2008.

Perspectives of SEEDS Participants

Projects facilitated by the SEEDS department have numerous benefits, including research-based and economic, for the UBC community, but they also truly enrich the lives and learning of those directly involved. Below are statements from UBC students, staff, and faculty, who have participated in the SEEDS program.

Feedback from Students:

"The SEEDS program for me was my favourite university experience. It was so much more rewarding than a regular course. It balanced out my schedule and my life with something that was my own and really exciting. I learnt a plethora of practical skills such as time management, speaking in public situations and communication. I would whole heartedly recommend this to any student with some determination and passion for a topic." – Forestry Student

"The SEEDS program has really changed my attitude towards sustainability issues. I feel more optimistic and more willing to take action in my everyday life." – Commerce Student

"UBC is not an inaccessible institutional block. It is a community of individuals doing their best. Getting to personally meet this network and play a role was hugely rewarding." – SEEDS Participant

Feedback from Staff:

"My involvement with SEEDS has been very beneficial in terms of enabling me to connect with students who are eager to embark on new research initiatives that build on an existing foundation of knowledge, and that provide useful information for my department." – Land and Building Services Staff Member.

"SEEDS has certainly been of great benefit to Plant Operations, not only because of the free research but because it has allowed our staff to become directly involved in learning mission of the university through participation in a multitude of student projects." – SEEDS Staff Advisor

Feedback from Faculty:

"The project report was unbelievable! The students tied in the entire course. It's like nothing I've ever read! I always benefit hugely from SEEDS when I see students taking the theory and applying it to a practical, relevant project." – SEEDS Faculty Advisor

"The sustainability challenges our world faces are increasingly complex. No longer can these challenges be addressed in isolation within the specialized towers of academia, behind the glowing screens of our students. Rather, these challenges require multi-stakeholder collaboration, curriculum greening, interdisciplinary teaching, learning, and research that is action orientated. The SEEDS Program provides an opportunity for this necessary endeavor. It helps creates opportunities on campus to unite our academics with the communities they are embedded within in working together to not only share knowledge but also to ultimately put into practice collaboratively. When I think of the future of education, I think of the SEEDS Program." – Land and Food Systems Senior Instructor

The Future of SEEDS

As well as focusing on the projects that are currently shaping UBC, SEEDS staff are also looking at the future of sustainability on campus. Over 30 projects are in motion for the 2008-9 school term, building on previous sustainability initiatives, and developing new facets for growth at UBC. SEEDS hopes to see more involvement in faculty members' curriculums, and more awareness of the program throughout campus. In addition to projects at UBC, SEEDS is also exploring a community program, which would apply sustainable practices to off-campus needs, and give students, faculty, and staff the ability to connect with a greater community. Since its inception, SEEDS has been contacted by university administrations worldwide, asking for advice on starting an academic sustainability program. A SEEDS-style program could be integrated into any university or college, regardless of its size, and hopefully, other campuses will begin to implement such programs. With the example of SEEDS at UBC, and the possibility of green programs and institutions in universities across the country and the world, the future looks bright for campus sustainability.

Allie Slemon is a 4th year Honours English student at the University of British Columbia. She is currently working on a SEEDS project on green buildings podcasts.

Darwin in the Year of Science, 2009

Marshall D. Sundberg, Department of Biological Sciences, Emporia State University, Emporia, KS.

In the public mind, Darwin is *The Origin of Species*; in the mind of many of our biologist colleagues you could add the Galapagos finches and natural selection. With little formal scientific training Darwin became a well-respected botanist, geologist, and zoologist whose idea of natural selection is arguably the most significant hypothesis in Western science – on a par with Newton's mechanics and Einstein's relativity. As noted by Judy Jernstedt (2009) in the forward to the special Darwin Bicentennial issue of the American Journal of Botany, this year marks the 200th anniversary of the birth of Darwin, "who considered himself first and foremost a botanist." It is also the 150th anniversary of the publication of *On the Origin of Species by Means of Natural Selection, Or the Preservation of Favoured Races in the Struggle for Life* (and of Darwin receiving the prestigious Wollaston Medal in geology). Judy also notes that these are only two of several momentous anniversaries in the history of scientific events or science policy being celebrated this year in the United States as the Year of Science. "This year-long event is sponsored by the Coalition on the Public Understanding of Science (COPUS; http://www.copusproject.org/) and the American Institute of Biological Sciences (AIBS). The objective is to engage the public in science and improve public understanding of how science works, why science matters, and who scientists are." The Botanical Society is a participating member of the COPUS coalition.

In this brief article I want to highlight three examples from Darwin's life that can easily be incorporated into class work to illustrate how science works. These examples come from the beginning, middle, and end of his career and demonstrate different aspects of Darwin as a scientist.

Most of us teach the *Beagle* voyage in our introductory courses as an entry to the topic of evolution. In most cases the emphasis is on the animals of the Galapagos Islands. The *Beagle* example I want to develop focuses more on geology while integrating plants and animals. Darwin began the voyage in 1831, a recent graduate Cambridge University where one of his most influential teachers was the geologist Adam Sedgwick. Sedgwick, one of the founders of geology, proposed the Devonian Period of the newly developing Geological Time Scale and staunchly advocated the catastrophic theory. That is, geological formations resulted from of a series of "Devine creative acts" over a long period of time. One of the books Darwin brought on the voyage was the recently published (1830) first volume of Lyell's

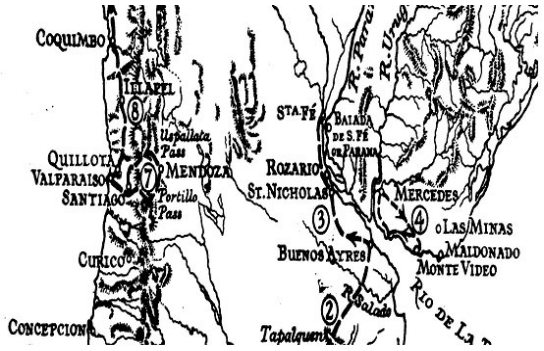

Figure 1. Darwin's overland travels from Valparaiso to Mendoza (7), from Barlow (1934)

The Principles of Geology: Being an Attempt to Explain the Former Changes of the Earth's Surface, by Reference to Causes now in Operation. He received subsequent volumes during the voyage as they were published. Lyell proposed an alternative theory that came to be known as uniformitarianism. Geological formations resulted from natural processes and these processes re-occurred gradually over a long period of time. Land could rise from the sea, even forming mountains, which in turn eroded and flowed downstream to be re-deposited as sediments on the sea floor.

In this early stage of his career, Darwin expressed keen interest in geology, as evidenced by the content of his notes and letters, particularly those concerning the 8 extended overland expeditions he took in South America (Barlow, 1934). The 7th expedition, and the month preceding, are the focus of this case study (Figure 1). By late 1834 the *Beagle* rounded the tip of South America and began charting the coast of Chile. On 20 February, 1835, he wrote: "This day has been remarkable in the annals of Valdivia for the most severe earthquake which the oldest inhabitants remember…I was on shore & lying down in the wood to rest myself. It came on suddenly & lasted two minutes…The rocking most sensible…There was no difficulty in standing upright; but the motion made me giddy. – I can compare it to skating on very thin ice or to the motion of a ship in a little cross ripple…An earthquake like this at once destroys the oldest associations; the world, the very emblem of all that is solid, moves beneath our feet like a crust over a fluid; one second of time conveys to the mind a strange idea of insecurity, which hours of reflection would never create…" (Barlow, 1834, p 277).

Two weeks later they arrived to a sight of utter destruction at the coastal city of Conception. Darwin's March 5th description of the devastation fills 6 pages - - one of the most extensive daily

entries in the diary. Notably he mentions "During my walk round the island I observed that numerous fragments of rock, which form the marine productions adhering to them must recently have been lying in deep water, had been cast high up on the beach." Captain Fitzroy was more explicit in his notes: "It appeared that the southern extreme of the island [of Santa Maria in Conception harbor] was raised eight feet, the middle nine, and the northern end upwards of ten feet." (Fitzroy, 1839,p. 412)

Ten days later Darwin began his trail expedition to cross the Andes from Valparaiso to Mendoza (Argentina) via the old Spanish road across Portillo Pass. On March 21 he recorded: "The cordilleras in this pass consist of two principal ridges, each of which must be about 12,000 ft high … There was a good deal of fancy even in this, for upon finding fossil shells on the highest ridge, in my delight I entirely forgot the Puna [mountain sickness]." (Barlow, 1834, p 291-2). Later, on his return via Uspallata Pass, further to the north, he described a well-known deposit of about 50 petrified (gymnosperm) tree trunks, some standing upright and nearly7 feet tall and 3-5 feet in circumference. "It required little geological practice to interpret the marvelous story, which this scene at once unfolded; though I confess I was at first so much astonished that I could scarcely believe the plainest evidence of it. I saw the spot where a cluster of fine trees had once waved their branches on the shores of the Atlantic, when that ocean (now driven back 700 miles) approached the base of the Andes. I saw that they had sprung from a volcanic soil which had been raised above the level of the sea, and that this dry land, with its upright trees, had subsequently been let down into the depths of the ocean. There it was covered by sedimentary matter, and this again by enormous streams of submarine lava-one such mass alone attaining the thickness of a thousand feet; and these deluges of melted stone and aqueous deposits had been five times spread out alternately. The ocean which received such masses must have been deep: but again the subterranean forces exerted their power, and I now beheld the bed of the sea forming a chain of mountains more than seven thousand feet in altitude." (Darwin, 1962. p 333-4).

The above scenario illustrates Darwin's powers of observation and inductive reasoning ability. Within a month's time Darwin experienced an earthquake, witnessed a resulting 10 foot elevation of the land, and saw "…shells which were once crawling on the bottom of the sea, now standing nearly 14,000 feet above its level" (Darwin, 1962, p. 322). "Darwin then traced the formation of mountains to a 'succession of shocks similar to those of Concepcion.'" (Herbert, 2005. P 226). If this type of once-in-a lifetime earthquake took place every hundred years, and land elevation increased 10 feet with each such quake, it is simple arithmetic to calculate a minimum time required to raise marine shells 14,000 feet- - 40,000 years. But evidence suggested that at least 5 cycles of land subsidence and re-emergence occurred so the total time must conservatively approach 0.7 million years. Darwin's observations supported Lyell's theory (and challenged Bishop Usher's date for the creation - October 23, 4004 BC).

By the mid-1850s Darwin stood in the prime of his career and enjoyed a highly regarded scientific reputation. Elected to the Royal Society, primarily for his geological work, he received the Royal Society's Royal Medal in 1853 for his work on barnacles. The following year he was elected to the Linnean Society. A wide-spread network of scientific correspondents communicated with Darwin as he gathered evidence for his new theory. "In June 1842 I first allowed myself the satisfaction of writing a very brief abstract of my theory in pencil in 35 pages; and this was enlarged during the summer of 1844 into one of 230 pages, which I had fairly copied out and still possess." (Darwin, 1898, p 68) He shared the latter manuscript with two of his closest confidants, Lyell and the botanist Joseph Hooker. In 1857 Darwin sent it to the American botanist, Asa Gray for additional review. Thus, only a select group of eminent colleagues were aware of his transmutation work. Notable among Darwin's less distinguished correspondents was a young field collector, Alfred Russell Wallace, which leads to a second story much better known to biologists.

Wallace, born in Wales but with an itinerant upbringing, came from a working class background and was self-trained in science. He possessed a love of nature and was an avid plant collector but he had none of the privileges of the scientific class. By chance he met a kindred spirit, Henry Walter Bates, and the two set off to earn their living by collecting specimens in the Amazon. For Wallace, the expedition ended in a disastrous shipwreck on his return voyage. Wallace lost hundreds of specimens of new species, his journals and notes - - "all lost with the ship." (Browne, 2002, p. 28) Like other early naturalists/explorers he published an account of his journey, but *Travels on the Amazon and Rio Negro* (1853) did not recoup his losses. Unlike many travel narratives, including Darwin's "Voyage of the Beagle," which became best sellers of the day, "*Travels*…" was remaindered by the publisher. Wallace set out again to collect, but this time to Southeast Asia. In 1855 Darwin, who was always interested in information and specimens from the tropics, initiated a correspondence with Wallace. Darwin read a borrowed copy of Wallace's book, and made a few notes in his journal. Thus he knew of Wallace and saw an opportunity to add to his network of correspondents and collectors. It was thus to Darwin, the only eminent scientist of Wallace's

acquaintance, that an infamous letter was posted from Ternate in 1858.

Like Darwin, Wallace took a copy of Lyell's "Geology" with him on his expedition along with a copy of Darwin's "Voyage." Both men were familiar with Malthus' "Principles of Population." Now, sick with fever in the Malay Archipelago, Wallace penned a letter outlining a self-acting process through which competition between individuals of a large and growing population would result in a gradual increase in those varieties having more favorable variations. "It is the object of the present paper to show…that there is a general principle in nature which will cause many varieties to survive the parent species, and to give rise to successive variations departing further and further from the original type…The superior varieties…would now have replaced the species, of which it would be a more perfectly adapted and more highly organized form." (Wallace, 1858). The accompanying note requested Darwin to send the letter on to Lyell (for possible publication) if he (Darwin) thought it was sufficiently interesting.

Figure 2. Burlington House, home of the Linnean Society today. In Darwin's day the Society had rooms in the central section of the building accessible through the large arched portal on the right.

What was Darwin to do? In a few pages Wallace virtually summarized the 240 page unpublished manuscript Darwin wrote 14 years earlier. On 18 June Darwin wrote to Lyell: "If Wallace had my MS sketch written out in 1842 he could not have made a better short abstract!" (Darwin, 1858a) A week later in a second letter to Lyell he wrote: "It seems hard on me that I should be thus compelled to lose my priority of many years standing, but I cannot feel at all sure that this alters the justice of the case." (Darwin, 1858b) Darwin and Wallace had independently arrived at a virtually identical theory of natural selection. Darwin spent decades gathering additional support for his version and circulated it in written form to only a few trusted colleagues – in confidence. Wallace only now developed the idea but immediately wrote a draft and sent it off to be considered for publication. The compromise solution, worked out by Lyell and Hooker, was worthy of King Solomon. Both Darwin's earlier manuscript and his letter to Gray would be presented along with Wallace's letter to the Linnean Society on 1 July, 1858, to thereby establish joint priority (Figure 2). Gentlemanly and scientific ethics would be maintained (Transcriptions are available on the Linnean Society website – see Wallace below). This is the story we know and tell and it illustrates Darwin's concern for propriety and scientific ethics. What is not so well known is that this was not a regular Linnean Society meeting but an extra one to read papers postponed from the 17 June meeting. The Darwin/Wallace paper was a last minute addition, included at the insistence of Hooker and Lyell who communicated the paper. Wallace was still in Ternate and Darwin was sick at home. "Hooker recorded 'The interest excited was intense, but the subject too novel and too ominous for the old school to enter the lists before armouring.' A few months later in his Presidential Address [Thomas] Bell …could only say of the period during which he had served the [Linnean] Society that it had not 'been marked by any of those striking discoveries which at once revolutionize, so to speak, the department of science on which they bear'" (Smith, 1982.)

The third vignette, from the end of his life, demonstrates Darwin's deductive abilities, probably strongly assisted by his son, Francis. (See review of Ayres' *Aliveness of Plants* in this issue.) Most textbooks show the experiments Darwin used to demonstrate that the tip of a grass coleoptile is sensitive to light and results in phototrophic curvature. Removing the tip, or covering it with an opaque cap, prohibits bending but a transparent cover permits the phototrophic response (Figure 3). What is not mentioned is that these are but a few of the phototropism experiments performed by the Darwin's and reported in *The Power of Movement in Plants* (1881, pp 468-483). A total of 13 experimental treatments were applied to *Phalaris Canariensis*, their main experimental organism. "Finally, although there can be no doubt that the illumination of the upper part of the cotyledons of *Phalaris* greatly affects the power and manner of bending of the lower part….our experiments were not conclusive, owing to the difficulty of excluding light from the lower halves without mechanically preventing their curvature." (Darwin, 1881, p. 477) To test the generality of their observations they repeated some of the experiments on *Avena sativa* cotyledons, *Brassica oleracea* hypocotyls, *Beta vulgaris* hypocotyls, and radicles of *Sinapsis alba*.

Figure 3. Wheat seedlings illustrating Darwin's phototropism experiments. A control plant, upper left, and four treatments as described by Darwin: decaptiated; foil-covered, glass-covered with and without India ink covering.

The message for students is that Darwin became an expert experimenter. Careful observations led to experimentally testable hypotheses. More importantly, he analyzed experimental results skeptically – is there another possible interpretation and if so, how can it be tested?

Beyond authoring "*The Origin*…" and becoming an icon of evolution, Darwin is the master model for science as a way of knowing and is therefore a most appropriate "poster child" for the Year of Science, 2009.

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Fluorescing World of Plant Secreting Cells . Roshchina, Victoria V. 2008, ISBN 9-781578 085156, 338 pages, (hardcover US $98.60), Science Publishers, Enfield, New Hampshire, USA, an imprint of Edenbridge Ltd. British Isles.

Autofluorescence occurs in many living cells and tissues including microbials, animals, and plants when excited by ultraviolet or violet irradiation. Stereomicroscopy of luminescence tissues and cells are especially attractive and distinct and have become a separate method of cellular analysis in many biological applications. For example, autofluorescence endoscopy has been used in assorted biomedicine applications such as differentiating between normal and cancerous animal tissues, looking at eye corneas with regards to diabetes, and gastrointestinal malfunctions. Fluorescent proteins found in sea animals also are used in genetic engineering. Despite many achievements with regards to luminescence microscopy, little has been published about the compounds that contribute to autofluorescence of living organisms.

'Fluorescent World of Plant Secreting Cells', written by Victoria V. Roshchina, summarizes information on autofluorescence of plant secretory cells as possible bioindicators and biosensors. She also provides practical applications of confocal microscopy and microspectrofluorimetry that can be applied at many universities and laboratories. Roshchina is regarded as one of the world's authorities on cell fluorescence, having published more than 63 papers on this topic. Her book contains seven main chapters that possess major themes and subheadings. At the end of the book are two appendices including a glossary of biological terms and color photographs of secretory cells, a useful bibliography, a taxonomic plant (Latin) index, and a subject index.

Chapter 1 provides a synopsis of the characteristics of fluorescence cells, their placement in plant tissues, techniques used to study autofluorescence, and roles of fluorescent structures such as attracting insect pollinators, aiding in defense against parasites and pests, and transmitting chemosignals from one to cell to another. Special attention is given to secondary metabolites that are present in secretory cells of various plant species and their color of fluorescence. Excellent tables are provided including the fluorescence maxima of substances in organs of plant taxa and the autofluorescence of organisms that are associated with plants including fungal spores, ticks, spiders, and cyanobacteria. In this chapter and throughout the book, Roshchina notes that particular compounds contribute to fluorescent intensities: phenols, flavins, alkaloids, quinines, polyacetylenes, terpenoids, and coumarins.

Differences in the fluorescence of external (trichomes, hydathodes, and nectaries) and internal secretory cells (laticifers, resin ducts, and idioblasts) among spore and seed-bearing plants is the major theme of Chapter 2. More than 141 species are discussed regarding their type of secreting cells and secretions and fluorescence maxima. Many examples are given that show how fluorescence colors vary within a plant as well as throughout its life history. For example, Roshchina discussed how 1) secretory cells associated with seeds and leaves of *Thuja occidentalis* possessed different emissions, 2) capitate and non-capitate trichomes on the same leaf of *Calendula officinalis* had different fluorescence maxima, and 3) the pigment composition and maxima in the fluorescence spectra of intact pollen grains of *Philadelphus grandiflorus* varied with maturation.

The third chapter discusses particular aspects of fluorescing secreting surfaces and compounds that are contained in secretory cells. Topics discussed include crystal excretions on root and leaf surfaces, exine, intine, and cytoplasm of sporopollenin, extracts of organic solvents produced by bud scales, flower petals, and leaves, and secondary metabolites including flavonoids, phenols, and terpenoids. She notes that factors associated with fluorescence are governed by temperature, pH of medium, the chemical nature of the compound, and the ability of the external chemical to oxidize or reduce the fluorescence substance.

Chapter 4 explores further as to how secretory structures change throughout their development in spore and seed-bearing plants. For example, bud scales of *Alnus*, *Betula* and *Populus* fill up with resin-like secretions that give off a bright blue-yellow luminescence in the early spring but this luminescence disappears when the bud scales drop and the young leaves emerge. Roshchina mentioned that this secretory function may be associated with protecting primordial leaves from pest and late frost damage. Additionally, she noted that oil cells and ducts, glandular trichomes, and salt-containing glands alter in autofluorescence during a plant's development which may reflect alterations in a composition and/or redox state of accumulated secondary products.

Interactions between cells of the same plant species or among different species related to fluorescent signaling is the focus of Chapter 5. Roshchina mentioned that pollen-pistil contact at fertilization, root-seedling contacts, pollen-pollen interaction

(stimulating or inhibiting pollen tube growth), and microbial parasites entering leaf sheaths of economically important grass species, all exhibited changes in fluorescence. Cell-acceptor or signal-stimulus responses commonly cause the recipient to generate a secreting substance that may be a protein, lipid, oxidant, or antioxidant. These mechanisms may be of interest to biochemists and physicists.

Chapter 6 discusses how fluorescent secretory cells have the potential of making pharmaceutical drugs, determining cell viability, and monitoring ecological disturbance without performing tissue homogenizations and long-biochemical manipulations. Emphasis is given to secretory cells within microspores of *Equisetum arvense* and assorted species of angiosperm pollen that are capable of responding to ozone fluctuations, peroxides, and stress. Charts, graphs, and reactions showing substrates and products clearly depict treated and untreated situations.

The final chapter examines how some fluorescent secretory compounds such as sesquiterpene lactones and alkaloids may be used as histological stains in studying intercellular and intracellular interactions. Most of the secretory compounds used in these studies were of weedy angiosperms and/or medicinal or poisonous pharmaceutical plants. In many instances, secretory compounds are able to bind with ATPase, cyclic AMP, contractile proteins, nucleic acids and lipids causing them to fluorescence under the irradiation of ultra-violet light, therefore, showing the location of particular structures.

The field of fluorescing cells is a dynamic field. This book provides a good basis of understanding plant secreting cells. Throughout the book there are overlapping themes, misspelled words, and word spacing errors. Data contained in this book, however, will remain pertinent for years to follow. This book is an excellent reference for professionals, researchers, and advanced students that are interested in ecology, plant science, criminology, and luminescence microscopy.

-Nina L. Baghai-Riding, Division of Biological and Physical Sciences, Delta State University

Ecology. Cain, Michael L., William D. Bowman, and Sally D. Hacker. 2008. ISBN 978-0-87893-083-8. Casebound. US $107.95. 552 pp. Sinauer Associates, Inc., P.O. Box 407, Sunderland MA 01375.

Ecology begins with physical environment and biosphere characteristics that influence living systems. This text is exemplary in providing this often-neglected information, as well as explaining why this knowledge is important in the study of ecology. Evolution is woven throughout, and is introduced in a stand-alone chapter (6). Populations follow, with excellent discussions of life histories, population distributions and abundance, growth and regulation, and dynamics. The third unit separates competition, predation and herbivory, parasitism, and mutualism/commensalism from the fourth unit on communities. Change is a theme throughout the book, and is carried into the sections on communities. A chapter is dedicated to biogeography. The ecosystem unit includes production (oceanic to global patterns of net primary production, plus secondary production), energy flow, and nutrient cycling. The final unit on applied and large-scale ecology addresses conservation, ecosystem management/landscape ecology, and global ecology. Three chapters were guest-written by other authors, although the style of writing and chapter format remain consistent.

Ecology textbook authors strive to achieve the perfect balance between content and book length. The exponential explosion of ecological understanding handicaps authors as they strive to be both concise and complete. Cain, Bowman, and Hacker recognized this challenge, and developed as their guiding writing principles “Teaching Comes First” and “Less is More.”

“Teaching Comes First” is unmistakably manifested throughout the textbook. Chapters are clearly organized in an outline format with highlighted key concepts. The chapter subheadings are actually colored boxes reiterating these key concepts. The opening for each chapter is a “case study,” a quandary that ecologists dealt with, with a description of the background information needed to understand the problem and the resulting questions that arose from the particular issue. Examples of case studies include Frozen Frogs (Coping with Environmental Variation chapter), Nemo Grows Up (Life History Analyses chapter), Carnivorous plants (Competition chapter), and Killer Algae (Nature of Communities chapter). Questions are often posed at the end of these starting blocks. The chapter then delves into the theories surrounding that case study, although the case study is only occasionally mentioned. At the end of

the chapter, the reader comes full circle back to the case study for a clear understanding of the application of these theories and concepts to the understanding (and perhaps solving) of the issue. Woven throughout the highly readable narrative are scientific processes of study, the iterative nature of scientific discovering, and the impact of human action. Chapter summaries and conceptual problems follow. The chapters end with suggested readings that provide not only citations but also a brief discussion of why that particular reading is suggested. The authors succeeded in aligning this book with the principle "Teaching Comes First."

"Less is More" is less evident in this book, thankfully. The amount of information in each chapter is significant. For example, the book begins by setting the physical frameworks for life on earth….which includes an amazing discussion of climate, atmospheric and oceanic circulation, etc. A unit on the biosphere follows, with an excellent case study on Pleistocene diversity on the North American Great Plains as compared with current Serengeti plains. A detailed discussion of photosynthesis, including leaf development responses to light intensity and photosynthetic responses to temperature, is quite extensive for a general ecology textbook. A discussion of photosynthetic pathways follows, and then flows into mechanisms animals use to cope with environmental variation in food sources. This book is literally packed full of example following example for the presented key concepts. Illustrations and examples model all life forms, including human. Global information is presented alongside regional (on the same page one can find a rainfall/temperature chart from Denison Nebraska USA coupled with a picture of the Altai Plateau in Russia; later the reader finds photographs on *Corophium volutator*-created tidal mudflats and the consequence of *Corophium*-parasitism on these physical structures facing a page with a figure on disease frequency in Romania before and after vaccination, for example). In striving for conciseness, many textbooks jettison the use of numerous examples to show how a concept works across multiple organisms or differing ecological scale. Fortunately, these authors chose not to minimize conceptual examples, and thus perhaps failed to fulfill their "Less is More" principle.

The authors also had two major goals – to provide the right emphasis with the right degree of difficulty, and to ensure integration of ecological functioning across multiple levels. Perhaps the reason the authors so fully achieve the "right emphasis" goal is their lack of achieving the "less is more" principle. The abundance and diversity of examples within the book succeed in articulating common principles across multiple scales of view. These fascinating stories clearly reveal the connectedness of the world in which we live and the commonality of processes across multiple ecological scales. These two concepts are very important for students to not only know but to understand and be able to articulate. A narrative presentation style ensures that the content is well-integrated and "flows," while the case study recapitulation at the end of the chapter brings student learning full circle. This book's straight-forward, captivating style of presentation should lead students to a more sophisticated level of comprehension.

The strengths of this book are many: clearly understood narration; significant detail and examples for each concept; well-researched examples across multiple life forms, habitats, and ecological scales; informative and excellent illustrations, diagrams, and photographs; recent and pertinent examples; interwoven discussions on scientific processes of discovery; a detailed and well-illustrated introduction to the physical processes that shape individual, population, community, and ecosystem characteristics and functionalities, etc.

The criticisms of this book are much fewer. The narrative writing style is a bit distracting for this traditional reader….and as I push my undergraduate students to write in technical style, this book (with sentences beginning with "It" and "There") will not be a good example for them to model. However, I think my students would actually *read* and *learn from* this textbook, so that may be an acceptable concession. The book is highly detailed, providing exactly the types of examples I bring to the classroom to explain the concepts for my students. If the book provides these examples, I would have to modify my lectures to complement the book ….which again may be a lucrative trade. This is not a highly mathematical book. Some formulae are presented (population growth, etc.), but very little on quantitative ecology techniques and interpretation. These would need to be presented in an accompanying laboratory, if one considered quantitative techniques an essential part of the initial undergraduate ecology course. Perhaps the online problem sets could be incorporated into the class discussions.

Would my students gain from using this textbook? Absolutely. Would they have a more useful understanding of ecological processes? Absolutely. Would I need to change how my ecology course is structured to accommodate this book? Definitely.

- Joyce Phillips Hardy, Department of Physical and Life Sciences, Chadron State College, Nebraska. 69337

Plants and Vegetation: Origins, Processes, Consequences. Keddy, Paul A. 2008. ISBN 978-0-521-86480-0 (Cloth US$75.00) 683 pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

This remarkable text presents plant ecology with an approach that is both intellectually rigorous and stimulating. Certainly other plant ecology books have covered the subject matter, and indeed this is not the only one you will ever need, but few will be as delightful and enlightening. Its noteworthy quality is the author's deliberate decision to not just write a reference book, but to present an engaging conversation with the reader. While rich in detail and examples, the emphasis is less on dogma and memorization and more about exploring. Overall, Plants and Vegetation is lively and interdisciplinary, and is most useful for immersing students into the discovery of plant ecology. In this review I will first present three principal merits this text has over most ecology text books, then describe the content, and close with some of the negative aspects of the book. The first strength of the book is that every topic is presented not only in theory but through dozens of field experiments. Most often the field studies (mostly from primary literature of the past four decades) are presented in brief, but some include experimental design, controls and treatments, scope, and caveats. Occasionally a long excerpt from the original paper is given to provide insight into scientific argument. In some cases the author outlines an approach to take, such as how to design herbivore exclusion experiments, or the difficulties of studying plant-fungal interactions. Therefore the reader is immersed not only in details but in the scientific process, a rare feat for a textbook. The scope of these examples is marvelous: hundreds of plant species and genera and many habitats around the world, including oddities like epiphytes, parasites, and carnivorous plants. Extreme, unique, and exotic environments are also frequently drawn from, including South African desert, the Guyana Highlands of South America, arctic alpine environments, and peat bogs. The end result is an exposure to real ecological phenomena which highlight key trends and processes.

A second major strength is that the author does not stop at description but often presents several alternative explanations for these trends, and emphasizes that our explorations are still ongoing. The author repeatedly notes areas for which evidence is weak, what the difficulties are in studying them, and notes "the fine opportunities available for (the student) who is willing to learn." The author poses challenges to the reader, such as to apply a concept to local plant communities the reader may be familiar with. He advises "Consider that it may be most profitable to focus your attention on an area that is little known, rather than looking for problems that are currently popular." Further, he provides criticism of some of the historical trends in ecology, and cautions against what he calls an "intellectual *coitus interruptus*." Because of this angle, and the wealth of examples, advice, and opportunities, the book may be useful not only to newer students but seasoned scientists who wish to expand or enliven their research program.

A third, and perhaps the most striking, strength is the author's extensive forays into history of science (Raunkiaer's exploration of plant communities), biography (Fritz Haber of the Haber Bosch process), early scientific writings (Antoine Lavoisier), philosophy (Plato), scientific argument (Clements and Gleason) and world history (deforestation of the Mediterranean region). While the longer asides are neatly set in Boxes, the immersion in tangential subjects is unavoidable, which is sure to spark mixed reactions from readers. This interdisciplinary approach is more extensive than any textbook I have read, and is a balance that some would say is sorely needed in modern science, while other readers will revolt against it. To me, the broad mindedness of this book encouraged an application of scientific processes to the real world, an understanding of non-scientific principles, and an appreciation of the countless efforts that came before us and on whose knowledge we build. This would be useful to any student of ecological processes (plant or animal), conservation biology, or ecosystem management, as well as a casual reader interested in the interface between science, the liberal arts, and larger societal issues.

As to content, the subtitle--Origins, Processes and Consequences--is accurate. After a review of classification systems (Chapter 2), the bulk of the book devotes one chapter each to: resources, stress, competition, disturbance, herbivory, mutualism, succession, community structure, diversity, and conservation. Some chapters are stronger than others. For example, Chapter 3, on resources, is a nicely balanced examination of resource distributions, gradients, limitations, and fluctuations. The author has an admirable knowledge of evolutionary biology and inorganic chemistry, which are referred to throughout. In keeping with the author's vast knowledge base and brief historical digressions, I learned of Darwin's 1881 treatise on earthworms and of the Roman siege and conquest of Carthage after which the soil was plowed with salt. Chapter 4, on stress, is systematic, clear, and also satisfying. The author balances the discussions in long (evolutionary adaptations) and short time scales (impacts on community composition). However, the reader will

still feel shortchanged--he first major shortcoming of the book is paucity of individual plant physiological responses to stress, to which the author offers further suggested reading.

Chapters 5 through 8 turn the same systematic approach to competition, disturbance, herbivory and mutualism (and commensalism). The author presents definitions of each, acknowledges alternate definitions and understandings, gives useful and engaging examples, synthesizes material from previous chapters, and shows how simpler ideas and models have been built upon. The author frequently iterates the connections between separate chapters, for example, the relationship between the resources available (Chapter 3) and succession and community structure (Chapters 8 and 9). I especially compliment the author on examining these processes across a broad spectrum of area and intensity, comparing different sites and processes at different scales, including "gradients of topography, flooding, fire-frequency, soil fertility, and altitude." As with much of the book, the author is honest in presenting various and competing views on a subject and some of the difficulties scientists confront when examining these topics. The second shortcoming of the book comes in Chapters 7 and 8, where coevolution, pollination and seed dispersal are all noted as principal aspects of plant ecology, but are then given scant attention. Decomposition and molecular ecology were also hardly mentioned. Ideally, each of these topics warrants another chapter all to itself. The reader will have to turn to other texts for a more complete exploration. (The author does list key references in each chapter for further reading.)
Chapters 9-12 emphasize change, community structure, and conservation biology. Chapter 9 concerns time, particularly succession, and is an excellent synthesis of the previous 4 chapters. However, the sections on the origin of angiosperms and continental drift seemed out of place, and were too brief to be satisfying. Similarly, the section on glaciations cycles were too simply presented, overlooking recent findings in molecular ecology. Chapter 10 presents the useful tools of classification and ordination. His objective "was not to authorize you to carry out different kinds of gradient analysis, but rather to equip you to understand research papers… (and) to advise those of you who use such tools to do so wisely". The final 100 pages, on diversity and conservation, include descriptions of causes and consequences of diversity, tools for measuring diversity, detailed critiques of specific case studies, and rigorous rather than vague guidelines for conservation management. The stories of the cypress swamps in the Louisiana delta and the tortoise species in the Galapagos Islands are quite poignant and contemporary.

Other weaknesses of the book are quite apparent, but none are serious enough to counterbalance the usefulness of the book. The lack of color photographs was at first a disappointment, especially considering the great variety of habitats and species presented in the book. However, the figures in this book are very practical, and are meant to reinforce, explain, or expand on the text, not to be a pretty picture. The use of multicolor, 3D images in most modern textbooks provides an attractive picture but can be both distracting and confusing. On the whole, graphs, diagrams, or sketches are abundant, simple, and informative (and are often adapted from primary literature). There is no glossary, and definitions are few, which is also a deviation from many textbooks. However, explanations of processes are rich, detailed, and cohesive, and topics are tied together so well that a motivated student will rarely if ever flounder. It must be noted that by no means is this book a modeling book. The few presentations of ecological models (i.e. herbivory, models of succession, and cost-benefit models) are easy to understand, but are generally somewhat superficial. A final weakness is the largely unnecessary Chapter 1, a cursory and disjointed summary of the origins of life, the endosymbiotic theory, colonization of land, and atmospheric changes. These seem unnecessary, as this is taught in high school, and I believe any reader will be quite bored.

Overall, this is a surprisingly easy to read, remarkably thorough, and balanced textbook. The author has focused less on exhausting every aspect of plant ecology and more on creating a critical, engaging, multi-disciplinary, and pragmatic approach to some major aspects. Further, the author shows a great appreciation for older literature and for the benefits of studying novel and unique habitats, rather than just those in Europe and North America. The ultimate goal of the book seems to be to instruct and to train plant ecologists, and in this it will be successful. Plants and Vegetation is therefore an excellent teaching tool, but not an exhaustive reference, for plant ecology.

-Sean Hoban, University of Notre Dame.

Burdock. Malcolm, Janet. 2008. ISBN 978-0-300-12861-1 (US $65.00 cloth), Yale University Press: New Haven, CT. 64 pages, 27 color illustrations.

This book review is written from two frames of reference. My first impression was based on an initial perspective of the book as it stands alone. The second was a more informed view after attending an exhibit of Richard Avedon's photographs, who was one of the main inspirations for the author. In both cases the book left me disappointed.

When I first received the book I opened it with anticipation, expecting from its title a compendium of the interesting history and facts about Burdock (*Arctium* spp.). I've taught about Burdock to both General Botany and Plant Physiology students (the inspiration for Velcro, its purported medicinal value, etc.). I've cleaned Burdock burrs out of my dog's hair and my hiking boot laces. When I first saw the book title I thought, "What a great idea for someone to write a book about this common but interesting plant!" Leafing through the book what I found was a series of untitled full-page photographs of single Burdock leaves, cut and standing in a vial of water against a blank background. "What is this?" I thought. Backtracking and reading the two page introduction, I learned that the author had spent three summers in the Berkshires (rural area in Western Massachusetts) and while out walking each day she would collect roadside Burdock leaves to photograph. She set up a small attic studio in her house and would put the leaves in water to let them revive and "come to attention and into their own" (Introduction, p. 2) before recording them in a photograph. She chose leaves that showed the ravages of time; ragged, dirty, insect-damaged, which to her were more interesting than young undamaged leaves. Her inspirations for the format were Richard Avedon's (1923-2004) portraits of people and illustrations from old herbals. I was familiar with some of Avedon's iconic images and with herbals, so with a more informed eye I looked through the photographs again. Still a series of leaves in vials. Nice green color, some interesting patterns from disease or insects, but the photographs still did not stir me. And I was not at all reminded of illustrations from herbals.

Thinking that I was just lacking in art criticism experience, I took the book along with me when I went to visit some friends in the greater Washington, D.C., area because one of them is a professional artist and art teacher (Marc Robarge). His opinion concurred with mine. Then he said, "You might want to visit the Corcoran Gallery, they have a large Avedon exhibit going on right now." What a great coincidence! I spent several wonderful hours wandering the galleries of the exhibit "Richard Avedon: Portraits of Power" (running Sept 13, 2008-Jan 25, 2009). It was inspiring, moving, and amazing, due to the impressive power of the photographs, the people and events that were documented through a long time period, and the scale of the photographs. "The Chicago Seven" took up a whole wall in a gallery, greater-than-life size. Charlie Chaplin, on the eve of being exiled from the United States, displayed a comic bravado that did not conceal his bitterness, captured in turbulent detail by Avedon. I tried to imagine a Malcolm Burdock leaf photograph alongside Avedon's "Roger Baldwin, founder, American Civil Liberties Union, New York" (1976). It would be completely out of its league.

Both artists framed their subjects in a similar way. Against a blank white background the subject of the photograph is decontextualized, that is, removed from any context that would influence our interpretation of the image and that leaves the subject under stark scrutiny. In the case of Avedon's photographs, the subjects are humans so we have an innate sense of scale and relationship to the emotional cues on their faces. In the photographs of Burdock leaves, we are observing "otherness" and most people lack any familiarity with the subject that would evoke emotion (except familiarity with the burrs, which are not in the photographs). My artist friend Marc commented that he had no idea that the leaves were up to two feet long until he read the Introduction – all sense of scale is missing in the photographs. There are several other major differences between Malcolm's Burdock photographs and Avedon's human photographs. Malcolm uses soft color while most of Avedon's portraits are rich black-and-white. Her photographs have a shallow depth-of-field rendering parts of the leaf out of focus, while Avedon's are sharply focused images. Granted, his earlier work did have soft-focused edges, but most of his career he used a large-format camera and every detail down to skin pores, wrinkles, and fabric weave is crystal-clear. However, the greatest difference between the two is in motivation and the choice of subject. Avedon documented people and events that are meaningful to a wide audience, even out of context. Malcolm published a photographic journal of her three summers in the Berkshires collecting Burdock leaves. I'm glad she enjoyed herself, but I doubt many if any readers will find much meaning in the leaf portraits lacking the context of Malcolm's own experience with them.

There are a few leaf images that are esthetically pleasing enough to imagine hanging on the wall, but none are better than average professional close-up photographs. Aside from the content, the quality of the book is excellent with heavy pages and a firm binding.

- **Carolyn Wetzel**, Ph.D., Department of Biological Sciences, Smith College, Northampton, MA 0106

Gardens and Cultural Change: A Pan-American Perspective. Edited by Michel Conan and Jefferey Quilter. 2007. ISBN: 978-0-88402-330-2. 110 pages. Dumbarton Oaks Research Library and Collection and Spacemaker Press, Washington, D. C.

The goal of a Dumbarton Oaks Colloquium in Garden History in 2003 was to engage anthropologists and archaeologists throughout the Americas in a discussion of the historic and current links between garden construction and cultural change. Although the editors admit that this ambitious goal was not quite realized, the book contains five interesting and very different papers more or less on this subject from Argentina, Mexico, the Caribbean and New York that present a hint of what can be learned from studying the history of gardens from an economic and political perspective.

From Argentina come two studies. Sonia Berjman traces the history of promenades and parks in Buenos Aires from 1580 to the present, tracking the Spanish original love for plazas, especially as sites for bullrings, followed by park plans influenced by European models, which led to the somewhat gloomy assessment of present-day parks that reflect modern urbanization, paving and privatization of historic parklands and limited accessibility. Daniel Shavelzon follows a specific Buenos Aires area park, Palermo, which had started as the consciously non-European home of Juan Manuel de Rosas, the governor of Argentina in the early 1800s. The buildings were destroyed, landscaping removed and land use changed over time as each new leader sought to impose his own ideas (and statue) on the landscape.

Parks are also the subject of Rachel Iannacone's discussion of early 20th century efforts in New York to provide small parks throughout crowded areas of New York City as public health measures. These small spaces were first designed as "picturesque" landscaped areas where fences kept people from all but the sidewalks lined with benches. After considerable controversy, these parks and others only gradually began to incorporate areas such as children's playgrounds, gymnasiums and even vegetable gardens maintained by a local farm school.

The actual form of gardens and their role in the economics and culture of the wetlands of the Valley of Mexico is documented by Saul Alcantara Onofre. Chinampas were ingenious rectangular garden plots about 20 feet wide and 40 or so feet long and were built by native populations of the area long before the appearance of the Spanish in the sixteenth century. They were constructed by layering vegetation from the wetlands and muck from the bottom and could be moved around on the waterways. Incredibly fertile, they were used to grow shrubs, vegetables and flowers which were harvested and moved along waterways by small boat directly to the center of Mexico City. Gradual encroachment by the urban areas of Mexico City, draining of wetlands and diversion of water to Mexico City has today greatly reduced the number of these cultivated rafts.

Catherine Benoit addresses the economic role of gardens as sources of food and private space for slaves on Central American plantations. Although enslaved Africans did not design the layouts of plantations, they were responsible for building their own housing and could to some extent control their plantings, often using plants and customs from their native lands. This resulted in a unique Creole garden culture which outlived the plantation era and can be seen in urbanized areas in many parts of the Carribbean and the Americas today.

So, the book contains five well-referenced historical accounts, each of which is interesting, but the whole can not really be summarized. The book's format, with text running almost from edge to edge of pages nine inches wide makes it extremely difficult to read, and editing, particularly in the chapter on Mexican gardens, was inconsistent, although illustrations throughout were well done. The study of garden history would perhaps have been better served if these chapters had been published separately in appropriate journals where they could be listed in bibliographic data bases, otherwise it is difficult to imagine how anyone interested in the solid research done on these topics would ever find them.

-Joanne M. Sharpe, Coastal Maine Botanical Gardens

Tea Roses: Old Roses for Warm Gardens. Chapman, Lynne, Noelene Drage, Di Durston, Jenny Jones, Hillary Merrifield, Billy West. 2008 (ISBN 9781877058677 (Cloth US$59.95) 240pp Rosenberg Publishing Pty Ltd., P.O. Box 6125, Dural Delivery Centre NSW 2158, Australia.

As the first book in over 100 years devoted solely to tea roses, this potentially can fill a very large niche, because the climatic conditions suitable for tea rose growth are found right round the world, in some of the world's most populous areas, including portions of India and China. Climate in southern California or around the Mediterranean is likewise suitable for roses that need no rest. Also with changing fashions and the rise of the "English roses" there is a return to appreciation of prolific roses not intended for competitive exhibition.

The authors, who have been working together for over a decade as the 'Tea rose group' of the larger Heritage rose group in Australia, are from the region around Perth in western Australia. Rarely is a book written by committee so successful. Somehow they have managed to combine their expertise in photography, writing, historical research, languages, horticulture and botany (not to mention manuscript editing and book composition) to good effect.

As the dust jacket says, *Tea Roses* is "lavishly illustrated with colour photographs and historical plates..." I estimate there are over 300 photos, with 3/4 taken by the authors, at least one of whom must be an expert photographer. Many of the remainder are of historical documents, including rose illustrations from botanical magazines of the 19th century. The dust jacket photos are truly striking, with 'Comtesse de Labarthe' (a.k.a. Countess Bertha) on the front and 'Anna Olivier' on the back.

The rose known as 'Anna Olivier' in Australia presents many of the usual complications that the authors found in working with tea roses. They note that in some European gardens, a soft yellow rose, known as' Etiole de Lyon' in Australia, is called 'Anna Olivier'. Also, 'Anna Olivier' gave rise to an unstable, reverting sport, 'Lady Roberts' (Cant 1902). The authors provide a photo of their rose which bears an excellent resemblance in both form and color to a chromolithograph from *The Garden* (1891). Such confusion as to identity is typical of the subject.

The rose 'Comtesse de LaBarthe' is commonly known as 'Duchesse de Brabant' in the U.S. As the old name Countess Bertha persists from older gardens in Australia, this is likely a Comtesse, not a Duchesse. For this and every rose grown by one or more of the authors, there is both a well-written narrative description and a summary table of distinguishing features. This provides detailed information on inflorescence and pedicel, bud shape and color, sepals, flower size and shape, petal shape and texture, stamens and carpels, receptable and hip, fragrance, leaves and bush habit. The total number of tea roses now in commerce in Australia is something under 100; the authors grow all these and more, many found in old gardens and cemeteries.

During the 1960s systematic efforts to recover tea roses were begun in England (Appendix 3), and somewhat later in Australia about half a dozen folks began serious preservation work. This bit of history is well documented here, and laid the basis for this book. Two other appendices indicate roses bred in Australia (about 30), and those whose sale was ended in 1921 as a result of a nurseryman's meeting.

The authors tell a good story of the origins, rise and fall of tea roses in about 40 pages. Another 20 pages are devoted to their culture and a general description including their growth habits, cold tolerance, flowering habits, flower form and colors. A full 130 pages are used for individual entries on close to 100 firmly known, and some unique but unidentified Cvs. Despite extensive searching of catalogs and other sources, it is unlikely that even another 100 names will be reliably fixed to unique plants (my opinion). There is simply too little description in most sources. This is frustrating to collectors, but of less consequence to those who simply enjoy roses and have a suitable climate to grow these older kinds.

The first of the six appendices reproduces Jules Gravereaux's color chart of 1902 (from his catalog). It helps one understand how color names were used in the late 19th century, when tea rose breeding was at its peak. Appendix 4 documents the history of roses featured in this book, including which catalogs listed it when, how it was reintroduced to commerce, likely synonyms and misnomers. This is a marvelous spreadsheet for historians. There is also a three page glossary for technical terms, and a list of abbreviations for the Appendix 4 table.

This book is very well produced, with clear font (Goudy Old Style), perfect color registration and rendering, nice layout and good binding. The eight page index has about 650 entries and the 6 page bibliography has around 300 references, including books, letters and papers, journal articles and a couple of websites. It may not be exhaustive but it is quite extensive, delving into many obscure corners for pertinent information. We may never see it's like again.

-Lawrence Davis, Kansas State University, Manhattan, KS.

Ending the Mendel-Fisher Controversy. Franklin, Allan, A.W. F. Edwards, Daniel J. Fairbanks, Daniel L. Hartl, and Teddy Seidenfeld. 2008. ISBN 978-0-8229-5986-1 (Paper US$27.95) 330 pp. University of Pittsburgh Press, Eureka Building, Fifth Floor, 3400 Forbes Avenue, Pittsburgh, PA 15260.

As we move into the world of post-Mendelian genetics, of RNAi and dicers, it may be worth reflecting on how this all got started over 100 years ago. For close to a century, a particular view of genetics, called Mendelian, was dominant both amongst professional geneticists, and in general education extending to the middle school level. It was while working with middle school and high school teachers that I first encountered the notion that Mendel might have perpetrated a fraud. I applied a good deal of effort trying to understand both the charges and the various responses that were appearing through the 1990s. Until recently the questions raised by Fisher appeared largely unanswerable. This volume may put that problem to rest.

Mendel obviously did not think of himself as a geneticist, but as a student of hybridization. His training in physics, and experience in practical horticulture, allowed him to gain new insights into the way that characteristics are transmitted from one generation to another. His discoveries were largely ignored for the first 30 years, and were treated as controversial by those who paid attention. Carl Naegeli, pre-eminent botanist, actively discouraged him from pursuing his ideas. Other prominent workers preferred their own more traditional interpretations. There are no records of efforts to repeat his work until about 1900.

Controversy is often good for book sales but rarely nice for the participants. When both are long-deceased it is mainly about their reputations, and when the controversy involves science, it is usually the whole scientific enterprise that suffers. That is certainly so in this case. Living in a state where Darwin, another great 19th century figure, is also frequently ridiculed, I am acutely aware of how important it is for successful science to maintain the highest possible level of integrity.

So what is the controversy? Simply put, some of Mendel's results are "too good to be true" in a statistical sense, if they represent the complete output of the clear, simple research program that he described in his two lectures to the scientific society of Brno (or Brunn) in early 1865. The publication describing Mendel's work, though reasonably widely distributed, was apparently not widely read until about 1900. At that time it was recognized for it's clarity of presentation of the case for discrete units of heredity, and as R.A. Fisher described it, was used for polemical purposes by the "rediscoverers."

Most interesting is Fisher's observation that Bateson used Mendel as a cudgel to beat Darwin, whose Theory of Natural Selection Bateson opposed. Darwin had a very fuzzy notion of how heredity worked, and early on, his thinking was Lamarckian and he viewed heredity as a blending process. Mendel's work describes a clear substrate on which selection can work (a collection of discrete characters), though no description of how change (speciation) might happen, other than by recombining (not blending)of already existent traits. Darwin supplied the concept of mutation, which Mendel never mentions.

We have no evidence that Mendel himself was opposed to Darwin's conclusions about selection as a force for speciation. Through careful analysis of Mendel's copy of Darwin's *Origin of Species*, Fairbanks and Rytting (chapter 7 if this book) noted that Mendel was well aware of Darwin's thinking by the time he published his results in 1865. Some key passages were highlighted by him. However, there is no way that Mendel could have known of Darwin's work in 1856 when he began his studies in earnest, or even in 1859. Mendel read little or no English and had a German translation of Origins from 1863. Mendel made few recorded comments on Darwin or his theory, although Fisher argues that Mendel in fact sought to explain some of Darwin's observations of variation under domestication by his own discovery of discrete factors. Mendel's text may be read in that way.

Fisher was not the first to note Mendel's "too good to be true" statistics. In 1902, W.F.R. Weldon made a detailed analysis of the results and applied the newly invented Chi squared statistic. He published his analysis in the first volume of Karl Pearson's *Biometrika*. A few years later Fisher, as an undergraduate, gave a talk presenting a similar commentary, but it was not until 1936 that he put all of his detailed analysis into a formally written form, in *Annals of Science*. Oddly, Fisher never mentions Weldon's work, though he used the same statistical tool. The centennial year of Mendel's discovery

sparked a renewed interest in Mendel, and the "too good" fit noted so clearly by Fisher. Since 1965 there have been dozens of detailed analyses of both texts, with both attacks and defenses of Mendel.

This volume, a well produced collective effort, comes about 40 years after the "too good" controversy really took off. The five main contributors to this volume include a physicist, a statistician, two biologists and one philosopher/statistician. They have included a standard translation of Mendel's work (chapter 2), that was used by Bateson in the early1900s, with his 1909 commentary, and Fisher's complete paper from 1936 (chapter 3). Physicist and philosopher of science Allan Franklin provides an overview of the controversy in the first 75 page chapter. In this he lays out the problem with a thorough review of both Mendel and Fisher's works. He also notes the various proposals pro and con, regarding whether Mendel cheated, or Fisher tried to discredit Mendel.

Chapter four, a closely reasoned 25 pages by statistician A.W.F. Edwards, incidentally Fisher's last student, thoroughly examines the problem of the too close results, while a postscript by Edwards considers alternative hypotheses. The fourth chapter is reprinted from a 1986 volume. There is little or no doubt left after Edward's discussion, that the data presented by Mendel is really a "best presentation" of selected results, not a complete record of his studies. Extreme results with poor chi-squared fits seem to have been trimmed away

Chapter five gives a summary of the controversy by V. Orel, a Czech biographer of Mendel, and D.L. Hartl, a professor of biology at Harvard. They analyze carefully the cogent notion that a scientific paper is rhetoric, not a diary. Mendel first presented his work orally and published it as presented, so his paper is clearly a rhetorical work. Certain phrases and ideas are repeated several times for emphasis by Mendel, while many details are omitted. This chapter appeared in another volume in 1994.

Much work has gone into attempts to reconstruct the chronology and estimate the scale of Mendel's work, most notably that of Fisher in his 1936 paper. Over the years, many biologists have added and subtracted more and less useful bits of information regarding the behavior of peas and their pests. Many of those authors are cited by Fairbanks and Rytting (chapter 7). The conclusion is that Mendel could have done what he said he did in the space and time he indicated. Left at issue is just exactly how he did it. Fisher greatly admired Mendel's clarity of presentation, but was bothered by the "too good" fit. Seidenfeld provides yet another look at the "goodness of fit" problem in chapter 6, specifically considering various ways that the data might have been trimmed or cooked. A very interesting appendix shows a modern day result with peas where again the fit is remarkably good.

Finally, Fairbanks and Rytting's chapter considers both botanical and historical aspects of the case, in an article that first appeared in 2001 in the *American Journal of Botany*. A very interesting point in their careful reading of Mendel, is that the first four traits he chose to study were those already analyzed by others. In his second year of study he successfully added three others. Thus Mendel used a completely logical approach to his work, first confirming and then extending a series of observations. His special contribution was to devise a simple mathematical relationship to explain the observed phenomena, and to propose a distinct mechanism that allows that relationship to come to fruition.

Fairbanks, in a postscript to chapter seven, reviews the ongoing (largely internet) controversy and provides logical correctives. One point that remains perhaps insoluble, in the absence of any original data or notebooks, is the "too good" fit. But the most reasonable hypothesis for why only a portion of Mendel's results are presented, and of those only the results that fit within a reasonable closeness to his model is simple. It may be drawn from a passage that Mendel was surely familiar with- "there is much else.. but this is written so that you might believe. For if it were all to be recorded, perhaps the whole world could not contain the books". Certainly it would be more than we would ever want to read. The present volume should suffice.

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Genetic Glass Ceilings: Transgenics for Crop Biodiversity. Gressel, Jonathan. 2008. ISBN 978-0-8018-8719-2 (Cloth US$65.00) 461 pp. The Johns Hopkins University Press. 2715 N. Charles Street, Baltimore, MD 21218.

When universities are beginning to form "Innovation Centers for Crop Design", as ours is doing, we need to take a look at what has become of plant breeding. That is the intent of this volume. The "Genetic Glass Ceilings" referred to in the title are of course the invisible mechanisms that prevent "Jack and the Beanstalk" from coming true. Taking a broad look at the whole question of "Transgenics for Crop Diversity", Jonathan Gressel brings to bear over 40 years of experience as a plant physiologist and genetic engineer. Gressel argues persuasively that in order to have the quantum jump in productivity essential to make healthy, renewable, sustainable food and fiber available to the whole world, we must use transgenics. Hence the subtitle..

Forty years ago, genetic engineering was unknown. Professor Gressel grew with the field, making contributions in a broad range of areas along the way. One of his most recent edited volumes deals with ferality in crop plants, the likelihood that crops run wild and turn into weeds. Questions such as, 'What are the odds that we turn clover into kudzu?' or 'Can we use the vigor of kudzu for producing biomass?' lie at the heart of many fears and fantasies of biotechnology and transgenics. This volume addresses those fears, brings realism to the fantasies, and emphasizes the growing recognition that most of our limited agronomic base (maize, wheat, rice, soybean) may soon reach its glass ceiling. We must consider other crops for other places that are not part of the huge international trade economy, not linked to the price of oil the way the big four are.

This is a serious book, covering a very challenging range of issues. Gressel does not hesitate to identify what he sees as problems outside the organism, such as crop subsidies that distort markets. He is also willing to present some notions that are novel or that go against the mainstream of agronomic thinking. So maybe the glass ceilings are not just inherent genetic limitations of the crops themselves, but rather are to some extent glass ceilings of the kind usually thought of by sociologists. Either way, we need to break through, soon.

Gressel's book is divided in to roughly equal halves, first dealing globally with the situation, and second using about 15 case studies to indicate potentials and pitfalls. Although the earliest scientific citation I noted here is from 1965, a very substantial majority of the references are from this past decade. That is as it should be in a rapidly moving field, when only 1200 of the many thousands can be directly cited. Those 1200 provide a useful entry into the remainder of the literature.

The general case for plant biodiversity is provided in an extensive forward by Klaus Ammann, and a much shorter argument for crop biodiversity is provided in the first chapter by Gressel. After thoroughly stating the case that a glass ceiling has been reached in the genetic potential of major crops, the author describes the tools for transgenic development, the biosafety considerations, the places where one needs to go through the ceiling and some specific instances where transgenics have already been used to make major advances in productivity or quality. Insect resistance in grains and virus resistance in papaya re noteworthy examples. Insect resistance has both the direct benefit of decreased predation on the crop, and secondarily by decreasing mycotoxin production in damaged seed. And as an incidental incentive to use, it actually lowers insecticide application substantially, decreasing both direct costs and labor costs.

The issue of biosafety is addressed extensively in a chapter over 65 pages long. Only the chapter on tools, at 30 pages, approaches this level of detail. Enhancing total biomass yield through engineering of photosynthesis or carbon partitioning is not a focus of this book. Crop diversity and more effective exploitation of available production potential in many smaller niches is the theme. Case studies are used as the basis for this discussion.

Some of the crops considered as good candidates for transgenic improvement while maintaining crop diversity, naturally enough, are not among the top 25 in current production. For instance, tef is considered as a crop for dry extremes and buckwheat (pictured on the dust jacket in full bloom), is considered for poor cold extremes. Constraints on and problems in sorghum, millet, safflower, lathyrus, tomatoes, olives, and orchids are examined. For most of these, overall biomass yield is not addressed. Rather, the specific needs of the crop, such as reduced allegenicity in olive pollen, or removal of a specific amino acid in lathyrus, is treated.

Gressel makes his case clearly with much creativity. He has obviously thought a long time about the issues at hand. He is a strong advocate of transgenics, well aware of potential hazards, but not prone to sentimentality about saving insect-plagued or mycotoxin-contaminated land race seeds. This book would serve as a good basis for a serious course in agronomy departments around the world. It should also be of interest to crop breeders wherever

they are located, for its wealth of thought-provoking ideas.

-Lawrence Davis, Kansas State University, Manhattan, KS.

The Aliveness of Plants: The Darwins at the Dawn of Plant Science. Ayres, Peter. 2008 ISBN 978-1-85196-970-8 (Cloth US$99.00) 227 pp. Pickering & Chatto, 21 Bloomsbury Way, London WC1A 2TH, UK.

This is the perfect book for every botanist to read and digest as we begin 2009, the 200th anniversary year of Charles Darwin's birth and the 150th anniversary of his publication of the origin of species. In fact, it should be required reading for ALL biologists. Using the vehicle of three generations of the Darwin family, Ayres presents a history of the origin of botanical science from the 18th into the 20th centuries – the transition from gentleman philosophers (Erasmus) doing "country house experiments"(attributed to Julius von Sachs in reference to Charles) to experimental scientists in their laboratories (Francis, who studied with Sachs). It demonstrates the transition of botany from a subfield of medicine whose practitioners had medical degrees to an independent, leading science. For our non-botanist colleagues it is instructive to demonstrate how misleading is the popular image of Charles the evolutionist because he studied plants as much as animals. "It has always pleased me to exalt plants in the scale of organized beings…any proposition [is] more readily tested in botanical works…than zoological." (Darwin to J.D. Hooker)

Plants were a hobby for Erasmus Darwin, who was by training a physician and by inclination a poet and philosopher. He inherited financial security and social position and passed this on to his succeeding generations. Erasmus is perhaps best known for his poem, The *Botanic Garden*, written in two parts. In the first, *The Economy of Vegetation* emphasizes insectivorous plants while the second, *The Loves of the Plants*, describes the Linnaean System. More significant, though was *Phytologia*, published two years before his death. Here Erasmus provides a synthesis of the state of botanical knowledge in 1800. He includes the works of Hales, Priestly, Lavoisier, and others (including his own) examining plants as photosynthetic organisms. Many of the individuals mentioned were his personal friends (also including Benjamin Franklin) and others he knew indirectly via his friends. He clearly anticipates the emergence of plant physiology from within botany but he also covers sexual selection, insectivorous plants, artificial selection and expounds a (pre-Lamarkian) theory of evolution. *Phytologia* was the standard for British botanical thought for the next several decades and his example of networking was taken up both by his grandson and great grandson.

Somewhat surprising is the little credit Charles gave to his grandfather for some of his ideas and inclinations – not just on evolution, but on the structure and function of plants. For instance, the world knew little about insectivorous plants until Charles published his book on that subject in which he declares "I heard that insects were thus caught, but knew nothing further on the subject." Yet Erasmus had a fascination with insectivorous plants which formed a major part of *Phytologia* in which he called *Drosera* the "Queen of the marsh." This is the same plant referred to by Charles' wife, Emma, in a letter to Charles Lyell's wife, "he is treating Drosera… just like a living creature, and I suppose he hopes to end in proving it to be an animal." Later, in a letter to Asa Gray, Darwin admitted "[*Drosera*] is a wonderful plant, or rather a most sagacious animal." Gray, long a friend of Darwin, is credited by Ayres of suggesting to Darwin that he pursue a study of climbing plants.

The best known of Darwin's botanical books is *The Power of Movement in Plants,*.co-authored with his son, Francis. This book grew out of the revision of *The Movement and Habits of Climbing Plants* in which the younger Darwin assisted with editing. Francis' mark in the subsequent revisions of all of his father's books can be seen in the citations of others' works which begin to appear. Francis' medical training required a research thesis and he was trained in the "modern" laboratory where specialized equipment and careful measurements were the norm. Similarly, "modern" standards of citation were required. It was natural for Francis to be concerned that his father's books met the new

standards of scientific publication.

Francis left a promising career in animal physiology to assist his father and in doing so brought the tools and techniques of laboratory biology to the partnership. Francis, unlike his father, was fluent in German and made two visits to Germany to study with Sachs, the world's pre-eminent plant physiologist. The Darwins and Sachs had differing views on tropisms which is reflected in their later writings. Francis recalled that "Sachs was most kind and helpful [during the first visit], and under his direction I contributed a small paper to his *Arbeiten*..." Sachs later wrote: "Personal acquaintances often have their good side. I first became aware of the whole wretchedness of Darwin's activities when Francis Darwin studied here...and when the miserable book 'On Movements' appeared, I realized that here we are dealing with literary rascals." As a result, "Power of Movement" was viewed less favorably when it was published than it is today!

Francis' botanical achievements usually are lost in the shadow of his more famous father. Yet like Charles and Erasmus, Francis was elected to the Royal Society based on his own work in plant physiology - - particularly on the function of stomata – a topic that was of interest to his great grandfather a century earlier. He also played a significant role in the development of botany as an independent scientific discipline at Cambridge and of "the new botany" in Britain. We are aware of the circle of friends Charles Darwin gathered around himself that influenced his studies. I was intrigued by the circle of friends and relatives around Francis, including: F. F. Blackman, Sidney Vines, R.A. Fisher, Henry Marshall Ward, and especially William Bateson.

In the last chapter, Ayres briefly traces the Darwinian botanical legacy deep into the 20th century. We are familiar with the thread leading from Darwin through Fritz Went and the discovery of auxin. Less familiar are Francis' contributions to the statolith theory of gravitropism, crop physiology in general, and the links between photosynthesis and transpiration. The latter thread connects to current work on climate change. There are extensive end notes and works cited and a thorough and complete index. I would have liked additional figures, both of the personalities cited and particularly from Francis' works. It was an enjoyable read for me and would be accessible to my students.

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Biology and Evolution of Ferns and Lycophytes. Ranker, Tom A. and Christopher H. Haufler. 2008. ISBN 978-0-521-69689-0 (Paper US$70.00). 480 pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

What botanist isn't attracted to ferns for their beauty and diversity of leaf form? We also really appreciate ferns when teaching the plant life cycle, because students can so readily see the two alternating generations and their reproductive organs. Likewise, lycophytes evoke a wonderful and mysterious past when they dominated Carboniferous landscapes, generating amazing fossils and useful coal deposits. Given such attractions, chances are that other botanists will be as interested as I to read this new compilation of chapters edited by Tom Ranker and Christopher Haufler. Written for advanced botany students and professional botanists, this book brings us up-to-date on diverse aspects of fern biology, which is covered substantially more completely than that of lycophytes.

Sporting a spectacular cover that illustrates part of a frond of a fern (whose species identity I could not find cited), the book begins with a brief preface that places the work in a historical context and describes the contents. Chapters are logically grouped into four parts: development and morphogenesis, genetics and reproduction, ecology, and systematics and evolutionary biology. Authors include internationally recognized research experts who uniformly do a good job of explaining the scientific value of their topics, describing recent advances, and setting future research agendas. The black and white illustrations are of generally fine quality and of appropriate type and number. Appendices on modern fern classification provide extra value. I did not note usage errors beyond an instance of the term "algae" used as a singular noun ("algae" is plural; "alga" is the appropriate singular). (The world can't really expect me to let that one go!)

Among the interesting things I learned are that illustrations of fern life cycles in biology texts can be improved, ferns display a surprising diversity of gametophyte adaptations and reproductive modes, high base chromosome numbers typical of many homosporous ferns likely resulted from ancient polyploidy events followed by extensive gene silencing, spore and stomatal size correlation with ploidy levels might allow inferences to be made from fossil and herbarium material, and certain ferns occur with mangroves! I was particularly impressed with the images of plastid and nuclear migration in response to light changes in Chapter 1, specific examples of fern speciation processes

and homage to Irene Manton's work in Chapter 10, and list of structural characters that seem to best correlate with molecular phylogenetic patterns provided in Chapter 16. I was pleased to see the argument in Chapter 11 that patterns of plant evolution cannot be inferred from studies of extant species alone, so fossils should receive due attention, a concept with which vertebrate paleontologists would surely agree. Readers will discover many other valuable ideas and information.

Despite these admirable features, the book has at least one deficit in my view. An introductory chapter providing an overview of the special features of fern and lycophyte biology would have been immensely helpful in preparing the reader to dive into the specialized topics to follow. For example, such an introduction could have defined what is meant by the terms "fern" and "lycophyte," useful because the authors of at least two chapters differ in their concepts of what taxa should be considered ferns. Readers who are unfamiliar with this ongoing systematic issue will likely be somewhat confused until they finish reading the book. Some readers would probably have appreciated an overview of fern structure and a generalized life cycle, as well as definitions and illustrations of eusporangia and leptosporangia, before plunging into the more focused chapters. Several authors, while lamenting relatively low research funding, cite perceptions that ferns and lycophytes are less economically/ecologically important than seed plants. Although human uses of these plants are mentioned in some chapters, more attention to ethnnobotany and economic botany would have excited readers as well as providing grant proposal writers with useful supporting information. Lastly, I was disappointed not to find much attention paid to lycophytes, psilotophytes, equisetophytes, or heterosporous ferns. Despite these complaints, I enthusiastically recommend this readable and authoritative book to scholars interested in the latest research on ferns.

-Linda Graham, Department of Botany, University of Wisconsin - Madison

California's Fading Wildfowers: Lost Legacy and Biological Invasions. Minnich, Richard A. 2008. ISBN 978-0-520-25353-7 (Cloth US$49.95) 360 pp. University of California Press, Berkeley, CA.

The overall thesis of this book is to put nails in the coffin of the paradigm that perennial bunchgrasses dominated all California grasslands prior to European settlement, and that overgrazing largely facilitated the transition to exotic annual species. In his influential relict analysis of grasslands, F. E. Clements (1934) concluded that the widespread native perennial bunchgrass Nasella pulchra was the historical dominant in California grasslands, in part because annual plants were ruderal species that could not be considered dominants in a climax community. Minnich argues that many grassland vegetation analyses since that time were based on Clements and a "shifting baseline system" where the presumed baseline data were already different from that observed by the first European explorers. Only recently have researchers begun to arrive at a consensus that annual forbs were the likely dominants in most non-wetland, treeless habitats in California. Vegetation dominanted by perennial bunchgrasses was likely only in the foothills of the Sierra Nevada and the Coast Range. Minnich's book provides historical data that should convince remaining naysayers.

Minnich crafts well-researched arguments to support his hypotheses regarding the evolution of California's herbaceous landscape: "1) California's pre-Hispanic vegetation consisted of vast carpets of wildflowers, not bunch grasslands; 2) the introduction of European species triggered a biological invasion without the help of man's activities such as grazing; 3) the transformation of herbaceous cover began along the coast and shifted inland, the pace of change being dependent on habitat, climate variability, and, most importantly, the time of arrival and adaptive modes of the invaders; and 4) the collapse of indigenous forblands over most of California happened right in front of our eyes with the invasion of bromes in the twentieth century." He reconstructs past grasslands through an exacting analysis of travel accounts, plant matter preserved in mission bricks, surveys, newspaper and magazine accounts, and livestock and weather records. Through that process, Minnich reveals patterns of prescribed burning by Native Americans, the timing of exotic plant invasions and simultaneous displacement of native herbs, and the history of livestock grazing across the state.

Minnich has created a must-have compendium for students, managers, researchers and historians interested in herbaceous vegetation in California. If the book is read cover-to-cover some repetitive use of data and arguments occur, but this repetition is

necessary to create a handy resource for specific geographical regions or time periods. He breaks the book into three windows of time, pre-Hispanic herbaceous vegetation, invasions and grazing during the Nineteenth century, and the invasion by bromes starting in the late 1800s. His book ends on a positive note, with suggestions for managing today's California grasslands to tip the balance back towards native wildflower fields.

It is difficult to find many faults with the contents of this book. It would have benefitted from having a timeline of historical events relevant to the changes in California's landscape, and having the locations discussed in the text included on the maps. However, the invaluable first appendix includes historic place names, modern place names, and latitude and longitude of all locations discussed. Extensive notes, Spanish-English plant name translations, collections data and historical references to wildflower displays round out the appendices.

Finally, one cannot help but appreciate the inclusion of so much lovely poetry and prose portraying the wildflower fields that once blanketed much of California's landscape. One of my favorites is worth quoting to here to demonstrate how qualitative observations can enable one to visualize the abundance of California's Fading Wildflowers:

"Along the railroads on either hand runs continuously the rich and radiant bloom. Your sight becomes pained, your very brain is bewildered, by watching the galloping rainbow. There are great fields in which glowers of many sorts are mingled in a perfect carnival of color; then come exclusive family gatherings where the blue, crimsons, or the purples, have it all their own way; and every now and then you come across great tracts, resplendent with the most gorgeous of all wild flowers, the yellow or orange poppy, which...a botanist [gave] the name Escholzia, but which long ago some poetic Spaniard...christened it El Copo de Oro (the golden cup)...reminds one of the 'Field of Cloth of Gold'." - John Hittell (1874).

-Adrienne Leigh Edwards, Plant Ecologist, Botanist, Chico, CA 95928 aledwards@csuchico.edu

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Cycads of Vietnam. Osborn, Roy , Ken D. Hill, Hiep T. Nguyen, and Loc Phan Ke. 2007. ISBN 978-0-646-46445-9 (Hardcover). 116 pages. Published by Roy Osborne, Brisbane, Australia and Wynand van Eeden, Cape Town, South Africa.

Cycads are among the oldest extant lineages of plants with a fossil record extending back 200 million years. However, far from being "living fossils", cycads are a successful and adaptable group of plants that have managed to flourish and diversify in tropical regions throughout the world. The living cycads are composed of three (some authors recognize four) familes: Cycadaceae, Zamiaceae, and Stangeriaceae. All cycads are essentially tropical or subtropical in distribution.

Southeast Asia, and Vietnam in particular, is rich in *Cycas* (Cycadaceae) species. *Cycads of Vietnam* is an elaboration and expansion of the recent revision of the Vietnamese species of *Cycas* (Hill et al., 2004). Hill et al. (2004) recognized 24 species of *Cycas* in Vietnam (not including two Chinese species occurring close to Vietnam's borders) while Osborne et al. describe 26 species.

Cycads of Vietnam begins with an introductory chapter including a very brief history of Vietnam, overviews of its geography, climate, flora and fauna, and ecology and vegetation types. Chapter 2 focuses on the biology of cycads and particularly on the family Cycadaceae (the only one present in Vietnam.) Also included here are discussions on the origins of the genus Cycas, the history of cycad discovery in Vietnam, vegetative morphology, reproductive features, pollination and seed dispersal, the occurrence of hybridization (at least three known hybrids), toxicity, ethnobotany, conservation, and cultivation. The section on cultivation is very brief and serves mostly to show that cycads are generally quite amenable to cultivation. However, this is tied the previous section on conservation. Cycads are very popular as cultivated plants both within and outside of Vietnam. This has put tremendous pressure on cycad populations that are often exploited by commercial collectors. All Vietnamese cycad species have been given provisional conservation status, but only one has been listed in the IUCN 1997 Red List. Several of the Vietnamese species occur within protected areas.

Chapter 3 consists solely of the key to *Cycas* species in Vietnam. This is followed by the 26 species descriptions in Chapter 4. Each description consists of color photographs, a distribution map, a list of synonyms, description of the vegetative and reproductive part, distinguishing features, notes about the species' discovery and the citation of the type description, etymology of the species' name,

the conservation status, and known hybrids. Many species have illustrations reproduced from the original species descriptions. The species descriptions are arranged by sections (*Stangerioides*, *Indosinensis*, and *Cycas*). The descriptions are followed by three appendices: Vietnamese place names, herbarium acronyms, and cycad-oriented websites and societies. The literature cited and glossary of terms rounds out the book.

Cycads of Vietnam is an informative book about a biologically rich but somewhat unheralded part of the world. The authors expanded on both their recent species descriptions (Hill et al., 2004) and the *Cycas* treatments by Whitelock (2002). The copious illustrations and photographs help put faces with the names of these Asian cycad species. The individual location maps are particularly informative and missing form earlier treatments (i.e., Whitelock 2002 and Jones 1993). Overall, I would recommend *Cycads of Vietnam* to anyone with a strong interest in cycads, and particularly in the genus *Cycas*. While limited to Vietnam, it is nice to see the detailed treatments that are not possible with a broader geographic treatment.

-James P. Riser II.

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Field Guide to the Wild Orchids of Texas. Brown, Paul Martin, artwork by Stan Folsom. 2008. University Press of Florida: Gainesville. 316 pages. ISBN 978-0-8130-3159-0 (soft-bound). US $29.95.

Encompassing more, different vegetation and physiographic regions and a greater land area than any other of the contiguous 48 United States, Texas certainly looms large. Floristic treatments of Texas regions and the entire state have produced prodigious works including the Manual of the Vascular Plants of Texas (Correll and Johnston 1979) and, more recently, Shinner and Mahler's Illustrated Flora of North Central Texas (Digges et al. 1999). Both of these volumes are essentials when it comes to gaining knowledge of Texas' vast vegetional wealth, but neither of them is the kind of thing one wants to carry into the field on a regular basis. Reasonably enough one might wish for a real field guide treating Texas plants, the kind of thing that fits easily into a backpack or even a large pocket, and the wish is cleverly fulfilled if your interest is in orchid identification.

Paul Martin Brown's Field Guide to the Wild Orchids of Texas is a sturdily bound volume with a number of features that make it a joy for orchid enthusiasts. The text is divided into four major sections: introduction to Texas vegetation regions and to orchid terminology and keying; the actual field guide portion featuring alphabetically arranged genera found within the state and individual species' descriptions and accompanying illustrative figures; a section of references and resources that provides a smorgasbord of taxonomic vantage points; and a region-by-region synopsis of what orchids one is likely to encounter where. Several appendices, a glossary, a bibliography, and index complete the book.

In terms of true utility, the keys to genera and species within genera are what make this guide most valuable. The majority of genera can readily be determined using the appropriate key, but there are exceptions. If confronted with a Malaxis, a novice would never find it because the key groups it among genera with basal leaves, but all known North American species produce cauline leaves. If one is familiar with Platanthera species in other locales, the use of a three-toothed or erose labellum margin to segregate out species assigned by Brown to the genus Gymnadeniopsis would surely cause some confusion (where would Platanthera integrilabia key if ever found in Texas?). At the species level identification tends to be more straight-forward. Information regarding species appears as a page of text and one or more illustrations facing photographs of whole plants, inflorescences, and vegetation and a distribution dot map for the species in Texas. Plant descriptions, habitat, and comments on species provide good, general information but are lacking in detail for those with an intimate knowledge of native orchids. Likewise, the photographs and illustrations serve as useful references in the field but do not suffice for providing diagnostic characteristics necessary to definitively nail down an orchid's identity. Comparing Wild Orchids of Texas to two classics of North American orchid identification, The Native Orchids of the United States and Canada excluding Florida (Luer 1975) and Orchids of the Western Great Lakes Region (Case 1987), Brown's field guide squarely occupies the middle ground as an identification tool. The

photographs and illustrations in Luer are more detailed; Case's species descriptions provide such clarity that one can envision the plant in its habitat without ever having visited a field site. To the good, Brown's text is more informative than Luer's and, in many instances, with better figures than Case.

Depending on individual predilections different readers will find the other sections of Brown's field guide to be more or less useful. In part three, References and Resources, both the species check list and distribution list by physiographic region provide the kinds of field tripping incentives well known to anyone who maintains a life list. The comparative taxonomy, complete with Brown's commentary on previous publications covering the orchid flora of Texas, does little more than hint at the sniping common among rival orchid taxonomists. Likewise, the synonymies and misapplied names seem better omitted from a field guide meant to encourage a passion for native orchids. Orchid Hunting, part four of Brown's text, should be a treasure for anyone finding him or herself spending some time in any of Texas' eco-regions, particularly if time is available for orchid seeking. Appendix 1, a modification of two prior publications, speculates on Platanthera chapmanii (or P. Xchapmanii) origins and interactions with other Platanthera species, a topic of continued debate and investigation probably better presented in a different venue. The remaining appendices (two and three), show distributions and flowering times, respectively.

In summary the Field Guide to the Wild Orchids of Texas provides a mix of field-useful and field not-so-useful information. Enthusiasts will find this book handy as a guide to identifying native Texas orchids. Serious orchid researchers will find parts of it annoying at best, but those parts aren't ones to be read in the field.

- Nancy E. Cowden, Ph.D. Biology Department, Lynchburg College, 1501 Lakeside Drive, Lynchburg, Va. 24501

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Luer, C.A. 1975. The Native Orchids of the United States and Canada excluding Florida. The New York Botanical Garden.

The Names of Plants, ed. 4. Gledhill, David. 2008. viii + 426 pages. ISBN 978-0-521-86645-3 (hardback US$95.00); ISBN 978-0-521-68553-5 (paperback US$45.00). Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

For some readers, "Fourth Edition" may be all the affirmation one needs in order to know that a book has merit. Certainly, for *The Names of Plants, ed. 4,* that is the case. The introductory pages provide a concise history of the naming of plants from ancient to modern times, a synopsis of botanical Latin, and accounts of formal botanical nomenclature (based on *International Code of Botanical Nomenclature*) and nomenclature of cultivated plants (based on *International Code of Nomenclature for Cultivated Plants*). Most of the book (pp. 32—412, some 17,000+ entries) is a glossary of words and word-elements used in names of genera and in epithets in binomials and trinomials.

Botanical lexophiles probably have W. T. Stearn's *Botanical Latin* (ISBN 0-88192-321-4, also an ed. 4 book) and/or R. W. Brown's *Composition of Scientific Words* (ISBN 1-56098-848-7) within reach. To get a sense of how Gledhill's book compares with those two, I checked a sample of 100 words, prefixes, and suffixes from Gledhill against Brown and Stearn. I chose words and elements not based on other plant names or on names of places or people (e.g., from Gledhill: *absinthoides* wormwoodlike, *aberdeenensis* from Aberdeen, South Africa, and *aaronis* for the prophet Aaron). Of the 100, I found 84 in Brown, 53 in Stearn, 43 in both, and 4 in neither.

On most pages in Gledhill, plant names and epithets derived from names of people, places, or other plants well outnumber those based on morphological descriptors. In that regard, Gledhill's glossary is a welcome and useful companion to those of Brown and Stearn and provides in one handy volume information not conveniently found elsewhere.

The following verbatim examples from Gledhill's glossary may provide a sense of its substance [numbers in brackets were added by me to indicate how many times an epithet was found as a basionym in International Plant Names Index (http://www.ipni.org:80/ipni/plantnamesearchpage.do)]:

Abobra from a Brazilian vernacular name

aboriginorum indigenous, of the original inhabitants, *aborigines, aboriginum* [2]

abro-, abros soft, delicate, abroV

Abronia Delicate, abroV (the involucre)

abrotanifolius -a -um wormwood-leaved, botanical Latin from abrotanon with *folium* [28]

abyssicolus -a -um inhabiting ravines or chasms, late Latin, *abyssus-colus*, from Greek a-byssoV,

without bottom [2]
abyssinicus -a -um of Abyssinia, Abyssinian (now Ethiopia) [100+]
Acacallis etymology uncertain
achy-, achyro- chaffy-, chaff-like-, acuron, acuro-, acu-?
acraeus -a -um of windy places, of hilltops, akrahV [5]
acreus -a -um of high places, of the summit, the highest, akra [0]
Anemone a name used by Theophrastus. Possibly a corruption of Naaman, a Semitic name for Adonis, from whose blood sprung the crimson-flowered *Anemone coronaria*
arnicoides resembling *Arnica*, arnakiV-oeidhV [7]

As seen in examples above, some epithets included by Gledhill are seldom used, and "*acreus -a -um*" appears never to have been used, as an epithet at species or infraspecies rank. Perhaps such entries should have been omitted to make room for others (e.g., *deltata, -um, -us*). Other quibbles include treatment of *glabratus* and *glabrescens* as equivalents (ditto for *orbicularis/orbiculatus*) and defining of *disciformis* as "having radiate flowers."

Syntactical anomalies (e.g., "am" for "is" in discussion of objects and subjects in sentence structure, p. 19; doubtless the result of "corrections" made by a grammar algorithm) and typographic errors (e.g., mixed Roman and Italic letters in *affinis*, p. 38) appear to be few and far between. There is an error at "*Franklinia* Benjamin Franklin (1706—90) inventor of the lightning conductor and President of the USA." First (1985) and second (1989) editions lack Franklin, third (2002) has Franklin an "American President;" perhaps a fifth edition will be justified. Still, overall, the pros well outweigh the cons and I am pleased to welcome this book into my library.
-John L. Strother, University Herbarium, University of California, Berkeley, CA 94720-2465

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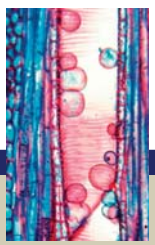

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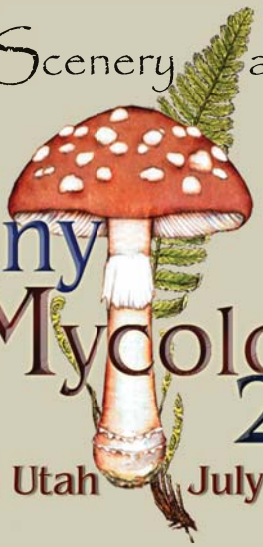

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