BULLETIN

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PLANT SCIENCE

The Botanical Society of America: The Society for ALL Plant Biologists

continued on inside cover

THE BOTANICAL SOCIETY OF AMERICA
Leading Scientists
and
Educators
since 1893

BOTANICAL SOCIETY OF AMERICA

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contents continued:

The Society visited Snowbird Utah for the second time in five years and this meeting was even better than the last. Approximately 1200 botanists and mycologists participated in a variety of field trips, workshops, special lectures, symposia, and talks. In addition to our usual botanical fellow-societies, we were symbiotically joined by our Mycological colleagues. For those of you who were not able to attend, we will be featuring some of the highlights of the meeting in this issue and the next. Also featured in this issue are one of the educational programs of the Fairchild Tropical Botanical Gardens and another installment of our international botany series.

The Fairchild has three major educational programs. The Explorer Program, grades k-12, is now 29 years old and still going strong. The Discovery Program, grades 3-12, is an innovative new program using GPS units and focused on biomimicry. The Fairchild Challenge, open to middle school and high school students (and piloting for elementary levels) is a very large and complex outreach program and is the focus of our article.

The International Section takes us to Equatorial Guinea, a small country on the west coast of Africa with big challenges and big opportunities in botany. It is on the southern limit of the Guinean Rainforests, a global biodiversity hot spot. I should note that in addition to this series of articles, the section is working on a proposal for a joint meeting with Peruvian botanists in Peru. Hopefully we'll have more to report in a future issue. For now, enjoy this issue and the end of summer.

- the Editor

News from the Society

American Journal of Botany Named a Top 10 Most Influential Journal of the Century

The Special Libraries Association (SLA) has selected the *American Journal of Botany* as one of the 10 most influential journals of the past 100 years in the field of biology and medicine. The SLA announced the results on June 16, 2009 at its annual business luncheon in Washington, DC.

To commemorate the SLA's 100th anniversary, The Biomedical and Life Sciences Division (DBIO) of the SLA convened an international panel of 9 eminent subject experts to compile a ballot for an electronic poll of their membership to determine the 100 most influential journals of biology and medicine over the 100 years of the association's existence. The AJB—published by the Botanical Society of America (BSA)—competed in a field of 13 nominated journals of Botany and was recently selected as one of the top 100. This new honor is even more prestigious.

Prof. Judy Jernstedt (Univ. of California, Davis), current Editor-in-Chief of the AJB, said, "This is an enormous honor for the American Journal of Botany, to be in the company of such distinguished journals. Our work is cut out for us, to try to be worthy of this recognition and to continue to improve the quality and stature of this society-supported journal."

The President of the BSA and former Editor-in-Chief of the AJB, Prof. Karl J. Niklas (Cornell University), said, "The BSA membership can take great pride in seeing their flagship publication honored in this way. Since the inception of the BSA, our members have striven to produce and disseminate peer-reviewed scientific articles of the highest quality. The recognition of the AJB as

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one among the top 10 journals in biology and medicine testifies to their hard work and dedication and to the importance of non-profit scientific societies like the BSA."

The remaining Top 10 journals include *Science, Nature, Proceedings of the National Academy of Science, New England Journal of Medicine, Journal of the American Medical Association, British Medical Journal, Journal of Zoology, American Journal of Physical Anthropology*, and *Journal of Paleontology*.

The SLA is a professional organization of subject specialist librarians, information managers, and publishing industry representatives. To learn more about the criteria for selecting the most influential journals, visit http://units.sla.org/division/dbio/publications/resources/dbio100.html.

The Botanical Society of America (www.botany.org) is a non-profit membership society with a mission to promote botany, the field of basic science dealing with the study and inquiry into the form, function, development, diversity, reproduction, evolution, and uses of plants and their interactions within the biosphere. It has published the *American Journal of Botany* (www.amjbot.org) for nearly 100 years. For further information, please contact Richard Hund, Project Manager of the *American Journal of Botany*, at rhund@botany.org or Amy McPherson, Managing Editor of the *American Journal of Botany*, at amcpherson@botany.org.

Thanks for your time!

Sincerely,

Dr. Karl Niklas
President
Botanical Society of America

Annual Meeting

BSA Election Results

Congratulations to Dr. Judith Skog as the incoming BSA President-Elect. Joining her will be Dr. Pamela Diggle as our Secretary for the next three years, and Rachel Meyer as the new Student Representative for two years.

In line with changes to our bylaws earlier in the year, we have three new positions on the BSA Board to support developments in specific areas of importance to the Society. They are: Dr. Scott Russell for Publications; Dr. Dennis Stevenson for Development; and Dr. Christopher Haufler for Education.

Thank you to Dr. Steve Weller for his service as Secretary for the past three years, to Andrew Schwendemann as Student Representative and for his role on the bylaws committee, and to Dr. Pamela Soltis for her extraordinary efforts as BSA Past-President.

Awards

Botanical Society of America Merit Award

Dr. Norm Ellstrand - 2009. The Botanical Society of America recognizes Dr. Norman C. Ellstrand with the Merit Award for his studies on plant population genetics; Ellstrand is one of the country's foremost experts on plant gene flow, the movement of genes from one organism to another. His research has involved the study of the possibility of escape of genes from genetically engineered crops into their wild relatives as well as the potential consequences of that escape. Ellstrand's work has shown that crops can mate with their wild relatives at rates and distances much higher than previously supposed. He also has shown that the hybrids are often more

fit than suspected, suggesting that once transgenes occur in hybrids they will spread readily. Ellstrand has warned that if transgenes confer an advantage to a weed, such as herbicide resistance, that weed will become more difficult to control.His recent research has come to focus on the evolution of invasiveness in plants. He was among the first to suggest that invasive species could evolve from relatively innocuous progenitors. Ellstrand is the author of more than 100 peer-reviewed research papers and of the influential book *Dangerous Liaisons? When Cultivated Plants Mate with Their Wild Relatives*. Norman Ellstrand is richly deserving of the Merit Award, the highest award of the Botanical Society of America.

Dr. Alan Graham - 2009. The Botanical Society of America recognizes Dr. Alan K. Graham with the Merit Award for his lifetime of perceptive and careful study, by which Graham has laid the foundations for our "concepts about the origins and history of tropical vegetation" in the Western Hemisphere during the past 75 million years. Encouraging numerous students and colleagues for several decades, he has greatly advanced the field of vegetation history, the basis of our understanding the past migrations of plants and animals in North and South America, their evolution, and the way in which we should understand their present distributions. For his life's works, the Botanical Society of America awards Dr. Alan Graham with its highest award.

Dr. Gar Rothwell - 2009. The Botanical Society of America recognizes Professor Gar W. Rothwell with the Merit Award because he has demonstrated a level of professional commitment and accomplishment that we all strive to attain. He is a world-class scholar as judged by his peers, an effective and persuasive teacher as judged by his University and students, and an active and convincing advocate for the plant sciences as judged by the scientific community. As noted by one of his peers: Rothwell's "work with fossil ferns of many types…helped to more accurately define the three major radiations of true ferns and to sharpen the focus when molecular clade estimates and phylogenetic analyses based only on molecular data conflicted with each other." These individual, but highly intertwined activities in his career have been carried out at the highest level of professionalism and with a sense of purpose that is rarely matched. "Scholar, teacher, and extraordinary professional citizen" for the plant sciences underlines the distinguished career of Gar W. Rothwell, who so richly deserves the BSA's Merit Award.

Dr. Marshall Sundberg - 2009. Professor Marshall D. Sundberg has demonstrated excellence in basic research, education, and exceptional service to the professional botanical community. His studies on the morphology of teosinte and its relatives are considered stellar contributions. Sundberg has made many valuable contributions to the Society, especially to the teaching section (vice-chair, program chair and workshop and section chair for many years) and as chair of the committee which revised and expanded the valuable 1995 booklet, *Careers in Botany*. This small booklet with large outreach for our society and for educators provided the resources to help students and professionals alike to understand the importance of a botanical education and how they could apply it to their life's work. Professor Sundberg has also chaired the Society's Education Committee, Membership and Appraisal Committee and assumed editorial responsibility for the *Plant Science Bulletin*. As the current editor of our Bulletin, established in the 1950's as a vehicle for disseminating information for our colleagues in the Plant Sciences, Marsh has surpassed this goal with his choice of subject matter, editorial insights and innovative reports. Marshall Sundberg is a notable public ambassador, speaker, researcher and advocate for plant biology at state, national, and international venues. Marshall Sundberg has earned the Botanical Society of America Merit Award, the highest honor our society can bestow on a colleague who has made outstanding contributions to botanical science and dedicated his career to our profession.

2009 J. S. Karling Graduate Student Research Award Recipient

Andrew B. Schwendemann
University of Kansas, KS - Advisor, Dr. Thomas N. Taylor, *Deep time plant physiology and its implications for climate change*

2009 BSA Graduate Student Research Award Recipients

Madelaine Bartlett
University of California, Berkeley, CA - Advisor, Dr. Chelsea D. Specht, *Evolution of floral symmetry in the petaloid monocot order Zingiberales*

Jessica M. Budke
University of Connecticut, Storrs, CT - Advisor, Dr. Cynthia Jones, *Examining the matrotrophic calyptra and its role in moss sporophyte development using* Funaria hygrometrica *L. (Bryophyta).*

Ben R. Grady
University of Wisconsin, Madison, WI - Advisor, Dr. Kenneth J. Sytsma, *Systematics and Edaphic Endemism in* Eriogonum *(Polygonaceae): An Integrative Approach*

Alison Hale
University of Pittsburgh, Pittsburgh, PA, - Advisor, Dr. Susan Kalisz, *Testing the stability of obligate mutualisms using the plant-arbuscular mycorrhizal fungi interaction as a model system*

Robert G. Laport
University of Rochester, Rochester, NY - Advisor. Dr. Justin Ramsey, *Reproductive Isolation in the North American Creosote Bush (*Larrea tridentata*, Zygophyllaceae)*

Maribeth Latvis
University of Florida, Gainesville, FL - Advisor, Drs. Pamela S. & Douglas E. Soltis, *Tracking Migration, Diversification, and Gene Losses Across North and South America in* Agalinis *(Orobanchaceae)*

Nicole E. Miller
Washington University, St. Louis, MO - Advisor, Dr. Peter Hoch, *Stress-adaptation and competition for pollinators: Implications for endemism*

Patricia Lu-Irving
University of Washington, Seattle, WA - Advisors, Dr. Richard G. Olmstead, *How do shifts in dispersal strategy affect the distribution and diversification of species? An example from the* Lantana-Lippia *complex (Verbenaceae)*

Alexandra Sasha Rohde
University of Pittsburgh, Pittsburgh, PA, - Advisor, Dr. Tia-Lynn Ashman, *Temperature and Water Effects on Phenology and Opportunity for Positive Assortative Mating in* Plantago

Jane E. Ogilvie
University of Toronto, Toronto, ON, Canada, - Advisor, Dr. James Thomson, *Pollination Facilitation Subalpine in Gentians*

Robert N. Schaeffer
Dartmouth College, Hanover, NH, - Advisor, Dr. Rebecca Irwin, *Direct and indirect effects of nectar microbial communities on pollinator behavior and plant fitness*

2009 Young Botanist Award Recipients
Certificate of Special Achievement

Andre Calaminus University of Florida, Gainesville, FL - Advisor, Dr. Pamela S. Soltis

Julia I. Chapman Ohio University, Athens, OH - Advisor, Dr. Phil Cantino

Anna Dennis Willamette University, Salem, OR - Advisor, Dr. Dr. Susan R. Kephart

Brinton Domangue James Madison University, Harrisonburg, VA - Advisor, Dr. Conley K. McMullen

David Farler Miami University, Oxford, OH - Advisor, Dr. John Z. Kiss

Karl Gorzelnik James Madison University, Harrisonburg, VA - Advisor, Dr. Conley K. McMullen

Annie Hanks Humboldt University, Eureka, Ca - Advisor, Dr. Frank J. Shaughnessy

Lucas T. Henderson Humboldt University, Eureka, Ca - Advisor, Dr. Alexandru M. F. Tomescu

Richard LaMar Hederstrom Connecticut College - Advisor, T. Page Owen, Jr.

Jane A. Hopkins Miami University, Oxford, OH - Advisor, Dr. John Z. Kiss

Amelia Huerta Miami University, Oxford, OH - Advisor, Dr. John Z. Kiss

Emily Johnston Ohio University, Athens, OH - Advisor, Dr. Harvey E. Ballard, Jr.

William John Karis Connecticut College - Advisor, T. Page Owen, Jr.

Roxanna Khadem University of California, Los Angeles, CA - Advisor, Dr. Ann M. Hirsch

Ashley Klymiuk University of Alberta, Edmonton, AB, Canada - Advisor, Dr. Ruth A. Stockey

Adam Kotaich Willamette University, Salem, OR - Advisor, Dr. Susan R. Kephart

Meagan Lebeau SUNY Plattsburgh, Plattsburgh, NY - Advisor, Dr. Chris Martine

Ralph McNeilage University of Tennessee, Knoxville, TN - Advisor, Dr. Elias J. Fernandez

Megan Pallo University of Missouri, Columbia. MO - Advisor, Dr. J. Chris Pires

Adel Peña Florida International University, Miami, FL - Advisor, Dr. Suzanne Koptur

Valinn Joseph Vincent Ranelli Connecticut College - Advisor, T. Page Owen, Jr.

Deb Rojas California State University, Chico, CA - Advisor, Dr. Christopher T. Ivey

Laura Schmidt Central Michigan University, Mount Pleasant, MI - Advisor, Dr. Anna K. Monfils

Angela Schultz University of Colorado, Denver, CO - Advisor, Dr. Dr. Leo Bruederle

Allison Schwartz University of California, Los Angeles, CA - Advisor, Dr. Ann M. Hirsch

Michael Schwieterman Miami University, Oxford, OH - Advisor, Dr. John Z. Kiss

Michael R. Sekor Vassar College, Poughkeepsie, NY - Advisor, Dr. Mark A. Schlessman

Molly Sultany Willamette University, Salem, OR - Advisor, Dr. Susan R. Kephart

Jennifer VanWyk Vassar College, Poughkeepsie NY - Advisor, Dr. Mark A. Schlessman

2009 Vernon I. Cheadle Student Travel Award

Madelaine Bartlett - University of California, Berkeley, CA - Advisor, Dr. Chelsea Specht Botany 2009 presentation: "*CYCLOIDEA-like genes and the evolution of floral symmetry in the* Zingiberales."

Brett A. Bergman - California State Polytechnic University, Pomona, CA - Advisor, Dr. Frank W. Ewers Botany 2009 presentation: "*Effect of Leaf Nodes on the Mechanical Properties of Stems*."

Nathan Derieg - University of California, Santa Barbara, CA - Advisor, Dr. Scott HodgesBotany 2009 presentation: "*Molecular basis of an adaptive trait: floral anthocyanin production in* Aquilegia."

Julia Nowak - University of British Columbia, Vancouver, BC - Advisor, Dr. Quentin Cronk Botany 2009 presentation: "*Morphological oddity of the Krishna Fig*.

TRIARCH (Conant) "Botanical Images" Student Travel Award

First Place, Mauricio Diazgranados, Saint Louis University **Nature Games**$500

Second Place, Julia Nowak, University of British Columbia **Canola vascular bundles**$250

Third Place, James Cohen, Cornell University **Apocynaceae flower close up**$150 **Botany 2009** Student Travel Award

Charles Edwin Bessey Teaching Award

Dr. Roger Hangarter is the Class of 1968 Chancellor's Professor in the Department of Biology at Indiana University. Although he is foremost a botanical researcher who studies how plants use light and gravity to regulate their growth and development, he recognizes the synergistic relationship between research and teaching. He is highly committed to, and has been highly successful at, communicating botany to public audiences. His Plants-In-Motion website provides a large collection of his own time-lapse plant movies and educational materials for teachers and students worldwide. He also develops visually compelling educational projects. His work is exhibited in US science museums as well as art galleries. Using time-lapse photography, Dr. Hangarter has created movies allowing us to see that plants are living organisms capable of some extraordinary things. His time-lapse movies provide a unique opportunity to demonstrate the dynamics of plant life. Professor Hangarter has shared his vision with the BSA at its annual meetings on several occasions—- including his most memorable delivery of the 2006 Educational Forum and Outreach plenary address entitled "Communicating an Awareness of Plants through Science and Art" at the Chico, CA meeting. In short, Dr. Roger P. Hangarter's significant and ever-evolving body of botany education work represents teaching innovation, documented national impact, attention to scientific quality, and a quest for public enlightenment.

Darbaker Prize

Dr. Patrick Keeling, Canadian Institute for Advanced Research, Evolutionary Biology Program, Department of Botany, University of British Columbia, Vancouver, BC, Canada. Dr. Keeling's research has contributed in a substantial and meaningful way in the area of organelle evolution, genetransfer, and genome evolution, including plastid evolution, in the microalgae of the Chromalveolates and Ulvophyceae.

LDS: Botany in 2009

Kent E. Holsinger, Presidential Address
Botanical Society of America

Department of Ecology & Evolutionary Biology
U-3043, University of Connecticut, Storrs, CT
06269-3043

Botany & Mycology 2009 was held in Snowbird. Snowbird is in Utah not far from Salt Lake City, the Mormon Temple, and the monument marking the spot where Brigham Young announced on 24 July 1845 that this is the place. So you might think that "LDS" refers to the Church of Jesus Christ of Latter Day Saints, and in Utah it does. But it's not what I'm referring to.

You might remember that the meeting was Botany ***& Mycology*** 2009 and think that I'm mildly dyslexic. After all, mycologists study fungi, *Claviceps* is a fungus, and it produces a compound that made Timothy Leary famous in the 1960s – lysergic acid diethylamide, LSD. I may be mildly dyslexic, but that's not what I'm referring to either.

Or if you really think I've gone off the deep end (and if you're still reading this, you probably do) you may think that I'm severely dyslexic and that instead of "LDS" I really meant to write "SLD", referring to the SLAC Large Detector. But the SLAC Large Detector is collecting data on the Z0 boson, which has nothing to do with botany, and I'm pretty sure that I'm not severely dyslexic. No, I really did mean to write "LDS", and this is why.

The meeting was Botany & Mycology ***2009***, and we all know that 2009 is a very important year. It is the 200th anniversary of Darwin's birth on 12 February 1809 and the 150th anniversary of his publication of *On the Origin of Species*. So that's the "D". And, of course, Darwin made many fundamental contributions to botany for which he'd be remembered today, even if he'd never written the *Origin*.

You probably also remember that another very important person was born on 12 February 1809, Abraham Lincoln. That's the "L". So where does the "S" come from? That requires a little detour into history.

You probably don't know that in 1849 the U.S. Patent Office issued patent number 6469 for a device to lift boats over shoals in rivers, but if you did know that you'd also know that patent number 6469 is the only patent ever issued to someone who would later become President of the United States – Abraham Lincoln. So Lincoln and Darwin share something besides a birthday. They share a commitment to science and technology.

In fact, Lincoln's commitment to science was so great that in the depths of the Civil War, in 1863 a couple of months before the Battle of Gettysburg, he signed the act establishing the National Academy of Sciences "to investigate, examine, and report upon any subject of science or art" (http://www7.nationalacademies.org/archives/nasfounding.html).

So the "S" is science, and the Botanical Society of America is celebrating 2009 as a Year of Science, along with many other scientific organizations, colleges, universities, museums, and educational organizations. We have a lot to celebrate in 2009 besides Darwin and Lincoln. Here's a very short list of examples:

-The 400th anniversary of Galileo's first use of a telescope to observe the heavens in 1609,
-The 150th anniversary of the founding of the Missouri Botanical Garden in 1859,
-The 250th anniversary of the founding of the Royal Botanic Gardens Kew in 1759,
-The 800th anniversary of the founding of Cambridge University in 1209, and
-The 1250th anniversary of the founding of the oldest university in the world, the University of al-Qarawiyyin in 759.

But we also have a lot to be concerned about. A survey that the Pew Research Center for the People & the Press released this summer shows a wide divergence in attitudes between scientists and the general public (http://pewresearch.org/pubs/1276/science-survey). While more than 80% of scientists agree that human activity is warming the earth and that living things evolved by natural processes,[1] only about 50% of the general public agree that human activity is warming the earth and barely 30% agree that living things evolved by natural processes. At a time when some of the greatest challenges facing us require some knowledge of science – climate change, biodiversity loss, emerging diseases, personal genomics, nanotechnology to name a few – the need for broad understanding of science has never been greater.

The Pew Survey also asked scientists to rate the importance of various problems in translating science into policy. More than 80% of us agreed that the public isn't knowledgeable – not surprising and not a new observation. It just so happens that 2009 is the anniversary of another event that you may never have heard about (if you're young) or that you've forgotten about (if you're old, like me) – the Rede lecture at Cambridge by C. P. Snow in which he lamented the divide between two cultures. "Literary intellectuals at one pole – at the other

scientists…Between the two a gulf of mutual incomprehension" (C.P. Snow, "The Two Cultures", *New Statesman* 6 October 1956).

That's the way we always describe it. "The public doesn't know enough." We look at survey results, like those from Pew, and convince ourselves that we need to teach people more science – and we do. But is that *all* we need to do? (Would I be asking the question if I thought the answer was "Yes"?)

Think about these results (also from the Pew survey):

·More than 80% of respondents think that science's effect on society is mostly positive. That's good.

·But they don't know much about what we think: Only a little more than half agree that scientists think humans are causing global warming or that humans evolved. That's bad.

·But only about 30% of respondents know that members of the U.S. House of Representatives have a 2-year term, only about half are familiar with Brown *v*. Board of Education, and nearly 30% don't know that the First Amendment protects free speech. So the public doesn't know basic civics much better than they know science.

The problem for science is not just that they don't know it, but that they don't care. So you have to wonder: Is the lack of science knowledge in the general public *their* problem, or is it ours? Maybe, as Pogo might have said, "We have met the enemy and he is us."

So how do we overcome the mutual incomprehension? We start with education for sure. We know how to do that, and we do it pretty well. Again from the Pew Survey, fewer than 20% of those who never attended college have a high level of general science knowledge, but almost 60% of those who finished college do. We need to continue to invest in and enhance our educational efforts, both as graduate students and faculty and as professional societies.

But teaching our students won't be enough, unless we're willing to wait 10-15 years and to write off the hundreds of millions of people who are beyond school age. We have to reach out beyond schools and colleges to engage a broader audience and to cultivate an appreciation for science. That's part of the reason for Year of Science 2009. For botanical societies, there are some obvious opportunities. We ought to build stronger connections with horticultural societies, garden clubs, and botanical gardens and arboreta, for example. We should also explore how best to use "new media" – blogs, Facebook, and the like – to engage a broader audience and to communicate the wonder and excitement of botany and science.

But (you knew there was going to be a "but", didn't you?) that won't be enough. Educating and engaging are great, but they presume that it's the *public* that has the problem, not us. Let me remind you of another anniversary we're celebrating this year. The 250th anniversary of the founding of Wedgwood China. Why do I mention this? There's the obvious Darwin connection. Josiah Wedgwood was Darwin's maternal grandfather, but that's not the only reason I'm mentioning it. In addition to being a Year of Science, 2009 is also the year in which Waterford Wedgwood declared bankruptcy. Why? Because in the words of Judith Flanders, it had lost "Josiah's intuitive grasp, his flair, his zest for selling" (*New York Times* 9 January 2009; http://www.nytimes.com/2009/01/10/opinion/10flanders.html).

I'm afraid we may be more like the Waterford Wedgwood that went bankrupt than the Wedgwood that Josiah founded. Josiah succeeded because he understood his market. He listened to his customers. Remember, the problem we're trying to solve is one of *mutual* incomprehension. Maybe we need to listen a little more carefully.

Over 2000 years ago Aristotle outlined the principles of persuasion in his *Rhetoric* (see http://plato.stanford.edu/entries/aristotle-rhetoric/ for a summary). The first principle is *logos*: the logical structure and evidence of the argument itself. That's the part that we as scientists tend to focus on and tend to think ought to be sufficient. Aristotle was devoted to reason and rationality, but he knew that reason and rationality weren't enough.

The second principle is *ethos*: the character and trustworthiness of the speaker. Think about that for a moment. Just over a week before Botany & Mycology 2009, Walter Cronkite passed away. At the height of his career he was, as David Halberstam wrote, "the most trusted man in America" (reprinted in *The Atlantic* 18 July 2009). When Walter spoke, America and the world listened.

Those of us old enough to have watched him will also remember that it was Walter who anchored the launch of Apollo 11, which landed on the moon 40 years ago in July, and many of the other launches starting with those of the Mercury program 8 years earlier. It was a time when science and technology captured the public imagination, and Walter's credibility must have been part of the reason.
But it wasn't only his credibility. It was his infectious enthusiasm. Walter was positively giddy when Apollo 11 blasted off. That's the third principle, *pathos*: engage the emotions of the listener. If your listener

gets bored, game over.

So in thinking about how to bridge the gap we have to remember that evidence and logic are necessary, but they're not enough. We need to remember why we do science, because it's ***FUN*** and exciting, and we need to share that excitement with others. We need to do it to ensure the health of our science, but we also need to do it to ensure the health of our world. The world needs science – and scientists.

Note: On the morning after I gave this address *Nature* published an editorial, ("Inspiring non-scientists," *Nature* 460:552; 2009; http://www.nature.com/nature/journal/v460/n7255/full/460552a.html) encouraging scientists to look at the TED conference talks (http://www.ted.com/themes/top_10_tedtalks.html) as a model to follow. Here's their conclusion:

TED talks tend to have a strong feel-good aspect, often featuring calls to make the world a better place. Rarely is the audience provoked or seriously challenged. But that's not necessarily bad — the attendees have paid thousands of pounds apiece in this case to have an uplifting time, after all. They are eager to hear about new ideas. And the process does spread those ideas among people who are themselves influential and well connected.

Scientists wishing to inspire non-scientists should look at a few of these talks online and learn a thing or two.

The PowerPoint slides that accompanied this talk are available on SlideShare: http://www.slideshare.net/kholsinger/bsa-presidential-address-2009.

(Endnotes)

[1] It 's frightening to think that more than 10% of scientists surveys think that living things did not evolve by natural processes.

Donald R. Kaplan Memorial Fund Benefit Dinner

The Developmental and Structural Section, with approval of the BSA Council, initiated the Donald R. Kaplan Memorial Lecture in Comparative Development Fund at the 2008 BSA meetings. Principle and interest from this fund will be used to invite a leading scholar to present a talk in comparative development of plants, sponsored by the Society as a whole, at the annual BSA meetings.

The Fund Raising Committee (Todd Cooke, Cynthia Jones, Chelsea Specht and Darleen DeMason, chair) organized a benefit dinner on Monday evening at Snowbird. A portion of each ticket went into the fund and an auction and raffle were held of donated gifts from both corporations and individuals. Frank Ewers was the Master of Ceremonies and Joe Armstrong expertly ran the auction. The major donors were AIBS, NRC Research Press, University of California Press and University of Chicago Press.

Among the private donations was a wooden bowl made by Jack Fisher, which went for $100. In addition to the lighthearted bidding wars during the auction, the entertainment included a botanical joke contest and a "name the author contest." Ann Hirsch and Stefan Kirchanski donated wine for each table, which also contributed to the festive and jovial atmosphere.

On a more serious note, the evening finished with a talk given by Chelsea Specht entitled "Bringing morphology into the field: diversity, complexity, and adaptation of plant form."

"Even though the college man raises no more wheat than his neighbor, he will have more satisfaction raising it. He will know why he turns the clod; he will challenge the worm that burrows in the furrow; his eyes will follow the field mouse that scuds under the grass; he will see the wild fowl winging its way across the heaven. All these things will add to the meaning of life and they are his."

—Liberty Hyde Bailey

Compliments of Jim Wandersee

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.

PlantingScience — BSA-led student research and science mentoring program

Summer Learning Fun for Teachers. The second PlantingScience Summer Institute was held June 8-16. What a phenomenal group of accomplished and committed middle school and high school teachers! And what an engaging and enlightening learning environment the scientist presenters offered these 12 teachers who came to Texas A&M University from across the country.

Paul Williams and Amber Robertson, along with input from classroom field-testing teacher Kathy Vanderloop, introduced the new Rapid Cycling Brassica Genetics Strand. Larry Griffing, along with teacher leaders Allison Landry and Toni Lafferty, introduced the Arabidopsis Genetics Strand. Beverly Brown led pollen and pollinator movement inquiries, with field-testing teacher Valdine McLean posting comments to teacher teams online. Following five days of science inquiry immersion, Claire Hemingway, Carol Stuessy, Sandy Honda, and Teresa Woods provided focused sessions to support implementing in the classroom, communicating with scientists and peers, and getting the most of the curricular materials.

Summer Institute teachers using simple but effective magnifying tools from Paul's Sandbox with guidance from Amber Roberston, graduate student University of Wisconsin, Madison (left) and Paul Williams, professor emeritus University of Wisconsin, Madison and Wisconsin Fast Plants (right panel).

Discussing ideas for pollinator movement experiments led by Beverly Brown, Associate Professor Nazareth College.

Examining results of new assay technique Larry Griffing, Associate Professor Texas A&M University, tested during the institute.

Larry Griffing also led a workshop at the 2009 American Society of Plant Biologists meeting in Hawai'i. Thanks to Larry for introducing 19 teachers to PlantingScience and continuing to strengthen the ASPB and PlantingScience collaboration.

Teresa Woods will be coordinating another round of classroom field-testing for the genetics and pollination modules this school year. She's also working with Renee Lopez Smith and Marshall Sundberg as they develop new PlantingScience modules. If you have interests in contributing to writing new units or shadowing student experiments and mentoring field-testing classes, please contact psteam@plantingscience.org.

Gearing up for PlantingScience School-year Sessions — Interested in Mentoring Students Online? Option to Join the 2009-2010 Master Plant Science Team.

We invite you to join the effort to enhance the standard school science experience by

communicating online with student teams as they plant investigations in their classroom.

If you have about an hour a week to volunteer during the 2-month Fall or Spring Online Session, consider joining as Scientist Mentor. The Fall 2009 Online Session will officially run October-November. The Spring 2010 Session will likely run mid February-mid April.

Special opportunities are open to graduate students and post-doctoral researchers who can commit to mentoring 3-4 teams in both Fall and Spring Online Sessions.

The BSA will sponsor 20 students/post-docs to serve on the 2009-2010 Master Plant Science Team.

For information and an online application form, please see the Scientist page on www.plantingscience.org. Or use the link below. http://www.plantingscience.org/index.php%3Fmodule=pagesetter%26func=viewpub%26tid=4%26pid=62

Plant IT Careers, Cases, and Collaborations Second Institute for Teachers and Career Camp for High School Students

How people use plants was the theme for the second Plant IT Institute for Teachers and Summer Career Camp for Students. Co-PI Ethel Stanley and presenter Toni Lafferty introduced 14 teachers from across the country to teaching plant biology content through student investigative cases. Materials and resources for the Apple Seeds Case, Seedy Sock Case, and Chia Case developed by Ethel and Toni are available online. Be sure to also check out the seven cases created by teacher teams during the 2009 Summer Institute, and investigative case materials from the 2008 session. You'll find these under the teacher tab on the project website http://myPlantIT.org

Ethel Stanley talking with Sandi and Becky as they analyze seed evidence in the Seedy Sock forensic plant science case.

In week two, the session was infused with the live-wire energy of 25 students primarily from Houston. They came to campus to explore cases with teachers, visit lab and research facilities, learn about college life, and meet scientists, professionals, and science media experts. Plant professionals from the USDA, TAMU Departments of Biology, Entomology and Horticulture, AgriLife, the Horticultural Greenhouse, Fruit and Vegetable Improvement Center, and local businesses Producers Cooperative and GreenTeams Inc. gave the students an idea of the diverse careers available to individuals interested in working with and sharing knowledge about plants.

Students interview Dr. Lori Hinze of the USDA Cotton Germplasm Research Group.

Charles Kazelik (aka Dr. Biology) and Beth Judy (aka Flora Delaterre) helped student prepare for the experience of interviewing the professionals they would meet by modeling an interview and gave the students tips on telling their own stories.

[Check out Dr. Biology's interview with Flora Delaterre on Ask-A-Biologist:

http://askabiologist.asu.edu/podcasts/content_logs/vol50_log_aab_podcast.html

Check out Flora Delaterre's Radio Shows on Medicinal plants:
http://www.floradelaterre.com/

And don't miss the 2009 PlantIT Student blogs on the project website:
http://myplantit.org/blog/

Our thanks to Co-PI Carol Stuessy, Associate Professor Department of Teaching, Learning, and Culture at Texas A&M University, and her graduate students for their incredible work hosting and collecting education research data for both the PlantingScience and Plant IT Summer Institutes!

Science Education in the News

Science Video Contest Winners Announced—Visual learners are in for a treat with the science videos submitted to recent contests. Educational videos reach new heights and new audiences. Find a new teaching tool or watch for the shear pleasure.

ChloroFilms, plant videos on YouTube supported by the American Society for Plant Biologists, Botanical Society or America and Canadian Botanical Society, awarded the winning video to "Fertile Eyes."

http://www.chlorofilms.org/

The Scientist Video Awards, sponsored by The Scientist Magazine and SciVee, cover a wide range of topics. Plant videos include water pressure measurement in the xylem of transpiring leaves and plant biotech for food and environment.

http://www.the-scientist.com/videoawards/

http://www.scivee.tv/node/11148

http://www.scivee.tv/node/10853

Long-Rage Vision for Transformative Change—The Carnegie Institute for Advanced Study Commission on Mathematics and Science Education released a report, The *Opportunity Equation: Transforming Mathematics and Science Education for Citizenship and the Global Economy*, that calls for an urgent and coherent effort to "do school differently" in order to deliver excellence equitably to all students. The report may be downloaded from:

http://www.opportunityequation.org/

Editor's Choice.
Botany in Science Education Journals

Robert Marquard and Rebecca Steinbeck 2009. A Model Plant for a Biology Curriculum. *American Biology Teacher* 71: 235-244.

Four teaching modules on reproduction, inheritance, biochemistry, and germination involving Cleome are described.

Kaesha Neil 2009. Flowering Phenology: An Activity to Introducte Human and Environmental Effects on Plant Reproduction. *American Biology Teacher* 71: 300-304.

An activity and discussion to introduce the concept of flowering phenology to high school students with extensions to field data collection.

Lara B. Pacifici, Craig Miller, and Norman Thomson. 2009. Student Participation in Ecological Research: Preliminary Insights from Students' Experiences in the Smoky Mountains. *JNRLSE* vol. 38.

Students' electronic journals kept during summer research internships at the Great Smoky Mountain National Park are analyzed to identify impacts of research experience for young people.

Zhong Ma, Cynthia Cooper, Hyun-Joo Kim, and Diane Janick-Buckner. 2009. A Study of Rubisco through Western Blotting and Tissue Printing Techniques. *CBE Life Sci Educ* 2009: 140–146.

Description of laboratory exercise for a cell biology course introducing techniques for quantitative and qualitative analysis of Rubisco from various plants.

Baskauf, Steven J. and Bruce K. Kirchoff. 2008. Digital Plant Images as Specimens: Toward Standards for Photoghraphing Living Plants. *Vulpia* 7:16-30.

We all use plant images in our teaching and research, and now, with the widespread availablity of digital cameras and digital imaging, it is more reasonable than ever to visually document all aspects of plant morphology. Baskauf and Kirchoff present, and illustrate, a system of standards for documenting plants. There are separate standards for woody angiosperms, herbaceous angiosperms, gymnosperms, ferns and other vascular non-seed plants, and cacti. High quality images illustrate each of the standards. The intent is that these will become the standards for Morphobank http://www.morph-bank.net.

In Memoriam:

Jack Dainty 1919 - 2009

Jack Dainty was a pioneering plant biophysicist who introduced a thermodynamic approach to the study of the movement of water and ions across plant cell membranes. Although he began scientific life as a nuclear physicist, an early interest in natural history and an early transformative teaching experience led him into the field of biophysics. Jack established strong research groups in plant biophysics first at the University of Edinburgh, and subsequently at the University of East Anglia and then University of Toronto. Through a series of influential review articles and research papers, Jack established the importance of understanding the basic physical processes that underlie the ion and water relations of plant cells.

Jack was born in an economically depressed coal-mining town near Sheffield, England. His father had died when he was three, and he grew up in what he described as a deprived and poverty-stricken environment, an experience that made him a life-long committed socialist. Although none of his immediate family had continued schooling past the age of 14, Jack received a scholarship to attend Mexborough secondary school where he specialized in mathematics, physics and chemistry in the last two years. He was taught English by the mother of A.S. Byatt and Margaret Drabble, but at that stage his consuming interest in literature was dormant. Jack was a very keen football player and at one stage was head-hunted by one of the professional Yorkshire football teams but mathematics prevailed! He also maintained a personal interest in natural history, going on long walks in the South Yorkshire countryside and reading British naturalists such as Gilbert White. In 1937, Jack won a scholarship to Cambridge University (an almost impossible achievement from such a background) to study mathematics, but he switched to physics, and graduated with first class honors in 1940. At the beginning and end of each term, he would cycle between Mexborough and Cambridge, a distance of 120 miles with his books secured on the back of the bike.

Completion of his studies at Cambridge coincided with the early days of the Second World War, and Jack was recruited by the military authorities to remain at Cambridge as part of a team working on nuclear fission. This research ultimately led to the construction of an atomic bomb, but it was realized at the time that only the United States had sufficient industrial power to actually make such a bomb. One of Jack's specific responsibilities was to calculate whether Germany had enough heavy water to make an atomic bomb (which it did not). Jack became head of the cyclotron team and spent the war years working on basic aspects of nuclear fission; for this work he received the Stokes Medal from Cambridge University in 1945. He was an ARP (air raid protection) warden and when on duty played bridge with Fred Hoyle and others to pass the time. Also, because of a shortage of faculty during the war years, Jack did a great deal of teaching, lecturing on atomic and nuclear physics and giving tutorials. He later said that teaching strengthened his understanding of physics and was of great importance when he switched to biological problems. During his time at Cambridge, Jack continued his interest in natural history, chiefly bird-watching, and read more deeply in evolutionary biology, including works by Darwin, Huxley, Mayr and Dobzhansky.

After the war, Jack spent two years at the Canadian Atomic Energy Laboratories in Chalk River, Ontario, where he helped to establish the program in nuclear physics and worked on methods to measure doses of radioactivity received by biological tissues. In 1949, he was invited to join the physics faculty in the Department of Natural Philosophy at the University of Edinburgh where he built up a research group around a small accelerator. In the early 1950's Jack was asked by the head of the department, who knew of his interest in biology, to take on the task of teaching elementary physics to a large class of medical, dental and veterinary students. Although he initially balked, he was offered the opportunity to establish a new Department of Biophysics as an

inducement, and thus, in his own words, he moved into biology "almost by accident". Early collaboration with an animal physiologist on the exchange of sodium across the membranes of cat nerve cells pointed Jack in the direction in which he was to make his most important contributions: the transport of water and ions across the membranes of plant cells. A brilliant physics graduate student, Enid MacRobbie (now Professor Emeritus, University of Cambridge) joined forces with Jack to work on membrane transport in plants, using the characean alga *Nitellopsis* and radioactive isotopes to measure influxes and effluxes of Na, K, and Cl. These pioneering studies demonstrated the presence of ion pumps in the cell membrane and tonoplast and established that the fast-diffusion, so-called free space, fraction of ions was located exclusively in the cell wall, not in the protoplast as previously thought. Further collaboration with Alex Hope at the University of Sydney on water permeability and ion exchange in the giant cells of the freshwater alga *Chara corallina* established that the rate of water exchange was controlled by the rate of diffusion across the unstirred layers of water external to the cell membrane.

These early publications made clear the importance of a biophysical approach to plant membrane transport and transformed the field. As a consequence, Jack was invited to write several reviews in the early 1960s, including ones for the Annual Review of Plant Physiology and Advances in Botanical Research. In these he argued that the older concepts of "suction pressure" and "diffusion pressure deficit" be replaced by more rigorous irreversible thermodynamic approach to understanding the driving forces of plant water relations. In 1963, Jack moved to the new University of East Anglia in Norwich where he attracted a strong group of academic visitors, graduate students and post-doctoral fellows working on ion and water relations, including the ion exchange capacity of cell walls and the measurement of membrane potentials. Here, he carried on with his strong interest in teaching physics to undergraduate biology students, as well as to graduate students in biophysics. His lectures to M.Sc students started at 8 am because everyone was so busy that this was the only time available. Jack somehow made it but often looking the worse for wear. The students were prepared and provided coffee and he would cadge a cigarette and puff away as lucidity prevailed.

In 1969, Jack moved again to the University of California at Los Angeles, first to the Laboratory of Nuclear Medicine and Radiation Biology and then to Department of Botany at UCLA. At that time, Hal Mooney had recently moved from UCLA to Stanford and Jack volunteered to look after his grad students and to teach an undergraduate course in plant ecology. Jack saw this as an opportunity to integrate his knowledge of biophysics with a life-long interest in natural history. Despite the enjoyment of putting a biophysical slant on everything ecological, he decided in the end that ecology was biologically too complex for a physical scientist. Development of this course, however, influenced the direction of research taken by Park Nobel at UCLA, who subsequently made important biophysical contributions to plant ecology and the course also provided the foundation for the successful advanced textbook written by Nobel.

After just two years at UCLA, Jack moved to the Department of Botany at the University of Toronto to take up the position of Chair and the opportunity to return to biophysical plant physiology. A former grad student from East Anglia, Mel Tyree, joined faculty at same time and together they formed a fruitful collaboration, studying water relations of *Tsuga canadensis* using the Scholander pressure bomb and symplastic transport between the giant internodal cells of *Chara corallina* using radioactive tracers as a test of theoretical considerations. In the mid-1970s, Bill Lucas (now University of California, Davis) joined the lab to continue electrophysiological work on the properties of HCO_3- transport across the cell membrane of *Chara* and demonstrated the dramatic effects of cations on HCO_3- influx and membrane integrity. Other students and associates also worked on the electrophysiology of membrane transport and on the ion exchange properties of plant cell walls. During this period, he was also an Associate Editor of *Plant Physiology,* a position that he took very seriously but enjoyed. Jack stepped down as Chair in 1976 and retired from the University of Toronto in 1984. In retirement, he continued collaboration with his successor, Eduardo Blumwald (now at UC Davis) on the regulation of ion channels in the cell membranes of halophytes. Jack continued to be sought after as a consultant and collaborator in various aspects of membrane biology and biophysics throughout his life. His most recent publication dealt with the biomechanics of aquatic vegetation (Schutten et al., 2005, J. Ecol. 93: 556-571); thus, his publication record spanned more than 60 years (another joint MS is under review at present).

As Chair of the Department of Botany at the University of Toronto, Jack was distinguished by his strong sense of fair play, open-mindedness, and lack of pretension. Despite his distinguished academic career, his behavior was democratic and his attitude toward the diversity of fields of study found in the department inclusive. He was uniquely able to personally connect with individual faculty members, support staff, and graduate students and was generous with advice and encouragement. Throughout his life, Jack was a loyal and steadfast

friend of many, maintaining friendships and collaborations with many in North America, the U.K and Europe, and Australia.

Teaching played an important part throughout Jack's career and he later stated that one of his most significant accomplishments was inculcate a feeling in students for the biophysical aspects of biology. For example, while at the University of Toronto, he taught an introductory biology course for non-Biology students on the "Design of Organisms" that discussed questions of size and shape and how these were determined by the physics of diffusion, the bulk flow of fluids, and biomechanical constraints. The text book for this course was "Gulliver's Travels", a choice that surprised many of the students, but one that forced them to think analytically about biological size. While an untenured faculty member, I (Nancy) audited an upper division course on "Plant Biophysics" taught by Jack (and Mel Tyree) and was entranced by how straightforward and logical he made the physical processes underlying membrane transport and the bulk flow of fluids in the xylem and phloem seem. Even an elementary understanding allowed an evaluation of conflicting theories and a check on the interpretation of experimental evidence.

The significance and impact of Jack's research accomplishments were recognized by appointment as "University Professor", the highest academic honor at the University of Toronto. He has been a recipient of the Gold Medal of the Canadian Society of Plant Physiologists and was elected a Corresponding Member of the Botanical Society of America and of the American Society of Plant Physiologists. Jack was also a Fellow of the Royal Society of Canada, the American Society for the Advancement of Science, and the Royal Society of Edinburgh. He was elected as a Foreign Associate of the Academy of Sciences of the Institute of France and also he was appointed an Academician of the National Academy of Lincei, Rome. Sadly, election to the Royal Society of London eluded him, a reflection of the somewhat myopic views of the day. In 1994, he was invited to write a biographical chapter for the Annual Review of Plant Physiology and Plant Molecular Biology (Vol 41: 1-40).

In retirement, he lived in France and Norwich in East Anglia, U.K. Much of the time was spent avidly reading European and North American literature or watching football. He had an excellent command of languages; a month before he died he had just finished reading a novel in French. He celebrated his 90th birthday a few weeks before he died with family, friends and colleagues, but had been in failing health for over a year. Jack is survived by Mary Elbeck and their sons Anton, Chris and Patrick and by Trish Shea and their sons Jack and Matthew.

At the University of Toronto he is remembered by the Jack Dainty Graduate Scholarship in Ecology and Evolutionary Biology, which was set up two months before he died. It gave him considerable pleasure that a Scholarship was to bear his name. So far about half of the funds needed have been donated. (Donations may be sent to the University of Toronto at Office of Advancement, Faculty of Arts & Science, 100 St. George Street, RM 2033, Toronto, ON, M5S 3G3, Canada. Cheques should be made payable to 'University of Toronto' and identified as 'Jack Dainty Fund')

Nancy G. Dengler
Robert L. Jefferies
Department of Ecology & Evolutionary Biology
University of Toronto

Corresponding member, Jack Dainty passed away in Norwich in June, 2009 at 90. He contributed to Plant Science in Britain, Scotland, USA, Canada, Australia and many European nations by applying physical theory to water and mineral transport in plants, and by founding departments of plant biophysics in Edinburgh, Scotland and East Anglia, England. From 1969 through 1980's he was in North America first at UCLA (1969-1971), then as Chair of The Botany Department at University of Toronto (1971-1984). He produced hundreds important papers and a series of books and chapters on plant biophysics and membrane transport, as well as providing editorial advice for *J. Plant Physiology, AJB*, and many other journals. Two British tributes are found in The Guardian and The Times (http://www.timesonline/tol/comment/obituaries/article657821.ece and http://www.guardian.co.uk/science/2009/jun/24/obituary-jack-dainty).

Jack Dainty's Major Contributions to Plant Science

Jack Dainty transformed the field of transport of water and solutes in plant cells and tissues, introducing strict physical principles and analysis. His legacy is three-fold, in his own scientific publications. in the strong influence he had on others, not only through personal contact and collaborations but also remotely through the literature, and in the scientific dynasties he founded when research students trained by him went out to found their own groups.

After his transfer from nuclear physics to set up Biophysics in Edinburgh in 1953 he worked first on the ionic relations of algal cells, including a giant Characean alga, an experimental system which had been used extensively by Osterhout and Blinks

in the 1930s at Harvard, Rockefeller and Stanford. Dainty then moved on to investigate the water permeability of plant cells, work which revealed the importance of unstirred layers in membrane transport. His studies of the ion exchange properties of cell walls demonstrated the role of fixed charges on cell wall polymers in determining ion access to the membrane. He went on to use the principles of irreversible thermodynamics to analyze movement of water and solutes across plant cell membranes, using a frictional model to characterize solute-water interactions. He provided insight into the mechanism of osmosis.

A portion of his legacy are the establishment of active research groups in three Universities, Edinburgh, East Anglia, and Toronto, and in each case he and his students and collaborators pursued rigorous biophysical research on an extremely wide range of problems in plant transport, on single cells, tissues and whole plants. They maintained a dominant position in the field for several decades. In Edinburgh and East Anglia he established graduate courses in Biophysics, which brought graduates in the physical sciences into biology. He taught them to think as biologists,and inspired them to remain in biological research. Together with his efforts to get biologists in general to think quantitatively, this may turn out to be one of the most important contributions of a remarkable career.

Dainty's Work in Australia

Dainty had made close contacts with botanists in Australia working on membranes in his early transition days from physics into botany in the 1950's. Dainty said "This experience of working in Australia with Alex Hope and Alan Walker was of the greatest benefit to me, not only owing to the ideas we had and the experiments we did. It was the first time I had worked in a biological milieu, and I believe I derived much from my close contacts with Bob Robertson, Joe Wiskich, and others who were more biochemically inclined than I and were trained as biologists, not physicists. Similar ideas were being followed in Australia, particularly by Alex Hope. Alex had been a member of a remarkable group in the Physics Department of the University of Tasmania at Hobart. This group was the brainchild of Lester MacAulay, the head of the department, who had an interest in how plants function and encouraged some graduate students to share it. Bruce Scott, Alex Hope, Alan Walker, Geoff Findlay, and Ian Newman are all from this school and have helped to make plant biophysical physiology eminent in Australia. In 1958 Alex was in the C.S.I.R.O. Plant Physiology Unit at the University of Sydney, This turned out to be an extremely fruitful collaboration. We came up with what I believe to be one or two important concepts from the experiments we carried out on the water permeability of *Chara australis* (now *corallina*) and on the ion exchange properties of the *Chara* cell wall."

Dainty's Work in the USA

Jack Dainty ,as a corresponding member of the Botanical Society of America, helped with Physiological and Molecular journal editing and Symposia for 25 years. He was also a member of the American Society of Plant Physiologists (Plant Biologists) and on the editorial board of *Plant Physiology*. He worked in the United States twice, once during the Los Alamos Atom Bomb days wherein his English team of nuclear physicists came to the US as well as Chalk River ,Canada. His second period was at UCLA (first to the Laboratory of Nuclear Medicine and Radiation Biology and then to the Department of Botany) for several years from 1969-1971 (where one of us (AT) visited him frequently). Dainty said of this period , " My short time at UCLA was certainly pleasant, thanks to George Laties, Park Nobel, Jacob Biale, and others." His peripatetic wanderings at scientific meetings kept him in contact with a series of plant scientists in the USA from his USA post-docs John Gutknecht and Anitra Thorhaug to many membrane workers throughout the USA, including British, Canadian and Austrialian workers who had come to the USA. He very much appreciated Botanical Society of America conferring a Corresponding membership title on him, writing to one of us (AT) in his last years about how he enjoyed the journal immensely and the honor bestowed on him at Norman, Oklahoma in 1979 where he received this honor. Dainty was also an Associate Editor of the *Journal Plant Physiology* for two periods of three years, handling biophysical papers—under the late Martin Gibbs.

Anitra Thorhaug , Yale University, School of Forestry and Environmental Studies, New Haven CT, USA

Enid MacRobbie, Cambridge University, Cambridge , England

Personalia

Alan Graham Receives American Society of Plant Taxonomists' 2009 Asa Gray Award.

The Asa Gray Award is given by the ASPT to an individual for outstanding accomplishments pertinent to the goals of the Society. This year's Asa Gray Award recipient is **Dr. Alan Graham**, Curator of Paleobotany & Palynology at the Missouri Botanical Garden and Professor Emeritus at Kent State University, where he received university awards for excellence in teaching and research and served as major advisor for 16 graduate students. Alan's extensive and diverse efforts on late Cretaceous and Cenozoic vegetation and flora of the New World have resulted in 118 scientific articles, two sole-authored books (*Late Cretaceous and Cenozoic History of North American Vegetation*, in 1999, and *Late Cretaceous and Cenozoic History of Latin American Vegetation*, in 2009), two co-edited and co-authored books (*Floristics and Paleofloristics of Eastern Asia and Eastern North America*, in 1972, and *Vegetation and Vegetational History of Northern Latin America*, in 1973), and 120 contributed and invited talks. Alan's contributions to teaching include a five-week course in Mexico that was taken by over 350 students over 14 years. He has served on the editorial board of *Systematic Botany*, in addition to other journals, and donated a 25,000 palynological slide reference collection and associated literature collection of nearly 17,000 reprints to the Smithsonian Tropical Research Institute. For these and other contributions, the ASPT is pleased to recognize Alan with this year's Asa Gray award.

A high school student proudly displays the fruits of his labor in a school garden - - see "Reversing Teenagers Disconnect from Nature" - p. 113.

Botanical Preserve Established in Honor of Centenarian, Rogers McVaugh

On Saturday June 6, Rogers McVaugh and his son Michael McVaugh, Professor Emeritus at University of North Carolina-Chapel Hill, held a 100th birthday party at the Hill Alumni Center on the UNC campus for Rogers, who reached his centenary on May 30, 2009. Over 60 friends and family attended this celebration, including many botanical colleagues from UNC, Duke University and North Carolina State University, and some colleagues from Mexico with whom he has worked. One of these colleagues, Dr. Javier Curiel, a physician with botanical interests, announced the establishment of a botanical preserve in Jalisco province in his honor, namely the Jardin Botanico Rogers McVaugh. It will be used to promote and educate about the unique mix of tropical and temperate vegetation in that area and environmental conservation. Dr. Curiel summarized some of the more interesting plants that occur in the forest preserve, and noted also that several interesting large mammals inhabit the area, including at least three types of large cats (puma etc).

Award Opportunities

American Philosophical Society, Research Programs

All information and forms for all of the Society's programs can be downloaded from our website, http://www.amphilsoc.org/ Click on the "Fellowships and Research Grants" tab at the top of the homepage.

INFORMATION ABOUT ALL PROGRAMS

Purpose, scope

Awards are made for non-commercial research only. The Society makes no grants for academic study or classroom presentation, for travel to conferences, for non-scholarly projects, for assistance with translation, or for the preparation of materials for use by students. The Society does not pay overhead or indirect costs to any institution or costs of publication.

Eligibility

Applicants may be residents of the United States or American citizens resident abroad. Foreign nationals whose research can only be carried out in the United States are eligible. Grants are made to individuals; institutions are not eligible to apply. Requirements for each program vary.

Tax information

Grants and fellowships are taxable income, but the

Society is not required to report payments. It is recommended that grant and fellowship recipients discuss their reporting obligations with their tax advisors.

Contact information
Questions concerning the FRANKLIN and LEWIS AND CLARK programs should be directed to Linda Musumeci, Research Administrator, at LMusumeci@amphilsoc.org or 215-440-3429.

INDIVIDUAL PROGRAMS

Franklin Research Grants
Scope
This program of small grants to scholars is intended to support the cost of research leading to publication in all areas of knowledge. The Franklin program is particularly designed to help meet the cost of travel to libraries and archives for research purposes; the purchase of microfilm, photocopies or equivalent research materials; the costs associated with fieldwork; or laboratory research expenses.
Eligibility
Applicants are expected to have a doctorate or to have published work of doctoral character and quality. Ph.D. candidates are not eligible to apply, but the Society is especially interested in supporting the work of young scholars who have recently received the doctorate.
Award
From $1,000 to $6,000.
Deadlines
October 1, December 1; notification in February and April.

Lewis and Clark Fund for Exploration and Field Research
Scope
The Lewis and Clark Fund encourages exploratory field studies for the collection of specimens and data and to provide the imaginative stimulus that accompanies direct observation. Applications are invited from disciplines with a large dependence on field studies, such as archeology, anthropology, biology, ecology, geography, geology, linguistics, and paleontology, but grants will not be restricted to these fields.
Eligibility
Grants will be available to doctoral students who wish to participate in field studies for their dissertations or for other purposes. Master's candidates, undergraduates, and postdoctoral fellows are not eligible.
Award
Grants will depend on travel costs but will ordinarily be in the range of several hundred dollars to about $5,000.
Deadline
February 15; notification in May.

The David Starr Jordan Prize
For Innovative Contributions to the Study of Evolution, Ecology, Population and Organismal Biology

In 1986, Cornell, Indiana and Stanford Universities established a joint endowment to fund a prize in honor of David Starr Jordan, a scientist, educator and institution builder of enormous influence on higher education in the United States who had important ties to each of these universities. The prize is international in scope and presented approximately every three years to a young scientist (40 years of age or less) who is making novel innovative contributions in one or more areas of Jordan's interest: evolution, ecology, population and organismal biology.

The intent of this prize is to recognize young scientists who are making research contributions likely to redirect the principal foci of their fields. In addition to a cash award, the recipient will receive a commemorative medal, will attend an awards ceremony, visit each of the sponsoring institutions and give scholarly presentations of his/her work. The selection of the prize winner will be made by a committee composed of representatives from each of the three institutions.

The sixth David Starr Jordan Prize will carry a prize of $20,000.00 and will be announced in Fall of 2009. This year the award ceremony will be held at Cornell University.

Nomination forms are posted on the David Starr Jordan Prize Website (www.davidstarrjordan.org). Nomination forms with supporting materials should be submitted by email. Questions should be directed to:

Dr. William L. Crepet, Chair
Plant Biology Department
412 Mann Library Building
Cornell University
Ithaca, New York 14853
(607-255-2131 - FAX 607-255-5407)
email WLC1@cornell.edu

All nomination materials must be received prior to August 15, 2009. For more information including a list of previous prize winners and their accomplishments, visit: www.davidstarrjordan.org

The Rupert Barnaby Award Of The New York Botanical Garden

The Rupert Barneby Award, named in honor of the late NYBG scientist and renowned legume expert, consists of US$ 1000.00 granted annually to assist researchers to visit The New York Botanical Garden to study the rich herbarium collection of Leguminosae. Comprising over 320,000 specimens, including ca. 8450 types, the collection is widely considered to be one of the best curated and most comprehensive of its kind, particularly with regard to New World legumes. Graduate students and early career professionals with research in systematics and/or legume diversity are given special consideration. Anyone interested in applying for the award should submit their curriculum vitae, a two-page proposal describing the project for which the award is sought, and the names of 2-3 references. The application should be addressed to Dr. Benjamin M. Torke, Institute of Systematic Botany, The New York Botanical Garden, 200th Street and Kazimiroff Blvd., Bronx, NY 10458-5126, USA, and received no later than December 1, 2009. Submission by e-mail is preferred (send to: btorke@nybg.org). Announcement of the recipient will be made by December 15, 2009. Travel to NYBG should be planned for a period, preferably of at least two weeks, in 2010. Recipients are asked to give a presentation about their research at NYBG.

Bullard Fellowships in Forest Reearch Harvard University

Each year Harvard University awards a limited number of Bullard Fellowships to individuals in biological, social, physical and political sciences to promote advanced study, research or integration of subjects pertaining to forested ecosystems. The fellowships, which include stipends up to $40,000, are intended to provide individuals in mid-career with an opportunity to utilize the resources and to interact with personnel in any department within Harvard University in order to develop their own scientific and professional growth. In recent years Bullard Fellows have been associated with the Harvard Forest, Department of Organismic and Evolutionary Biology and the J.F. Kennedy School of Government and hve worked in areas of ecology, forest management, policy an conservation. Fellowships are available for periods ranging from six months to one year after September 1st. Applications from international scientists, women and minorities are encouraged. Fellowships are not intended for graduate students or recent post-doctoral candidates. Information and application instructions are available on the Harvard Forest web site; http://harvardforest.fas.harvard.edu. Annual deadline for applications is February 1st.

American Institute of Biological Sciences (AIBS) Legislative Action Center

Available to all members of **The Botanical Society of America**, the new American Institute of Biological Sciences (AIBS) Legislative Action Center (www.capwiz.com/aibs) is a free online tool that alerts you when important science legislation is coming up and then allows you to quickly and effectively communicate with members of Congress, the President, and local elected officials, as well as send letters to national and local news outlets.

If scientists are to play a role in shaping science policy, securing funding for research, promoting science education, or helping the public understand scientific issues, it is important to become an active citizen, so you are encouraged to join the Action Network with the AIBS Legislative Action Center (www.capwiz.com/aibs) today!

Positions Available

Postdoctoral Fellowship in Pollination Biology

A postdoctoral position is expected to be available to conduct research to identify, characterize, map traits that contribute to out-crossed insect-mediated pollination in soybean.

The funds will come through the USDA ARS; candidates must be U.S. citizens. Candidates with a Ph.D. and demonstrated ability to conduct QTL molecular mapping and the ability to conduct transmission and scanning electron microscopy are encouraged to apply. The microscopy will be done in the Bessey Microscopy and NanoImaging Facility at Iowa State University in collaboration with Dr. H.T. Horner. The position is expected to be available mid-spring 2010 and funding will be for 2 ½ years, subject to satisfactory performance. The salary will be at the GS-11 level, plus benefits. Please check with Dr. R.G. Palmer to confirm that the grant was awarded before sending documents, which include curriculum vitae, reprints of published papers, and the names, addresses, telephone numbers, and emails of three referees to:

Dr. Reid G. Palmer
SDA ARS
G301 Agronomy
Iowa State University
Ames, Iowa 50011

Email: reid.palmer@ars.usda.gov

Postdoctoral Opportunity in Ecological Genomics: Genomics of Drought Stress in Prairie Grasses

Kansas State University Postdoctoral Opportunity AVAILABLE. We have a position available for a post-doctoral research associate to study the ecological genomics of drought stress. The project will include studies of the responses of natural prairie ecosystems to variation in precipitation using the ecologically dominant prairie grass big bluestem as a model. The work is part of a project funded by the USDA Plant Biology Abiotic Stress program. The project will include common garden transplant experiments and genomic approaches to test for the signature of adaptive genetic differentiation among natural populations of big bluestem across the precipitation gradient of the Great Plains.

This specific research assembles investigators with complementary expertise in Plant Ecological Genomics (Johnson www.ksu.edu/johnsonlab, Garrett www.ksu.edu/pdecology), Genomics (Ahkunov eakhunov@ksu.edu), Evolutionary Genetics (Morgan http://www.ksu.edu/morganlab) and Restoration Ecology (Baer, SIU www.plantbiology.siu.edu/Faculty/Baer/index.html) to elucidate the response and adaptation of prairie grasses to abiotic stresses. This work will take place in the laboratories of Drs. Johnson, Akhunov, and Garrett and in field sites across the Great Plains, with close collaboration with Drs. Morgan and Baer. There will also be opportunities to interact with other researchers in the context of the KSU Ecological Genomics Institute (www.ecogen.ksu.edu).

For this postdoctoral position, we seek candidates with a Ph.D. in the biological sciences with interest in evolutionary and ecological genetics. Preference will be given to individuals with experience in functional genomic approaches, including next-gen sequencing, custom microarray development based on 454 screens, using custom arrays to screen patterns of gene expression among ecotypes in response to drought stress and VIGS techniques. Importantly, applicants should have the interest and willingness to cross disciplines. The successful candidates must be able to design and conduct independent experiments. Excellent oral and written communication skills and the ability to work well in a team-based/collaborative research atmosphere are essential.

Applications will begin to be reviewed on Aug 15, and will continue until the position is filled. Start date for the post-doctoral position is Sept 6, 2009. A complete application must consist of:
1) A cover letter detailing your qualifications and how they relate to the advertised position.
2) A professional resume
3) Reprints/preprints of publications
4) Names and contact information for three referees

Send a complete application package by e-mail to: dmerrill@ksu.edu

Complete applications can also be mailed to:
Doris Merrill, Program Coordinator
Ecological Genomics Institute
Division of Biology, Kansas State University
104 Ackert Hall, Manhattan, KS 66506-4901
Phone: (785) 532-3482
Fax: (785) 532-6653

Courses/Workshops

2nd Northeastern Weed Science Society (NEWSS) Noxious & Invasive Vegetation Management Short Course (NIVM)

September 21-25th, 2009 near Harrisburg, Pennsylvania.

This course has evolved to meet the demand and need for training and instruction of professionals involved in the administration and/or application of management strategies for invasive plants here in the Northeastern United States. The short course is designed for public and private land managers (parks, conservancies, preserves, forests, private parcels and farms) from Maine to North Carolina who desire a better understanding of non-cropland weed management. A huge success in 2008, the course has expanded to include even more topics. This year, **pre-registrants** can select from a choice of topics they most want to see included in the week long event. Other topics will cover principles of vegetation management, early detection and rapid response training as well as in-depth instruction on herbicide properties, biological, mechanical and chemical tools of weed control and hands on weed identification each day. Classroom, laboratory and field exercises will be utilized and the program is designed to encourage interaction between students and instructors. This year's course will also offer different session workshops for novice and advance applicators.

Weed management professionals affiliated with the society instruct and staff the course. This event is a not-for-profit activity of the Northeastern Weed

Science Society and is sponsored in part by a grant from the U.S. Forest Service. To cover anticipated expenses and course training materials the course tuition will be $400.00 for a 4.0 day terrestrial course and $150.00 for a 1.0 day aquatic course or a discounted $500.00 for those individuals interested in staying for the entire event. Students will need to cover travel, lodging and some meal expenses. The course is limited to the first 75 pre-registered applicants for the terrestrial portion of the course and the first 75 pre-registered applicants for the one day aquatic. Pre-registration is required to attend this course and should be submitted before **June**.

The announcement flyer and pre-registration documents are now posted on the NEWSS Website. We appreciate your assistance in disseminating this important and exciting information to potential registrants.

Melissa A. Bravo, Coordinator for NEWSS NIVM Short Course
Botanist/Weed Scientist
Bureau of Plant Industry Pennsylvania Department of Agriculture
2301 North Cameron Street, Harrisburg, PA 17110
mbravo@state.pa.us
717-787-7204

Symposia, Conferences, Meetings

XVIII International Botanical Congress

The Australian botanical community invites you to Melbourne, Australia inJuly 2011 to participate in the XVIII International Botanical Congress.

Australiahas a vibrant scientific community active across all botanical disciplines and its researchers play a prominent and highly collaborative role in international biological sciences.

The Australian flora, with its many endemics and strong Gondwanan element, provides a unique opportunity full of inspiring experiences for the botanical visitor. Its ancient landscape includes vast deserts, tropical and temperate rainforests, floristically rich heathlands and unique eucalypt forests. Marine environments include a rich flora and the most extensive coral ecosystem, the Great Barrier Reef.

Australia's botanical community is eager to welcome our colleagues from around the world to the 2011 IBC for an intellectually stimulating and socially memorable occasion.

Judy West, Congress President
For more information see: http://www.ibc2011.com/Default.htm
(note: call for Symposia is now open)

Fourth International Conference on Plants & Environmental Pollution

7-10 February, 2010
Lucknow, India

It is to inform you that the first circular - Call for registration and Abstracts - for the Fourth International Conferenace on Plants and Environmental Pollution (ICPEP-4) has been issued and it can be viewed/dowloaded from the links given below;

1. View Conference information: http://isebindia.com/icpep-4/icpep-4.html

2. Download the first circular - Call for registration and Abstracts: http://isebindia.com/icpep-4/icpep-4_1st_circular.pdf (430 kb)

3. Download the Registration Form only: http://isebindia.com/icpep-4/icpep-4_reg_form.pdf

For additional information contact:

(Dr. K J Ahmad & Dr. R D Tripathi)
Organizing Secretaries, ICPEP-4
International Society of Environmental Botanists
National Botanical Research Institute
Lucknow-226001, India
E-mail: isebnbrilko@sify.com
or isebmail@gmail.com
Webpage: http://isebindia.com

"The Identification of Grasses," by H. D. Harrington

A grass can be "glumey" in more ways than one
When its classification remains to be done;
You pull off the parts, and soon feel your age
Chasing them over the microscope stage!

You peer through the lenses at all of the bracts
And hope your decisions agree with the facts;
While your oculist chortles with avid delight
As you strain both your eyes in the dim table light.

You are left on the horns of quite a dilemma
When you count the nerves on the back of the lemma;
Then you really get snoopy and turn each one turtle
To see if the flower is sterile or fertile.

And then the compression, no problem is meaner—
Is it flat like a wallet or round like a weiner?
"How simple," you think, "for a mind that is keen"—
But what do you do when it's half-way between?

You probe and you guess how the florets will shatter,
For you know later on it is certain to matter;
You long for the calmness of labor that's manual
When the question arises— "perennial or annual?"

And that terrible texture, the meanest of all,
Is one of the pitfalls in which you can fall;
"Catrilaginous" maybe—or is it "chartaceous?"
Has even the experts exclaiming "good gracious!"

Then you wail as you wade through the long tribal key
"Oh why must this awful thing happen to me?"
"Grasses are easy," our teacher declares,
As he mops off a brow that is crowned with grey hairs!
—

Compliments of Karl Niklas

Complete the following online survey by 8 September!

The 2006 meeting of the International Association for Plant Tissue Culture and Biotechnology, held in Beijing, China saw a change in the name of our association to the International Association for Plant Biotechnology (IAPB). Since that 2006 meeting, the Executive Committee of the IAPB has worked to create a better flow of information to and between attendees and to plan for the next congress. I am pleased to share some information with you and invite you and your colleagues to attend the upcoming congress.

In 2010, the IAPB will meet in St. Louis, MO—near the heart of the U.S. agriculture industry. It was in St. Louis that many of the early discoveries of plant biotechnology were made. It is also a region that contains outstanding research institutions, private companies, and growers groups that develop and/or employ the products of agriculture. We, the current leadership of the IAPB and the committee members planning the meeting, hope you will join us in St. Louis in the summer of 2010 for an exciting meeting of plant science and biotechnology. Learn the latest advances in plant biotechnology with informative sessions on fundamental and applied aspects of plant sciences presented by leading international scientists. Topics to be addressed through plenary addresses, keynote lectures, and poster presentations include:

* climate change and its effects on agriculture
* advances in plant science: tolerance to heat, droughts, insects, and diseases
* advances in biofuels and other biorenewables from plants
* metabolic engineering of plants/cells for pharmaceuticals and nutriceuticals
* agriculture and biotechnology in developing countries
* biosafety, regulatory structures and commercialization
* advances in tissue culture and transformation
* germplasm preservation

REGISTRATION OPENS SOON

Member of IAPB and/or SIVB:
Early Registration: (August 15-Feb 1, 2010) - $575
Regular Registration: (Feb 2-Apr 30) - $625
Late Registration: (May 1-Jun 1) - $725
Onsite Registration: (anytime after Jun 1) - $800

Non-member:
Early Registration: (August 15-Feb 1, 2010) - $650
Regular Registration: (Feb 2-Apr 30) - $725
Late Registration: (May 1-Jun 1) - $825
Onsite Registration: (anytime after Jun 1) - $900

Student Early Registration (August 15-Feb 1, 2010) - $400
Student Late Registration (May 1-onsite) - $500
Single Day Registration: $250

One Day Fees:
Any One Day: (Fee includes coffee, lunch and registration materials) - $250 US

Membership Fees:
If you elect to join or renew your membership in either IAPB or SIVB during the registration process, please select the “Member” rate when you register.

Join or Renew your IAPB Membership: Non US Rate - $25 US; US Rate - $45 US
Join or Renew your SIVB membership: Non US Rate and US Rate - $160 US

AMERICAN GENETIC ASSOCIATION VI CONGRESO SOUTHERN CONNECTION BECA EN GENÉTICA ECOLÓGICA DE PLANTAS

15 – 19 Febrero 2010
Bariloche, Argentina

La American Genetic Association (AGA) financiará las actividades relacionadas con el Simposio "Plant ecological genetic insights in the southern hemisphere" que tundra lugar durante el VI Congreso de Southern Connection que se llevará a cabo entre el 15 y 19 de febrero de 2010 en Bariloche, Argentina.

AGA ofrece 20 becas parciales para asistir al VI Congreso de Southern Connection. Las becas están dirigidas exclusivamente a estudiantes latinoamericanos. Podrán postular aquellos que se encuentren realizando estudios de maestría o doctorado y estudiantes postdoctorales cuya finalización de tesis de doctorado no supere los tres años. Las becas cubrirán costos de inscripción y alojamiento con media pensión. Los gastos de traslados y otros gastos generales serán responsabilidad de cada postulante.

Requisitos generales
• Ser estudiante de postgrado o profesional joven.
• Ser originario y residente de Latinoamérica.
• El tema de estudio debe relacionarse con alguna/s de la/s siguiente/s área/stemática/s: genética ecológica, genética de poblaciones, genética de la conservación, filogeografía y/o filogenia.
• Cada participante seleccionado deberá presentar en el Congreso en modalidad oral o poster el trabajo contenido en el resumen enviado para postular a la beca.

Procedimiento para postular
Para postular a las becas, enviar por correo electrónico el resumen del trabajo a presentar en el Congreso, que deberá contener hasta 1500 caracteres, incluyendo objetivos, métodos, resultados y conclusiones a: southernconnection2010@gmail.com Indicar en el ASUNTO: BECA AGA y en el cuerpo del correo incluir los siguientes datos personales: Nombre y apellidos completos, grado que estudia, año de ingreso, Institución donde estudia, nombre de la Tesis, nombre del Tutor y fecha esperada de término de la Tesis. Por favor indique su preferencia de formato (oral o poster), teniendo en cuenta que las presentaciones orales están sujetas a disponibilidad de espacio. El resumen se deberá adjuntar en formato Word y el nombre del archivo deberá ser el nombre y apellido del postulante (Por ejemplo jose_perez.doc).

NO SE ACEPTARÁN POSTULACIONES ENVIADAS POR FAX O POR CORREO POSTAL

Fecha límite de postulación Lunes 10 de agosto 2009

Los resultados se darán a conocer por correo electrónico a cada postulante seleccionado el día 21 de agosto de 2009. La nómina de postulantes seleccionados será publicada desde el 21 de agosto en la página web del Congreso http://www.sccongress2010.com.ar. Las decisiones son finales e inapelables

AMERICAN GENETIC ASSOCIATION VI CONGRES SOUTHERN CONNECTION Scholarships for the Symposium on Ecological Plant Genetics

15 – 19 February, 2010
Bariloche, Argentina

The American Genetic Association (AGA) will finance activities related to the Symposium Plant Ecological Genetic Insights in the Southern Hemisphere that will take place during the sixth Congress of Southern Connection that will take place between 15 and 19 February 2010 in Bariloche, Argentina.

AGA offers 20 partial scholarships to attend the Sixth Congress of Southern Connection. The scholarships are directed exclusively to Latin American students studying for the master's or doctorate or postdoctoral students who completed their doctoral theses no more than three years ago. The scholarships will cover costs of registration and accommodation with half board. The costs of transportation and other expenses will be the responsibility of every applicant.

General Requirements
• Be a graduate student or young professional.
• Originate and be a resident of Latin America.
• The study must be linked to any of the folowing areas or themes: green genetics, population genetics, genetics of conservation, phylogeography and/or phylogeny.
• Each participant selected must be submitted to Congress an oral or poster presentation summarized in the abstract sent to apply for the scholarship.

Procedure to apply for the grants, e-mail the abstract of the work to submit to the Congress, and which must contain up to 1500 characters, including objectives, methods, results and conclusions to:
southernconnection2010@gmail.com.
Indicate in the header: SCHOLARSHIP AGA and in the email body include the following personal data: full name, degree studying, the year in income, Institution where he studied, the name of the Thesis, name of the Guardian and expected date of completion of the thesis. Please indicate their preference of format (oral or poster), taking into account that the oral presentations are subject to availability of space. The summary must attach in word and the file name must be the first and last name of the postulant (for example jose_perez.doc).

APPLICATIONS SENT by FAX OR BY POSTAL MAIL ARE NOT ACCEPTABLE

Deadline Monday August 10 2009. Successful applicants will be notified on August 21, 2009. The listing of applicants selected will be published on August 21 on the web page of the Congress http://www.sccongress2010.com.ar. The decisions are final and without appeal.

Reports and Reviews

Reversing Teenagers' Disconnect from Nature

Caroline Lewis, Director of Education
Fairchild Tropical Botanic Garden

Group photo of students debaters from high schools county-wide at the annual Fairchild Challenge Environmental Debate

Identifying the problem

Fairchild Tropical Botanic Garden exists as an 83-acre oasis of plants and wildlife in the midst of highly urban Miami-Dade County. Sandwiched between two National Parks, Everglades to the west and Biscayne Bay to the east, the majority of Miami residents will never likely experience either. Why? Who or what is to blame? Parents? Teachers? School Systems? Community and Government organizations? The pace of life today? Maybe, all of these.

Evidently, there is a chasm-like disconnect from nature among our young people, the long-term effects of which are, at best, disturbing. Today, large culturally and socio-economically diverse populations have limited access to green spaces, overscheduled agendas, and an abundance of indoor, electronic, sedentary entertainment - a recipe for significant nature deficit and disengagement. Our young people are alarmingly out-of-touch with the outdoors, and we are less willing or less able to make time to connect with nature.

To some extent, parents and teachers may make more of an effort at the elementary grade levels. At our botanic garden, for the past three decades, we've hosted and continue to host some 60 youngsters, daily, for hands-on learning activities. The experience is transformative, with comments from elementary school students that tug at your heart. Sample reactions include: I loved when we had to dig in the ground and find worms. ~ I cannot believe I was seeing nature itself! ~ This is the best day of my life. I wish I could live here!

It seems the even bigger void in addressing nature deficit in young people is in the teenage years. In an article written in 2002, Jane Goodall, world renowned scientist, noted that "the greatest danger to our future is apathy." This maxim should resonate as a call to action for parents, teachers, school systems, community organizations and government. It helped us at Fairchild Tropical Botanic Garden realize that we must design and provide meaningful opportunities to engage young people, if we are going to help reverse their chasm-like disconnect from nature.

The Fairchild Challenge – a working solution

At Fairchild Tropical Botanic Garden in Coral Gables, Miami, Florida, we measure success in numbers of species saved through research and conservation and lives changed through education and engagement. Thus, in 2002, in order to encourage thousands of urban teenagers to better appreciate the beauty and value of nature and foster their environmental awareness, scholarship and stewardship, we launched the Fairchild Challenge. Now, through their teachers, more than 50,000

South Florida students from 141 middle and high schools are engaged in the program.

The mission of the Fairchild Challenge is to foster interest in the environment by encouraging young people to: appreciate the beauty and value of nature, develop critical thinking skills, understand the need for biodiversity and conservation, tap community resources, become actively engaged citizens, and recognize that individuals do indeed make a difference.

The Fairchild Challenge is launched annually at the beginning of each school year, and ends with an Awards Ceremony in May. It is a free, interdisciplinary environmental program that offers separate but

A middle school student models her hat made out of plant parts at the Fairchild Challenge Plant and Paper Hats Fashion Show

related Challenge options or competitions for middle and high schools, grades 6-8 and 9-12, respectively. The program allows schools to earn points by participating in some or all of the Challenge options. These are interdisciplinary, aligned with state education standards, and pitched to schools via teachers in a variety of disciplines. The program is designed to engage thousands of teenagers and, by extension, their teachers, parents, friends and communities.

The menu of Challenge options varies annually and may include: Create/restore/expand and interpret school gardens or natural habitats. Investigate water flow and quality. Perform original poetry, song or dance celebrating nature. Explore cultural uses of plants through intergenerational interviews. Create artwork inspired by nature. Produce themed

Two students find inspiration in the Garden at the annual Fairchild Challenge Art Workshop

skits, public service announcements, and pod casts. Build models of LEED buildings, solar cookers and solar model cars. Explore careers working alongside scientists and naturalists. Prepare high-nutrient-value plant-based meals. Capture people and plants through photojournalism. Produce research-based opinion papers and projects. Participate in formal debate on local/global topics. Compare environmentally friendly versus unfriendly products. Promote green initiatives and report on efforts taken at home, school and in the community. Complete school energy and waste audits and biodiversity inventories. And, we are always exploring new ideas from staff and stakeholders.

The Fairchild Challenge quickly becomes an all-school effort. Annually, schools earning at least 700 points (a very attainable goal) earn the Fairchild Challenge Award. Prize money is also awarded to the top point-scoring schools to be used toward environmental initiatives. Fairchild Challenge

Student participating in the Fairchild Challenge at La Selva Biological Station in Costa Rica, one of 46 trained Fairchild Challenge Satellite Partner sites worldwide

participating students receive Challenge T-shirts or drawstring backpacks (with winning student design) and family passes to the Garden. Outstanding students and teachers are also recognized, as are school-nominated student Environmental Role Models, affectionately called ERMies. Additionally, schools earning the Fairchild Challenge Award for five consecutive years are named Fairchild Challenge Schools of Excellence. The program allows parents, teachers, school systems, community and government organizations to work together to shape the program and celebrate the creativity and accomplishments of tens of thousand of students.

Fairchild Challenge schools include Title 1 schools

A group of high school students proudly poses on stage at the Fairchild Challenge Awards Ceremony

and college prep private schools, as well as charter schools and schools for physically and emotionally handicapped kids. Promoting the program through schools maximizes youth involvement, regardless of age, race, religion, socioeconomic status, interest, and ability. Additionally, we support schools by offering garden mini-grants, plants and tree saplings, teacher professional development, comprehensive web resources, media coverage, transportation subsidies, lunch or snacks at all events, and resources for specific options, including seeds for germination experiments, solar energy kits, art supplies, environmental films on DVD for critique, etc.

The Fairchild Challenge readily attracts partnerships with community members who volunteer as ambassadors, evaluators, funders, and sponsors, and include artists, scientists, county officials, school district staff, educators, and parents. We also partner with colleges, universities, parks, nature centers, government agencies, community groups, and private businesses. Very fluidly, the Fairchild Challenge is able to include, embrace and promote a range of other nature-friendly initiatives, supporting the work of like-minded organizations.

Fundraising for the program is broad-based and donor retention is high. Often, our donors volunteer in the program and see firsthand how engaged the students, teachers and schools become. Our funders, partners and stakeholders embrace the Fairchild Challenge for its hands-on approach to connecting youth with nature, appeal to diverse learners, empowerment of students, positive impact on school climate, and celebratory design.

Teachers of all disciplines also embrace the program; 97% of those surveyed indicated they would participate annually. Alumni of the Fairchild Challenge (now college students) are coming back to volunteer in the program. Feedback from students and teachers indicate that we are helping to build communities of learners who appreciate the beauty and value of nature. Samples of student and teacher feedback comments from the past several years include:

Student feedback: I saw the environment with new eyes. ~ I learned so much about the environment that can be applied in my life in the future. ~ Thank you for giving us a voice in our community. ~ The

Students from the top-scoring Middle School proudly display certificates and winning entries at the Fairchild Challenge Awards Ceremony for Middle Schools

Challenge has motivated me to make changes in my personal life that I had never considered. ~ When I am outdoors I can forget about everything that is going on in my life and concentrate on its beauty and purpose without ever getting tired of it. ~ I learned creative ways to educate peers about environmental issues. ~ I learned that plants are extremely important to the survival of all living things. ~ Nature is even more beautiful than we think, just open your eyes. ~ After participating in the Challenge options, I feel important and needed in my community. ~ Learning through the Fairchild Challenge has taught

me to be a better citizen and encouraged me to take an active part in making the world a better place.

Teacher feedback: The Challenge has made caring about the environment 'cool' to my students. ~ Thank you for the honor of being the bridge that encourages students to participate in life, contribute to community, and live in harmony with their environment. ~ It is amazing how much this program impacts our community by the efforts of our students. ~ I have been energized and inspired to involve my students much more in environmental issues. ~ Faculty are now learning about their environment through students. ~ Autistic students were recognized for their abilities instead of their differences. ~ Please thank the donors for supporting a program that brings urban kids closer to nature.

Two high school students get up and close with a magnifier and Poinciana flower during Environmental Immersion Day at Fairchild Tropical Botanic Garden

~ This is an incredible program that engages students in their own education. ~ It helps expose students to the natural beauty of our area that most of them don't even know is here. ~ The Fairchild Challenge touches the future, allowing students to see their role in a constantly evolving world environment. ~ Thank you for finding exciting ways to help the teachers build interest in conservation, trees, and the whole gamut of environmental issues. ~ Thanks again for sponsoring such a wonderful competition. This year's teachers are already getting materials ready for next year and their enthusiasm is contagious.

Next steps

The Fairchild Challenge is proving to be an effective way to engage tens of thousands of teens and preteens, and by extension, their schools, families, friends, neighbors and communities. Interest is growing nationally and internationally. Educators from 43 zoos, public gardens and museums have attended Fairchild Challenge Satellite Training workshops to learn about and eventually implement the Fairchild Challenge in their own communities. Sites trained range from Chicago and Utah, to Durban, South Africa and Costa Rica. Thus far, eight sites have, with guidance, designed and launched their own Fairchild Challenge for their area schools, and several more sites are in the planning phases.

Additionally, in 2007, the Conservation Fund, a leading environmental nonprofit, convened a group of national leaders and formed a National Forum on

A middle school student listens intently as a Haitian American senior citizen shares stories of the plants he has known in his life at the annual Green Treasures event

Children and Nature. Recognizing an urgent need, the Forum sought to identify demonstration projects that would serve as innovative models for community leaders, planners, educators and others who want to take concrete steps locally to connect children with nature. The Forum received 560 proposals from projects seeking endorsement, and ultimately, selected 30 projects, based on relevance, impact, sustainability and potential for success.

The Fairchild Challenge was recently named one of the 30 selected projects. By endorsing the Fairchild Challenge, the Conservation Fund's National Forum on Children and Nature celebrates its relevance, impact and sustainability. The Forum seeks to raise visibility and support for endorsed projects.

There is tremendous potential for refinement, expansion and replication of the Fairchild Challenge. It is a very scalable program. Currently, we are exploring ideas such as web-based communication and summer leadership institutes for Fairchild Challenge students, teachers, and

partners from the various satellite programs. Conceivably, millions of urban youth (40,000 in 20+ cities over 5 years) could be engaged in the Fairchild Challenge in the near future. Long term, the program could well effect systemic change across the country and beyond with respect to bridging young people's chasm-like disconnect from nature.

Working with the National Forum on Children and Nature to gauge interest and lobby support, we plan to approach several large Foundations sensitive to initiatives like the Fairchild Challenge and share the program's ability to: reconnect youth with nature and promote creativity, scholarship and civic engagement; align the scope of work to state and national education standards; and influence education by providing real-world, interdisciplinary, open-ended learning opportunities. Ultimately, we would love funders to consider endowing the Fairchild Challenge, ensuring its existence for generations to come.

Teenagers are at an interesting time in their lives; many believe they can do anything, and they have passion, time and energy. By nature, they are bright, articulate, confident, assertive, fearless, and funny. But teens are also confused, angry, shy, selfish, and narcissistic. Often, they are looking for something bigger than themselves to embrace and the Fairchild Challenge seems to provide an outlet. It allows diverse audiences of urban teens to connect with nature physically, emotionally, creatively, and intellectually. We, educators, parents, administrators, and community partners, should offer support and cheer loudly!

*Leading a **GREEN MOVEMENT** in schools everywhere*

Caroline Lewis, Director of Education
Fairchild Tropical Botanic Garden
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calewis@fairchildgarden.org
www.fairchildgarden.org

All photographs courtesy of the Fairchild Educational Staff.

Botany in Equatorial Guinea & in the Island Nation of São Tomé and Principe

Anitra Thorhaug,
School of Forestry and Environmental Studies,
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INTRODUCTION

Equatorial Guinea is one of the smallest (28,051 km^2) and most botanically interesting of the West African nations. This nation has a small human population of just over half a million and a small terrestrial spatial extent (28,051 km^2), but a rich flora with both offshore volcanic islands and its mainland part forms a portion of one of the legendary world hot spots the Cameroon Forest (Figure 1). The oceanic space of the archipelago is very rich and far larger (500,000 km^2). The island archipelago portion of Equatorial Guinea is comprised of Bioko Nor and Sur, Annabon, and geologically the archipelago includes the island nation of São Tomé and Principe (Figure 2). All of these islands are a botanist's dream. There are two portions of the nation of Equatorial Guinea :1) the mainland portion ,which reaches east from the coastline inland to the Cameroon highland jungles of Central West Africa, with plant species and ecosystems similar to the Cameroon Highlands included in the Guinea hotspots and one of the three richest biodiversity areas in Africa (Figure 1): and 2.) the two offshore Islands (Bioko and Annabon), which are onto themselves a botanical ecosystem akin the Galapagos or Hawaiian islands for their endemism, although crops species have been brought from the African mainland for millennium and Europe from for five hundred years(Figure 2). Equatorial Guinea has 3250 plants species with 66 endemic plant species and 23 (while others estimate 61) threatened plant species. Threats are increasing : government mining, petroleum and gas business, make this nation the number three exporter of oil and Gas in Africa. Offshore fisheries and exploitation by foreign nations of the timber are also accelerating.

I had the excellent fortune of being sent there in winter of 1992 by the United Nations and welcomed as the guest of the government so that I could look first hand at the nation.

The nations' mainland (Figures 1 & 2) borders Cameroon highlands on the Equatorial Guinea mainland north coast, Gabon to the east and south, while the chain of Atlantic islands included in Equatorial Guinea have Nigeria to the north and Cameroon and Gabon to the east as their neighbors. Spatially the terrestrial portion of the mainland is only 26,017 km^2, São Tomé and Principe lie further away from the mainland and cover approximately

Figure 1. Map of mainland Equatorial Guinea (Rio Muni) seen in white in lower right and largest Island of the archipelago (Bioko with capital Malabo) also seen on white in upper left. See the below satellite map in Figure 2 for outlying islands in archipelago of Annabon, Principe, and São Tom¿. (from United Nations FAO)

Figure 2.) NOAA 2002 satellite photo with superimposition of mainland borders of Rio Muni on the African Mainland. The four inhabited portions of the island chain can clearly be seen to the left. Additionally the underwater portions seamounts of the Equatorial Guinea islands, Bioko Nor and Sur (large island outlined in white at the top center in the ocean), and Annobon (furthest to the extreme lower left in chain appearing as a white dot) and Island nation of Principe and São Tomé (which appear as two green islands between the white dot and the outlined island in the center left oceanic area).

836 km^2, and while the Equatorial Guinean island of Bioko covers over 2000 km^2, Annobon is the furthest from the mainland coast with an territorial area of 44 km^2. But due to the line of volcanic islands, the archipelago of Equatorial Guinea and Annabon plus St Tomé and Principe have an enormous oceanic space of 500,000 km^2. Situated in the Gulf of Guinea, there are a series of neighbors to the north of the islands with neighbors (west to east) Liberia, Cote d'Ivoire, Ghana, Togo, Benin, Nigeria, and Cameroon.

BACKGROUND of GEOLOGY, OCEANIC and ATMOSPHERIC CURRENTS AFFECTING the BOTANY of the TWO NATIONS

Equatorial Guinea is unusual in several ways which includes being composed of a series of offshore volcanic islands which are theorized by some to be formed in the Triassic-Jurassic period when the Atlantic Ocean between Africa and South America was being formed. A prevalent geological theory is that the "Cameroon line" was a fracture from a triple junction point in the Atlantic and became a geological fault about 80 million years ago extending along a zone from Mount Cameroon eastward toward Lake Chad and westward to the Gulf of Guinea but the fracture did not continue to extend toward the European plate (a failed arm of the fault). The fault contains the Mbere rift Valley and the Cameroon Highland Mountains. This theory attributes the fault line formation to the African plate rotating counter-clockwise which opened up magma conduits so that a line of volcanoes formed which includes Annobon and Bioko. The oceanic portion of the line of volcanoes are clear in the satellite photos (Figure 2) showing the string of offshore islands and sea mounts, of which 9 are active (receiving shocks 3 times in the last hundred years). Also, an eruption occurred in 2000 in the string of craters and crater lakes (Lake Nyos) in the mainland portion of the fault. The most active volcano is connected with a large fracture zone evidently on the African Continent itself including Lake Chad and Mount Cameroon. The island of Bioko (previously named Fernando Pó) is the farthest island north in the volcanic archipelago in the Bight of Biafra . The structure of the island is cones of two volcanoes reaching 3,008 m named Pico de Santa Isabel. Bioko is primarily of volcanic origin, resting on a sedimentary base, and having thickly wooded mountains, with predominantly a steep, rocky coast. Bioko is just offshore of Cameroon (25 mile to Cameroon's west) and Nigeria (to Bioko's northeast). The smaller and more distant (latitude 1° 24´ S) island of Annobón with the small area of 44 km^2 is primarily composed of a volcano 900 m high and is part of Equatorial Guinea. The mainland portion of Equatorial Guinea is Rio Muni with its terrestrial

area of 26,017 km ^{2}. Its width is 130 km with an average western seaboard to mountains length of 200 km. Rio Muni has small offshore islands of Corisco, Elobey Grande and Elobey Chico. Rio Muni's coastal plain is composed of sediment which is about 15 km deep with a tiered escarpment of strata at 300 m, 500 m, and 600 m, where a granite plateau formed being the western extension of the Gabonese Crystal Mountains. As one progresses eastward up into the mountains the land becomes heavily forested and higher so that mountains can reach 1200 m. The Mbini (formerly the Benito) River drains about 60 percent of the area. The entire mainland portion of the nation Rio Muni, as in many other West African nations, is drainage basins of a dominant river system. The central mainland area lies in conjunction with the upland forests of the Congo and thence eastward to the interior tropical African jungles, especially the Cameroon Highlands and the Gabonese Crystal Mountains. The geography of the two portions of the nation obviously differs greatly especially with large rivers on the mainland portion.

The climate is humid, tropical with an average temperature in the Islands' area 25^0 C, which does not vary greatly. Equatorial Guinea generally has a hot, humid tropical climate with average annual rainfall varies from 1,800 mm in the north-east to 3,500 to 4,000 mm in the south-west (Cape San Juan) of Río Muni, over 2,500 mm in Bioko, and reaching over 10,000 mm in some interior places in Rio Muni. Seasonal rains are greatest December through February which are accompanied by highly energized storms.

The Central West African nations north of Cameroon have a portion of the Basement complex of West Africa covered by sedimentary formations. Also there are sandstone deposits, both having rich oil reserves, as in Nigeria. There is a ridge of volcanic highlands which form the western end of the East African Rift Valley. Running to the south west (as already mentioned), this volcanic fracture zone includes the islands of Bioko, San Tomé, Principe and Annobon (Figure 2). The edge of the West African tectonic plate (less studied than other plates) lies close to the island chain and is active. Terrigenous sediment predominates over much of the oceanic region. In the Gulf of Guinea, 90% of the sediments are terrigenous. The shelf grows deeper rapidly on the west side of the archipelago islands except in Bioko which sits on part of the continental shelf.

The oceanic setting of the island chain is highly interesting since it involves a set of currents and counter currents which bring the mid-Atlantic equatorial waters past the island portions of the nation. The cooler and nutrient-rich Benguela Current flows along the Southern-Western African Coast from the south to north reaching Rio Muni, where it turns west (away from the coast) toward Bioko, and may be found at differing seasons and wind conditions east, west or south of Bioko. This brings a richness of phytoplankton not yet fully explored. The Guinea Current flows eastward and south-eastward along the coast of the Gulf of Guinea, reaching its end at Bioko. The waters near Bioko are those of upwelling and potentially excellent fisheries and rich marine plants. The South Equatorial Current flows westward near the equator and then south. The above currents are mainly wind driven. Several large rivers draining nations to the east and north of Bioko on the African continent produce ocean current velocities from their mouths outward into the sea tens of kilometers due to rainy season discharges. Thus the currents around Rio Muni and the islands especially Bioko are complex and changing with far fewer scientific records and studies than on the Western Hemisphere's South Equatorial Atlantic coast. These currents potentially bring spores and seeds of marine plants and occasionally terrestrial plants into the convergence of the Equatorial Guinea area, although this rafting and current dispersal is not well studied.

Atmospheric mixing also occurs in the strong air patterns over the tropical Atlantic bringing offshore winds having strong meterological events. The large-scale, seasonal wind patterns originate from the Azores and The Canary Island pressure centers in the Atlantic. Prevailing winds are from the north-east in the northern part and from south to south-east in the southern part of the region except in the Gulf of Guinea, where wind directions vary considerably. The south-west monsoon dominates being the strongest yearly wind event which reaches the furthest north in summer. Violent tropical Atlantic storms are common and highly energized. Lightening in these storms is frequent and consistently causes forest fires which rage until rains extinguish them.

Botanically, during glacial periods, these islands's environmental conditions from Bioko to Annabon were not changed as greatly as the mainland flora's conditions so that the island flora formed a botanical refuge with ancient African plants which still occur on these islands (or their successors) (Leal , 2004). Possibly, the islands' conditions were sufficiently different from the temperatures and humidity of the mainland (due to the conservative tendency of the ocean water) that the island temperatures remained sustainably tropical-subtropical for a range of plant species (or their predecessors) found there today. The mainland became drier, while the islands retained humidity from aersols, fogs, dews, and other oceanic

moisture. The next question is what occurred to the oceanic and nearshore marine flora of the islands versus mainland during these climatic upheavals? The marine flora is still not well defined at the inception of the second millennium except for the mangroves, although the intertidal contains large stands of seagrasses and a rich array of red and brown algae, and the benthic habitats contain a richness of marine plants helping to support a rich fisheries. This question marine benthic history remains unanswered at present.

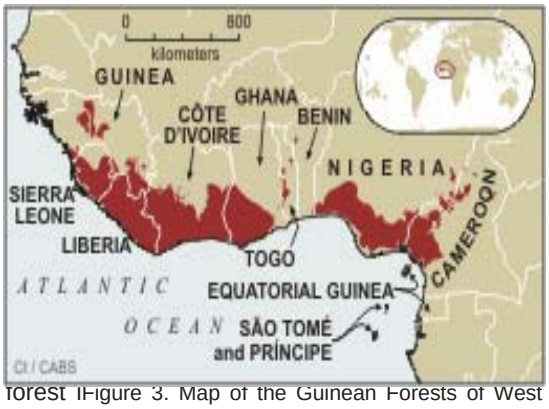
BIODIVERSITY and ITS THREATS, PROTECTED AREAS, and FOREST DIVERSITY in EQUATORIAL GUINEA

Protected areas are 16.8% of the total land in 2003 (WRI, 2009) located in 10 protected sites locations. Of the 3250 plant species, 66 are endemic and 23 are threatened (various authors' estimates run from 21 to 61 threatened species probably due to recent threats of logging plus forest removal for agriculture). Protected animal species associated with the forest habitat are also present having one of the highest areas of animal species (194 species of mammals, 418 birds, and 91 reptiles) (World Resources Institute 2009) in Africa. For example, the mainland highland forest areas have been called the third richest in species of birds in Africa (Stuart, 1986, Gartlan, 1989, and Statterfield et al. 1998).

Loss of biodiversity is an ongoing environmental problem. FAO has expressed concern about the rate of conversion of lowland forests into agriculture which rate is unsustainable. As these critical forest habitats are destroyed and converted to farmland, both plant and animal species are lost. Many of the International treaties dealing with plant and animal species exportation, sales, exploitation within the nation, biodiversity and other treaties have been agreed to by the government, which is an active member of the United Nations. Equatorial Guinea is a party to the following treaties: Biodiversity, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ship Pollution. All these treaties are signed, but not ratified. (This is not meant by me as a statement of adherence to the treaties, but is set forth as a factual statement of legal signatures.)
The biological assessment and evaluations of the flora and fauna of the islands have been described in a number of recent publications (Collar and Stuart, 1988, Jones and Tye, 1988, Jones, 1994, Atkinson *et al*., 1991, 1993, Leal, 2004, 2005) and more below where details are found. Endemism at the generic, specific and sub-specific level appears extremely high for such a small land area. As with island faunas elsewhere, the high taxonomic rank of endemic forms indicates that the process of relictualization has occurred on these islands for millions of years. Hilton-Taylor (2000) has predicted that many critical species on these islands have small populations which are threated with extinction. Much of the protected area is in covered in forest-land, little is protected for other ecosystems such as wetlands, nothing for marine ecosystems. In the opinion of this writer more wetland area should be set aside, especially on the south coast of Rio Muni and the islands. Also any coral reefs should be set aside as protected. Forests cover 79% of the inland portion of the mainland Rio Muni and much of the offshore islands (although on the islands, due to historical colonial farming much area is secondary forest therein definitions and amounts vary between estimates). The most critical ecosystems botanically are those on the islands full of endemism and secondly those in proximity to the Cameroon highlands, one of the highest terrestrial biodiversity areas on the planet besides Pacific coral reef systems. According to FAO, forests presently dominate 52.8% of about 1.6 million hectares of the nation, which are being harvested at 0.89% per annum. FAO estimates about 600,000 ha of forests are virgin. According to FAO, there has been a recent rapid change in forest cover. Between 1990 and 2000, Equatorial Guinea lost an average of 15,200 hectares of forest per year (0.82%). From 2000 and 2005, 0.89% per annum. Thus, from 1990 and 2005, Equatorial Guinea lost a total of 12.3% of its forest cover (228,000 hectares). Wetlands of international importance include only three Ramsar sites made official in 2005. (There are more deserving of the Ramsar site certification). The number of tree species in the IUCN red list include 1 critically endangered, 3 endangered and 11 vulnerable species.

This ecoregion of the four islands of Príncipe, São Tomé, and Bioko and Annobon in the Gulf of Guinea, off the west coast of central Africa support high numbers of endemic species, including several endemic genera and families. This area has been compared with other island centers of endemism (e.g. Galápagos or the Hawaiian archipelagos including their underwater seamounts, which in the case of Equatorial Guinea's seamounts are underexplored. Being volcanic there should be submarine lava tubes which may have fantastic marine flora and animals as do those lava tubes near the Canary Islands.) Evolutionary features typical of island faunas and floras, such as gigantism, dwarfism and unusual ecological, physiological and behavioral adaptations are also found in a range of species.

The Guinean hotspot (Figure 3) (an estimated 9,000 vascular plant species and 1,800 endemic species) includes two distinct sub-regions, whichncorporate several important Pleistocene



forest iFigure 3. Map of the Guinean Forests of West Africa, one of the world's biodiversity hotspots. (Source: Conservation International).

refugia created by the retraction and fragmentation of forests of the last 80 million years: 1.)Upper Guinea hotspot stretches from southern Guinea into eastern Sierra Leone and eastward through Liberia, Cote d'Ivoire and Ghana into western Togo; 2.) Nigeria-Cameroon hotspot , extends along the coast from western Nigeria to the Sanaga River in southwestern Cameroon. The two sub-regions are separated by the Dahomeny Gap in Benin, an area of farmland, savanna and highly degraded dry forest.

The Upper Guinean hotspot includes the four islands in the Gulf of Guinea: Bioko and Annobon, and São Tomé and Principe. Bioko is considered geologically to be a continental-shelf island, whereas the remaining three are considered oceanic (See Figure 2). The flora of these islands is highly distinctive. The island of Bioko has 1105 plant species of which 12% are endemic (Excell, 1973). There are 37 endemic plant species on Príncipe, 95 on São Tomé (along with one endemic genus), and 20 endemic species on Annobon (Figueiredo, 1994, WWF and IUCN, 1994). Only 16 of the region's endemic plants are shared by more than one island. This emphasizes the high degree of isolation under which these island's floras evolved and it indicates that potentially each island received its flora separately from the mainland. (The patterns of current of wind and water would be potentially possible to corroborate this theory.) The Rubiaceae, Orchidaceae, and Euphorbiaceae are characteristic of the islands' flora having high generic diversity and high numbers of endemics according to Figueiredo (1994). Significant endemic radiations among other plant genera (e.g. *Begonia* and *Calvoa*) are also found. The Pteridophyte flora of the islands is also considered particularly rich (Figueiredo 1998). The islands are distinguished as Centers of Plant Diversity (WWF and IUCN 1994). For instance giant begonias (*Begonia crateris* and *B. baccata*) are found as are other plant and animal giantism and dwarfism. Some international agencies and NGO's have proposed to protect the remaining areas of primary forest on São Tomé and Príncipe as national parks. A law establishing procedures for the proclamation and management of a protected area system was passed in 1999. The proposed parks would protect the largest remaining habitat blocks, including areas of primary forest. São Tomé and Príncipe are preparing to declare protected areas for the Parques Naturais d'Ôbo, which will cover a total of 293 km^2. It is pleasing to be able to state that the entire island of Annobon was recently ratified as a protected area. Let us hope these legal status declarations have some effect. The second Guinean sub-region, Nigeria-Cameroon, extends along the coast from western Nigeria to the Sanaga River in southwestern Cameroon going inland toward the east. Important montane regions, including the Cameroon Highlands (Mt. Cameroon, at 4,095 m is the highest peak in West Africa) and with south ends of the range of ecosystems in mainland Equatorial Guinea (Rio Muni) as well as on the island (Bioko). Part of the value of the region is the high number of both endemic plants and animals. Also the rapid development of farming and forestry as well as population growth in these areas puts the species in threat. As previously mentioned, FAO is concerned about lower altitude mainland areas being rapidly converted into forests. There are a number of economically important species found among the outstanding plant species in this second Guinean hotspot. This region forms the origin for a series of important cultivated plants. The original native oil palm (*Elaeis guineensis*) (widely cultivated throughout the tropics for palm oil) is found along with valuable timber species including African ebony (*Diospyros gracilis*), two genera of African mahogany (*Entandophragma and Khaya*), and iroko (*Milicia excelsa*), which have been widely exploited. In the Bamenda Highlands a distinct sub-region within the Cameroon Mountains 120 plant species are endemic. The subregion has rare woods such as Mahogany, ironwood, cam wood and mimosup . In a smaller sub-region within these highlands, the Kilum-Ijim forests within these highlands have *Arundinaria alpine* (Alpine Bamboo) and quantities of endemic species. These forests form the habitat for a food web of animals with 62 mammalian species (11 are endemic). There exist 36 endemic bird species, 40 amphibian endemics, 9 reptiles and possibly a large number of endemic fish. Butterflies species exceed 950 with over 100 endemics.

CURRENT FOREST STATUS

There is currently estimated to be 40 km^2 of primary forest on Príncipe, and 240 km^2 on São Tomé. Over larger areas of both islands, secondary forest vegetation is regenerating on old plantations. On Annobon, much of the forest, with the exception of the high peaks of Santa Mina and Quioveo, has

been modified by humans over several centuries but remains important habitat for endemic species. Many of the endemic species have adapted to modified habitats on the cocoa and coffee plantations because of the use of shade trees to protect crops. Some International agencies have for decades proposed to protect the remaining areas of primary forest on São Tomé and Príncipe as national parks. A law establishing procedures for the proclamation and management of a protected area system was passed in 1999. The proposed parks would protect the largest remaining habitat blocks, including areas of primary forest, as has been done with Annobon. Concerns exist over the protection and status of the remaining areas of drier forest on São Tomé, and for the long-term survival of species confined to lowland forests of these islands. The remaining lowland forest habitats are being gradually cleared for agriculture. Knowledge of many species of conservation concern is so poor that it is difficult to assess whether the proposed national parks on São Tomé and Príncipe will adequately protect these populations.

Threats to Plant Species

During the sixteenth century, a large area of dry forest in the north and northeast of São Tomé was cleared for sugar cane production. After the decline of this cash crop at the end of that century, some of this forest recovered. From the middle of the nineteenth century, large coffee and cocoa plantations were established on both Príncipe and São Tomé, which led to the widespread modification and destruction of primary rain forest. Rain forest in the north of Príncipe was also severely modified during a campaign against sleeping sickness from 1911-16. However, many endemic species adapted to the shade forest found in plantations. After the 1930s, and especially following independence in 1975, many plantations were abandoned, and there was some regeneration to secondary forest. Since the mid-1980s, land reforms have led to the development of market gardening and consequent land conversion from coffee and cocoa plantations. Some secondary forest areas have also been cleared once more for agricultural use. This is of some concern because it will put pressure on endemic species that have adapted to secondary and plantation shade forest, and it will also increase pressure on remaining primary forest areas.

Agricultural practices on Annobon have traditionally been based on a forest agricultural system that was less damaging to biodiversity than the large-scale plantations of Príncipe and São Tomé. However, there remains a danger that agricultural encroachment in the primary montane forest zones of Pico Quioveo and Pico Santa Mina will result in irreversible damage to these habitats.

PLANT INTRODUCTIONS:

The crop plants of the colonial plantations such as cocoa and coffee are introduced plants, as are those which the pre-colonial groups brought with them, namely, the Fang, Bantus, Bubis and other tribes. Earlier biodiversity on the four islands may have been particularly susceptible to the introduction of non-native species. On all four islands, a number of terrestrial mammals, both domestic and wild, have been introduced over the centuries (Dutton 1994) some of which have done damage to native species. For example,recent introductions of terrestrial gastropod species have been recorded on all three islands (Gascoigne 1994a). Little direct exploitation of the endemic terrestrial wildlife occurs. Medicinal plant use is almost exclusively concerned with non-endemic species.

Educational Botany and Botanical Groups

There is the Universidad Nacional de Guinea Ecuatorial (Equatorial Guinea National University), founded in 1995 in Bata (on the Mainland) with a medical school and other active professional schools. Botanical activity is found in the Agricultural School and the Fishing and Forestry School. None of the islands, nor Fernando PÛ„has a University. Citizens wishing higher education have been accustomed to going to Europe, Russia, or the USA for university training, where many of the present government engineers, administrators and scientists have been schooled.

There are a series of donor government projects and multi-governmental projects (EU and other regional groups). Overseas development projects from Spain, Portugal, USA, EU have been central in the botanical research being carried out. Also there are a series of various disciplinary projects at an International level by African Development Bank, African Union, BDEAC, CEMAC, FAO, G-77, IBRD, ICAO, ICRM, IDA, IFAD, IFC, IFRCS, ILO, IMF, IMO, IOC, ITSO, ITU, MIGA, NAM, OIF, OPCW, UNCTAD, UNESCO, UNIDO, UNWTO, UPU, WFTU, WHO, WIPO, UNDP, and other international agencies. Thus, during the past thirty years much more information has been obtained about the flora of Equatorial Guinea than previously.

Anthropological history

Probably the original mainland inhabitants were pygmies (groups of Pygmies are presently located in scattered locations in Rio Muni). Historically recorded are waves of Bantu migrations occurred in the 1600-1800 after the Portuguese had claimed the area. Later migrations included the Fang tribes from the Cameroon into Rio Muni displacing Neolithic populations and the Bubi (chiefly into Bioko where they became the first human inhabitants). Migrations between the 17th and 19th centuries brought further coastal tribes (such as Ndowes, Bujebaes,

Balengues, Kombis and Bengas) along with their languages. The Fang comprise about 80% of Equatorial Guinea's population, while the Bubi comprise about 15% along with some Fernandinos. Probably the Annobon population was brought by the Portuguese from Angola for colonial plantations, which also was the case in São Tom¿„and Principe. At present there are also Europeans, other African groups, and Asians living in Equatorial Guinea.

Recent Human History

The history of the small nation has been a bit strained in the twentieth century. After being a Portuguese colony, for hundreds of years, in 1778, the island of Bioko, adjacent islets, and commercial rights to the mainland between the Niger and Ogoue Rivers were ceded to Spain in exchange for territory in the Western Hemisphere and then governed from Buenos Aires. These areas were ruled by Spain until 1958. Colonization began in the early sixteenth century when São Tom¿„became the world's largest sugar producer and, after this crop's decline, the island grew to be an important slave trading post. Annobon became a Spanish colony in the eighteenth century and now forms part of Equatorial Guinea. In the nineteenth century, coffee and cocoa plantations were established on São Tomé and Príncipe so that Africans from Angola chiefly were moved to the islands to work on the estates. These islands have remained populated and became an independent country in 1975.

The Republic of Equatorial Guinea is now an African democracy which exports oil. Since its recent beginnings to pump gas and oil to export abroad in 1992, it has rapidly become Africa's number three in exports of gas and oil ranking after Nigeria and Angola. Equatorial Guinea also has other natural mineral resources such as gold, bauxite, diamonds, tantalum, sand and gravel. The sea in this portion of Africa has plentiful fish for the native artisanal fishermen, although dangerously offshore rights are sold to foreign fishing companies.

The population of Equatorial Guinea is slightly greater than a half a million of which about half live in the major cities with Malabo the nation's capital. Average life expectancy is 49.7 years in Equatorial Guinea. Median age is 18.83 year with fertility rates over 4. Infant mortality rate is 85.13 deaths per 1000 births (WHO, 2005). About 52% work as farmers, arborists and artisanal fishermen. Artisanal fishing is important in the coastal and island areas, while arbors, livestock and farming are central employment sectors in the mainland and growing inland replacing forest-based livelihoods. Little English is spoken, although knowledge of Portuguese, Spanish, and French are common with the inhabitants, who also speak several indigenous languages such as Fang and Bubi. The population of São Tomé and Principe is 206,000 of which 95% live in São Tomé who are chiefly farmers, with 2300 fishermen. The São Tomé average life expectancy is 65.3 years with 63.8 of men and 66.7 for women. The São Tomé median age is 14 with 4.39 fertility rate. A series of other employment sectors are available, although the population is very young. There is some service work.

Equatorial Guinea now has the second highest per capita income in the world, after Luxembourg, although this is derived by simply dividing the GDP by the population. This ranking has several effects. The United Nations can no longer provide the nations the loans and other newly industrializing nations' services. Second, the other nations expect a developed nation set of standards from this young democracy which is independent from Spain only some 50 years.

Two emerging regional governance issues are the following: first, a great deal of piracy occurs along the Bay of Guinea coastline in general, both within these territorial waters and those of all the adjacent nations of Gulf of Guinea. A second regional problem is the illegal immigration of citizens of many West African nations along the general coastline from Gabon to Liberia then northward into Morocco and thence into Europe in small boats. Both trends are occurring in increasing numbers.

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Books Reviewed

Positive Interactions and Interdependence in Plant Communities. Callaway, Ragan M. 2008/ ISBN 978-1-4020-6223-0 (Hardcover) 415 pp. Springer, P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

In this book, Ragan Callaway argues persuasively that ecologists have vastly underestimated the influence of facilitation and positive interactions among species in plant communities. In particular, beginning with chapter one, he forges into battle with the ghost of Henry Gleason and his individualistic view of the biotic forces responsible for structuring plant communities. Callaway makes it clear that the individualistic view is inadequate as a means to describe plant assemblages because positive interactions among species create webs of interdependence. By reviewing a century's worth of literature that spans terrestrial ecosystems across all biomes, Callaway mounts a convincing argument for facilitation as a potent force driving patterns in the succession, structure and function of plant communities.

In chapters two, three, and five, Callaway provides a comprehensive review of the mechanisms that cause direct, indirect, and species-specific positive interactions. He marshals a very large, and arguably excessive, number of examples from the literature to support each purported mechanism. Even Callaway laments that his approach is "a bit mind numbing", but he ultimately concludes that, "sometimes science by siege can make a point." Despite the tedium, these chapters should be required reading for anyone interested in studying facilitation. Callaway challenges the dogma that competition is the primary structuring force in plant communities, although he acknowledges that positive interactions are not new to ecological understanding. He further argues that a renewed appreciation of positive interactions could "catalyze new thinking about old theories." In the end we came to agree with him.

As a complement to the extensive literature review, Callaway also provides two chapters centered on e

the Stress Gradient Hypothesis (SGH), which predicts that as abiotic stress increases, positive interactions will increase disproportionately in importance relative to competitive interactions. The SGH is unfortunately the only major theoretical synthesis explored in any detail but it serves as a refreshing reprieve from the barrage of examples from the literature covered in the first half of the text. Chapter 6 provides a substantial number of thought-provoking examples of facilitation expanding species' realized niches, promoting community stability and biodiversity, impacting exotic species, and the most likely way that facilitation could cause evolutionary changes among interacting species. It was this chapter that stimulated our most thought provoking discussions of potential future research avenues.

This book is almost certainly the most extensive review of the literature on positive interactions in plant communities to date and thus a key source of references on nearly any topic regarding facilitation and its importance. For those specifically interested in facilitation, Callaway's attention to detail in these examples will be a valuable introduction to the most commonly used experimental designs and their shortcomings. To supplement his review of the literature, Callaway occasionally points out specific areas in need of further study, making this book a valuable springboard for those interested in facilitation research. Nonetheless, some of us felt that Callaway missed an opportunity in many places to identify holes in our knowledge regarding specific areas where research is most critically needed to advance the field.

We read this book as part of a graduate-level seminar course, and by the end, nearly all of us were wishing for a more synthetic approach to the topic. Our primary complaint was that the book read more like an annotated bibliography rather than a synthetic work designed to provide novel insights to community ecological theory. Perhaps this is too much to ask when the major thrust of the book is seemingly to convince ecologists that ignoring these interactions leads to scientific peril. Callaway could have made a more compelling argument if he had illustrated that facilitation is the major force influencing species composition or dynamics in communities where competition had previously been the accepted explanation. From an editorial perspective, the book had numerous typos, figures that lacked clarity, references left out of the bibliography, and an index that had too few entries to be of much value.

Initially, the book seemed like a timely and pertinent read for anyone interested in plant community ecology. However, after pouring through the exhaustive list of examples of facilitation that the balance between competitive and facilitativ interactions (Chapter 4) and how research on facilitation contributes to an understanding of a diverse range of topics in community ecology (Chapter 6). Most importantly, Callaway presents dominates over two-thirds of the text, we felt that the target audience for this book should be narrowed to scientists primarily interested in pursuing facilitation-oriented research or to community ecologists who are firmly rooted in the dogma of competition as the driving force in communities. For these groups, the book will undoubtedly provide insight into the methods used to conduct solid research in, and highlight the importance of, positive interactions in plant communities. The extensive literature review will certainly prove invaluable for this audience. For readers with a more general interest in plant or community ecology, however, we suggest reading Chapters four and six first. The introduction to the SGH and the link to larger themes in community ecology (e.g., niche space and co-evolution) will lay the conceptual foundation that gives the reader the context to understand the importance of the numerous examples of facilitation found in other chapters. We also recommend supplemental reading (e.g. Bruno et al. 2003, Brooker et al. 2008) to buttress the theory behind facilitation introduced in this text.

Despite the overall paucity of theoretical implications and syntheses, this book provides a thorough and compelling argument for the critical importance of facilitation in plant communities. Surprisingly, many ecologists still appear to adhere to the Gleasonian (individualistic) paradigm that Callaway effectively skewers. Even as recently as last year, Ricklefs (2008) argued that, "communities are not integral entities." Callaway's myriad examples assault this ideology, and will leave readers with a much greater understanding of the interdependence of species and the influential role that positive interactions play in plant communities. For this Callaway has done the field of plant community ecology a great service.

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A Primer of Conservation Biology, 4th ed. Primack, Richard B. 2008. ISBN 0-87893-692-0 (Paper US$49.95) 349 pp. Sinauer Associates, Inc. P.O. Box 407, Sunderland, MA 01375-0407.

This introductory book by the qualified and knowledgeable Professor Richard Primack is a clearly written, beautifully illustrated, accessible, comprehensive summary and guide to the field of Conservation Biology. Students enrolled in a number of different introductory or non-major courses, as well as non-scientists, citizens, and professionals who wish to learn more about the field will find this book to be precisely the breadth and depth of information they are seeking.

"A Primer of Conservation Biology" begins in the first chapter with an introduction to the field including its history, major definitions and concepts, and unifying goals. Each chapter then successively builds on previous chapters in terms of both content and concept. The first four chapters following the introduction describe and explain topics in biodiversity including identification of species, measures, types and patterns of biodiversity, placing economic values on biodiversity, major threats to biodiversity, processes of extinction, and specific challenges faced by small populations. The final four chapters summarize broad conservation efforts including methods used to evaluate and monitor populations, creation of new populations, establishment of protected areas, conservation outside of protected areas, and sustainable development in the future. The book ends with a poignant charge to conservation biologists to take on active roles that will help bring about the protection of the world's biodiversity.

This book fulfills its stated purpose as a "concise guide for those who require a well documented overview of the subject but do not require in-depth experimental data or lengthy scientific discussion" and is perfectly suited for its intended audience. The text is easy to read, terms are carefully explained, and the use of jargon is avoided. The main take-home message from each chapter or chapter subdivision is clearly discernable. Topics covered and references used are current and relevant. Several features enhance the utility of this book as an introductory text for students such as an instructor's resource CD that includes all the tables and figures from the book, chapter end summaries of the main points covered, excellent discussion questions that encourage students to digest and apply what they've read, and annotated references for further reading.

Throughout the book, the use of simple color figures and tables and real-life examples bring understanding and relevance to the subject matter covered. Figures include graphs, diagrams, flow charts, maps, and high-quality photos. The choice of real-life examples is well balanced and makes use of a full range of species (including plants), habitats and geographic areas of the world. Examples are also chosen to familiarize the reader with some of the most important and well-known stories in conservation biology, for example, the recovery of sea turtles, multiple uses of horseshoe crabs, and plight of the American Chestnut.

In my opinion, this book has only a few shortcomings. First, some topics are possibly oversimplified and presented without controversy. In other words, the reader might be given the impression that certain concepts are straightforward and free from disagreements or challenges, for example, ecological economics, global climate change, reintroductions, mass extinctions, and minimum viable population sizes. Perhaps a discussion of controversy and complexity for these and other issues is outside the scope of this book. Second, some portions of the text are very dense – the author attempts to cover large amounts of complex information briefly and simply, for example, ecosystems in chapter two. This dense text likely reflects the need to introduce certain terms and concepts for later discussion to readers who are not already familiar with them. Finally, a few minor complaints are that the heading and subheading designations within chapters are not clear, the discussion of extinction rates in chapter 5 is somewhat confusing, and the chapters at the end of the book could possibly be subdivided into smaller chapters, each with a more precise focus.

This fourth edition of "A Primer of Conservation Biology" appears to be a significant improvement over previous editions in that color figures and photos have been added, topics have been better organized into shorter chapters, and recent developments and approaches in conservation have been included.

In summary, this book is informative, interesting, and fun to read. It covers a wide range of topics in conservation biology and can be enjoyed by anyone wishing to learn more about the field. Although it suffers from some oversimplification, I would not hesitate to adopt it for my own introductory course or recommend it to a friend or professional in another field.

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Self-Incompatibility in Flowering Plants: Evolution, Diversity, and Mechanisms. Franklin-Tong, Vernonica E. (Ed.) 2008 ISBN: 978-3-540-68485-5 (Cloth, $219.00) 314 p. Springer. 233 Spring Street , New York, NY 10013.

Self-Incompatibility in Flowering Plants serves as a reference to the latest advances in self-incompatibility (SI) research. Although it cannot be a replacement to the classic 1977 (2nd revised edition 2001) text book, it provides a more recent summary of the current status of self-incompatibility research. The book contains brief descriptions of topics providing a good source for the recent literature on this topic. The book can serve varied audience – an ecologist, evolutionary biologist, molecular biologist or cell biologist. It would also help some-one trying to gain a peek into all of these different areas and then explore any of these in greater detail by going through the original articles. Being an edited book, the writing style varies from chapter to chapter and that is a little frustrating as some chapters do not offer the same detail as others do. The book forms a really good compilation of the works by the authors' research in the field of SI. The book overall is a good summary of the recent advances in SI and can form an immediate reference on topics but priced at $219, I would say it is on the expensive side.

The focus of the book includes ecology, evolution, phylogeny, molecular and cell biology of self-incompatibility and provides details on the complexity and diversity of interactions. Providing a glossary of terms at the beginning is really the best part of such a specialized book. The book is divided into two parts – the first focusing on the evolution and genetics of SI while the second delves completely into the molecular and cellular bases of SI. Some chapters on ecology, environment and genetics of SI really read a little choppy desiring continuum across the different topics described but provide a good segue into the remaining chapters in the book. The evolutionary genealogies of SI and individual case studies of evolution of SI in Brassicaceae form a good transition into advances in molecular and cell biology of SI. In addition, the book also deals with other individual cases such as poppy, *Ipomoea*, grasses and finally terminates with the classic SI example of *Primula*.

The first two chapters by Barrett and Shore and Good-Avile et al respectively summarize the ecology and genetics of heterostyly and self-incompatibility. Barrett and Shore begin with a description of the sexual organs of a flower and with a diagrammatical representation the heterostylous floral polymorphisms present a clear description of the heterostylous variations. The chapter then progresses into the phylogenetic reconstructions and the functional significance of heterostyly and its effect on the reproductive ecology. These parts of the chapter are very brief and are essentially the summary of many recent reviews as the authors have mentioned. The authors have described and contrasted the different theoretical population genetic models to explain the evolution of distyly. Being an ecologist myself, I finished reading this chapter wishing it was not as brief and wanting some details especially on the topics of floral morph ratios and reproductive success and theoretical models and predictions. Good-Avila et al take the book into the genetics of self-incompatibility beginning with a brief introduction on the evolution of breeding systems, the advantages of selfing and the genetic and environmental interactions determining self fertility. This chapter provides a 'non-exhaustive' peek at the many mechanisms that underlie self fertility of individuals in self-incompatible species. The chapter provides a good description of the S-locus, self fertility in the presence of S-alleles, modifiers of SI, and it includes mentions of pseudo self fertility and plasticity in self fertility. I found the discussion on the fate of self-fertility genes and the conditions for maintaining stable polymorphisms of self fertility and SI to be a very interesting summary of the theoretical aspects of self fertility and SI. The chapter by Allen and Hiscock discuss the diversity of SI systems and summarize the different hypotheses on the evolution of SI in angiosperms and the underlying phylogenetic relationships. This chapter presents a picture of the evolution and the phylogeny of SI by attempting to combine the current SI data with the recent angiosperm phylogenies. The description of SI in basal angiosperms is fairly detailed and forms a good beginning moving onto SI in monocots, phylogenetics distribution of SI in the different angiosperm families leading to the different expressions of SI including late acting ovarian SI and the more common gametophytic and sporophytic SI. This chapter is interspersed throughout with possible avenues for future research. Sherman-Broyles and Nasrallah begin with an excellent contrast of Darwinian thoughts on self fertility and Stebbins hypothesis of selfing being the most frequently travelled path in plant evolution. They focus on the studies of sporophytic SI system in the Brassica family and briefly discuss the loss of SI in many plant lineages. They focus on self-fertility in *A. thaliana* and summarize the hypotheses explaining the switch to self-fertility in the species.

The latter chapters deal with the molecular and cellular bases of SI each discussing either single species, family or a set of families where cellular pathways and molecular mechanisms have been explored in great detail. The chapter by Watanabe et al highlights the important milestones in the research on SI in *Brassica* beginning with an

introduction on the importance of SI for agriculture. The chapter contains brief descriptions of the Bateman model of the sporophytic control of the S-locus, and identification of S-locus glycoproteins (SLG). It follows a chronological progress in *Brassica* SI with the discovery of the second S-linked gene for SI in *B. olerecea*, the functional evidence for the role of this S receptor kinase (SRK) in SI and a bioassay system for the identification of a pollen 'S gene' that would interact with SRK. With a description of the dominance relationships among the complex set of S genes in Brassica, the chapter concludes with future prospects of SI and how we can allow our knowledge of the SI system to be applied in a plant breeding context. The chapters by Zhang and Xue and that by McClure deal with the flowering plants of the family Solanaceae. Rosaceae and Plantaginaceae exhibit the most widely distributed S-RNase-based SI system described so far. These chapters describe the molecular bases of S-RNase-based SI and the S-RNase genes on the female side and the S-locus F-box on the male side and the influence of non S-locus genes on their functions. The chapter by McCubbin forms a good culminating point by taking on the classical example of SI in Primula. This chapter ties in the different topics discussed by Barrett and Shore in the first chapter and with a reassessment of the historical information on SI in *Primula*, McCubbin excellently reviews how the recent developments at the molecular level could generate promising tools to improve our understanding of self incompatibility in *Primula*. The chapter summarizes the floral characteristics of the mating types in Primula and the functions of the heteromorphic characters. The genetic structure, location and size of the S-locus, the allelic dominance and the current status of the molecular genetic characterization of the genus are described fairly briefly. The chapter concludes with a description of future prospects and ties in the aspects described in the ecology and diversity parts of the book into the molecular developments of SI.

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Chocolate: Pathway to the Gods (subtitle: The Sacred Realm of Chocolate in Mesoamerica) 2008. Dreiss, Meredith L. and Sharon Edgar Greenhill. ISBN 978-0-8165-2464-8 (195 pages, hardcover with DVD, $30.00) University of Arizona Press.

Chocolate: Pathway to the Gods is a visually impressive book, containing numerous beautiful full-color images of artifacts, places, and practices historically associated with chocolate and its production. The book focuses on Mesoamerica, especially the Mayan period. Despite the plethora of high-quality books available on the social and natural history of chocolate, this book fills an open niche by providing an overview of chocolate in Mesoamerica that is approachable to non-scholars while maintaining a suitable level of well-documented scholarship to appease the specialist.

The book is loosely divided into topics such as rituals, wealth, healing powers, and ecology, but the topics overlap significantly because of their inherent interactions. Page space is about equally divided between images and text. There are a few maps to clarify locations mentioned in the text. The authors state that the book arose because they had collected too many images for their 60 minute DVD (included with the book, see below). It is apparent that they used the text and interesting stories to tie the images together, versus using images to illustrate the text. Because of this, one can approach the book either by flipping through and stopping at an eye-catching image and learning about it from the text, or by more methodically reading through each section.

My only criticism of the book has to do with its somewhat irregular and ill-defined timeline. The mental crisscrossing of centuries within any given section can be bewildering. The reader is thrown, for example, from "Early Classic Maya" to the "Madrid Codex" with little to no explanation of the relationship between the two. It is assumed that the reader is familiar with the major periods of Mesoamerican history and therefore there is no definition of them in the book. Readers would greatly benefit from a one page timeline listing the major periods and location of the described cultures by year. [As a substitute, you can consult the entry on "Mesoamerican chronology" in Wikipedia.org]

The 60 minute DVD (2005) that is included with the book is well-produced and really interesting to watch. It suffers a bit from the same time-travel giddiness of the book, but having the information portrayed in video helps the viewer maintain a better sense of time and place. My two pre-teen kids wandered through the room while I was watching it and stayed for the whole movie. I later heard one of them describing the role of chocolate in present-day "Día de los Muertos" (Day of the Dead) rituals to her friends.

In summary, *Chocolate: Pathway to the Gods* is a worthwhile addition to your library if you are interested in chocolate, Mesoamerican history, and/or economic botany. The combination of book and DVD would be useful in a class on Mesoamerican history, Latin American studies, or economic botany. It also provides clear photographs of period artifacts that may serve as inspiration for Mayan-themed art.

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Mushrooms as Functional Foods. Cheung, Pater C.K. (ed.) 2008. ISBN 0-470-05406-2 (Cloth US$90.00) 259 pp John Wiley & Sons, 111 River Street, Hoboken, NY 07030.

As our interest in the medicinal aspects of plant chemicals increases, it makes sense that our focus should also include chemicals produced by fungi. Interestingly, more than 400 fungal species have known medicinal properties. These medicinal uses are responsible for approximately $6 billion in global sales; however, less than 0.1% of those sales occur in North America.

When discussing health benefits of any food, the first step is obvious: nutritional value. Cheung's chapter covers this topic comprehensively. For example, mushrooms typically contain more protein than plants, while being low in fat and calories. But as a functional food - one that promotes health and reduces disease risks - mushrooms offer us much more. For example, they have known antioxidant ability (although little information on the character of these antioxidants is known) and the ability to lower blood cholesterol. Cholesterol-lowering effects may be due to a variety of effects. These include presence of compounds like lovastatin, which block cholesterol biosynthesis, or may even be due to fungal cell wall components interfering with cholesterol absorption from the gut. Mushrooms are also associated with lowering plasma glucose levels, a bonus for diabetics.

While most mushroom nutriceuticals (a refined or partially refined extract) are derived from mycelia and culture filtrates, sclerotia are an underutilized resource. Wong and Cheung's chapter not only discusses characteristics of sclerotia, but goes on to describe three specific sclerotia that are used both as food and medicine. The chapter also explains pharmacological activities of their cell walls, and especially ^{2}-glucans, on physiology, ranging from their ability to increase calcium and magnesium absorption to their ability to modulate the immune system.

I felt the chapter most central to the book's focus was V. C. E. Ooi's chapter on the antitumor and immune modulating roles of higher fungi. Ooi focuses on how mushroom polysaccharides activate macrophages and natural killer cells, induce apoptosis, and suppress metastasis. The author also discusses the relationship between polysaccharide size and anti-tumor activity - the larger the polysaccharide, the greater the anti-tumor effect. It also appears other structural characteristics like branching and helices influence antitumor activity. The information in this chapter certainly points out the folly of not including these compounds in cancer treatment regimens.

The final chapter of *Mushrooms as Functional Foods* deals with global inconsistencies in how mushrooms as dietary supplements are regulated. The regulatory systems in the U.S., Canada, European Union, Australia, Japan and Israel are all discussed, as well as the best techniques for obtaining consistent nutriceuticals, and potential methods for consolidating food safety systems.

The one major drawback I found was that the title leads one to believe the book will focus almost solely on the ability of fungal compounds to improve health. While *Mushrooms as Functional Foods* included several chapters specifically on the nutritive and medicinal nature of mushrooms (see above), it also included several sections that don't easily fit the topic. For example, bioremediation is discussed in the introductory chapter. Another subject that stretches to fit the idea of functional foods was the molecular analysis of *Lentinula edodes* (shiitake) growth and development strategies. I was hoping that this chapter would include information on its main medicinal compound, lentinan, but due to limited research, the only information on this functional aspect was the post-harvest degradation of lentinan. Most material in this chapter discussed items such as the molecular basis of fruiting body development and the chemistry of food source degradation. Interesting, but I feel the topic is perhaps not yet worth an entire chapter in a book on mushrooms as functional food.

The book is targeted at those in working with functional foods, in the areas including nutrition and complimentary/alternative medicines. The writing was clear, findings concisely described, the sections well-marked, material was exceptionally well-referenced, and all authors pointed out areas where little research has occurred - making this a great jumping off point for future research projects.

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Micropropagation of Orchids, Second Edition, Arditti, Joseph. 2008. ISBN 978-1-4051-6088-9 (Cloth US$475.00) 1523 pp. Blackwell Publishing Ltd, 350 Main Street. Malden, MA 02148-5020.

Only the skilled can judge the skillfulness,
but that is not the same as judging the value of the result.
C.S. Lewis, *A Preface to Paradise Lost*

This might seem a rather improper way to begin a review. I do not attribute to myself the quality of skill, but rather an assessment of the value of the result. As to the notion of the skilled as judges, this is an apt description of the second edition of Joseph Arditti's *Micropropagation of Orchids.* At first glance one might believe this to be a mere compilation of recipes gleaned from the published literature. That would overlook its true value. Arditti is not merely a scribe or compiler transmitting what others have done, but a synthesizer who, having himself been an active scientist and micropropagator, has sought out, studied, interpreted, and (where necessary) inferred the details of orchid micropropagation. He has brought to this massive work the skills of a scientist and the art of a teacher. In so doing he provides not only the method, but also a judgment of its skillfulness.

This is hardly a book one sits down by the fire to enjoy. It also is not likely to find a place on many coffee tables. But it does contain a wealth of information drawn from a career devoted to all things orchid—and if put to proper use will become a marked up, dog-eared essential in the laboratory.

A carefully detailed and important initial chapter is devoted to the history of orchid micropropagation. Therein Arditti seeks to right what he perceives as the flawed record of history (for which he apologetically takes some small responsibility). He admits in his preface to having been "made to remove parts of the story which placed the discovery and its discovers in proper perspectives…" from a similar chapter in the First Edition. This new edition's chapter on history carefully details the many who were instrumental in advancing orchid micropropagation, and reinstates those removed parts. In so doing it provides the full picture and acknowledges the contributions by many deserving individuals to the development of orchid micropropagation.

Through Arditti's history the reader gains an appreciation of the fact that while we often attribute advances in science to a handful, it is the contributions of many taken together that forms a body of knowledge. Like a teacher, he introduces us to many who might otherwise be forgotten (we see not only a name, but in addition for many a photo, a signature, and an occasional personal note). Was the fact that only one individual has received the greatest credit for the work deliberate fabrication by those with commercial or other interests? An error of understanding? The result of commercial protectionism? Arditti leaves his reader to decide but provides a thorough history that reads like a good mystery novel.

Having dispensed with the background, for the rest of this work it is time to roll up your sleeves. As noted, this is no simple "how to cookbook." Rather, Arditti provides the reader the details and tools (from how to make the necessary stock solutions and media to how to deal with contamination in cultures, or where to purchase supplies) to become skilled in the art of micropropagation. And as fitting the largest of plant families, we see that the methods are as diverse as the forms of the orchid flower. For some the details are manuals in themselves (see, for example, methods for *Cymbidium* or *Dendrobium* in Volume 1 and those for *Phalenopsis* in Volume 2). While for many others they are only brief notes, as is the three-paragraph entry for *Dactylorchis*. But even here there is valuable information for while the original publications provide only scant information, Arditti, drawing on his understanding of the topic, infers for us details omitted by the original authors.

When teaching them the techniques of tissue culture and micropropagation, I used to warn my students that success was a mix of science, experience, luck, and a bit of "witchcraft." Many years ago, for example, we sought to develop methods for culturing *Paphiopedilum* (the success for which Arditti suggests remains uneven). After numerous failed efforts we were overjoyed to find a piece of ovary tissue packed with what appeared to be bright green callus growth. A laboratory accident led to the loss of that culture and despite many efforts, we were never able to repeat it. Thus, Arditti cautions his reader that these techniques are far from foolproof. And, perhaps most valuable, he provides throughout editorial evaluations and advice that could prove invaluable for adapting individual efforts.

The publisher's description of *Micropropagation* refers to it as a "classic." Certainly if one lines this up with Shakespeare, it would fail that test. And even in science, I would hesitate (as I am sure the author would) to list it alongside Darwin's *Origin of Species*. But in the sense of its universal value and importance, this Second Edition will undoubtedly be considered a classic, if only because it will serve as a sole and invaluable resource on the subject. It has grown from an appendix in a volume of the series *Orchid Biology, Reviews and Perspectives*

(edited by Arditti and others), to the nearly 700-page First Edition, to the present more than 1500 pages, 2-volume work…a measure of how far and how rapidly the techniques of micropropagation have expanded.

While most of the two volumes is devoted to a species by species listing of methods, there are valuable appendices on supplies, Internet resources, and some fundamental chemical and physical resources (e.g., light, units of measure, glossary, etc). A very substantial bibliography allows the interested reader to research and study the original references themselves…and serves as a testament to the fact that this is the result of a lifetime devoted to the study of orchids.

As the author of what he says will be the last such volume he will produce, Arditti takes opportunity to project into the future. He sees, not surprisingly, continued growth and spread of these techniques and looks to (hopes for?) others who would take up the task of the next edition in another 15-20 years. If I could speculate, I would suggest that it would be difficult to find someone with a similarly intimate knowledge of orchids and the science and intrigue that surrounds them. Finally, I would predict that this work will be considered a classic in one more sense: it will (very soon I expect) be scarce and out of print. There is, to return to Lewis's admonition, therefore, great value in this result.

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Plant Desiccation Tolerance. Jenks, Matthew A. and Andrew J. Wood (eds.). 2007. ISBN 0813812631 (Cloth US$200.00) 311 pp. Blackwell Publishing Professional, 2121 State Avenue, Ames, IA, 50014.

I chose to do this review as I wanted to know more about desiccation tolerance in plants. I now do, however, it is ultimately a book for physiologists, biochemists, molecular biologists and perhaps it is most suited to those in agronomy, plant breeding and conservation. The book does not deal in any great depth with the ecology and evolution of desiccation tolerant plants or methods in plant desiccation tolerance research. Bewley (1975) described desiccation as the ability of an organism to dry to equilibrium with dry air and resume normal metabolic function on rehydration. He proposed that desiccation tolerance is an inherent property of the cell. That property limits damage to a repairable level while maintaining integrity in the dried state and upon rehydration, mobilizes repair mechanisms. Sugars, glasses, proteins and genes all play a role in the different organisms and structures that are desiccation tolerant. This book provides an up-to-date review of the various molecules and mechanisms involved.

Structurally the book is divided into three sections with 10 chapters. Each chapter is followed by a list of references. It has an index, but not a glossary or list of abbreviations that it might well have had. For example, ABA or GA are abbreviations that many plant biologists of any description may readily recognize; however, T_g (glass transition temperature) or even LEA (late embryogenesis abundant) are at another level of specialization. Having said this, I must also say that there are not a lot of abbreviations and a one-page list would have done the job. Section 1, Vegetative desiccation tolerance has five chapters. One chapter is dedicated to angiosperms and one to lichens. Section 2, Desiccation tolerance of pollen, spores and seeds has 4 chapters. Section 3, Applications of Desiccation tolerance research curiously has only one chapter.

Regardless of the extent of future changes in our climate, many regions of the world already struggle with drought, many of those also with famine, and it was somewhat surprising, that only one chapter was dedicated to applications of desiccation tolerance. That chapter focused on the work done on one desiccation tolerance associated gene (*XvSap1*). A chapter on climate change, world food supplies and a discussion on such things as elucidating the relationship between desiccation tolerance and productivity (Alpert, 2006) may have rounded off the last section and provided a better finish. I make this comment in light of what I read in the preface and on the cover to this book. I did expect

to see more on the practical applications of desiccation research. Interestingly, issues relating to the application of desiccation tolerance research are often mentioned; however, the text stops at exploring them in that context. For example, the desiccation tolerance/productivity tradeoff hypothesis is mentioned in reference to the evolutionary history of the tracheophytes but is otherwise not considered. This is the only thing that distracts from an otherwise well-written and presented book and it might have been better to have omitted Section 3 but kept the chapter, '*XvSap1* a desiccation tolerant gene with potential for crop improvement'.

Chapter 1 was a very informative, enjoyable read and not limited to plants. 'Desiccation, unlike dehydration, is both a *process* and a *destination*' (page 7), made me want to read on. Sufficient introductory information was provided in Chapter 1 for the rest of what followed. For example, anhydrobiotes (desiccation tolerant organisms) may be divided into two broad categories based on their differing abilities to survive rapid or relative slow desiccation. This was one central theme that came up numerous times throughout the book. The chapters were well edited and there is continuity between them. For example, in Chapter 2 we find that there are two general strategies for surviving desiccation: constitutive and induced cellular protection, both coupled with rehydration-induced repair. In part these two strategies reflect the board categories introduced in Chapter 1 (being able to survive rapid or relatively slow desiccation).

In summary the book provides a comprehensive and recent review of plant desiccation tolerance. There is an emphasis on the physiological, molecular and genetic aspects; however, it is well supported with general biological and ecological information making it a more palatable read for the non-specialist as well.

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-Adrian Renshaw, University of Western Sydney, Australia.

Plant Signal Transduction: Methods and Protocols (Methods in Molecular Biology), Vol. 479, Pfannschmidt Thomas, (Ed.) 2009. ISBN 978-1-58829-943-7 (Cloth US$99.00) 357 p. Humana Press, a part of Springer Science + Business Media, 333 Meadowlands Pkwy Secaucus, NJ 07094.

This text pertinently addresses the field of signal transduction in plants. Largely framed in the area of plant responses to the environment, the text overviews methods for investigating a broad range of areas related to plant signal transduction, primarily for use with model systems such as *Arabidopsis thaliana*. The stated emphases of the text are on *in planta* studies, as well as methods for studying plant signal transduction proteins.

This volume covers a wide range of basic and cutting edge techniques that can be used in any number of areas of plant signaling research. The text opens with an insightful overview chapter that frames the many signals – both external and internal – that plants must respond and adapt to in the environments in which they exist and reproduce. An overview of some eminent areas of plant signal transduction are examined and described. The nature of signals and locations of signal perception, i.e. local, neighboring or long distant, as well as the receptors that perceive signals and receptor outputs are covered using well-known examples. The complexity of each of these components is also addressed, as is the resulting intricacy of signaling networks. This overview is an appropriate introduction to the techniques needed to unravel and probe experimentally complex plant signaling networks, which are the focus of subsequent chapters.

There are a number of major themes covered by the chapters included in this volume. These themes include mutant analyses and complementation for probing gene function, imaging and microscopy-based analyses, techniques for probing protein function, and methods for exploring protein-nucleic acid interactions. Each of these major themes is addressed in a number of complementary chapters that in some cases are dispersed throughout the text.

Mutant analysis is addressed first. One of the most widely used tools for probing gene function is reverse genetics – i.e. assaying mutants that harbor a mutation in a gene of interest for disrupted phenotypes that may lead to insight into gene function. Approaches for identifying developmental phenotypes in *Arabidopsis* mutants are addressed in Chapter 2 entitled "Phenotyping of *Arabidopsis* Mutants for Developmental Effects of Gene Deletions." The full spectrum of assays needed for analyses from seed sterilization and germination to

the assessment of a number of phenotypic characters, including cotyledon shape and size, hypocotyl lengths and a number of other physiological parameters are addressed. In the following chapter "Phenotyping of Abiotic Responses and Hormone Treatments in *Arabidopsis*", the search for phenotypes that are dependent on external stressors, i.e. abiotic factors and hormones, are discussed. The experiments described in this chapter provide methods for identifying conditional phenotypes or functions of genes that may not lead to readily observable developmental phenotypes. While these two chapters provide a brief overview to a large variety of screening conditions, detailed analysis of the impact of any one of the factors or conditons will require additional insight into the potential impact of distinct factors on specific pathways or biological functions. Later in the volume, a heterologous mutant approach is presented as an effective tool for probing the functions of plant signaling proteins (Chapter 15). In this chapter entitled "Functional Complementation of Yeast Mutants to Study Plant Signalling Pathways", the approach of complementing yeast mutants to probe plant gene function is explored. This approach is described in the context of having been used successfully for studying plant stress response genes. A practical method for probing the impact of disrupted gene function or the impact of changes in the ambient environment on plants is the quantification of changes in gene expression. Quantitative Real-time reverse transcription PCR (RT-PCR) is a widely used method employed for this purpose. In chapter 4 of this volume, quantitative RT-PCR using SYBR green chemistry is described. This fluorescence-based method allows high-throughput gene expression analyses. The chapter addresses a number of issues related to primer design, generation of standards, utilization of controls, and data analysis.

The discussion of imaging techniques ranges from more general approaches using confocal microscopy to more specific experimental measures, such as the detection of intracellular calcium concentrations (Chapter 5) and the measurement of cellular redox states (Chapter 6) and the detection of reactive oxygen species (Chapter 7). Each of these chapters provides detailed steps for the effective use of particular probes or biosensors, feeding or expression of probes/biosensors and microscopy-based detection. Later in the text, a number of chapters focus on confocal laser microscopy-based imaging techniques. Confocal imaging has emerged as a powerful tool for investigating protein localization and function *in planta*. One emergent, powerful technique for studying protein-protein interactions using confocal imaging is Bimolecular Fluorescence Complementation (BiFC). The widely used BiFC technique can be used in protoplasts, as well as for transient expression in tobacco as discussed (Chapter 12). The mating-based split-ubiquitin system also is addressed (Chapter 14). This system, which uses a yeast host to probe plant protein interactions, is purported as complementary to *in planta* assays such as BiFC. Additional specific confocal-related techniques addressed include fluorescence cross-correction spectroscopy (Chapter 13).

Protein-based methodologies are discussed in a number of contexts. The discussion of these methodologies includes a chapter on thioredoxin-based redox regulation (Chapter 8), which describes a rather specific affinity-purification of thioredoxin target proteins. Methods for detecting *in vivo* protein phosphorylation (Chapter 9) and phosphatase activities (Chapter 16) also are discussed. As the phosphorylation status of many proteins are critical for their roles in signaling, these chapters provide key insight into practical methods for understanding protein function in signal transduction pathways. Protein phosphorylation methods are discussed specifically in regards to the detection of phosphorylated proteins in thylakoid membranes. The chapter on phosphatases addresses investigating phosphatase activities *in vivo*. As protein kinase and protein phosphatase activities are often antagonistic, the discussion of protein phosphorylation and phosphatase activity, though dispersed in the text, seems well aligned. Protein regulation also is discussed in regards to the impact of the ubiquitin-proteasome system on protein stability in *Arabidopsis* – an emergent issue in many plant signaling pathways. The methods useful for identifying proteins that are a part of the protein degradation system or targets of the system are detailed (Chapter 10). The more global protein-based method of proteomics is the focus of Chapter 11. The technology is discussed based on its use for probing circadian rhythms in *Chlamydomonas reinhardtii*. This chapter, unlike the majority of the included chapters, reads as a case study on the efficacy of the technique for addressing a specific research question in this case in *Chlamydomonas.* Protein interactions with nucleic acids and the resulting impact on plant signaling are addressed in a number of chapters. Chromatin Immunoprecipitation (ChIP) assays have become increasingly important for investigating *in vivo* transcription factor binding properties. These types of studies can be complementary to gene expression studies. In chapter 17, a general overview to ChIP analyses is presented. Additional methods for probing DNA-protein interactions are covered including fluorescence-based electrophoretic mobility shift assay (Chapter 18), the yeast-one-hybrid assay (Chapter 19), and transient protoplast

assays and *in silico* analyses (Chapter 20). RNA-protein interactions also receive some coverage as a case study of RNA-protein interaction in the *Arabidopsis* circadian system (Chapter 21).

This volume of Springer Protocols covers a wide range of cutting edge techniques that are leading to novel insight into signal transduction pathways in plant biology. Most of the chapters are written as how-to guides in the successful use of these techniques, while a limited number of chapters are presented as case studies. A major drawback that I noted was the somewhat random organization of the chapters, rather than organization around emergent themes and/or related experimental approaches. All in all, however, this is a fine reference text that surveys a range of current plant experimental tools and techniques.

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The Marie Selby Botanical Gardens Illustrated Dictionary of Orchid Genera. Peggy Alrich and Wesley Higgins. Bruce Hansen, Robert L. Dressler, Tom Sheehan and John Atwood, eds. 2008. ISBN 978-0-8014-4737-2 *xxx* + 482 pp. Cornell University Press, Ithaca, in association with Selby Botanical Gardens Press.

This comprehensive illustrated dictionary of some 2500 orchid genus names lists the approximately 850 genera recognized as of 2007 as well as those names validly published but no longer accepted, invalidly published names, orthographic variants, and names published before 1753 (pre-Linnean taxa). It is important to note that "The accepted names used in this dictionary follow the taxonomic use in the Orchid Identification Center at Marie Selby Botanical Gardens, Sarasota, Florida USA and may vary from other treatments."

The Table of Contents lists several small sections of interest including a profile of the orchid family by David H. Benzing which sets the stage for the largest section, Orchid Genera Botanical Descriptions. It is a challenge to introduce such a diverse family as the Orchidaceae in just a few pages but the profile of the family ably covers the defining characteristics of orchids including vegetative and reproductive structures, flower biology and speciation. There is a fascinating reference to the discovery of an extinct stingless bee preserved in amber excavated from a mine in the Dominican Republic in the year 2000 where the insect was found bearing orchid pollen (Ramírez *et al*., 2007). The Orchidaceae have hitherto lacked a definitive fossil record so the discovery of a bee carrying well preserved orchid pollinia, which in itself is an unique fossil observation of orchid-pollinator interaction, led to the naming of *Meliorchis caribea* as a new genus and species. *Meliorchis* is the single accepted fossil orchid genus name appearing in the dictionary.

The major part of this book is the list of orchid genera with their botanical descriptions. The authors recognized their daunting task in presenting a complex assemblage of names in a way that would be easily searched and most useful to the reader. A guide to dictionary use appears at the beginning of this section. The genera are presented in alphabetical order and color-coded according to current name status: a simple key to color coding appears at the bottom of odd-numbered pages thereafter. Whether a reader is simply curious about orchid names or is a serious student of the Orchidaceae, they will find the coding easy to master although there could be some difficulty for visually challenged readers with the shades of green, red and brown used. Also, if a reader had not first browsed the profile of the orchid family, they may not have known the name of the fossil genus, *Meliorchis,* and could spend some time searching the Botanical Descriptions section to find the one fossil genus name that is color-coded dark blue. *Antholithes* and *Protorchis* are fossil genus names that are not validly accepted. This category of names is printed in lighter blue type. It might have been helpful to note these few fossil genus names on the Guide page.

Flowering plants are diverse in their floral structures and orchids are particularly so. There is such an array of colors and shapes that perhaps the best way to present this diversity is to employ a pictorial approach. Color is used but the small medallion-style images do not distract the reader rather serving to intrigue and beckon one to explore further. There is sufficient detail to recognize favorite genera and species, and colors are true. The majority of illustrations used in this work represent type species of currently accepted and validly published orchid genera. These are an eclectic mix of paintings, drawings and photographs. We also find reproductions of pages and plates from historic works such as *Species Plantarum* (Linnaeus 1753), and *Histoire Particulière des Plantes Orchidées* (Thouars, 1822). Some genera of historic interest are illustrated including *Viscum* Sloane, a genus name published in 1707. On the same page as *Viscum*, we find *Vanilla mexicana* Miller used to illustrate another pre-1753 genus, *Volubilis* Catesby. The type species, *Volubilis siliquosa plantaginis folio* Catesby, was published in *The*

Natural history of Carolina, Florida and the Bahama Islands, Savannah, in 1747.

Readers will appreciate the inclusion of a Guide to Book/Periodical Abbreviations used in this work. Additionally, there is a Guide to Taxonomists and an alphabetical listing of taxonomists who have published one or more new genus names. The taxonomist's name, date of birth (and death, if applicable), and the B&P standard abbreviation for the author is provided according to *Authors of Plant Names* by Brummitt & Powell (1992). The dictionary would not have been complete without sections on current nomenclatural rules and a glossary of terms used in the text.

The authors recognize the fluid nature of orchid nomenclature but we should bear in mind that there is limited cross referencing of accepted names and validly published genus names not currently accepted by the Orchid Identification Center at Marie Selby Botanical Gardens so that additional searching of databases may be needed to establish synonymy. There is certainly a wealth of useful material within the pages of this singular work for the specialist: the quantity of orthographic variants alone is impressive. This dictionary will also serve as a useful starting point for those with a casual interest in the field. The authors are to be commended for skilfully presenting complex information in an appealing fashion and assembling a vast array of citations in one remarkable book.

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- Marilyn H.S. Light, North American Region, Orchid Specialist Group, Gatineau, QC, Canada, K1N 6N5

Moth Orchids. The Complete Guide to *Phalaenopsis*. Frowine, S. A. ISBN-13-978–0-88192-870-9. Hard Cover. $39.95. pp. 204. Timber Press, Portland, Oregon.

About 50 years ago *Phalaenopsis* flowers existed in all imaginable colors as long as they were purely white only. Size varied, but not the color. And, the plants were grown mostly by knowledgeable hobbyists. At present *Phalaenopsis* flowers can be white, green, purple, pink, rose, yellow, orange, maroon and multicolored with dots, stripes, blotches and combinations of these. Inflorescences can bear a few or many flowers and can be erect of gracefully arching. The plants are no longer grown by expert amateurs. *Phalaenopsis* is now one of the most commonly grown orchids in the world. Millions of plants in full bloom are sold in nurseries, supermarkets, discount outlets, florist establishments, hardware stores, swap meets and of course orchid specialists. They can be seen in living rooms, offices, hospitals and in the background of movie and television sets. Some areas of Changi Airport in Singapore overflow with magnificent displays of white *Phalaenopsis* (that site alone is worth a trip to Singapore especially since other areas of Changi have equally magnificent displays of *Dendrobium*, *Oncidium* and other orchids).

The popularity of *Phalaenopsis* and the many existing and potential growers of this orchid have created a need for "how to" manuals and guides which this book aims to fill. It does so very well by describing and illustrating a large number of hybrids, providing good and clear information about cultivation and including lists of sources, hybrids, fragrant forms, four page (two columns each) bibliography and a helpful index.

This is a very good horticultural guide which we can recommend highly as such especially for those who are just starting to grow *Phalaenopsis* or want to keep alive a plant or two received as a gift. It is not a botanical book and does not claim to be one. That is why this review is very short. A longer and more analytical review belongs in a horticultural publication.

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Plant Taxonomy: The Systematic Evaluation of Comparative Data, Second Edition. Stuessy, Tod F. 2009. 539 pp. ISBN 978-0-231-14712-5. $99.50 (cloth). Columbia University Press, New York, NY.

Stuessy's "Plant Taxonomy" provides a comprehensive review of the literature of the field. As such, it will serve well as jumping-off point for taxonomists who need a deeper understanding of the theoretical or philosophical aspects of their science. Despite its comprehensive coverage and extensive bibliography (about a third of the total length!), I'm not convinced it would be a good introduction to taxonomic practice for upper-year undergraduates.

The greatest strength of this book is the exhaustive review of the literature. I expect there are few 'dark corners' of taxonomy that are not illuminated in the text. I compiled a list of interesting papers to look up as I read, and I expect even experienced researchers will find previously overlooked nuggets in here. The focus is clearly on cataloguing the literature, and in places little context is provided. Many passages begin with a brief outline of an issue, followed by a list of papers on either side: "Jones argued that this was crucial (1970), while Smith disagreed (1971)". In other words, the book documents the arguments that took place, leaving the reader to look up the cited papers to evaluate the issue for themselves.

In other cases, Stuessy has gone to lengths to illuminate issues that warrant careful consideration. Species concepts are presented in some detail, as they should. However, I'm not convinced that the debate around whether subspecies or variety should be preferred as the primary infra-specific taxonomic rank is important enough to justify the pages devoted to it. Regardless, for those that disagree, Stuessy provides an interesting historical perspective.

The second part of the book is devoted to the various data used by taxonomists. Each of the ten chapters includes a selection of recommended references, an overview of the kind of information that can be acquired, the equipment and training necessary, and particular taxonomic issues to be aware of. These concise reviews will be quite useful for graduate students, or for researchers looking to develop a new data source.

A notable weakness of the book is the treatment of classification approaches. The debates among pheneticists, cladists and phyleticists are recorded here in some detail, but the methods themselves are not well explained. For readers already comfortable with these techniques, there is useful background here, but a graduate student with no previous exposure to ordination will not find this an accessible introduction. The explanation of cladistic techniques is hampered by an introductory example with a data matrix that doesn't match the associated cladograms. These shortcomings undermine the presentation of the explicit phyletic techniques, which depend on the reader understanding the previous two approaches.

A guiding theme throughout the book is the construction of hierarchical classifications. This is clearly the central issue in Stuessy's view of taxonomy, and this aspect of the discipline is thoroughly presented. The coverage of other issues, such as species diagnosis and delimitation and phylogenetic reconstruction, is less satisfying. I wouldn't recommend this book as a text for courses focusing on these latter topics. It would, however, be a very useful resource for researchers and graduate students who need an overview of the taxonomic literature.

-Tyler Smith, MaGill University, Montreal, Quebec, Canada.

Rare Wildflowers of Kentucky. Barnes, Thomas G., Deborah White and Marc Evans, 2008, ISBN 978-0-8131-2496-4, 190 pages, (hardcover US $39.95), The University Press of Kentucky, Lexington, Kentucky, USA.

Landscapes around the world are drastically changing. Natural resources are rapidly being consumed to support increasing human population growth. Old-growth forests, wetlands, and prairie grasslands are being cut down for agricultural and urban development. Paved roads are being constructed in areas that were considered remote less than 20 years ago. Pollution and over-collection of plants for pharmaceutical trade or that are attractive to collectors (e.g., orchids) have caused the demise of other species. Many exotic plants such as *Ailanthus altissima* (tree-of-heaven), *Pueraria montana var. lobata (*kudzu), and *Euonymus alatus* (winged euonymus), intentionally or accidentally introduced by humans are eliminating many native plant species that have evolved and adapted to local conditions for thousands of years. Apart from human disturbance, other native species are rare because they have a narrow geographic range, are habitat specialists, or represent historic relicts from colder climatic conditions associated with the last Pleistocene ice-age. For example, Mountain maple, an ice-age relict, is found at cool air flowing cave entrances that are isolated from the hot summer Kentucky sunshine. Climate change is in no small part, contributing to habitat decline. Native plants also are important as a food source, provide critical information about the health of natural communities, and serve as a basis of ecotourism.

Rare Wildflowers of Kentucky explores the decline of native plants in natural areas throughout Kentucky. At first glance, this text resembles a coffee-table book. It has a horizontal format (22.3 cm x 26 cm), large white margins, more than 200 color

fphotographs of particular wildflowers (some are full page), the lack of black-and-white illustrations, and it heavily relies on common names rather than scientific names. Barnes, a naturalist at the University of Kentucky took all or the gorgeous and stunning color photographs with his Nikon F100 camera. White and Evans of Kentucky's State Nature Preserves Commission wrote the majority of the text.

Many important scientific concepts (e.g., biodiversity and species rarity) are explained clearly throughout the book. Emphasis, however, is given to approximately 220 threatened or endangered species within Kentucky, most of which are vascular plants. Sixteen mosses and one lichen also are included. Species omitted were mainly grasses, sedges, and rushes that the photographer claimed were difficult to make photogenic. These authors mentioned that only two plants among the many that are listed as rare or endemic to Kentucky: *Leavenworthia exigua* (Kentucky glade cress) and *Solidago albopilosa* (white-haired goldenrod). Additionally, these authors noted that only eight of the 273 plant species listed as endangered or threatened within the state of Kentucky are on the Federal endangered/threatened species list. Many of the listed species within Kentucky, such as *Cypripedium parviflorum* (the small white lady's slipper), occur at the periphery of their natural range. The authors stressed that Kentucky is located in the middle of several neighboring plant communities that are defined by their geology, hydrology, relief, wind, and so forth. The Appalachians influence the east, the Gulf Coastal Plain the west, the Great Plain floras the west, and other species are associated with more northern temperate regions. Saving species at the edge of their range may contribute to genetic diversity and could possibly lead to evolution of new species.

The book is divided into two main parts. Part one contains a 45-page introduction, that is divided into small subsections including "reasons for decline of native species", "reasons for protecting native plants", "natural communities of Kentucky", "rarity", and "extinction and preservation of species". Short tables scattered throughout this part summarize several important scientific concepts including intrinsic and extrinsic values of plants, common exotic species, as well as provide succinct definitions for assorted biological terms including glades, extirpated, endemic, and mesic. At the conclusion of part one it states how an individual can assist with saving rare plants: green living and support conservation organizations either with financial donations or as a volunteer.

The natural communities subsection is especially informative. It discusses how the original landscape of Kentucky was transformed from being more than 90% old-growth forests prior to European settlement in the mid-eighteenth century to being degraded or damaged beyond recovery by logging practices, grazing, fires, and urban development. A half-page colored map depicts the major natural regions and physiographic province boundaries within the state near the beginning of this subsection. Each physiographic province and associated plant communities are briefly discussed and have accompanying photographs such as Appalachian dry forests, bluegrass mesophytic forests, upland non-forested communities, prairies, bluegrass savanna-woodland, and cliff communities.

Part two is a 117-page section entitled "The Rare Plants". This part is divided into five subsections: "Forests", "Prairies and Glades", In and along Rivers", "Wetlands", and "Cliff lines and Rockhouses". Interesting habitat strategies and facts are given about each rare plant that is discussed. For example, *Podostemum ceratophyllum* (thread-foot) that thrives in riparian regimes has thin long leaves that help it to reduce stress from river currents and possesses a cement-like compound in its roots that aid in anchoring itself to rocks. Captions associated with each photograph often provide additional information about a plant's distinguishing features. For example, the photograph caption of *Stenanthium gramineum* (eastern featherbells), mentions how the flowers help to distinguish it from a grass and that it possesses a six feet tall flowering stem.

At the end of the book are two appendices. The first appendix contains a three page list of scientific and common plant names that appear in the text. The second appendix provides a seven page list of rare, extirpated or extinct plants for the state that was compiled by the Kentucky State Nature Preserves Commission. Each plant in this list is given a code as to whether it is endangered, threatened, of special concern, or historic. A short but useful list of references and an index follows the appendices.

Overall the book is well organized but the photographs lack scales so it is difficult to interpret the size of plants and their respective parts. Also, the photographs are mainly of flowers rather than of vegetative features. Metric units also are not included in the text. However, this book is well written and is recommended for general naturalists, gardeners, horticulturists, lower-level biology undergraduate students, and concerned citizens interested in protecting rare plants.

-Dr. Nina L. Baghai-Riding, Delta State University

Books Received

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