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BOTANY IN ACTION!

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From the Editor

It's the end of summer and many of us are trying to shift gears in preparation for another academic year. It's a good time to reflect back on summer activities and consider what we can incorporate into our classes to excite our students about botany. The Society itself provides some good examples, some of which we highlight in this issue. First and foremost is to recognize outstanding accomplishment at all levels, from the BSA's Merit Award to outstanding presentations by graduate students in individual sections. As demonstrated in President Weller's address, the Society continues to promote excellence in botanical research through the *AJB*, and we continue to extend support and encouragement to fellow societies throughout the world, such as our Brazilian friends (who will be hosting the next Latin American Botanical Congress). Our discipline is thriving.

Also in this issue are two articles, one long and one brief, that provide interesting historical perspectives on plants in society. In the past, when I wanted to demonstrate the influence of plants on the culture of a country, my immediate example was tulips and the Dutch Golden Age. The article by Soediono and colleagues on the orchid 'Kimilsungia' provides an interesting and more immediately relevant example of which I was completely unaware.

Christianson's brief article emphasizes two points that I stress with my students. First, once something is published, as in a textbook, we tend to accept it without question. But questioning can often lead to a more thorough and more correct understanding. Second, even today, and even in science, there continues to be value in having knowledge of a language other than English.

-Marsh

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The Botanical Society of America's Merit Award

The Botanical Society of America's Merit Award is the highest honor our Society bestows. Each year, the Merit Award Committee solicits nominations, evaluates candidates, and selects those to receive an award. Awardees are chosen based on their outstanding contributions to the mission of our scientific Society. The committee identifies recipients who have demonstrated excellence in basic research, education, or public policy, who have provided exceptional service to the professional botanical community, or who may have made contributions to a combination of these categories. Based on these stringent criteria, the 2011 BSA Merit Award recipient is:

Dr. Ann Hirsch
University of California, Los Angeles

Dr. Hirsch is recognized for her outstanding contributions in the research of plant–microbe interactions, bridging the interactions among genes, plant growth regulators, signal transductions, and microbes. Her research is truly exceptional in combining field aspects of basic research and classical knowledge with molecular aspects, especially in legume–microbe interactions; she has been described as a bold and fearless experimentalist. Ann has also had a long and outstanding record in education where she has set very high standards, and her passion for research has created a stimulating laboratory environment for many undergraduate students, graduate students, post-docs, and visiting scholars to start or pursue careers in science. Dr. Hirsch has excelled in all aspects of her professional life and is richly deserving of the 2011 Merit Award.

Awards Presented at Botany 2011

Charles Edwin Bessey Award

(BSA in association with the Teaching Section and Education Committee)

Dr. Susan Singer,
Carleton College.

Dr. Singer is the Laurence McKinley Gould Professor of the Natural Sciences at Carleton College. She has served as Co-director of the Carleton Interdisciplinary Science and Math Initiative as well as the Director of the Perlman Learning and Teaching Center. At the national level, Dr. Singer has served as a program director for the National Science Foundation and recently worked on the American Association for the Advancement of Science's recent publication "Vision and Change." This document is a call to action that is already impacting the future of biology teaching. Dr. Singer has received numerous grants, which have often resulted in publications including student authors. Her recent work as a member of the Education, Outreach, and Training Committee of the iPlant Collaborative epitomizes the national impact her actions have had on creating innovative and effective approaches to teaching botany.

Darbaker Prize

The Darbaker Prize in Phycology is given each year in memory of Dr. Leasure K. Darbaker. It is presented to a resident of North America for meritorious work in the study of microscopic algae based on papers published in English by the nominee during the last two full calendar years. This year the Darbaker Award for meritorious work on microscopic algae is presented to:

Dr. Sallie (Penny) Chisholm, Massachusetts Institute of Technology.

Dr. Chisholm's recent and past publications are on the significant role of the microalgal group *Prochlorococcus*. She and her collaborators have elucidated their wide distribution in the oceanic environment and have demonstrated essential critical environmental factors, including light and nutrients, which account for the varied distribution certain ecotypes and species. Their most recent emphasis is on the genomic characterization with respect to phosphate uptake, and the potential involvement of the cyanophages in the transfer of genetic material. She has also offered her well-considered opinion in influential scientific journals to discourage oceanic iron fertilization since it likely will seriously impact the ecosystem.

Lawrence Memorial Award

The Lawrence Memorial Fund was established at the Hunt Institute for Botanical Documentation, Carnegie Mellon University, to commemorate the life and achievements of its founding director, Dr. George H. M. Lawrence. Proceeds from the Fund are used to make an annual award in the amount of $2000 to a doctoral candidate to support travel for dissertation research in systematic botany or horticulture, or the history of the plant sciences.

The recipient of the Award is selected from candidates nominated by their major professors. Nominees may be from any country and the Award is made strictly on the basis of merit, i.e., the recipient's general scholarly promise and the significance of the research proposed. The Award Committee includes representatives from the Hunt Institute, The Hunt Foundation, the Lawrence family, and the botanical community.

Brian Sidoti
student of
Dr. Kenneth Cameron
University of Wisconsin

Special Awards

Dr. Kent Holsinger, BSA Past-President

The Botanical Society of America presents a special award to Dr. Holsinger expressing gratitude and appreciation for outstanding contributions and support for the Society. Kent has provided exemplary contributions to the Society in terms of leadership, time, and effort.

Rachel Meyer
BSA Student Representative to the Board, New York Botanical Garden

The Botanical Society of America presents a special award to Rachel expressing gratitude and appreciation for outstanding contributions and support for the Society.

Isabel Cookson Award (Paleobotanical Section)

Established in 1976, the Isabel Cookson Award recognizes the best student paper presented in the Paleobotanical Section

Jeffrey Benca
University of Washington

Advisor, Dr. Caroline Stromberg, is the 2011 award recipient for the paper entitled, "Morphological variation in the panglobal Devonian lycopsid genus *Leclercqia:* A new species from Washington State, Co-authors: Caroline Stromberg and Maureen Carlisle.

A Delicate Balance in a Dangerous Place Submitted by Cassandra Coleman, 2011 Triarch Botanical Images Student Travel Award

George R. Cooley Award
(Systematics Section and the American Society of Plant Taxonomists)

George R. Cooley award for best contributed paper in plant systematics. The ASPT's Cooley Award is given for the best paper in systematics presented at the annual meeting by a botanist in the early stages of his/her career. Awards are made to members of ASPT who are graduate students or within five years of their postdoctoral careers. The Cooley Award is given for work judged to be substantially complete, synthetic, and original. First authorship required; graduate students or those within five years of finishing their Ph.D. are eligible; must be a member of ASPT at time of abstract submission; only one paper judged per candidate.

Erin Tripp
Rancho Santa Ana

For the talk entitled "*Physacanthus* (Acanthaceae): a heteroplasmic, intergeneric, interlineage hybrid?" Co-authors: Lucinda McDade, Siti Fatimah Isa, and Iain Darbyshire

Katherine Esau Award
(Developmental and Structural Section)

This award was established in 1985 with a gift from Dr. Esau and is augmented by ongoing contributions from Section members. It is given to the graduate student who presents the outstanding paper in developmental and structural botany at the annual meeting.

Natalia Pabon-Mora
New York Botanical Garden

Advisor, Amy Litt, for the paper "Functional redundancy of non-core eudicot *FUL-like* paralogs in regulating flowering time and petal development." Co-author: Amy Litt.

Honorable Mention
Chi-Chih Wu
University Of Colorado Boulder,

Advisor, Pamela Diggle, for the paper "The impact of the lower genetic relatedness of endosperm to its compatriot embryo on maize seed development." Co-authors: Pamela Diggle and William Friedman.

Margaret Menzel Award
(Genetics Section)

The Margaret Menzel Award is presented by the Genetics Section for the outstanding paper presented in the contributed papers sessions of the annual meetings.

Matthew Parks
Oregon State University

Advisor, Aaron Liston, for the paper "Separating the Wheat from the Chaff: Mitigating the Effect of Noisy Data in Plastome Phylogenomic Analyses." Co-authors: Richard Cronn and Aaron Liston.

Maynard Moseley Award
(Paleobotanical and Developmental and Structural Sections)

The Maynard F. Moseley Award was established in 1995 to honor a career of dedicated teaching, scholarship, and service to the furtherance of the botanical sciences. Dr. Moseley, known to his students as "Dr. Mo" died January 16, 2003, in Santa Barbara, California, where he had been a professor since 1949. He was widely recognized for his enthusiasm for and dedication to teaching and his students, as well as for his research using floral and wood anatomy to understand the systematics and evolution of angiosperm taxa, especially waterlilies. (PSB, Spring, 2003). The award is given to the best student paper, presented in either the Paleobotanical or Developmental and Structural sessions, that advances our understanding of plant structure in an evolutionary context.

John Benedict
Arizona State University,

Advisor, Kathleen Pigg, is the 2011 Moseley Award recipient, for his paper "The fossil history of *Zingiberales* and new insights based on fossil and extant members."

Emanuel D. Rudolph Award
(Historical Section)

The Emanuel D. Rudolph Award is given by the Historical Section of the BSA for the best student presentation/poster of a historical nature at the annual meetings.

Nuala Caomhanach
University of Missouri

Advisor, Kim Kleinman, for her presentation: "*Thomas Nuttall and 19th century botany: The St. Louis connection*."

The 2011 Grady L. Webster Award

This award was established in 2006 by Dr. Barbara D. Webster, Grady's wife, and Dr. Susan V. Webster, his daughter, to honor the life and work of Dr. Grady L. Webster. The American Society of Plant Taxonomists and the Botanical Society of America are pleased to join together in honoring Grady Webster.

Dr. Sherwin Carlquist

Xylem heterochrony: an unappreciated key to angiosperm origin and diversifications

Botanical Journal of the Linnean Society, 2009, 161, 26–65

Edgar T. Wherry Award (Pteridological Section and the American Fern Society)

The Edgar T. Wherry Award is given for the best paper presented during the contributed papers session of the Pteridological Section. This award is in honor of Dr. Wherry's many contributions to the floristics and patterns of evolution in ferns.

Monique McHenry
University of Vermont,

Advisor and co-author David S. Barrington, for her paper; "Investigating morphological diversity of Andean *Polystichum* (Dryopteridaceae): seeking explanations for incongruence between sequence variation and morphological variation"

Botany 2011 Presidential Address

Dr. Steve Weller

My goal tonight is to share some personal reflections about who we are as a scientific society, and the kinds of changes that I believe will help our society to remain relevant as we look to the future. My curiosity about the composition of the Society and the range of research interests represented among us stems from reading and publishing papers in the *American Journal of Botany* over many years, and serving as an associate editor in recent years.

The journal is especially rich in papers on ecology, reproductive biology, systematics, population biology, anatomy and morphology, and genetics. The content of the *American Journal of Botany,* and the nature of the membership of the Society both reflect a fundamental interest in using plants to test hypotheses, and we come together at these meetings because of this interest. Many of us belong to other societies and attend those meetings as well, but we appreciate the opportunity to attend Botanical Society of America meetings and enjoy the interchange with others who have the same plant-centric focus. We also influence a broad array of disciplines, however, including many whose members publish their work in diverse journals.

Two examples illustrate the point of how our members broadly influence science. My first example highlights the importance of phylogenetic information for understanding the role of self incompatibility in the explosive radiation of flowering plants in the Cretaceous Period—Darwin's "abominable mystery". Self-incompatibility (SI), was first suggested by Whitehouse in 1950 as the cause of angiosperm diversification. The idea has been impossible to test until phylogenies of the flowering plants became available, produced by members of this society. These phylogenies have revealed remarkable evolutionary insights.

Boris Igic and Josh Kohn have found identical RNases controlling the expression of mating types in gametophytic self-incompatibility (GSI) in divergent plants families. Their work, using phylogenetic trees, shows that these RNases are identical by descent in the Plantaginaceae, Solanaceae, and Rosaceae, suggesting that gametophytic self-incompatibility evolved in the common ancestor of the Asteridae and Rosidae. Families included in these lineages constitute about 75% of non-monocot families, which suggests that this type of self-incompatibility evolved early in the evolution of flowering plants. Despite the widespread occurrence of gametophytic self-incompatibility, we also know that many families in the

Asteridae and Rosidae have other forms of self-incompatibility. Sporophytic self-incompatibility (SSI) in the Asteraceae and other families is one example. These additional instances of self-incompatibility systems evolved independently and show no homology with GSI. Clearly, phylogenetic information has played an enormously important role in understanding these evolutionary questions.

But have we addressed Darwin's "abominable mystery"—the diversification of the flowering plants? To answer that question, we need to go deeper into the evolutionary history of the flowering plants, to those earliest branching lineages, represented here by *Amborella* and *Anemopsis*, and assess the occurrence of SI in these lineages. When we do that, we find several types of self-incompatibility in basal angiosperm clades (Allen and Hiscock, 2008). These patterns suggest that different types of self-incompatibility may have evolved early in the evolutionary history of the angiosperms, and may have been important in the evolutionary diversification of the angiosperms. But the point I am making is the importance of phylogenetic trees to the entire exercise—without them, we could not take these approaches, and we would have no basis for speculation about the role of self-incompatibility in the evolution of the flowering plants. Molecular evolutionary approaches have given us important insights into the evolution of flowering plants, but we need our phylogenetic framework to interpret this work. Of course, *Amborella*, the most basal of angiosperm lineages, is dioecious, suggesting even more complexity to the story.

For my second example of how we, as members of the Botanical Society, influence a broad spectrum of research, I turn to the other end of the biological spectrum. We all recognize how changes at the global scale are having profound effects on ecosystems due to climate change, introduction of invasive species, and other human activities that affect the world. How does our work address these important questions? I approach this question using a study of an invasive species that has had profound effects on native plant communities, and the people who depend on these plant communities. *Pennisteum setaceum,* or fountain grass, is native to the Mideast and invasive in parts of the southwestern United States and Hawaii. In Hawaii it has had a huge impact on dry forest ecosystems because it is a fire promoter. Even a single fire cycle results in death of the canopy forest, and conversion to nonnative grassland in Hawaii. Loss of these native forests results in desertification of large regions of Hawaii, and loss of species important to native Hawaiians. Recent efforts to restore of dry forests in Hawaii are directly attributable to the leadership of native Hawaiians. Is fountain grass equally invasive throughout its range? The answer appears to be no. In contrast to Hawaii, fountain grass seems much less invasive along highways in southern California, where unfortunately it has been planted by the State Highway Department. Populations in southern Arizona seem to have an intermediate level of invasiveness.

We asked whether genetic variability or phenotypic plasticity was associated with these differences in invasion, information fundamental for understanding the nature of invasiveness. Fountain grass was known to be apomictic, but we expected that there would be some genetic variation due to occasional sexual reproduction. An analysis using ISSR markers, which should be very sensitive to genetic variation, instead indicated that populations across this region were genetically identical (Poulin et al., 2005). But would molecular approaches be sufficient to rule out relevant genetic differences? Several common garden experiments, one in a field plot and another in a greenhouse, were used to check for genetic variation that could not be detected using molecular markers. Results from the common garden experiments demonstrated that plants from different regions had identical growth and reproduction (Poulin et al., 2007). On this basis, plants from these different regions appear to be genetically identical, at least in those traits influencing invasiveness. Phenotypic plasticity, related to differences in summer rainfall, is primarily responsible for the differences in invasiveness across the range that we sampled. Watering treatments in a common garden mimicked natural differences in rainfall in California, Arizona, and Hawaii. Results from the experiment demonstrated reduced growth and reproduction under conditions resembling rainfall patterns in California, the region where fountain grass is least invasive. The take-home lessons from this example are several-fold. First, fountain grass has an enormous effects in ecosystems because it promotes fires and converts native to completely exotic habitat. Second, our ability to understand the invasiveness of fountain grass depends on understanding the breeding system of this species and the interplay between the genetic and environmental controls on the phenotype. This research was published in the *American Journal of*

Botany, and it is hard to imagine a more appropriate journal.

Recent data confirm that the papers we publish in the *American Journal of Botany* increasingly impact science. The 2010 Journal Citation Report from Thomas Reuters shows that our impact factor is now 3.052, above 3.0 for the first time in the journal's history and up from 2.684 last year. The journal now ranks 27th among 187 journals in plant science, two rankings higher than last year. Special issues such as the Darwin Centennial issue in 2009 and the Biodiversity issue in 2011 have undoubtedly contributed to the steady increase in impact factor of *AJB* because of the greater breadth of topics in these issues. For example, half the papers in the Biodiversity issue focused on community and ecosystem ecology, topics that are not normally as well represented in the journal. Indexing by PubMed, initiated in 2010, will also increase the impact of the journal. We have our outstanding editors, Judy Jernstedt and Amy McPherson, the *AJB* staff, the organizers of species issues, and of course all the contributors who submit their best papers, to thank for the increasing influence of our journal.

How do we continue to maintain the vitality of our field, and provide the insights critical to other disciplines? This question brings me to the second part of my talk—the kinds of changes that are taking place in the workforce, and how they will affect our Society. Two influential reports, published 10 years apart, have addressed this issue. The first report, entitled "Ensuring a Strong U.S. Scientific, Technical, and Engineering Workforce in the 21st Century," was published in 2000 by the National Science and Technology Council, under the Executive Office of the President. A second report, "Expanding Underrepresented Minority Participation," from the National Academy of Science, was published in 2010. Both reports emphasize that participation of all ethnic and gender groups in the scientific workforce must grow to maintain strength in science and technology in the United States. We can use these reports to see how the population and science and technology workforce have changed over the last 10 years.

In recent history, non-Hispanic white males have formed the bulk of the U.S. science, technical, engineering, and mathematics (or STEM) workforce. For example, in 1997 white non-Hispanic males formed 36% of the population, but 65% of the science, technical, and engineering workforce. In contrast, white, non-Hispanic women formed about 38% of the population, and 18% of the STEM workforce. Women have fared somewhat better in the biological disciplines, where they received 42% of doctoral degrees in biology in 1996, relative to 32% of the doctorates in the STEM workforce, and presumably constituted a greater part of the biology workforce relative to other science and engineering disciplines. A very small proportion of under-represented minorities pursued advanced degrees in science and engineering. In 1997 Hispanic males constituted about 5% of the population, but less than 3% of the STEM workforce, and for Hispanic women, the percentage of the workforce in science and technology was less than 2%. These individuals occurred in such low numbers in the STEM workforce that they have limited opportunities to serve as role models or mentor other minorities.

How is the population changing, and what does this mean for the future of the science, technical, and engineering workforce? Based on the 2000 report, the most significant change in the projected population from 1995 to 2050 is both a relative and absolute decline of non-Hispanic white males and females from about 74% of the population in 1995 to a projected value of 52% in 2050. What ethnic groups are increasing during this period? By far, Hispanics are projected to show the largest increase, from about 10% (men and women combined) to 24% of the population in 2050. The African-American workforce will increase from 12% to 14%, and the Asian-American workforce from 4% to 9%. The Native American portion of the workforce is expected remain the same at less than 1%. In summary, over this period the minority portion of the populations is expected to increase from about 25% to 48%. If we are to maintain a leadership role in the sciences, then it is clear that we must encourage more representation of women and minorities in the sciences, and in the Botanical Society of America. If we simply continue to train people in science and technology as we have in the past, we could see a 9% decline in the percentage of 22-year-olds receiving bachelor degrees in science and technology from 1995 to 2050 because of the increase in minorities who are less likely to graduate in these areas. This projection could change, depending on how successful we are in training underrepresented groups.

Where do we stand at present, 10 years after the publication of the first report? The 2010 report, "Expanding Underrepresented Minority

Participation", points out that although the United States once led in the attainment of postsecondary education in the world, the country is now in 11th place in the world. At the same time minority groups underrepresented in science and engineering continue to be the most rapidly growing part of the U.S. population. In 2006, underrepresented minorities (African Americans, Hispanics, and Native Americans) constituted 28.5% of the population but only 9.1% of the science and engineering workforce. As expected based on demographic trends, minority representation increased dramatically between 1972 and 2007 in public schools, particularly among Hispanics. At the same time we see a progressive decline in the representation of underrepresented minorities as we proceed up the academic ladder, from 38.8% underrepresented minorities in K-12 public enrollment, to only 5.4% receiving doctorates. Retention of minorities in programs is a critical issue. The 2010 report noted that only about 20% of undergraduate minority students enrolled in STEM disciplines completed their bachelors degrees, compared to 33% of white students in these areas.

Based on the 2010 report, enrollments of minority students are increasing at both the undergraduate and graduate level, so we have reason to believe that trends are in the right directions, although the base for these percentage calculations is quite small. Retention of minorities in these areas of studies is viewed as critical. What can be done to increase retention of students? Redesign of undergraduate courses to include active learning and collaboration, increased social support, and more mentoring have all been suggested as ways to increase retention of minorities. Needless to say, increased spending will be essential for these programs to be implemented and continued, and in today's economic and political climates, the uncertainties are tremendous. In the Botanical Society, we have continued to support the PLANTS program to bring undergraduates to our national meeting, with the generous support of the Society and a National Science Foundation grant that was just funded to support the PLANTS program. Doug and Pam Soltis, with support from the National Science Foundation, have provided significant support to increase diversity at our meeting. PlantingScience is a major form of outreach for the Society. We strive to increase diversity, not only because we know it's the right thing to do, but because we must if the United States is to remain at the forefront of science and technology. As a Society, we do our best to achieve better representation of women, minorities, and people with disabilities because we recognize their contributions to our discipline. Unless these individuals are encouraged to participate, the science that we value will be relegated to an increasingly smaller segment of the workforce.

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National Science and Technology Council. 2000. Ensuring a strong U.S. scientific, technical, and engineering workforce in the 21st century. Office of Science and Technology Policy.

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Whitehouse, H. L. K. 1950. Multiple-allelomorph incompatibility of pollen and style in the evolution of the angiosperms. Annals of Botany 14: 199-216.

Acta Botanica Brasilica 25(2): 253-254. 2011.

Editorial / Editorial

Reflections on the role of publications by scientific societies in celebration of the 25th year for *Acta Botanica Brasilica*

From your sister society to the north: the Botanical Society of America

Upon the occasion of the 25th year of publication of *Acta Botanica Brasilica* (*ABB*) by the Brazilian Botanical Society, we offer some reflections on the importance of the *American Journal of Botany* to the Botanical Society of America. As the primary scientific journal of our society, publication began in 1914, 21 years after the society was founded in 1893. Our journal, as does *ABB*, accepts papers on every aspect of plant science. The journal is particularly rich in papers that focus on organismal approaches. Papers on plant genomics, molecular evolution, and community and ecosystem ecology are less well-represented, although research published in the journal informs these topics. Because of its organismal focus, the journal is an important resource for those researchers looking for information on plants. Our journals also attract interest in our societies, as researchers become aware of others sharing common research interests. Attendance at national meetings and interactions with other researchers is one outcome of publication of our journals. For many of us who were trained as botanists, our first introduction to the society was through meetings as students. For us, the journal has played a role as the venue to publish our research and for information on the important research of others in botany. Journals are the basic resource for fundamental research in science; most major scientific societies support some publication that contributes to the scientific compendium of knowledge in the world. However, as we approach our hundredth year of publication and as you celebrate your 25th year, the publication world is changing rapidly due to electronic access. This rapidly changing landscape raises important questions for authors, societies, publishers, and researchers. Will the journal remain the important work, or will the actual article become the more important item for consideration? How will societies survive on a new business model, independent of the income from the purchase of the journal? If access to journals is free, who pays for costs of the peer review and editing to ensure that papers are of the highest quality? Time alone will answer these questions, but societies must be ready and carefully consider now how to meet the challenges ahead. Researchers need to think about paying to publish, rather than paying for the published material.

As we think about our journal and its importance for our society, the definitions of journal provide thought- provoking material. Of course, a definition of "journal", as the definition of" acta", is a periodical presenting articles on a particular subject such as plant science. The word "journal" however, has additional meanings, such as a personal record of occurrences, experiences, and reflections kept on a regular basis; a diary. And isn't that exactly what our journal does for our society? It presents the experiences and knowledge of our various researchers who have published their hypotheses, data, and conclusions over time in the journal. Looking back through the topics of the journal, we can trace the important emphases of the field of botany – from discovery of species and their geographical occurrences, the accumulation of these species into floras, and the growth patterns and processes of these organisms, to more detailed morphological and anatomical studies, through genetic and physiological processes influencing the form and structure of plants, to broad ecosystem relationships among all organisms including the plants and the physical factors that influence these organisms. At all levels of botanical investigation, we see shifts in experimental approaches with increasing use of molecular tools for studies on phylogenies, gene action, and cellular processes. Thus, the journal becomes a personal reflection of the growth and development of the society over the last century, and provides valuable information about the scientific process in plant biology. This observation leads directly to another definition of the word "journal" as an official record of daily proceedings, as of a legislative body or a ship's log. Perhaps not daily, but the monthly publication of the journal has provided an official record of the proceedings happening throughout the diverse research disciplines of the society. The journal provides an important historical thread that ties the society members together with all who have preceded us, and which we hope will continue to form that bond with future botanists.

In addition, the journal provides a record of the best in scientific research produced by a researcher. An article written according to strict guidelines and peer reviewed to provide validity for the results becomes part of the scientific record. Journal articles document the complete research

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process and provide a means of repeating the research to verify the results. Students reading and discussing these articles in journals learn the scientific method and the rules for scientific publication, as students have for centuries. They will continue to do so, whether these articles are produced in printed format on paper or in electronic online publications, which is certainly the way most scientists now are accessing scientific literature. Given the ubiquity of information on the web, endorsement of articles by a scientific society becomes even more critical to verify the authenticity and value of the work. A web-based, "rate this article" approach may work in some cases, but not in scientific disciplines.

Journals have another role as well- they can lead the way by encouraging research directions that are likely to lead to new and promising results. For example, the editors of journals and the members of a society can solicit contributions for special issues of a journal that bring together papers on topics that are important to a field, but may not have been well-represented in the journal. These special issues may have synergistic effects by heightening an awareness of research approaches especially beneficial to a discipline. Special issues may also be useful for reflecting on the status of a field, and integrating research approaches over a broad range of disciplines. Two recent issues of the *American Journal of Botany* exemplify these approaches. The journal celebrated the Darwin Bicentennial by publishing a special issue in 2009 on Darwin's "abominable mystery," the apparently sudden appearance of flowering plants in the Cretaceous Period. This issue of the journal contained a very broad array of papers, emphasizing topics ranging from paleobotany to molecular genetics. A reader of this issue would gain a very comprehensive approach to research questions surrounding the evolution of flowering plants, and perspective on how scientists in other disciplines apply their approach to the problem. A more recent issue of the journal published in 2011 was devoted to biodiversity- in the broadest sense possible. Topics covered included diversification of ecosystems throughout paleohistory, evolutionary diversification of flowering plants, diversity in microbial communities, and the effects of species invasion on biodiversity. Ecosystem and global change issues were especially well represented, and might generate more attention to these topics in future issues of the *American Journal of Botany*. These special issues, which have been highly cited, indicate the role of a journal in contributing to the growth of a particular discipline or area of research, and indicate that even in an age when most readers download articles rather than issues, the synthesis of ideas in a single location, electronic or otherwise, can be influential.

We live in an age where communication often seems instantaneous, and the flow of ideas so rapid that new research directions rapidly gain momentum. The same forces that promote this exchange of information may have negative consequences for our societies, unless we think carefully about new business models for our journals. Several models exist, such as the traditional approach where the reader/user pays, models where the author pays for publishing, institutional sponsorship methods, marketing support (but these do not work well for specialized scientific articles), providing portions of articles or special articles for free but requiring payment for complete articles or issues of journals, or hybrid models of these methods. The *American Journal of Botany* offers free access after one year to all the articles but if researchers or libraries wish to have more instantaneous access, they pay. All these models have issues that have been discussed in great detail. As scientific societies we need to be part of the discussion on the business models of open-access publishing because we must generate the resources to continue to produce solid, verifiable scientific articles that are openly accessible to all. We owe it to those who established the high standards for our society publications and we owe it to the students and researchers of the future to provide a continuous, historical, reliable, and trusted resource and outlet for the best of botanical information.

Judith E. Skog
BSA President

Stephen G. Weller
BSA President-elect

Welcome New BSA Staff Member

Beth Parada
Online Publication Editor

Beth joined the *AJB* editorial team in July 2011 to manage the review, editorial, and production process of the online-only section *AJB* Primer Notes & Protocols in the Plant Sciences. Before joining the BSA, Beth was Managing Editor at the Missouri Botanical Garden Press, where she managed the editorial and production process for the Garden's two quarterly journals, *Annals of the Missouri Botanical Garden* and *Novon*, as well as for titles published in the series *Monographs in Systematic Botany from the Missouri Botanical Garden* and the many flora projects published by the Garden. Her background in scientific publishing also includes five years of experience with Elsevier as Issue Manager for the *Annals of Emergency Medicine* and coordinating the development and production of online courseware.

HARVARD UNIVERSITY
BULLARD FELLOWSHIPS IN FOREST RESEARCH

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 have worked in areas of ecology, forest management, policy, and 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 postdoctoral candidates. Information and application instructions are available on the Harvard Forest website (http://harvardforest.fas.harvard.edu). Annual deadline for applications is February 1st.

BSA Science Education News & 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

Master Plant Science Team

Thanks to 2010-2011 Master Plant Science Team

We extend our gratitude to the 2010-2011 Master Plant Science Team, a special cohort of PlantingScience mentors who commit to mentor about 4 teams in both the fall and spring session.

The Botanical Society of America sponsored: Lorraine Adderley, Rob Baker, Kate Becklin, Amanda Birnbaum, Angelle Bullard-Roberts, Katie Clark, Rafael Rubio de Casas, Melissa Gray, Eric Jones, Allison Kidder, Haley Kilroy, Laura Lagomarsino, Chase Mason, Dr. David Matlaga, Arjit Mukherjee, Kelly O'Donnell, Taina Price, Emily Sessa, Kate Sidlar, and Lindsey Tuominen.

The American Society of Plant Biologists sponsored: Robert Barlow, Betsy Justus, Sasha Ricaurte, Madhura Siddappaji, and Erica Fishel.

Thank you for your valuable mentoring efforts. Thanks also to those helping field-test for your insights on the new inquiries. Your extra efforts are a big boost to the PlantingScience community!

Call for 2011-2012 Applications

The Master Plant Science Team (MPST) is designed to provide compensation for a cohort of graduate students and post-doctoral researchers who make a substantial contribution as an online mentor during an academic year. To support your extra efforts, there are extra benefits and support systems. MPST members receive free membership to the Botanical Society of America for the year commitment and 50% off meeting registration fees.

Joining the 2011-2012 team involves:

- participating in online mentorship training mentoring about 4 student teams via the web during BOTH fall and spring sessions (each session lasts about two months)
- posting to student teams about three times per week
- providing extra support and facilitating communication for one classroom teacher and his/her class

An application is available online:

www.plantingscience.org/MPSTApplication.html

If you'd like to spark scientific curiosity and understanding in today's youth, but the MPST isn't a good fit for you, consider joining as a regular PlantingScience mentor:

http://PlantingScience.org/NewMentor/

2011 PlantingScience Summer Institute for Teachers

2011 Summer Institute teachers and plant science leaders share a bit of shade under a famous old oak on Texas A&M University campus.

The learning fun was sizzling hot in College Station, Texas, at this summer's fourth PlantingScience Institute for Teachers (June 23-30, 2011). We were once again mightily impressed with the number and quality of workshop applicants. Having to accept only 32% of the deserving applicants made for some hard choices. Nineteen teachers traveled from 13 U.S. states and as far away as Seoul, South Korea, to share the experience of plant inquiry immersion with Dr. Marsh Sundberg of Emporia State University and Dr. Larry Griffing of Texas A&M University. Adding to the rich learning environment were teacher leaders Kim Parfitt of Cheyenne Central High School and Randy Dix of Olathe North High School, who field-tested modules last year, and seven teachers who previously attended a summer institute and participated in online mentored inquiry sessions. These are sure signs of a vibrant PlantingScience community and a cohort of teachers eager for opportunities to engage in deep thinking about plant biology and scientific inquiry.

A discussion of the essay "The Importance of Stupidity in Scientific Research" kicked off the session and, following a visit to the greenhouse to examine plant diversity, teachers were off and running on plant investigations that culminated in teacher team presentations. Microscopy and ImageJ were tools introduced for both plant investigation themes. Another feature in common was the high value placed on mucking-around time as an important phase for building background knowledge and allowing, sometimes unanticipated ideas to surface and connect. Following the five-day inquiry immersion, the focus shifted to classroom implementation. Larry and his wife kindly hosted a sumptuous BBQ party for all at their farm on the penultimate night, where the participants surprised Larry and Claire with birthday wishes. Conversations among workshop teachers are continuing on the PlantingScience Institute Facebook group set up by Dick Willis.

Larry Griffing (who also co-led the 2009 institute) introduced teachers to the plant genetics workhorse, *Arabidopsis*, and the use of recombinant inbred lines for classroom research on population variation and teasing apart roles of genetics and environment. Working with a large amount of new information, such small seeds, and classroom sets of plants can be challenging, but Larry achieved his aim for the module of moving genetics beyond Mendel and bringing quantitative reasoning and data visualization into prominence. In fact, the teachers investigations were so productive that Larry awarded two prizes: the Araba-daba-do award for the most innovative data collection and Araba-daba-data award for the most comprehensive data analysis.

Teacher teams with their "Tri-comb" awards created and bestowed by Larry Griffing for most innovative data collection (top) and most comprehensive data analysis (bottom) of their Arabidopsis *investigations.*

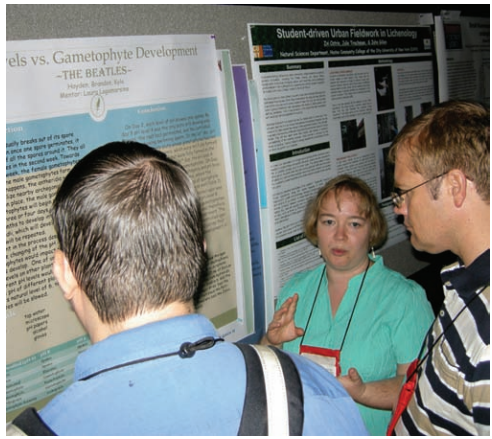
Marsh Sundberg (who also co-led the 2008 and 2010 institutes) employed his extensive skill in asking guiding questions as teacher teams sought to cause and explain celery curling in the celery challenge, which integrates cell types, osmosis, and transpiration. As one might expect for an open-ended inquiry such as this, teacher teams explored some relationships such as geometry and physics of the celery segments that have not previously been explored by teams. For the five returning teachers who had experienced the celery challenge last year, Marsh posed a related and special challenge to design an inquiry for their classrooms using ferns to examine osmosis and transpiration. In keeping with tradition established last year, the presentation of their work included a song-and-dance routine about transpiration. A number of teachers are continuing the labshop challenge with Marsh by distance.

Deliberating options for the fern transpiration inquiry with Marsh Sundberg (far right).

This last workshop under our current NSF award (DRL-0733280) was again expertly hosted by co-PI Dr. Carol Stuessy, Texas A&M University Associate Professor of Teaching, Learning, and Culture. Carol, her graduate student Cheryl Ann Peterson, and other members of the TAMU research team are examining the impact of the teacher professional development workshops and interactions in the online community. Cheryl Ann Peterson shared preliminary data of her dissertation research at the Botany 2011 meeting. Tantalizing findings include that a greater percentage of teams whose teachers attended the 10-day workshops compared to non-workshop teachers post evidence of scientific thinking regarding particular elements of their inquiry projects, such as mentioning confounding variables in their experimental design or connecting their conclusions of the experiment to the data that were collected. It is exciting to see data on the PlantingScience model of scientist-student-teacher partnership accumulate as the current grant cycle begins to come to a close and we plan for the future.

PlantingScience Student Posters at Botany 2011

Kara Butterworth displayed at Botany 2011 four posters created by student teams in her Honors Biology class at Combs High School in Arizona. During the spring 2011 PlantingScience online session, Kara had 13 teams of 9th and 10th graders investigating C-Ferns. With advice from their online mentors and Kara's support in the classroom, the students asked diverse questions including the role of pollution on spores, effects of space and density on sex ratios, and relationships between pH and timing of life cycle stages and rate of growth. Kara, now living in Colorado, will bring the PlantingScience experience to a new set of students, and she hopes to bring high school students to talk about their posters at future Botany meetings.



Kara Butterworth showcases posters created by her high school team "The Beatles" on their investigation of pH level of agar on spore development. Note the students' acknowledgement of their mentor Laura Lagomarsino.

The End Of The Botany Degree in The UK.

Drea, S. 2011. *Bioscience Education* 17(2)

The decline of botany noted in the pages of *PSB* since its inaugural issue more than 50 years ago has not been a phenomenon unique to the United States. According to the author of this article, "The last student enrolled in a pure 'Botany' degree in the UK began in the University of Bristol this year, 2010."

Exploring the Complexity of Tree Thinking Expertise in an Undergraduate Systematics Course

Halverson, K.L., C.J. Pires, and S.K. Abell. 2011. *Science Education* 95(5): 794-823.

The authors use multiple assessments, both quantitative and qualitative, to uncover student misunderstandings involving phylogenetic tree interpretations in a plant systematic course.

Natural Antibiotics: A Hands-on Activity on Garlic's Antibiotic Properties.

João Fonseca, M. and F. Tavares. 2011. *The American Biology Teacher* 73: 342-346.

There are a number of protocols out there for examining antibiotic properties of a variety of organisms, but what I like most about this one (aside from the garlic) is that kitchen utensils and ingredients are used, along with some basic scientific glassware. The media is "from scratch," starting with boiling meat on the stove, then adding sugar and salt (and some agar). How do you get your garlic extract? Start with a garlic press! Can you just use a garlic clove? Either you try it or read the article.

What's Inside a Sweet Pepper Fruit? Thinking About the "Insides" in Plants.

Kemel, D., B. Druzina, and T. McCloughlin. 2011. *Journal of Biological Education* 45(1): 29-36.

The simple question in the title of this paper opens up to inquiries of the nature of the gas inside the chambers of a sweet pepper and alternative approaches to testing hypotheses. For instance, is the pepper hollow? How could you test this non-destructively? If it is hollow, is it empty? What does empty mean? How can this be tested? The simple sweet pepper provides all the living material needed for a semester-long inquiry to answer the initial question!

Perceptions of Strengths ond Deficiencies: Disconnects Between Graduate Students and Prospective Employers.

Sundberg, M., P. DeAngelis, K. Havens, B. Zorn-Arnold, A.T. Kramer, K. Holsinger, K. Kennedy, R. Muir, P. Owell, K. Schierenbeck, and L. Stritch. 2011. *BioScience* 61(2): 133-138.

A surprising result of the Botanical Capacity Assessment Project, which surveyed academic botanists, botanists in federal and state agencies and NGOs, and botany graduate students, was that many of the skills and content areas viewed by graduate students as their greatest strengths were seen by potential employers as areas in need of additional training.

Diane R. Campbell elected Fellow, AAAS

Dr. Diane Campbell, a Professor in the Depatment of Ecology & Evolutionary Biology, University of California, Irvine, has been named a Fellow by the American Association for the Advancement of Science. Campbell, who studies evolution in natural plant populations and plant-pollinator interactions, is known for her work on plant hybrid zones, the evolution of plant breeding systems, and the evolution of floral traits. We apologize for her omission in the list of new AAAS Fellows in the last issue of PSB.

Botany 2012
The Next Generation
July 7-11, 2012
Columbus, Ohio

Dr. Helen Kennedy Honored by Society of Woman Geographers.

Dr. Helen Kennedy, Honorary Research Associate in the Deptartment of Botany and Honorary Curator of Vascular Plants in the UBC Herbarium from 1998-2003, has received an Outstanding Achievement Award from the Society of Woman Geographers, stating: "Your many years of studying prayer plants in the fast disappearing rain forests all over the world is an inspiration to us all. And hopefully your work and possibly introducing them for cultivation will keep these unique plants from going extinct." She was presented the award at the Society's triennial convention in Boulder, Colorado, in May 2011.

The Society of Woman Geographers was established in 1925 at a time when women were excluded from membership in many professional organizations, particularly the Explorers Club, which did not admit women until 1981. The Society of Woman Geographers has previously awarded only 33 Outstanding Achievement Awards.

John Kiss
awarded Distinguished Professor title

John Kiss, professor of botany, was awarded the title of Distinguished Professor by Miami University's Board of Trustees Friday, June 24, effective July 1. Established by Miami's trustees in 1981 to attract and retain the most eminent professors, the title of Distinguished Professor carries with it a $6,000 annual stipend for professional expenses. A faculty committee screens nominations and conducts rigorous appraisals, including evaluations by nationally known scholars.

Kiss, professor of botany and a faculty member at Miami University since 1993, earned tenure in 1997 and was promoted to full professor in 1999. In 2008, he was named chair of the department of botany. He is internationally known for his research in botany and space biology.

One of his nominators explained that Kiss' "work … contributes to America's STEM initiatives by stimulating student interest in science and technology, recruiting them into undergraduate and graduate programs, providing stimulating didactic learning and 'hands on' experience in research on Earth and, in some instances, opportunities to utilize the International Space Station environment for plant biology experiments."

Most noted among his research is the National Aeronautics and Space Administration (NASA)-funded project, Tropi-2, designed to better understand how plants integrate sensory gravity input from multiple light and gravity perception systems. The goal of the project is to determine plants' potential use as a food source during prolonged human time in space. The project highlight was two, six-day experiments on the space shuttle Endeavor to the International Space Station in February 2010. For his work, he earned the 2010 NASA Honor Award. He also earned a 2007 NASA Ames Honor Award.

Kiss' research also includes 89 published peer-reviewed articles, 122 book reviews and almost 200 invited talks at professional meetings and other academic institutions. In addition, he has earned funding support of $5 million from more than a dozen major agencies, including the National Science Foundation (NSF), the National Institutes of Health (NIH) and NASA.

In many of his projects, Kiss includes his students in the research. He has taught more than 10 different courses to graduate and undergraduate students, advised some 36 undergraduate students' independent research projects, 11 master's students, seven doctoral students, and five postdoctoral scholars. His dedication to his students and to his research was honored by several awards: Miami's Alumni Enrichment Award (1997); University Distinguished Scholar (2006); Distinguished Scholar of the Graduate Faculty (2005); and 2001 Researcher of the Year by Miami University's Sigma Xi, an international scientific and research honor society.

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 "Grants" tab at the top of the homepage

Information about ALL PROGRAMS

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, although applicants to the Lewis and Clark Fund for Exploration and Field Research in Astrobiology must be U.S. citizens, U.S. residents, or foreign nationals formally affiliated with a U.S. institution. 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.

BRIEF INFORMATION ABOUT 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 1; notification in May.

Contact information

Questions concerning the FRANKLIN and LEWIS AND CLARK programs should be directed to:

Linda Musumeci

Director of Grants and Fellowships

American Philosophical Society

104 S. Fifth Street

Philadelphia, PA 19106

215-440-3429

www.amphilsoc.org/grants

LMusumeci@amphilsoc.org

215-440-3429

Courses

Undergraduate Course in Hawaiian Natural History (Summer 2012)

The Department of Biological Sciences at Campbell University is now accepting applications from undergraduate students for a 4-week field course to be held on the Hawaiian Islands of Hawaii, Kauai, and Oahu from May 19 to June 17, 2012. Course participants will explore the origins of the Hawaiian archipelago, the diversity of plant and animal life across Hawaiian ecosystems, evolutionary processes in oceanic island systems, and the roles that plant species play in Hawaiian culture. Students participating in the program can earn four undergraduate credits.

For additional information, please contact course instructor Dr. Christopher Havran by e-mail at havran@campbell.edu or by phone at 740-893-1732. Additional information, including a tentative course syllabus, is available at the course website: http://www.campbell.edu/academics/study-abroad/programs/.

Missouri Botanical Garden Part Of Collaborative Effort To Digitize Charles Darwin's Personal Library

(ST. LOUIS): The Missouri Botanical Garden, along with other members of the Biodiversity Heritage Library (BHL) consortium, has joined the Cambridge University Library, the Darwin Manuscripts Project at the American Museum of Natural History in New York, and the Natural History Museum in London in a collaborative effort to digitize the personal scientific library of Charles Darwin. The collaboration marks the first time that notes and comments scribbled by Darwin on the pages and margins of his own personal library will be available online.

The majority of Darwin's personal scientific library is held at the Cambridge University Library in England. In total, Darwin's library amounted to 1,480 books, of which 730 contain abundant research notes in their margins. These annotated books are now in the process of being digitized. The first phase of this project has just been completed, with 330 of the most heavily annotated books launched online at the Biodiversity Heritage Library for all to read at http://www.biodiversitylibrary.org/collection/darwinlibrary.

"The Darwin collections are among the most important and popular held within Cambridge University Library," said Anne Jarvis, university librarian. "While there has been much focus on his manuscripts and correspondence, his library hasn't always received the attention it deserves…for it is as he engaged with the ideas and theories of others that his own thinking evolved."

Because Darwin's evolutionary theory covered so many aspects of nature, reading served him as a primary source of evidence and ideas. Darwin once complained that he had become a "machine for grinding general laws out of large collections of facts."

The pages of Darwin's library, smothered in his scrawl, give a direct view of the Darwinian intellectual machine in action. With the Charles Darwin Library online, now everyone can retrace how Darwin systematically used reading to advance his science.

Most of Darwin's personal library rests at Cambridge University Library and at Down House. Although the majority of the books are scientific, some are humanities texts on subjects that Darwin transformed into scientific topics.

The series of transcriptions accompanying each page allows everyone to see which passages Darwin found relevant to his work, stimulated his thinking, or just annoyed him as he read the work of others. For example, his friend Charles Lyell wrote in his

famous "*Principles of Geology*" that there were definite limits to the variation of species. Darwin wrote alongside this, "If this were true adios theory."

The online transcribed marginalia relies on the work of two scholars, Mario A. Di Gregorio and Nick Gill, published in the 1990s and now greatly enhanced by Gill. In addition to images of the books and transcribed jots, the information is fully indexed so that people can search for topics and ideas relevant to their interests or work.

"Getting to make these historic books available to the world for the first time is quite an honor," said Chris Freeland, director of the Missouri Botanical Garden's Center for Biodiversity Informatics. Freeland and his team of programmers built the technology components needed to deliver Darwin's digitized library and handwritten annotations to users all over the world. Working closely with project scholars, they built new interfaces to handle transcriptions and annotations into the existing Biodiversity Heritage Library web portal, a freely available digital library of more than 90,000 texts dating from the 15th century.

The digitization project was jointly sponsored by the Joint Information Systems Committee (JISC) and National Endowment of the Humanities through a Transatlantic Digitization Collaboration Grant.

For more information about the Missouri Botanical Garden, visit www.mobot.org. For more information on the Biodiversity Heritage Library, visit www.biodiversitylibrary.org.

Zapatitos Submitted by Pamela Puppo 2011 Triarch Botanical Images Student Travel Award

Missouri Botanical Garden Instrumental in Creating and Maintaining Taxonomic Name Resolution Service Computerized Tool Helps Researchers Standardize Lists of Biological Names

(ST. LOUIS): The Missouri Botanical Garden has been instrumental in aiding iPlant Collaborative, the Botanical Information and Ecology Network, and others to create the Taxonomic Name Resolution Service (TNRS) which assists researchers in correctly identifying biological names.

Biological names are compared against those in Tropicos®, a database created by the Missouri Botanical Garden containing more than 1.2 million scientific names and 3.9 million individual specimen records. Tropicos® is actively maintained and updated by taxonomic experts at Missouri Botanical Garden and around the world.

In 1753, Carl Linnaeus published *Species Plantarum*, which introduced Latin binomials to the world and laid the foundation for how we name species and make sense of the diversity of life. This taxonomic naming system is still in place three and a half centuries later. Today, scientific names remain the necessary bond joining observations to organisms and data sets to each other. Scientific names are the currency of communication for ecologists studying tropical diversity, crop scientists searching for biological control and systematists assembling the Tree of Life. However, it turns out that a large fraction of the names that biologists are using are incorrect.

"Scientific names are the cornerstone of communication in the field of plant science. Surprisingly, a large fraction of the names that biologists are using are actually misapplied, making it next to impossible to accurately describe the number of species in a particular area. TRNS, using the authoritative data from Tropicos®, has the ability to quickly and efficiently solve this problem," said Chris Freeland, director of bioinformatics at the Missouri Botanical Garden.

Misspelled, outdated, or ambiguous names are common and can lead to mismatched observations, erroneous conclusions, and an inability to make predictions across space and time. Large databases, such as Global Biodiversity Information Facility and GenBank, suffer from high rates of taxonomic

error, with up to 30% of names unmatched to any published species name.

Even for published names, 5% to 20% are out-of-date names. The TNRS provides a web service to standardize taxon names so that biologists can ensure they are using the correct species names.

The TNRS works by taking names submitted by the user and breaking each down to its simplest parts. Users submit lists of scientific plant names to the TNRS. The names are passed through cycles of exact matching, parsing (breaking the name into its component parts), more matching, and finally "fuzzy" matching. Fuzzy matching searches for near matches and enables the TNRS to correct even badly misspelled names. Once the names have been matched to published scientific names, the TNRS converts any out-of-date names (called synonyms) to the authoritative, currently accepted name.

"The Taxonomic Name Resolution Service is an important step forward for researchers across biology. For years, we have been trying to check species names for errors and bring them to a common taxonomy, painstakingly doing this name by name. Now we can do both steps for thousands of taxa at one online web service," said Dr. Amy Zanne, of the University of Missouri, St. Louis.

While the process sounds simple, it turns out that it is a difficult computational problem to solve. Originally, cleaning a list of taxonomic names would have to be done manually; a researcher would look up each name individually to confirm its accuracy. In recent years, some of these steps have been automated, but as separate processes. The TNRS performs all of these tasks together, simplifying and accelerating the chore of taxonomic name standardization.

While the TNRS currently resolves names only against Tropicos®, in the future it will be extended to include other taxonomic databases, such as the USDA list of names for plants in the United States, with the goal of including all published plant names. Because the software's source code is being released with an open source license, developers will be able to expand it to resolve scientific names of other organisms such as animals and fungi.

iPlant collaborated with researchers Brian Enquist and Brad Boyle from Botanical Information and Ecology Network, Zhenyuan Lu from Cold Spring Harbor Laboratory, Sheldon McKay from Cold Spring Harbor Laboratory and later the University of Arizona, and Bill Piel from Yale's Peabody Museum to solve the names problem. They created a unique technical design that lead to the creation of the TNRS. The Missouri Botanical Garden provided vital access to the contents of their Tropicos® database of plant names. The TNRS builds on the work of Dmitry Mozzherin of the Marine Biological Laboratory, whose name parser from the Global Names Initiative was modified to break submitted names into constituent parts for the matching process, and Tony Rees of the Commonwealth Scientific and Industrial Research Organisation in Australia, whose TaxaMatch algorithm was adapted to perform fuzzy matching of misspelled names. Recently, a new Global Names Architecture effort received National Science Foundation funding, and iPlant looks forward to collaborating closely with this group to tackle the remaining challenges in taxonomic name standardization.

For more information about the Missouri Botanical Garden's Tropicos® database visit: http://www.mobot.org/press/Assets/FP/tropicos.asp.

For general Missouri Botanical Garden information visit: www.mobot.org.

58th Annual Systematics Symposium
Missouri Botanical Garden
7-8 October 2011

Trees

The United Nations has declared 2011 to be the Year of the Forest

Organizing committee: P. Mick Richardson and Amy Zanne

Registration must be accompanied by a $50.00 registration fee, which also covers the cost of refreshments at the Friday mixer and lunch (but not dinner) on Saturday. The cost of the dinner on Saturday is an additional $50.00.

Information on local hotels and motels will be available to registrants. No refunds will be granted after 24 September. There is no guarantee of food being available if you register after 24 September.

Please use electronic registration and payment, at http://www.mobot.org/MBGSystematicsSymposium.

Friday 7:30 – 9:30 PM	Informal mixer in Ridgway Center
Saturday 8:30 AM – 8:30 PM	Talks in Ridgway Center
Andrew Groover (USDA, Davis)	What genes make a tree a tree?
David Hibbett (Clark U.)	Mycorrhizae and fungal breakdown of lignin
David Kenfack (Harvard U.)	50-Hectare plots
Elisabeth Wheeler (NC State)	Inside Trees. 100 Million Years of Wood Structure
Speaker to be decided	Ecophysiology/climate change
Allison Miller (SLU) & Briana Gross (USDA, Fort Collins)	Domestication of tree crops
Martin Gardner (RBG, Edinburgh)	Evening speaker: Conservation of conifers

With support from the National Science Foundation

Kimilsungia: How an Indonesian Orchid Became a Revered Symbol in the Democratic People's Republic of Korea After Its Name was Changed

Noes Soediono[1], Joseph Arditti[2] and Rubismo Soediono[1]
[1]Flora Sari Orchids, Jakarta, Indonesia (rba-runa@cbn.net.id, rubismo@cbn.net.id)
[2]Department of Developmental and Cell Biology, University of California, Irvine (jarditti@uci.edu)[1]

Received 15 October, 2010.
Accepted 12 April, 2011.

Introduction

Strange events, controversies and weird stories often result from interference by religion, politics, government, dogma and cults of personality in science, technology, horticulture and other areas which must remain free from such interference. A state visit, a meeting between two heads of state, and a personality cult are the reasons why the Indonesian orchid *Dendrobium* Clara Bundt (Fig. 1, 2A, 2B, 2D, 3G, 8E, 10A) was renamed *Dendrobium* Kimilsungia in honor of the "Great Leader" and "Eternal President" Kim Il Sung (1912-1994; Fig. 3A, 5A, 5B, 8A, 9, 10B) of the Democratic (*sic*) People's Republic of North Korea (DPRNK), where it is revered. A book (Fig. 4) tells the story of this orchid from the DPRNK point of view (Kim and Pang, 1999). A fascinating story emerges when information about this orchid from inside and outside NDPRNK and in the book are combined.

Before we proceed it is necessary to debunk the most obvious inaccuracy, one propounded by Kim Il Sung himself, which is that: 1) "a flower named after a great man for the first time in the thousands of years of human history came in the world" with the naming of *Dendrobium* Kimilsungia, and 2) no flower "had previously been named after a great man" (Kim, 2007). A number of orchids were named after great men well before *Dendrobium* Kimilsungia, and some after. Several examples which come to mind easily are *Cattleya* General Patton, the multigeneric hybrid genus *Darwinara*, *Dendrobium* Madam Curie, *Paphiopedilum*

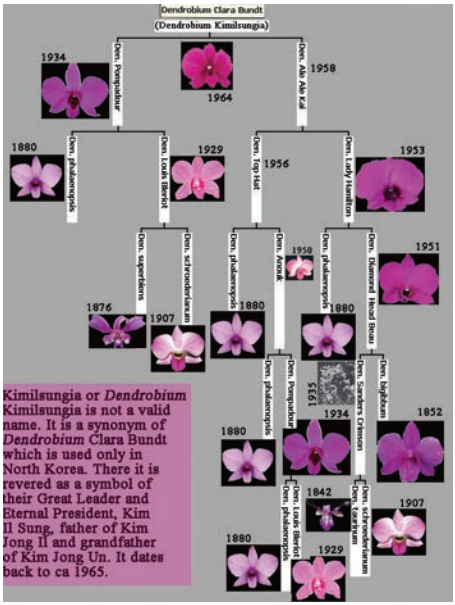


Fig. 1. Pedigree of Dendrobium *Clara Bundt, aka* Dendrobium *Kimilsungia.*

Winston Churchill, *Sophrolaeliocattleya* Tchaikovsky, *Vanda* Eisenhower, and Vandaenopsis Nelson Mandela There are many others.

History

Dendrobium Clara Bundt (aka *Dendrobium* Kimilsungia; Fig. 2A, 2B, 2D, 3G, 8E, 10A) was bred (Fig. 1) by C. L. Bundt (Fig. 3E), owner of an orchid establishment on 15A Djalan Muchtar Luthfi (now spelled Jalan Mochtar Lutfi), Makassar (Unjung Pandang, the island of Sulawesi), Indonesia. The establishment still exists. Two of us (NS, JA) visited it in 1981 with our friend George Risakotta on our way home in Jakarta from the islands of Banda

[3] [3]We thank Dr. Tim Wing Yam, Singapore Botanic Gardens for reading and commenting on the manuscript, the pedigree chart of *Dendrobium* Clara Bundt and for clarifying nomenclatural practices; Dr. Irawati (some Indonesians use only one name) former Director, Bogor Botanical Gardens (Kebun Raya Indonesia) for Sujana Kasan's photograph and information about him; Sofie Birri, Kebun Raya Indonesia for photographs of the plaque in Fig. 9 and information regarding the director of KRI; and Coralie Hills for a copy of Chequer and Chequer, 2007..

and Ambon in the Malukku Archipelago. By then it was owned by his daughter Clara (Fig. 3D, 8B). In 1964 Bundt registered his hybrid with the Royal Horticultural Society Orchid Registration Authority as required for orchid hybrids (Wreford, 1972) naming it *Dendrobium* Clara Bundt after his daughter (Fig. 10A).

Because of the registration of the hybrid with the Royal Horticultural Society Orchid Register (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/orchidregister.asp; Fig. 10A), its name, which conforms with the rules of orchid hybrid nomenclature (Cribb, Greatwood and Hunt, 1985), is recognized internationally and was valid in the orchid world when Kim Il Sung visited the Bogor (which the book consistently misspells as Bogoru) Botanical Gardens (BBG) in Indonesia in April 1965 (Fig. 3H, 9). He was accompanied by Indonesian President Sukarno (1901-1970; Fig. 3B, 3H, 8A; in office from 1945 until being deposed in 1967). Kim saw (or was shown) the orchid and liked it. According to one account Sukarno named it after Kim on the spot despite 1) not having the authority to name this or any other orchid hybrid, and 2) the fact that the orchid was already named. That much is fact. Other stories about how *Dendrobium* Clara Bundt became *Dendrobium* Kimilsungia "---aroma of flower symbolic of a great man everlasting---" (Kim and Pang, 1999; Fig. 4A, 4B) in North Korea are fanciful completely or in part. It is also not true that *Dendrobium* Kimilsungia is one of two national flowers of DPRNK (Chequer and Chequer, 2007).

Fig. 2. Dendrobium *Clara Bundt, aka* Dendrobium *Kimilsungia (A, B, D) and (C) Begonia Kimjongilia (source: World Wide Web).*

Some of the story details the Kimilsungia book tells/adds are convoluted and at best questionable. According to the book the Great Leader saw the orchid on his visit to BBG, liked it, and modestly demurred ("I have done nothing extraordinary") when Sukarno proposed to name it after him, but was overruled ("Your respected Excellency has already rendered enormous services to mankind"). Thus *Dendrobium* Clara Bundt got its DPRNK name, *Dendrobium* Kimilsungia whereupon "enthusiastic applause and cheers arose . . . [and a] children's chorus began to sing the *Song General Kim Il Sung,*" and a "new variety of flower was named after the great man" (Kim and Pang, 1999). One cannot help but wonder where the children's choir came from. Was the choir prescient and came to BBG knowing that an orchid would be (re)named in honor of Kim Il Sung? And, how would Indonesian children in Bogor know a North Korean song? This part of the story is hard to accept as fact. It is also hard to believe that the Great Leader who allowed or maybe even encouraged great adulation and a personality cult for himself would be too modest to allow an orchid to be named for him.

Kim Il Sung's son, Kim Jong Il, the Dear Leader, has a slightly different version (Kim, 2007) of the story (our comments are in bold face in brackets). "Forty years have passed since then, but I still recall with deep emotion the days when I visited Indonesia with President Kim Il Sung . . . When visiting the Bogor Botanical Garden, I felt more deeply how much President Sukarno respected and revered President Kim Il Sung. With a long history, this world-renowned botanical garden was well worth visiting. With flowers of the orchid family, cactuses, and other rare tropical flowers in full bloom, I felt as if I were visiting a world flower fair. When we approached a display in a greenhouse of the botanical garden, Sukarno took a pot of flowers [**presumably as shown in Fig. 8A**]

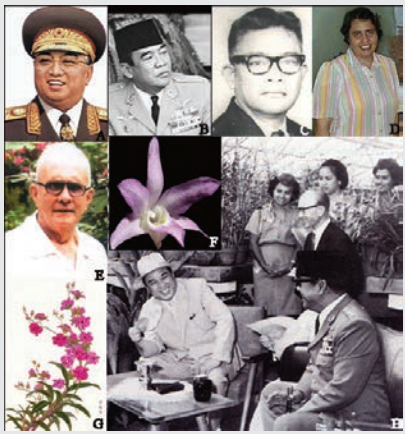


Fig. 3. Individuals and orchids associated with Dendrobium Clara Bundt, aka Dendrobium Kimilsungia. A. President Kim Il Sung of the Democratic People's Republich of North Korea. B. President Sukarno of Indonesia. C. Sujana Kasan, Director of the Bogor Botanical Garden (Kebun Raya Indonesia) at the time. D. Clara Bundt. E. C. L. Bundt. F. Dendrobium moniliforme. G. Dendrobium Clara Bundt, aka Dendrobium Kimilsungia. H. President Kim Il Sung (left wearing white hat) and President Sukarno (right wearing a black traditional Indonesian songkok hat) accompanied by aides meeting in the orchid house at the Bogor Botanical Gardens (source: A, B, C, E-H, World Wide Web; D, courtesy Dr. Irawati, Bogor Botanical Gardens).

from the director [**Sujana Kasan (27 December 1916 to 15 February 1974) was the director of the Bogor Botanical Gardens from 1959 until 1969**] of the botanical garden, and asked President Kim Il Sung how he liked the flowers [**this is one version, another is that Kim Il Sung was attracted by the flowers and approached them**]. The director explained that it was a variety of the orchid family a famous florist of the garden [**another claim is that the breeder was Sujana Kasan (old spelling Soedjana Kasan) himself, the director of the garden at the time, but the actual breeder was C. L. Bundt in Makasar who was not part of the garden staff**] had bred after long, painstaking research [**orchid breeding may benefit from experience by the breeder, intuition and some luck, but "painstaking research" is not required to breed a simple hybrid like Dendrobium Clara Bundt**], and it was a peculiar flower in that it blossomed twice a year, being in bloom for two to three months [**it is not uncommon for Dendrobium hybrids to bloom for long periods because not all inflorescences come into bloom at the same time, each flower opens slowly and flowers can last a long time**]. After looking at the flower for a while, President Kim Il Sung said that it was very beautiful and expressed thanks to his host for showing him such a fine flower. Then, Sukarno said sincerely that he wanted the flower [**sic, the hybrid**] to be named after President Kim Il Sung. The director of the botanical garden, too, expressed his wish to call it Kimilsungia. President Kim Il Sung gently declined their suggestion, saying that he had done nothing so special and that there was no need to name a flower after him. Sukarno replied, 'No. You have rendered enormous services to mankind, so you deserve a high honour.' He refused to withdraw his request. Back in Jakarta, he repeatedly brought the matter to us. On receiving a report about it, President Kim Il Sung said that if President Sukarno and the Indonesian people wished it so sincerely, he would accept the suggestion as a token of their esteem for our people ... President Sukarno promised that he would ensure that the technique of cultivating the flower would be completed [**no special techniques are required to grow a Dendrobium plants in Indonesia; developing a specific method for growing a tropical orchid in North Korea may require time, but it must be developed there, not in the tropics**] and that it would be sent to our country in one or two years. But the flower failed to come to our country for several years . . . the director of the Bogor Botanical Garden and the florist who had bred the flower disappeared without a trace [**simply not true, the**

Fig. 4. The book Kimilsungia by I. G. Kim and H. J. Pang (translated into English by K. J. Coe and J. H. An). Published by the Foreign Languages Publishing House, Pyongyang, Democratic People's Republic of Korea. A. Cover. B. Title page (source: scans of a copy of the book owned by J. A.).

passing of Sujana Kasan's in 1974 was known and mourned, and the C. L. Bundt orchid garden remained in existence]. However, convinced that Kimilsungia would have been preserved and grown with care . . . I sent officials to Indonesia in 1974 to find the flower. They traced the flower with the assistance of the local people, found it and fetched two pots of the flower to our country. Looking at the flowers I could confirm that they were identical with the Kimilsungia I had seen 10 years previously at the Bogor Botanical Garden. Kimilsungia is a beautiful flower; the more one looks at it, the more one feels attracted and attached to it. Flowers of the orchid family are known for their beauty but Kimilsungia, with its pinkish-purple petals and graceful and elegant shape, is extraordinarily beautiful [**Dendrobium Clara Bundt aka Dendrobium Kimilsugia is an attractive but certainly not an "extraordinarily beautiful" hybrid and according to Dr. Irawati a former recent director of the Bogor Botanical Garden, it does not grow well there**], and evokes ennobling emotions . . . After its arrival in our country, I ensured that the flower was sent to the Central Botanical Garden for study of the methods of its cultivation and propagation. It was no easy task to adapt the flower to the climatic and soil conditions of our country, and propagate it [**Dendrobium**

Fig. 5. Images of Great Leader Kim Il Sung (left) and Dear Leader Kim Jong Il (right) standing behind Dendrobium Kimilsungia (purple) and Begonia Kimjongilia (red) with a young couple (A) and mothers and their children (B). C, D. Dendrobium Kimilsungia exhibits (source: World Wide Web).

Fig. 6. Cultivation of Dendrobium Kimilsungia in the Democratic People's Republich of North Korea. A. External view of the Kimilsungia greenhouse in the Central Botanical Garden. B. Interior of the Kimilsungia greenhouse (source: scans of a copy of the book owned by J. A.).

species and hybrids are easy to propagate clonally both horticulturally and in vitro]. But, convinced that the officials and researchers of the Central Botanical Garden would succeed, I ensured that they were given positive assistance by the Party: A special greenhouse was built; an institute with highly qualified researchers was organized and the latest equipment and materials necessary for their work were provided; and many seedlings of pure breed were also provided [**plants, mature or seedlings other than those of Kimilsungia would not be needed**]. The researchers [**presumably the group shown with Ms Clara Bundt in Fig. 8B**], after repeated painstaking study and research under our Party's deep concern and care, found at long last many methods for propagating in our country the flower that had been bred in a tropical zone. They succeeded in finding the method of propagation by tissue culture, which thus made it possible to produce many seedlings [**sic, plantlets**] of the flower at one time. The flower was officially registered [**Fig. 8C, 8D**] in a scientific name with an international orchid-related society in Britain [**the orchid hybrid register is maintained by the Royal Horticultural Society, not by an orchid society: see the Nomenclature and Registration section below for further discussion**] **in the early 1980s, coming to be known as a particularly celebrated flower [this is true only in DPRNK**]"__(http://www.uriminzokkiri.com/Newspaper/english/2007/2007-06-20-r2.htm). One claim in the book is that President Sukarno

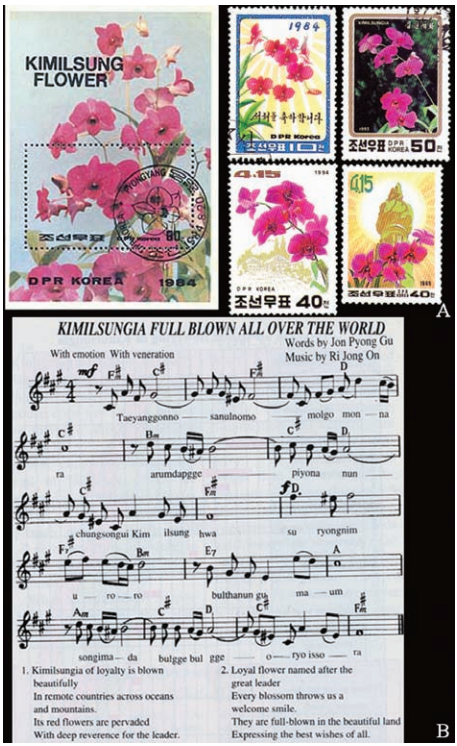


Fig. 7. Dendrobium Kimilsungia stamps (A) and (B) song (sources: A, World Wide Web; B, Kim and Pang, 1999).

prepared for Kim Il Sung's visit by asking for a new flower (i.e., hybrid) to be ready for the occasion. Bundt supposedly came up with "*Dendrobium moniliforme* which he had recently produced" at a request by "Sujanakasan" [**a misspelling of Sujana Kasan (Fig. 3C; 1916-1974)**]. This is clearly impossible because *Dendrobium moniliforme* (L.) Sw. (Fig. 3F) is not a hybrid which can be "produced" by a breeder, or anyone else for that matter. It is a natural species, ironically native to Korea (and also China and Taiwan. Furthermore, *Dendrobium moniliforme* is not part of the breeding line (Fig. 1) of *Dendrobium* Clara Bundt (aka *Dendrobium* Kimilsungia) and does not even resemble it (Fig. 2A, 2B, 2D 3G vs Fig. 3F).

In addition to this account of events in Bogor in 1965, the book adds a secondary and an even more improbable report that Kim Il Sung received the orchid in 1975 (but see the annotated citation above from http://www.uriminzokkiri.com/Newspaper/english/2007/2007-06-20-r2.htm). The book states that a "deeply moved" Bundt "finally succeeded in breeding Kimilsungia and sent it to Pyongyang in 1975." If the hybrid existed and plants were in flower when Kim Il Sung visited Indonesia in 1965 (Fig. 9), Bundt would not have had to "finally succeed" in 1975. Nor would he have to re-breed an existing and thriving hybrid. Also, why would Bundt send to Pyongyang in 1975 an orchid he named after his daughter in 1964? Furthermore, since Sukarno was deposed in 1967 and died in 1970 and Sujana Kasan passed away in 1974, they could not send an orchid to Pyongyang. Moreover, if the hybrid was registered in 1964 (Fig. 10A) and bloomed in 1965, it was bred before that, not in 1975. And finally, if Bundt came up with *Dendrobium moniliforme* in 1965, why would he bother or need to produce another orchid in 1975? This part of the book makes no sense. Altogether, three different and contradictory accounts regarding the origin of *Dendrobium* Kimilsungia are described in the DPRNK book:

1. The Great Leader visited BBG, saw *Dendrobium* Clara Bundt, liked it and President Sukarno named it after him. This possible and likely, but does not render the name *Dendrobium* Kimilsungia valid (Cribb et al., 1985; Fig. 10B).

2. *Dendrobium moniliforme* was produced for Kim Il Sung's visit to Bogor by C. L. Bundt at the behest of Sujana Kasan. This is impossible as explained above.

3. C. L. Bundt produced *Dendrobium* Kimilsungia and sent it to Pyongyang in 1975. This makes little sense.

As presented in the book the history of *Dendrobium* Kimilsungia is convoluted, inconsistent, replete with contradictions, rife with inaccuracies and loaded with invented "facts." Sukarno and Soejana Kasan are dead and cannot tell their sides of the story, but Kimjongilia, a *Begonia* named after Kim Il Sung's son, Dear Leader Kim Jong Il and introduced in 1988, can tell about itself and by implication also about *Dendrobium* Kimilsungia.

One of the perks DPRNK leaders have seems to be at least one namesake plant. The Great Leader has his orchid, *Dendrobium* Kimilsungia. His son Kim Jong Il, the Dear Leader, has *Begonia* Kimjongilia (Fig. 2C, 5A, 5B). According to information from DPRNK, *Begonia* Kimjongilia was bred by the Japanese horticulturist Mototeru Kamo (b. 1930) who was reported to have produced another *Begonia* in 2010 in honor of Kim Jong Eun (also spelled as Kim Jong Un), the Dear Leader's son and heir

apparent (will it be named Kimjongunia?). Bomi Lim, a reporter for Bloomberg reached Mototeru Kamo by telephone at his home in Kakegawa, Japan and reported that "Kamo . . . said he has visited North Korea about 10 times, [but] denied sending a new flower to commemorate Kim Jong Un, [and] neither had the 1988 begonia been intended for the father [of Kim Jong Un i. e., Kim Jong Il]. Kamo also said that 'At the time, no one knew anything about Kim Jong Il . . . Therefore, there's no way I could create a flower to suit his image.'" He added further that "Horticulture and politics should be separate" (http://www.humanflowerproject.com/index.php/weblog/comments/february_16_dictator_theorists/). Thus, if the North Koreans contrived stories about two begonias, they probably did the same for one *Dendrobium*.

How an Indonesian orchid found its way to North Korea where it was given a new name, is cultivated in a special facility (Fig. 6A, 6B), became revered (Fig. 5A, 5B) and lavishly exhibited (Fig. 5C, 5D) in a festival named after it every April, put on stamps (Fig. 7A), and memorialized in song (Fig. 7B) will probably remain a mystery. An account that contains at least some ~~of the real~~ plausible facts associated with this story has been circulating for a long time. It suggests that seeing Kim Il Sung's admiration for the flower, Sukarno told him that it was a newly bred hybrid at BBG and still unnamed. He named it Kimilsungia on the spot. After that plants were probably taken or shipped to North Korea. Soejana Kasan did not breed this hybrid. One of us (JA) knew him as a very pleasant and erudite man, a great story teller and an excellent horticulturist (and cook) who knew orchids well, but was not interested enough in them to breed any. The orchid Sukarno named Kimilsungia was and still is *Dendrobium* Clara Bundt.

The 1999 Kimilsungia show (perhaps similar to the one in Fig. 6C and 6D), held to honor the 87th birthday of the "revered President Kim Il Sung," contained 2,000 flowers, was visited by 260,000 people and included speeches by international dignitaries praising the "unparalleled great man" and the "revolutionary flower." A report in the German magazine *Spiegel Online International* 24 October 2010, carries a description dated 19 October 2010 by Andreas Lorenz about a recent show: "On the 60th anniversary of the North Korean Communist Party, Kim Jong Il wallows in a cult of personality. In an auditorium on the Taedong River in Pyongyang, two special blooms appear in an ocean of flowers: the violet Kimilsungia and the red Kimjongilia. Cross-bred from orchids and begonias, the special flowers are named after the "Dear Leaders" of North Korea -- Kim Il Sung, President for Eternity, who died in 1994, and his son, Kim Jong Il. Thousands of people push past the flowerpots and have their photographs taken for 600 won (about four dollars) in front of giant paintings of the two Kims." (http://www.spiegel.de/international/0,1518,380385,00.html).

Another description of this show can be found in the *Economist*, 14 October 2010. "Sometimes there are Kimilsungia exhibitions. Sometimes there are Kimjongilia ones. Citizens of Pyongyang are also treated to combined Kimilsungia and Kimjongilia shows. One such got underway at the beginning of this month, at the Kimilsungia-

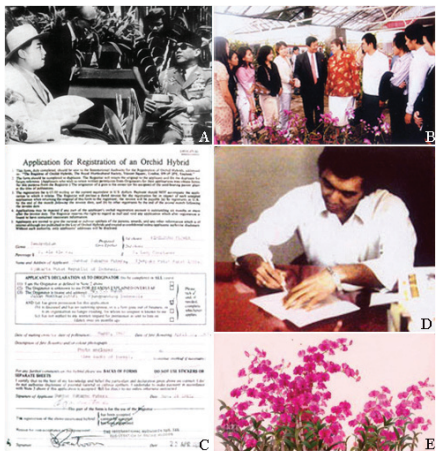


Fig. 8. Dendrobium Kimilsungia personalities and documentation. A. President Sukarno (right) showing and orchid plant (presumably the oneto be named Dendrobium Kimilsungia) to Great Leader Kim Il Sung in the Bogor Botanical Gardens (Kebun Raya Indonesia) orchid house. B. Clara (misspelled as Klara) Bundt interacting with the Kimilsungia Research Group. C. Application for the registration of Dendrobium Kimilsungia with the Royal Horticultural Society International Orchid Register on 20 April 1982. The photograph is not clear enough to be read. D. Guntur Sukarno Putra (President Sukarno's son) signing the application for registration. E. Grouped Kimilsungia flowers (Sources: A-D, http://songunpoliticsstudygroup.org/0409/RedSun09/KIMILSUNGIA, *E, World Wide Web).*

Kimjongilia Exhibition House: innumerable pots filled with the same two kinds of plant, a monotony alleviated only by a guide's prediction that North Korea will one day get a third variety. . . Kim Il Sung officially remains president, against the odds, but the Kimjongilia, a giant red begonia, somehow leaves its visual stamp on Pyongyang even more pervasively than the Kimilsungia, a normal-sized purple orchid. It might be said that the Kimjongilia's bouffant petals echo the hairstyle of North Korea's eponymous ruler, but a guide at the exhibition has a more politically correct explanation of the flower's appearance. Its bright red hue, she says, reflects Kim Jong Il as a 'person of passion, with a very strong character....' A journalist asked whether different temperature requirements made it difficult to keep begonias and orchids together. "We grow them with our hearts," said the guide. In August North Korea's Kimilsungia and Kimjongilia Research Centre came up with what might be a more reliable way of getting the best out of the Kimjongilia. After "years of research," said the state news agency KCNA, it devised a chemical agent that could lengthen the blooming period by a week in summer or by 20 days in winter. . . One display was of potted Kimjongilias supposedly donated by foreign diplomatic missions. China's was uppermost, together with a photograph of Kim Jong Il shaking hands with China's president, Hu Jintao. Individual European countries were conspicuous by their absence, but there was one pot plant there in the name of the European Union. Oddly for plants that have acquired such crucial political significance in North Korea—the army has its own huge breeding centre for them—since both are actually foreign creations. The Kimilsungia was presented in 1965 by Indonesia's founding president, Sukarno, and the Kimjongilia arrived in 1988, courtesy a Japanese botanist. Kim Jong Un, Kim Jong Il's anointed successor, who was seen by foreign journalists for the first time on October 9th and 10th, has yet to acquire a flower. 'In future we will have one,' assures the guide" (http://www.economist.com/blogs/asiaview/2010/10/north_korean_iconography).

Scientific meetings regarding Kimilsungia were or are also being held in DPRNK. One example is a seminar held in 2005 "to commemorate the 40th anniversary of Kimilsungia, the flower of the sun" (http://www.globalsecurity.org/wmd/library/news/dprk/2005/dprk-050416-kcna04.htm). It included talks on "Photosynthesis Features of Kimilsungia and Environmental Conditions for the Cultivation Based on Them", "Researches into Nurturing Pure Line of Kimilsungia", "Ways of Blooming Kimilsungia on the Day of the Sun" and the "Researches into Ways of Bringing Kimilsungia into Full Bloom on the Day of the Sun and Other Days" (http://www.globalsecurity.org/wmd/library/news/dprk/2005/dprk-050416-kcna04.htm; http://www.kcna.co.jp/item/2005/200504/news04/16.htm). "Prior to the seminar leader Kim Jong Il's famous work 'Kimilsungia Is an Immortal Flower Blooming in the Hearts of Humankind in the Era of Independence' . . . was conveyed" (Kim, 2007; http://www.kcna.co.jp/item/2005/200504/news04/16.htm). We were not able to find and obtain published papers based on these presentations.

The meeting in 2006 and ones held in 2006, 2007, and 2009 are reported to have been attended by a person named Ri Pyong Sang who is described as being the "chairman of the American Kimilsungia-Kimjongilia association (http://www.kcna.co.jp/item/2005/200504/news04/16.htm; http://www.kcna.co.jp/item/2006/200604/news04/13.htm; http://www.globalsecurity.org/wmd/library/news/dprk/2007/dprk-070414-kcna03.htm; http://www.kcna.co.jp/item/2009/200904/news13/20090413-27ee.html). A search on Google found: 1) no information about a Ri Pyong Sang, 2) no evidence for the existence of an American Kimilsungia-Kimjongilia association, and 3) that the North European Kimjongilia Association was formed in Sweden in 1995, followed by the establishment of the Mongolian Kimjongilia Association in 1997, formation of the Japanese Kimjongilia Fanciers Society in 1998 and founding of the American Kimilsungia-Kimjongilia Association in the United States in 2004. Therefore it was not possible to contact Ri Pyong Sang and the American Kimilsungia-Kimjongilia Association (even if they do exist).

Nomenclature and Registration

C. L. Bundt registered *Dendrobium* Clara Bundt (*Dendrobium* Ale Ale Kai × *Dendrobium* Pompadour) in 1964 (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/orchiddetails.asp?ID=57200; Fig. 10A). This is the hybrid President Sukarno named Kimilsungia in 1965 in honor of Kim Il Sung. Thus, the name *Dendrobium* Kimilsungia is considered a synonym by the Royal Horticultural Society Orchid Register (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/

orchiddetails.asp?ID=130396; Fig. 10B). According to Gruss (2003) Dendrobium Kimilsungia is an invalid grex (Gruss, 2003) and not a cultivar of *Dendrobium* Clara Bundt. If so, which is probable, Part II, Rule 13 on page 14 of *The Handbook on Orchid Nomenclature and Registration* [(Cribb, Greatwood and Hunt, 1985) should be followed. "The specific, collective or grex epithet must never be omitted when citing or publishing the cultivar name of an orchid except where to context makes the identity of species, natural hybrid or grex clear (e.g. in a list of cultivars of the one particular species or one particular grex)] which governs orchid hybrid nomenclature, a cultivar name would have to be written as *Dendrobium* Clara Bundt 'Kimilsungia.' An attempt to register *Dendrobium* Kimilsungia was made on 3 July 2003 (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/orchiddetails.asp?ID=130396) or 20 April 1982 (Fig. 8C, 8D), but it only succeeded in affirming its synonym status (Fig. 10B). Be all this as it may, Ms Clara Bundt does not seem to be upset by the effort to rename the orchid her father named for her. She even visited a Kimilsungia festival and interacted with the research group (Fig. 8B) which works with the orchid (http://songunpoliticsstudygroup.org/0409/RedSun09/KIMILSUNGIA/left6.htm).

Fig. 9. A plaque in the Bogor Botanical Gardens (Kebun Raya Indonesia) orchid house commemorating DPRNK president Kim Il Sung's visit and Indonesian President Sukarno's presentation to him of the orchidaceous hybrid which is called Kimilsungia in North Korea. The name of the orchid on the plaque is incorrect. Dendrobium Clara Bundt, not Dendrobium Kimilsung Flower was renamed Dendrobium Kimilsungia (photograph of the plaque Sofie Biri at the request of Dr. Irawati, both at the Bogor Botanical Garden).

According to the Royal Horticultural Society Orchid Registrar, at one time it was not clear whether the Kimilsungia which is celebrated in DPRNK, is the Dendrobium Clara Bundt grex itself or a cultivar derived from it. The registrar added the following note to the list of new orchid hybrids list for March 2003: "Dendrobium Kimilsungia. Periodically the registrar receives queries about this plant. The name is widely used in North Korea for a hybrid Dendrobium derived from Den. Ale Ale Kai × Den. Pompadour, which grex was originally registered as Den. Clara Bundt by the originator in 1964 [Fig. 10A]. This plant was also named Kimilsungia by Indonesian President Sukarno, in honour of Kim Il Sung of North Korea on the occasion of his visit to Indonesia in April 1965. It is not clear to the registrar whether the name Kimilsungia applies to the grex or a cultivar derived from it. There is also a similarly named grex, Den. Kimilsung Flower, which is derived from Den. Ale Ale Kai x Den. Lady Constance." The registrar subsequently changed his mind about the "not clear" above. Dendrobium Kimilsungia is listed as a synonym (Fig. 10B) on the current Royal Horticultural Society Orchid Register web site (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/orchiddetails.asp?ID=130396) .

If claimed to be the grex itself, *Dendrobium* Kimilsungia is invalid or "wrong" (Gruss, 2003). And, if it is a cultivar the proper name is *Dendrobium* Clara Bundt 'Kimilsungia', not Dendrobium Kimilsungia (see quote in brackets above and Cribb et al., 1985). More confusion is added to this nomenclatural circus by the *Dendrobium* Kimilsung Flower (*Dendrobium* Ale Ale Kai × *Dendrobium* Lady Constance) which is mentioned above. It is a hybrid related to *Dendrobium* Clara Bundt which was originated by C. Bundt (since an "L." is not part of the name this could be Clara itself rather than her farther C. L.) and registered in 1982 by G. Putera, (http://apps.rhs.org.uk/horticulturaldatabase/orchidregister/orchiddetails.asp?ID=63165). Despite its name this hybrid is not revered anywhere. We could not locate a photograph.

Cultivation, Propagation and

Horticulture

Dendrobium Clara Bundt was bred to be grown outdoors in the tropical climate of Sulawesi, Indonesia. As "Kimilsungia . . . the immortal flower symbolizing the sun, the great man . . ." (Fig. 2E) it must be grown in greenhouses (Fig. 6A, 6B) in a country with a climate which is anything but tropical. To their credit, it seems that DPRNK orchid specialists studied this hybrid very carefully and developed appropriate cultivation techniques. They also formulated methods which bring the plants into flower at specific times and year around. One of the flower-inducing methods utilizes a lanolin paste containing 0.25-0.5% benzyladenine (BA). Altogether the horticultural approach to the orchid in DPRNK seems to be excellent. *Dendrobium* growers in countries with a similar climate can learn from it.

In recent years investigators and growers in other parts of Asia found that BA can bring about flowering in *Dendrobium* (for a review see Chia et al., 1999). However, 1) the time *Dendrobium* Clara Bundt (aka *Dendrobium* Kimilsungia) was taken to Pyonyang (sometime between 1965 and 1975), and 2) the likelihood that Western or even Asian journals are probably not be available in DPRNK raise the possibility that the discovery may have been made independently in North Korea. Useful clonal (in vitro and by division) and seed propagation for this type *Dendrobium* were also developed in DPRNK.

Dendrobium Clara Bundt did not become very popular and was/is not cultivated widely throughout the world. The same is true for it as *Dendrobium* Kimilsungia. However in DPRNK it became, and still is, a revered orchid, which is grown and displayed in large numbers.

Dedication

Joseph Arditti dedicates his efforts to Vince Galasso, a friend and neighbor for more than a quarter of a century.

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Note: Some of the figures are of very low quality

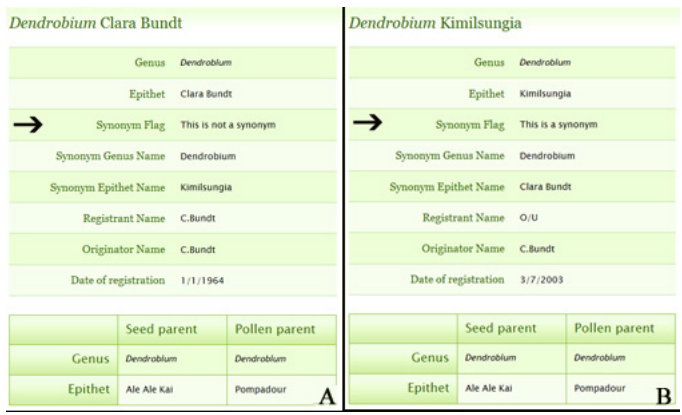

Fig. 10. Dendrobium Clara Bundt (A) and Dendrobium Kimilsungia (B) registration. Arrows point to the synonym status of the grex names.

Brief Note to Plant Science Bulletin

"Lavish in variety, thrifty with innovation": Darwin's paraphrase of Milne-Edwards[1]

Michael L. Christianson[2]
Department of Plant Sciences
One Shields Avenue
University of California, Davis CA 95616

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[1] I appreciate the library holdings at the Davis and the Berkeley campuses in the University of California system, and gratefully acknowledge support from the Grady L. Webster Memorial Research Fund; this paper is a consequence of access to first and subsequent editions of *Origin of Species* at the University of Kansas and the emphasis placed by my major professors at Michigan State University, Drs. L. W. and R. P. Mericle, on the importance of seeing original sources.

[2] author for correspondence, e-mail: mxianson@pacbell.net.

ABSTRACT

Premise: Darwin repeats his paraphrase of Milne-Edwards' words twice in Origin of Species. Tracking down the original Milne-Edwards source not only finds the work that influenced Darwin, it provides an independent check on the accuracy of his translation and allows for a translation into modern, not Victorian, English.

Modern work to understand the evolution of development is largely a story of extant genes re-purposed to produce novel morphologies or evolutionary innovation (e.g., Carroll, 2008). As modern as this idea is, it was an evolutionary concept already recognized by Darwin (1859). Darwin credits Milne-Edwards as the source of the idea that Mother Nature is "prodigal in variety, but niggard in innovation" (p 194, Darwin, 1859). Further, Darwin found the observation sufficiently important to also refer to it in the Recapitulation with which the book concludes (p 471, Darwin, 1859). Whether one is interested in finding Milne-Edwards' original text to up-grade Darwin's paraphrase for modern audiences, or to see how well Darwin's paraphrase captured the meaning of Milne-Edward's, actual words, one needs to find the original Milne-Edwards, source.

Perhaps because Darwin thought that his 1859 book, *On the Origin of Species*, was a mere outline of a longer work that was to follow, it is a book remarkably free from any citations to literature quoted, paraphrased or otherwise referred to in the text. Fortunately, the scientific literature is increasingly well indexed, and the University of California libraries are sufficiently comprehensive that I was able to find and peruse works by Milne-Edwards that pre-date the 1859 publication of *Origin of Species.*

One such work contains text that could be translated or paraphrased as Darwin did (p 437, Milne-Edwards, 1867, quoting verbatim a work of 1851). Much of Darwin's library has been digitized (www.biodiversitylibrary.org) and inspection of Darwin's copy of Milne-Edwards (1851) finds the quoted passage to have underlined phrases and a marginal notation referring to further comments by Darwin. I provide the entire paragraph for context, with what appears to be the portion used by Darwin in boldface.

"Mais, lorsqu'on vient à étudier avec plus d'attention cette multitude d'animaux variés, on ne tarde pas à s'apercevoir que la nature, tout en satisfaisant si largement à la loi de la diversité des organisms, n'a pas eu recours à toutes les combinaisons physiologiques qui auraient été possibles. Elle se montre, au contraire, toujours sobre d'innovations. On dirait qu'avant de recourir à des ressources nouvelles elle a voulu épuiser en quelque sorte chacun des procédés qu'elle avait mis en jeu; et **autant elle est prodigue des variétés dans ses créations, autant elle paraît économe dans les moyens qu'elle emploie pour diversifier ses oeuvres**." (p 8-9, Milne-Edwards, 1851)

Given that Milne-Edwards is referring to the rhetorical Mother Nature, his use of the adjective "économe," or "thrifty," alludes to its use as a noun meaning "housewife." Had Milne-Edwards intended to suggest the stinginess conveyed by the English word '"niggard" he would have used any of the several words with that meaning in French, e.g., ciche, ladre, pingre, mesquin. Similarly, because "prodigal" in modern English includes the

connotation of imprudence, a modern translation of "prodigue" might use the word "lavish."

Incorporating these changes, Darwin's paraphrase would credit Mine-Edwards with the observation that nature is lavish in variety, but thrifty with innovation. Indeed, a loose translation of the entire Milne-Edwards' phrase, strengthening the metaphor of Mother Nature as housewife, could be "as lavish as she is with the banquet of (bio) diversity, Mother Nature seems correspondingly thrifty with the ingredients she uses."

It is certainly useful to have an alternative translation of Milne-Edwards' words. It precludes confusion between "niggard" and other words beginning with N. It also removes the value judgment contained in the word "prodigal" and the implication of stinginess, a character trait that a Mother Nature might have, but not one possible for a modern conception of an impersonal nature or natural selection. Ultimately, the importance of this alternative translation lies in capturing an accurate sense of the original text. "Lavish in variety, thrifty with innovation" shows exactly how perceptive a naturalist in the first half of the nineteenth century could be, and helps us understand the context that gave rise to the special genius of Darwin.

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Book Reviews

Books Reviewed

Developmental and Structural

Atlas of Stem Anatomy in Herbs, Shrubs and Trees.

Schweingruber, F., A. Börner, and S. Ernst-Detlef. 2011. Vol. 1.
(Cloth US$139) 495 pp. Springer, Heidelberg. pp. 495.

This remarkable book is the first of two volumes that represent the fruit over 40 years work by Fritz Schweingruber on the stem anatomy of dicotyledonous herbs, shrubs and trees. It represents a monumental effort to document stem anatomy across a wide range of dicotyledonous, and to make this information accessible for future generations. The first volume covers the Magnoiliids and Eudicots, but excludes most of the Asterids which are covered in the forthcoming Vol. 2. I emphasize the accessibility of the work because the presentation of this research extends beyond the physical volumes published by Springer to the online Xylem Database and accompanying data tables, parts of which predate the publication of the book (Schweingruber and Landolt, 2005-2010). I will return to a discussion of these online resources after reviewing the book.

The Atlas differs from the Anatomy of the Dicotyledons (Metcalfe and Chalk, 1983) in several important respects. First, although some taxa without secondary growth are included in the Atlas, the emphasis is on those with secondary growth. This is not to say that all of the study species are "woody" in a traditional sense, as many would have been classified as "herbaceous" before the production of this work. In fact, many so-called herbaceous plants produce at least some secondary growth, and sometimes have abundant secondary growth (Dulin and Kirchoff, 2010). For instance, individuals of Arenaria biflora (Caryophyllaceae) in the alpine and sub-alpine zones have been found with up to 43 annual rings. Clearly, this is no ordinary herb. As long as we restrict ourselves to a simplistic understanding of plant growth that divides plants into those with secondary growth (woody plants) and those without (herbs), we will never understand the full range of plant growth forms, or be able to realistically relate these growth forms to anatomical structures. Sherwin Carlquist has been making this point for years with respect to shrubby, suffrutescent, pachycaulous, and lianoid growth growth forms (Carlquist, 1962, 2001). The Atlas extends this work to cover so-called herbaceous plants, while confirming and enlarging our knowledge of stem anatomy in shrubs and trees.

The book's use of standardized character descriptions leads to the second difference with the Anatomy of the Dicotyledons. The authors use, and extend, the International Association of Wood Anatomist's (IAWA) character definitions (a type of controlled vocabulary) to describe the structure of the xylem (Wheeler et al., 1989), and produce their

own standard characters for the description of the bark. Though my co-authors and I have pointed out the limitations of controlled vocabularies when used across wide ranges of taxa and structures (Kirchoff et al., 2008), I believe controlled vocabularies have a place of when their domain of applicability can be clearly circumscribed, such as in the description of wood. In most cases the wood anatomical structures described in the Atlas are relatively homogeneous, at least with respect to the wide range of variation in structures one finds in, for instance, flower structure across the angiosperms. There may be disagreements about the best way to describe a libriform fiber, or the degree of vessel size difference must be present between the early and latewood for the wood to be called ring porous, but these types of discrepancies pale in comparison to the difficulties encountered when trying to find a single set of terms that allow the determination of homologies between flowers as diverse as those of Euphorbia and Magnolia (Kirchoff et al., 2008).

If controlled vocabularies are to be used, they are best when each term is illustrated, preferably with multiple examples (Leggett and Kirchoff, 2011). The original IAWA term descriptions employ this practice to good effect (Wheeler et al., 1989), and the Atlas follows the same example, improving on it in some ways. Approximately 20 pages at the front of the Atlas are devoted to illustrated definitions of technical characters. Using the IAWA classification as a starting point, the authors extend the characters to take new data into account. For instance, Character 2 in the IAWA classification is "Growth ring boundaries indistinct or absent," but this character definition does not differentiate between annual plants with second growth, and plants with no secondary growth. Both types of plants are covered in the Atlas. Because of this, the authors create two new sub-characters (character states): 2.1 "Only one ring (Annual plants)" and 2.2 "Without secondary growth." Character 2.1 is illustrated with 12 photographs, while Character 2.2 is illustrated with six.[1] I am pleased to see this use of multiple illustrations, as my colleagues and I have advocated the use of multiple photographs to document character and character state variation (Kirchoff et al., 2007; Kirchoff et al., 2011; Leggett and Kirchoff, 2011). When multiple illustrations are used in this way, problems with interpreting the meaning of the verbally defined characters are mitigated (Stevens, 1991). In addition to Character 2, many of the other IAWA characters are also refined for use in the Atlas. In this way, the Atlas serves not just as a repository of anatomical descriptions, but also as an updated character and character state reference, similar to the original IAWA publication (Wheeler et al., 1989).

The heart of the Atlas consists of xylem and bark anatomical descriptions arranged by family. Each family chapter begins with a brief summary of the number of species studied, the life forms of the species, and the vegetation zones in which they are found. The opening page also contains representative images of the study species. The body of each chapter consists of lavishly illustrated descriptions of the characteristics of the xylem, and of the phloem and cortex of the covered species. If ecological trends emerged from the study, then these are noted in a separate section. There is also a brief discussion of the previous literature on xylem and bark anatomy of the family. Each chapter ends with a frequency table of characters found in the family. For instance, of the 161 species of the Brassicaceae that are investigated 105 had growth rings that were distinct and recognizable (character 1), 18 had growth rings there are indistinct or absent (character 2), and 36 had only one ring (character 2.1). The astute reader will notice that this tabulation leaves two species unaccounted for. It also leaves open the question of how many of the 18 species that have growth rings that are indistinct or absent also lack secondary growth (character 2.2, which does not appear in the table). These types of discrepancies are perhaps inevitable when dealing with huge data sets like this, though they are always frustrating and one hopes that the authors have taken every precaution to minimize them.

Before going on to some limitations and technical problems with the Atlas, I want to return to the Xylem Database and its downloadable list of anatomical features (Schweingruber and Landolt, 2005-2010). All of the images in the Atlas are available in the Xylem Database, and may be used royalty-free in other publications (Fritz Schweingruber, personal communication). Newly

[1] *A complete (unillustrated) list of the character definitions can be downloaded in a Word document from the online Xylem Database Schweingruber, F. H., and W. Landolt. 2005-2010. The xylem database. Swiss Federal Institute for Forest, Snow and Landscape Research. Birmensdorf, Switzerland. http://www.wsl.ch/dendro/xylemdb/index.php.*

available from the Database (as of April 1, 2011) is a character by taxon matrix in the form of an Excel file with 3357 entries. Each entry row represents a species, while each column contains presence or absence information on each wood and bark character. The wood characteristics are listed by their extended IAWA code, while the bark features are classified according to the new character descriptions provided in the Atlas. This detailed character by taxon information is not available in the Atlas, which only provides summary tables as discussed above. The availability of the full matrix makes it possible to conduct correlation analyses that are not included in the Atlas. Dr. Schweingruber is to be commended for making this data freely available, something that few other scientists have ever done.

Having covered many of the strong points of the Atlas, I now turn to a brief consideration of some of its weaknesses. While the production quality of the Atlas is, on the whole, excellent, the resolution of some of the images has been degraded because of they are oversaturated in the magenta (Fig. 1). Comparison of the published images with those available from the Xylem Database shows that these are clearly production errors, and are not due to the original quality of the images. One expects better from Springer.

A second unusual feature of Springer's production relates to their release of the Atlas through the SpringerLink website.[2] Although Springer offers this book through SpringerLink to subscribing institutions, only the title pages, table of contents, list of abbreviations, and the index, are available online. The whole text of the book is missing from the online version. One wonders at the thought process behind the decision to place the book online, but exclude all of its contents.

While I am very happy with the visual treatment of character definitions in the Atlas, I still feel that more can be done to clarify characters through visual means (Kirchoff et al., 2007; Leggett and Kirchoff, 2011). For instance, the distinction between ring porous (character 3) and semi-ring porous (character 4) secondary growth has always been a matter of degree. How much difference in vessel size must exist between the early and late wood for a species to be classified as ring porous? Neither the IAWA character definitions nor the Atlas deal with this problem. One approach to this seemingly intractable problem is to define the character states based solely on visual criteria. This can be done by creating groups of images that represent the two main categories, ring porous and semi-ring porous. Intermediate states between these two main categories can also be represented by groups of images. In this approach the groups of images themselves become the character definitions. Terms are used only as secondary labels for the groups of images. This procedure is illustrated for the inudentum of oak leaves in Fig. 2. The black (and grey) boxes in this figure represent the character states for this character. These character states are not described verbally, but labeled with letters (A – E) so that they may be easily referenced. The image groups themselves define the character states. In one case, character state E, there are subsidiary states (groups) within the main character state. This subdivision of character state E illustrates the fine type of distinctions that can be made with visual definitions. Using a visual approach it is possible to define characters and character states in very precise ways, yet at the same time show the variation within each state. As visual character definitions are used in practice, new images can be added to the character state groups so that a record is kept of the variation within each character state. In this way it is possible to continually reevaluate the viability of each state as new data (images) are added. It is also possible for new investigators to quickly evaluate the quality of the characters and character states that have been used in previous studies. I hope that method such as this will come into wider use in the near future.

In summary, the Atlas of Stem Anatomy in Herbs, Shrubs and Trees is an important new contribution to our knowledge of stem anatomy, and particularly to our knowledge of the occurrence of secondary growth in so-called herbaceous plants. In addition to completely changing our concept of what it means to be herbaceous, the Atlas provides important information on the structure of the bark in many species that have not been previously studied. Coupled with the information available through the online Xylem Database, the Atlas has to be viewed as one of the most important publications in plant anatomy and morphology of recent years.

[2] *http://www.springerlink.com/content/978-3-642-11637-7*

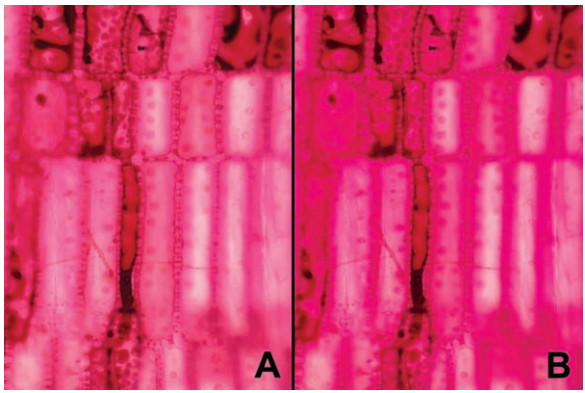
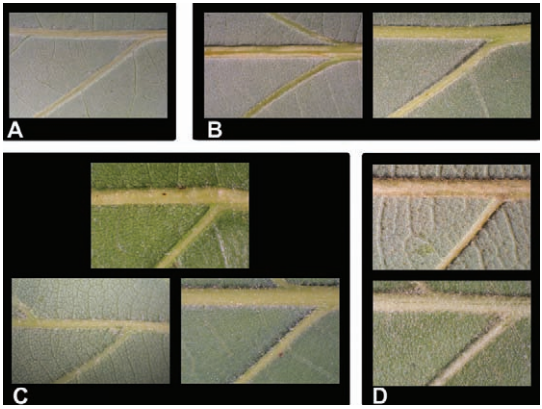
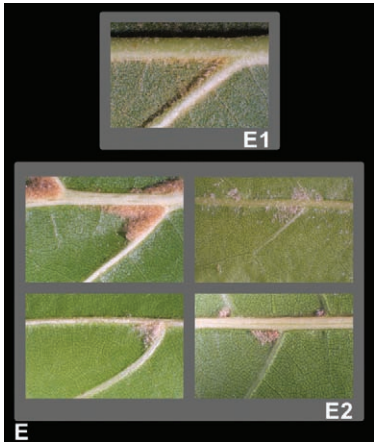


Figure 1: Simulation comparing a normal image (A) with one with oversaturated magenta (B). The fine details (pits, etc.) are obscured in the oversaturated image. The images are from Fig. 6 (Ambroella trichopoda) from the chapter of the Atlas on the Ambrollaceae (Schweingruber et al., 2011). The photograph is of a radial section showing upright ray cells with bordered pits in uniseriate axial rows. To produce the figure the raw image was downloaded from the Xylem Database (Schweingruber and Landolt, 2005-2010), duplicated and brought into Photoshop CS. The RGB image was converted to CMYK, after which a Hue/Saturation adjustment layer was used to adjust the magenta +8 points so that the digital images were as close as possible to the published image in hue. The channel mixer was then used with a clipping mask on the right image (B), and magenta was increased to +114% on the magenta channel. The resulting right image (B) matched the detail that is visible in the printed original.

Figure 2: Visual character description – inudentum on abaxial surface of oak leaves. Character states are defined by the images in each box, not verbally. Inclusion of multiple images is used to show variability in the state. In this example each character state is denoted by a letter (A-E), and one (E) has two sub-states (E1, E2). Species identification follow. A, Quecus alba. B, Q. muehlenbergii (left), Q. macrocarpa (right). C, Q. bi-color (above), Q. prinus (below left), Q. michauxii (below right). D. Q. stellata (above), Q. falcata (below). E1, Q. velutina. E2, Q. schumardii (above left), Q. phellos (above right), Q. palustris (below left), Q. nigra (below right).





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-Dr. Bruce Kirchoff, Department of Biology, UNC Greensboro, Greensboro, NC 27402
kirchoff@uncg.edu

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Ecological

Carnivorous Plants and their Habitats Volumes One and Two.

McPherson, Stewart. 2011. (£34.99 each) 1441 pages, 799 images total. www.redfernnaturalhistory.com

Stewart McPherson, the author of Carnivorous Plants and their Habitats Volumes One and Two, frightens me. This is a good thing, as I work on carnivorous plants, and Stewart's incredible output to date, 8 volumes of 500-plus pages each, is a wonderful motivator. Thank God he's not a physiologist or I soon might not have anything to work on. His work is even more remarkable when one considers the quality (reams of gorgeous and informative photos, eminently readable text, detailed history, current phylogenetic approach, etc.).

These two volumes cover carnivorous plants, first conclusively confirmed to be such by Darwin, in total and in detail. McPherson begins with overall discussions of the history of our understanding of these plants and a general overview of currently accepted groups. He then considers their evolution, associated organisms other than prey, and habitats in a general sense. The various groups of carnivorous plants are considered by the type of trap (e.g. pitcher plants) rather than taxonomically, and, finally, their future, troubled as it is by habitat degradation and loss. The Appendix, Bibliography, and Index round out this two-volume set. The grouping by trap type makes great sense given the similar habitats of plants with similar traps and the way that enthusiasts of carnivorous plants usually think about these green monsters.

This is a very complete work, in many ways the most complete work on carnivorous plants done by anyone, anywhere. McPherson even works in the newly identified carnivorous and barely known genus Philcoxia (there have been no more than a tiny handful of papers on it) with lovely habitat shots and closeups. He includes UV reflection images of various traps to indicate the view that insects receive. He includes many, many genera (briefly) of sub-/proto-/hemicarnivorous plants. The taxonomic discussion is deep and

thoroughly in line with the most current systematic information—and on and on. At most one might niggle at one or two of the hundreds of photos, such as the one or two too-dark images of Darlingtonia in the field, but really one has to hunt for errors or items to negatively criticize. This work is a tremendous accomplishment. It belongs, given the general interest in carnivorous plants and their value in promoting botany to non-botanists and to students, on every university library shelf and on every professional bookshelf. Get a copy today.

-Douglas Darnowski, Department of Biology, Indiana University Southwest

Historical

Catalogue [of the] 13th International Exhibition of Botanical Art & Illustration.

Bruno, Lugene B.
2010. ISBN 978-0-913196-84-7 (Paper US$25.00) 198 pp. Hunt Institute for Botanical Documentation, 5th Floor, Hunt Library, Carnegie Mellon University, 4909 Frew Street, Pittsburgh, PA 15213-3890.

The Hunt Institute for Botanical Documentation, one of top two or three repositories of botanical art in the world, has produced the catalog of their 13th International Exhibition, displayed in the Fall of 2011. Once again, the catalog is worth having if you are at all interested in botanical art, a colorful delight full of both scientific information and aesthetic pleasure.

One interesting change, perhaps related to the maturation of the ongoing renaissance in botanical illustration, is the increase in the fraction of the volume which is dedicated to works other than those created using watercolor or gouache on paper. One often first thinks of watercolor on paper (or perhaps vellum) as the medium of choice for portraying plants—think of Ehret and Redoute, among others. Here, however, there seem to be represented many more works on vellum as well as quite a few more prints of various sorts than in past catalogs from the Hunt. Watercolor pencil also features more heavily than in prior years. These different types of illustrations are not formally set off, but they are, however, mostly grouped together as one proceeds through this work. Some especially striking works, at least to the eye of this reviewer, include the Hawthorne with searingly red fruits (p. 20), the Nasturtiams on p. 23 (though the leaves, as opposed to the flowers, are rather dull), the Iris germanica on p. 108, and the ripe sunflower on the cover, with its strikingly vibrant and warm earth tones. If you like plants as both art and science, get a copy today.

-Douglas Darnowski, Department of Biology, Indiana University Southwest.

Discovering New World Orchids.

Manning, S.
2010. ISBN 978-0-9565594-0-1 (Hard cover, US$96). Published by the author at 4 The Cedars, Nantwich, Cheshire, CA5 5GZ, UK

An old adage and the title of a science fiction novel about the conquest of earth by space aliens I read a long time ago are that when new lands/planets are discovered the three M (missionaries, merchants, military) arrive quickly in the order listed and colonize them. What the adage leaves out is orchid collectors who were among the first to arrive in newly discovered lands on earth in past centuries to explore, collect (we would call it poach and pillage at present) and ship vast numbers of plants (many of which perished en route) to dealers in Europe and the UK. And, as the author of this book so aptly puts it, "Every one of the estimated 25,000 to 30,000 different orchids . . . has a (sic) history . . . those of tropical America carry with them exciting, thrilling, fascinating and at times almost unbelievable stories." Actually orchids from other areas also carry fascinating stories, but this book happens to deal with the Americas.

These stories are associated with the adventurers/collectors who often risked and sometimes lost life and limb (and still do) to find new and rare orchids. The stories of these individuals are not always well known. Or, one has to be steeped in orchids and orchid literature and have access to rare and obscure books and journals to find the stories. Not many have this luxury.

This book, although it emphasized the author's genus of interest, Masdevallia, tells the story of

many collectors, adventurers and some rascals (and their sponsors, antagonists, friends and enemies) who went to the New World (actually mainly Central and South America) in the 1700s, 1800s, and even 1900s in search of orchids. The book is excellently illustrated with new and very old (some of these are fuzzy) color and black-and-white images of orchids, non-Orchidaceous plants, indigenous people, various individuals, schools, houses, graves, grave stones, stamps, waterfalls, mountains, rocks, birds, slaves and masters, flags, coins, steamboats, locales, advertisements, structures and assorted odds and ends.

There are many stories in the book including that of the Czechoslovakian collector Benedikt Roezl, who was tall, bronzed, had a flaxen moustache and a hook in place of his right arm which was lost in a machine. His "dexterity with that curved piece of iron was something to marvel at." Interestingly, a statue of Roezl in Charles Square near the Botanic Gardens in Prague shows him with both arms. Another interesting individual was Benjamin "Ben" Williams whose image in the book suggests that he too may have been an adventurer/collector or even an individual to stay away from. In fact, he was a home-bound excellent writer on orchid cultivation, an orchid grower for a man of wealth and later the owner of a famed orchid establishment. He was certainly not a person to stay away from. Not to be forgotten are the odd kings, despots, sea captains, emperors, empresses, nobles and wealthy individuals who funded expeditions, supported collectors and/or collected and grew orchids. Their pictures and stories are also in the book.

The book is not free of problems. Its design, fonts, use of text boxes, placement and labeling of footnotes, reference to cited literature and the listings of references are unusual and quirky. There are also illustrations which add little or nothing to the book, clutter pages and could, or even should, have been left out. Further, it would have been good to provide the birth and death dates of all, not just some, individuals in the text and/or in figure captions. Such information is not always easy to find, but it is available for many, perhaps most of the individuals mentioned in the book. Should there be a second edition, it would benefit greatly from a professional copy editor and designer.

A comparison with Carlos Ossenbach's two-volume History of Orchids in Central America (Ossenbach, 2008a, 2008b; for a review see Arditti, 2009) is inevitable. Ossebach paints a larger canvas, tells a much broader story and places orchid history in the context of general historical developments. His books are designed more conservatively to good advantage. They are very well illustrated, but contain no color and are produced modestly. This book is more sumptuously produced, has color and is less concerned with general history. Ideally, those interested in orchids and orchid history should read both works because they complement each other.

As a rule self-published books must be approached with caution. Many pursue specific agendas, ride hobby horses and/or are merely ego food. This book is an exception. It is informative, well written, nicely produced and fun to read despite its quirks.

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Ossenbach, C. 2008a. History of orchids in central America, vol. I. Carlos Ossenbach, Sabanilla de Montes de Oca-Horquetas de Sarapiqui, San Jose, Costa Rica.

Ossenbach, C. 2008b. History of orchids in central America, vol. II. Carlos Ossenbach, Sabanilla de Montes de Oca-Horquetas de Sarapiqui, San Jose, Costa Rica.

Bamboos at TBGRI.

Koshy, K.C.
2010. ISBN 978-81-920098-0-3 (paperback)
104 pp. Tropical Botanic Garden and Research Institute, Palode, Kerala, India.

This is a wonderful book on a developing bambusetum, a living collection of bamboo species. The site is part of the Tropical Botanic Garden and Research Institute (TBGRI) in Kerala, India, in the foothills of the Ghat Mountains in the country's southwest. The Garden was founded in 1979 and the bambusetum in 1987. It is the latter's founder, K.C. Koshy, who is the book's author, and his passion for the collection comes through in his description of its development. He began with a small plot of about 2 acres with a handful of species. Over the years, the area has grown to 16 acres with 68 species and 12 hybrids. The growth was thanks to over 900 accessions.

Koshy tells the story of the project in a straightforward fashion, discussing the obstacles encountered and the successes achieved. He notes the advantages of a bambusetum: the accessibility of a collection for scientific study including the flowering cycle, the availability of material for farmers or foresters, and the possibility of studying the other species which form communities with bamboo. He also describes bamboo-collecting expeditions and their fruits.

Among other notes on these plants, Koshy makes clear the major hurdle to studying bamboos: they flower very rarely, and in many cases only once in a life cycle. Since the vegetative forms of many species look very similar to each other, it was difficult for Koshy to even know how many species he had, particularly at the early stages of the project. In addition, such infrequent flowering makes it not easy to create hybrids, though his team has managed to produce twelve, which are all listed here.

Also included are short discussions about the roles a number of botanists played in developing the collection. There is even a short section on the VIPs who have visited the bambusetum, including Ghillian Prance, then Director of the Royal Botanic Gardens at Kew.

Following this introductory material, Koshy then presents the heart of the book, an annotated list of the bamboos species at TBGRI. Many of the descriptions, which include information both on the living plants and herbarium specimens, are accompanied by photographs. There are data here on when the plants were accessioned, on flowering if known, and statistics on length of internodes and the size of leaves. These descriptions are brief and are presented more as lists than narratives. However, they would be useful to those studying bamboos and having some knowledge of the family.

After this section, which takes up about three-quarters of the book, there is information about the TBGRI's bamboo museum and about its nursery. The book ends with a discussion of future plans as well as a list of references, and finally an index to bamboo scientific names.

This 104-page paperback is beautifully produced with many photographs, including a number of full-page ones showing close-ups of particular species as well as views of the TBGRI. The volume was obviously a labor of love for Koshy and for the Garden. It is not a general introduction to bamboos, but it would be a shame if it were missed by someone seeking to learn more about these plants. The introductory material as well as the explanations of how hybrids were developed provide excellent general descriptions. The detailed information on each species would be interesting to an expert, and in the years ahead it will serve as documentation for what this bambusetum held at a particular moment in its history.

-Maura Flannery, Department of Biology, St. John's University.

Flora of China Volume 25 Orchidaceae

Chen Xinqi, Liu Zhongjian, Zhu Guanghua, Lang Kaiyong, Ji Zhanhe, Luo Yibo, Jin Xiaohua, Phillip J. Cribb, Jaffrey J. Wood, Stephan W. Gale, Paul Omerod, Jaap J. Vermeulen, Howard P. Wood, Dudley Clayton, and Alexandra Bell.

Text volume, 2009. ISBN 978-7-03-025533-4/Q-2353.0101, 978-1-930723-90-0 (V. 25), 9278-0-915279-34-0 (entire work), Hard cover, 570 pages, one map, $125.
Illustrations volume, 2010. ISBN 978-7-03-025959-2/Q-2374, 978-1-930723-89-4 (V. 25), 9278-0-915279-34-0 (entire work), Hard cover, 642 illustrations, 666 pages, one map, $175.
Science Press, Beijing, China and the Missouri Botanical Garden Press, St. Louis, MO, USA.

A third of a century has passed since the "ping pong diplomacy" that opened China to the West and China has changed dramatically. Orchid businesses flourish and large international orchid shows which contain many western hybrids and native Chinese species attract huge crowds (Arditti, 2011). Orchid books are published freely (for example, Perner and Luo, 2009). Robust research programs study all aspects of the Orchidaceae and result in numerous publications in international peer reviewed journals. The two volumes under review here deal with the 1,388 orchid species (491 endemic) in China.

As can be expected, a work which covers that many orchids is very large (1,236 pages total). Still, space is at a premium. Therefore descriptions of species are sorted and in most cases do not exceed 130 words. However, they are complete, informative and describe every species adequately. This is accomplished in part by using a concise style and small (I would guess 6-8 point), but easily readable print as well as not providing ethymology for both generic names and specific epithets. These would have been nice to have, but are not strictly necessary. Besides, this information can be found easily on the World Wide Web with a few clicks of a mouse.

Chromosome numbers are included if available. The number of species and their distribution as well as those found in China and endemic taxa are given for every genus. Distribution in China is given at the provincial level.

Also included are Chinese names followed by pinyin transliterations, synonyms, a reference to the original/first description and relevant comments when necessary. I read many (though not all) descriptions in the book. Some were of species with which I was familiar and others that were new to me. In both cases I found the descriptions to be well written, easy to read and satisfactory. A master key to genera is included in the text volume. There are also keys for each genus. I did not have an opportunity to test any of the keys with living plants, but they seem workable.

A vexing problem with the descriptions is that they do not contain references to the illustrations. This would not be a problem if the illustrations were arranged alphabetically, but they are not. They are arranged according to tribes, genera and species. This required hunting through the volume, or referring to the index, both of which waste time. A list of new nomenclature, indexes to Chinese, pynyin and scientific names and plant families in the Chinese flora conclude the text volume.

Some, perhaps most, of the 642 line drawing plates in the illustrations are of one species, others are of two, three or more. Therefore many more species than 642 are illustrated. The illustrations are by 48 artists whose styles are different. This is inevitable in a large work like this one and does not detract from it scientifically, but is unpleasant to the eye. What does detract somewhat is that some of the drawings (page 1 for example) do not show enough detail to be useful and many do not contain scales. The amounts of information, levels of detail and number structures shown in different illustrations also vary. Indexes to Chinese, pynyin and scientific names and families in the Chinese flora conclude the illustrations volume.

This is a major work with a minimal number of minor, perhaps insignificant, flaws which are easy to compensate for, not miss or overlook. One improvement which would benefit a possible second edition would be to place the illustrations next to the relevant species. This would still result in two volumes but it would be nice to be able to look an illustration while reading the description to which it pertains, or vice versa.

-Joseph Arditti, University of California, Irvine.

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Arditti, J. 2011. Conservation through propagation. Orchids 80: 114-116.

Perner, H. and Y. Luo. 2009. Orchids of Huandong. Sichuan National Park, Sichuan Publishing Group, Sichuan Art Publishing House.

Books Received

The Future of the Western Hemisphere, the Next Fifty Years, the Path to Sustainability. Thorhaug, Anitra, et al. (Paper US$25.00) Greater Caribbean Energy and Environment Foundation, Inc. 1359 SW 22 TER, Suite1, Miami, FL 33145.

An Illustrated Guide To Common Plants Of San Salvador Island, Bahamas, 3rd edition Lee B. Kass. 2009. ISBN 0-935909-85-0 ($25.00) 183 pp. The Gerace Research Centre, San Salvador Island, Bahamas.

Late Cretaceous and Cenozoic History of Latin American Vegetation and Terrestrial Environments. Graham, Alan. 2010. ISBN 978 1 930 72368 9 (Cloth US$95.00) 618 pp. Missouri Botanical Garden Press, P.O. Box 299, St. Louis, MO 63166-0299.

A Natural History of the New World. The Ecology and Evolution of Plants in the Americas. Graham, Alan. 2010. ISBN 978 0 226 30679 7 (Cloth US$110.00) 408 pp. University of Chicago Press, 1427 E. 60th Street Chicago, IL 60637 USA.

Pollination and Floral Ecology Willmer, Pat. 2011. ISBN 978-0-691-12861-0. (Cloth US$95.00) 828 pp. Princeton University Press, 41 William Street, Princeton, New Jersey 08540-5237.

RNAi and Plant Gene Function Analysis: Methods and Protocols. Kodama, Hiroaki; Komamine, Atsushi (Eds). 2011. ISBN 978-1-61779-122-2 (Cloth US$119.00). Humana Press. 333 Meadowlands Parkway, Secaucus, NJ 07094.

Spatio-Temporal Heterogeneity: Concepts and Analyses. Dutilleul, Pierre R. L. 2011. ISBN 978-1-107-40035-1 (Paper US$57.00) 393pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

News from the International Botanical Congress

Botanists have brought plant taxonomy into the 21st century. The international botanical code was amended to allow on-line publication of new species, rather than solely print publication. Furthermore, the plant description may now be either in Latin or English. (Yes, scientific names remain in Latin.)

The immediate response in Nature 475: 424 "Zoologists should follow botanists…"

Botany 2011
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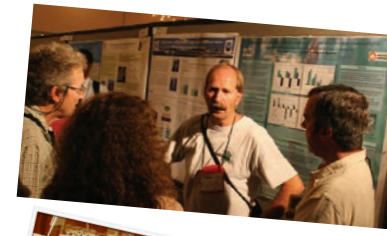
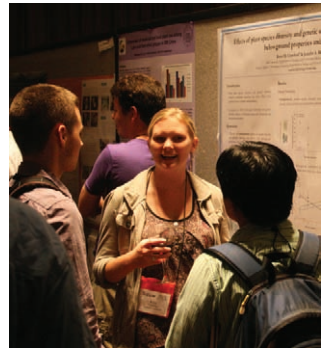
St. Louis, Mo - July 9 - 13





Scientific conferences are not actually about the science; they're about the people who do science. You can learn about the science of botany from published papers and books, but you can only learn about the people who do the science of botany by attending botany conferences
-Dr. Joseph Armstrong, member, Botanical Society of America

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Editor
Department of Biological Sciences
Emporia State University
1200 Commercial St.
Emporia, KS 66801-5057
Phone 620-341-5605
psb@botany.org

The Botanical Society of America is a membership society whose mission is 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.

Botany in Action!

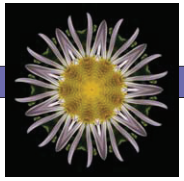
At Botany 2011 a group of enthausitic botanist volunteers braved the sweltering St. Louis heat and gathered to help support the efforts of Gateway Greening, the non-profit organization promoting urban neighborhood gardening.

Gateway Greening is a non-profit organization celebrating 27 years of promoting urban neighborhood vitality and stability, healthy living and quality of life through community food projects, education and wellness programs and civic greening.

Gateway Greening forms alliances with non-profit organizations, faith-based institutions, institutions of higher learning and neighborhood groups to provide resources for citizen-managed open spaces that encourage healthier, safer and more enriched lives. Gateway Greening provides the resources and knowledge that enable them to develop food-producing gardens and landscaped areas on public land. Gateway Greening also works with area schools and institutions of higher learning to bring gardening programs into the classroom; educating children on the wonders of gardening.

This first time event at a Botany 2011 was a major success and one that we hope to continue at future conferences—the spirit of giving back to our host cities!

Much more about Botany 2011 in future issues of the Plant Science Bulletin.





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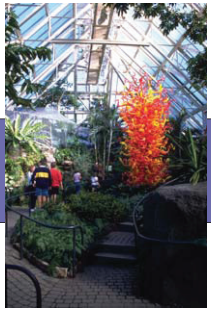

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