PLANT SCIENCE BULLETIN

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

WINTER 2006 VOLUME 52 NUMBER 4

ISSN 0032-0919

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With this issue we wrap up our 2006 centennial year and look forward to a bright future for botanists. In the News from the Society section we summarize, or provide a transcript, of several of the major addresses from the Centennial Meeting. We cannot do justice to Roger Hangarter's Keynote Address from the Education Forum, but he provided a number of web addresses featuring some of his spectacular multimedia collaborations. Roger is an officer in our sister society, the American Society of Plant Biologists, and next year for the first time in three decades, we will be meeting together in Chicago - - a true congress of American botanists. In his Presidential Address, Chris Haufler provided an overview of botany and the Society during its long and distinguished history and proposed a theme of "Growing Together," even though "It's not easy being green…" Peter Raven, in his opening remarks at the discussion session on Building for the Past, Providing for the Future, highlighted the exciting directions for botanical research as we move into the 21st century.

Each of these speakers acknowledged the critical importance of educating the public about the essential importance of plants in the world. There are many ways to do this, but in our lead article we highlight the recent success of Dan Gladish at the Hamilton Campus of Miami University, Hamilton, Ohio. I was excited! Imagine what might happen if each of our campuses had a similar botanical impact on the local community. Let's keep that in mind when we start thinking about "New Year's resolutions" for 2007.

- editor

Erratum

In the previous issue Karl Niklas was inadvertantly omitted from the list of recipients of the Centennial Award. The following photo is proof that Karl is alive and well and a recipient of the Centennial Award.

Karl Niklas (left) receiving Centennial Award from Peter Raven.

Letters to the Editor

Follow-up to: Crime Solving Plants in Plant Science Bulletin (vol. 53, no. 3). I very much enjoyed reading the article by Shirley Graham on forensic botany in the Fall, 2006 (vol. 52, no. 3), issue of the Plant Science Bulletin. I whole-heartedly concur with her assessment that specialists in key disciplines essential to forensic botany "are relatively few in number, and aging, and younger replacements are increasingly rare."

I am one of those aged, rare birds who has combined an academic career with frequent forays into

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Published quarterly by Botanical Society of America, Inc., 4475 Castleman Avenue, St. Louis, MO 63166-0299. The yearly subscription rate of $15 is included in the membership dues of the Botanical Society of America, Inc. Periodical postage paid at St. Louis,MO and additional mailing office.

POSTMASTER: Send address changes to:
Botanical Society of America
Business Office
P.O. Box 299
St. Louis, MO 63166-0299
E-mail: bsa-manager@botany.org

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forensic science using my professional skills in wood anatomy and wood deterioration. Over the past 30 years, I have been an expert witness in murder trials, accidental injury and death cases, other kinds of lawsuits and numerous non-litigation wood analyses for industrial engineering firms, pulp and paper companies, wood product manufacturers, museums, etc. Many of these cases have allowed me to expand my consciousness into fields for which I previously had only cursory knowledge. Certainly, the forensic cases have brought me new insights into the practice of law; and it is that aspect that I wish to expand upon here - - as a cautionary tale for any botanists venturing into this field.

The old saw that "you can prove anything with [selected] statistics", fits for lawyers who can "prove" their case with selected evidence. I find it to be a prudent tactic to have an initial consultation with potential law firms prior to accepting an assignment in order to assess whether the analysis I can provide will be of any objective value in the case. This lets me develop an analysis that should withstand cross-examination scrutiny in a trial. This approach has, for at least the past three decades, allowed me to serve on the side that prevails. Unfortunately, several decades ago when forensic science was in its infancy, unscrupulous lawyers or even government agencies could easily distort forensic science evidence. A case that may support this contention is the one that is the lead example in Shirley Graham's article - - the famous Lindberg kidnapping case.

In January of 1981 I was contacted by attorney Robert R. Bryan who was representing 82-year-old Anna Hauptman, wife of Richard Bruno Hauptman (that is the correct order of his name, despite the reordering done by prosecution and others to highlight his Germanic origins in the post-WWI era of the 1930s).

Due to federal legislation, known as the Freedom of Information Act, documents relating to the 1936 trial that had been previously unavailable were now in the public domain. Anna Hauptman believed that her husband was innocent of the crime for which he was executed, and her lawyer, in his words, was "reviewing over 90,000 documents and other items previously suppressed by the New Jersey State Police." A key piece of evidence, as noted by Shirley Graham was the ladder left at the Lindberg home the night of the kidnapping. Forty-five years after the trial, this ladder was still in the possession of the New Jersey State Police (NJSP). I agreed to analyze all of Arthur Koehler's documents and we hoped that I would eventually be able to re-analyze the ladder.

Let me first attest to Dr. Koehler's standing as an expert in wood structure. In the mid 1930's Koehler was, as I wrote in 1981, "one of the few persons capable of doing a thorough wood analysis." In 1924 he had published the well received text "Properties and Uses of Wood", (McGraw-Hill). His very high standing in the field would have made it difficult for Hauptman's defense lawyers (had they even had the resources or inclination) to find an equally qualified expert to counter any claims made by the prosecution. This lack of depth in the field - - a problem facing us still - - often gives the law firm that finds the top expert unfair advantage during a litigation. I mention this to further bolster the remarks made by Shirley Graham.

In going through Koehler's documents and testimony, I was impressed with the thoroughness of his analysis. It is true that he sometimes speculated beyond his data ("the board, therefore, might have been in use for a purpose, like shelving, in which, it did not suffer injury"). Under today's trial procedures, such speculation would be challenged and might weaken the credibility of the expert witness. However, this was not an issue in 1936 and in any case is only a minor quibble. The critical piece of evidence was the portion of the ladder (rail 16) that Koehler eventually matched to a sawn out board from the attic in Hauptman's house. A key bit of information that is left out of the many stories written about Koehler's analysis of the ladder is the time scale. Yes Koehler may have "alerted authorities to look for a missing board", but the N.J.S.P. had been in possession of the ladder since the kidnapping, and they had searched Richard Hauptman's house and garage several times prior to his arrest. At any of those times, they could have taken a board and "doctored" the ladder.

During the investigation, the N.J.S.P. refused to share any information with the F.B.I. (too long a story to delve into). An F.B.I. document of May 26, 1936 (reportedly withheld from the court proceedings) stated "The identification of the wood in the ladder, resulting in the opinion that the wood in the attic of Hauptman's residence was identical with that of the ladder was developed subsequent to the withdrawal of the Bureau from an active part in the investigation and occurred <u>after</u> the New Jersey State Police had rented the Hauptman residence." Even before the rental, the house and garage "had been searched at least nine previous times."

Koehler also testified that "a comparatively dull plane" had been used on rail 16 and two rungs. A N.J.S.P. officer "discovered" the dull plane to match the marks on the boards on a shelf in Hauptman's garage.

Some bits of evidence don't square with Hauptman being the maker of the ladder. Richard Hauptman was a skilled carpenter. In fact, he had cabinetmaker skills as evidenced by a custom wooden trunk he had built for his car. Yet, Dr. Koehler wrote in his report "the construction of the ladder in general is very crude, showing poor judgement in the selection of the lumber and in the design of the ladder, and poor workmanship. For a job that was to pull down $50,000, [the ransom demand] it showed poor foresight." Another logical question one might ask is why would a carpenter go to his attic and rip up and saw out a floor board to make a ladder. He clearly would have plenty of easier ways of getting some wood. I could elaborate on the many other aspects of the investigation and trial that would fail to meet judicial standards of today, but since these don't relate to the ladder, I will forego that discourse.
In the end, although I was permitted to revisit the N.J.S.P. headquarters, and saw the famed ladder, I was not allowed to do any forensic analysis, and, therefore, withdrew from the case. So, despite the books and T.V. documentaries that have argued the probable innocence of Hauptman, we will likely never know the truth of his guilt or innocence. The caution here is that the ladder evidence in the Lindberg case, or any other trial evidence, can be cleverly used or misused, to tip the scales of justice for good or ill purpose.

In the Hauptman case, the press and public had already convicted him before he entered the "show" trial of the century. So, in real life, not all cases are neat and tidy as portrayed on CSI or other TV dramas. Nevertheless, forensic science has proven to be a fascinating part of my career in botany, and one I plan to continue upon my University retirement.

-Richard Jagels, Professor of Forest Biology, University of Maine

The Conservatory at MUH and the 4th Grade Project

The Hamilton (Ohio) Campus of Miami University (MUH) recently celebrated the first anniversary of the opening of its botanical conservatory. In celebration of this, it seemed appropriate to share with members of the Botanical Society of America our excitement about this "growing" success, and how we are using this opportunity to increase interest in plants and the plant sciences in our region, especially for students of all ages.

The initial idea for a "Plant Collection Center" to be used by students in botany classes at Miami University and as a resource for K-12 education was proposed by me in 2002 as part of a capital improvements campaign. A Hamilton businessman and philanthropist, Richard Fitton, and his wife, Rebecca, showed an interest in supporting the project, but indicated that they thought the idea was too modest. An expanded concept was developed and approved by MUH staff and administrators.

The Conservatory
Beginning in 2003, a series of meetings involving architects, contractors, MUH administrators, the donors, and myself resulted in plans for a much expanded and architecturally distinctive structure, large-scale artwork, formal gardens, a grove of native trees, and expansion of and improved trails for our pre-existing demonstration tallgrass prairie "garden," which was planted by volunteers in Spring of 2001. The Fitton family ultimately agreed to donate $3.65 million for the project, which also included an operational endowment and funds for a graduate assistantship. Mr. Fitton requested that it be named simply "The Conservatory." The Miami University Board of Trustees gave final approval in April, 2004. The groundbreaking was Sept. 1, 2004. Construction was completed in mid-September, 2005, and landscaping around The Conservatory

began. Most unfortunately, Mr. Fitton did not live to even see the groundbreaking.

In the meantime, Dr. Richard H. Munson was hired as Manager of The Conservatory in September, 2004. Together we planned the acquisition and layout of our collection of exotic plants and gardens, and, once the climate control systems were functional, we began acquiring plants. Because we had only 2.5 wk before the dedication ceremony, we took advantage of every commercial retail and wholesale dealers of exotic plants (especially Tropical Foliage, Inc. and Tristate Foliage, Inc.) in the Cincinnati area to get our initial specimens. Most of these were interesting plants of good quality. Later, when events began to proceed at a more sane pace, we acquired plants as gifts from our good friends at Krohn Conservatory in Cincinnati, from Bill Hendricks at Klyn Nursery in Perry, OH, and from Tim Metcalf and Ernesto Sandoval at the Botanical Conservatory of the University of California at Davis (my Alma Mater), who have been especially generous. We also purchased a number of plants from the Glasshouse Works in Stewart, Ohio. Our students, colleagues, and volunteers have brought plants and seeds to us, notably from the State of Florida, Puerto Rico, India, and Gabon.

The Conservatory has seven "zones" for its collection. Externally we have display gardens, including a plaza with formal gardens (which currently are planted with 60% native plants or their cultivars), a herb garden, and a vegetable garden. We also have the aforementioned prairie (all-native to Ohio except for the weeds), and the nascent native tree grove with many specimens yet to be planted (we are growing many of them from seed). The Conservatory structure itself is about 7000 ft^2 with 5200 ft^2 under glass. There is an atrium where our large, arborescent specimens are displayed, a tropical room, a desert room, and a "horticulture" room for cultivars and hybrids. A separate service wing is devoted to research, instruction, propagation, and student class projects. We also have a meeting room that can seat 30 and a headhouse that contains workspace, office space, equipment such as boilers and a reverse-osmosis water purification system, and our computerized climate control system.

Currently the doors are only open to the public a total of 18 h/wk, but we hope to expand those hours soon as our volunteer group grows. On the other hand, we give guided tours to school classes and civic groups by appointment. In addition to visits by our various biology classes, faculty of art, photography, and writing classes are taking advantage of the facility. We are most proud of the relationship with have begun with the Hamilton City School District, which includes our new 4th Grade Program.

The 4th Grade Program

An examination of the Ohio State Science Standards revealed a surprising fact: the only grade in which plant biology is featured specifically is the 4th. Although this was pretty disappointing, we decided to "make lemonade" by developing curriculum for the 4th grade. Prof. Elisabeth Schussler, who has written articles for Plant Science Bulletin and other periodicals on the subject of "plant blindness" (the widespread problem in our society of being unaware of plants in general and their importance in the environment), is now a member of the Miami University Botany Department. She joined us in this important effort to raise awareness about plants in children.

The program initially involves six Hamilton elementary schools and will be expanded pending assessment of the outcomes. It has a classroom component managed by the classroom teacher, a laboratory component managed by the District's Science Specialist, Terry White, and a conservatory component managed by me. Beth Schussler made sure that each component addressed the state standards specifically so that teachers would be attracted to the program despite the current political climate, which emphasizes testing and "accountability" in a punitive way.

The classroom component focuses on plant growth, plant reproduction, and the scientific method and takes advantage of a commercial product from Carolina Biological Supply Co., the "Plant Light House™" and *Brassica rapa* cv. 'Wisconsin Fast Plant®' as the subject plant material. Each classroom in the initial program received a complete "lighthouse." Each "lighthouse" is a white plastic chamber, 42x42x52 cm in size, with one open face. Each is equipped with a compact fluorescent lamp whose height can be adjusted. In each chamber are two water reservoirs that provide moisture by capillary action for 16 small plant growth cells containing conventional potting soil and one Fast Plant. Each classroom also received deceased bees and applicator sticks from which the students fashion "bee sticks" for manually pollinating half of their plants. The students will later evaluate the effectiveness of their pollination efforts by counting fruits and seeds from the two groups of plants. The teachers will take this opportunity to discuss scientific method. In addition to the above, which was sponsored by the office of Barbara Fuerbacher, the Assistant Superintendent of Schools, I provided basic information about plant morphology that the students could use while examining their plants and flowers.

After the children had been working with their "lighthouse" plants for a while and have had a chance to observe their plants growing and flowering and to learn some morphology in the classroom, they will visit the MUH Campus for a day for the other two program components. Upon arrival at MUH the students are to be divided into two groups. One group goes to a plant biology teaching laboratory where Terry White guides them through the dissection of flowers with an accompanying discussion of plant reproduction and the mutualistic role of pollinators. The other group goes to The Conservatory for the "Plant Treasure Hunt Game" where they exercise their descriptive powers and communication skills.

Before the game starts, there is a free question session. Then the students choose partners. Each student gets a writing tablet and pencil and is invited to choose one of the collection rooms in The Conservatory (different than her/his partner), to find an interesting plant in that room, and to write a detailed description of the plant using botanical nomenclature as much as possible - but omitting the name, of course. They then trade papers with their partners and search their partner's room to try to find the respective plants. If they have difficulty they may consult with their teacher or me, or they may ask their partner to provide more information. When they think they have found their mystery plants, they consult their teacher or me and write down the binomial on the description and get it initialed by the adult. The partners then choose another room and go through the process again. The team with the most plants correctly identified at the end of the approximately one hour period wins the game, but everyone gets a sticker with The Conservatory logo that says, "I hunted exotic plants at MUH," their notepad, which likewise has our logo on it, and a packet of Ohio native prairie wildflower seeds, so everyone is a winner.

We did this for the first time this past Tuesday, October 10th. It was a huge success. The children were very excited about every aspect of the day. I was bombarded with questions the entire time. The winning teams in the treasure hunt correctly identified 12 and 15 plants, respectively ... and we had enough time left in the day to go for an "explore" in the tallgrass prairie afterwards, where they began to satisfy what appeared to be an insatiable curiosity about spiders. It was a day to be remembered by all of us. I hope I shall have recovered sufficiently by this coming Tuesday to take on another group of 40-50 nine-year-olds. Furthermore, I can tell you that my respect for elementary school teachers has been thoroughly renewed.

By Daniel K. Gladish, Assoc. Professor of Botany and Director of The Conservatory

News from the Annual Meeting

Communicating an Awareness of Plants through Science and Art

Education Forum Keynote Address

Roger P. Hangarter, Indiana University.

"This is how I used to teach phototropism in plant physiology" (A traditional lecture and demonstration lab). So began Roger Hangarter's forum address on the evolution of "sLowlife," his award-winning multimedia presentation that opened at the National Botanical Garden in October, 2005 and ran through March, 2006 (it will be in Chicago in 2007). www.slowlife-exhibit.org What changed the way he teaches is when he took his Webcam, originally used for research on tropisms, and "turned it on the students." His students had "absolute total amazement that plants move!" Hangarter asserts that this shouldn't be such a great surprise for students. After all, in Lord or the Rings, Tolkein created talking, moving trees, the ENTS, that behaved like perfectly sensible individuals - - providing you observed them following their maxim – "Don't be hasty!" The key to filming plants is "You have to watch the plants and know what they do before you start filming."

Hangarter's original black and white time-lapse videos formed the core of his fascinating "Plants in Motion" web page http://www.bio.indiana.edu/~hangarterlab/. Today, students make similar images of their own as class data and digitally analyze the motion they observe. The images on Hangarter's page are downloadable and may be used in your own Power Point presentations for classes!

Originally this web page was set up for students, but Hangarter also began receiving emails from artists, including Dennis DeHart, an artist on the faculty of the State University of New York at Buffalo. The seeds of "sLowlife" were planted!

According to Hangarter, the "sLowlife" exhibit was designed to be "an exercise in subliminal education" demonstrating first, that plants are alive, and second that plants respond to stimuli. Upon entering the exhibit, visitors are confronted by a screen with 101 panels of *Arabidopsis* plantlets, about 10% of which are in motion at any one time. Random panels are periodically replaced by graphs of published data describing the movements - - a new kind of "abstract art." This introduction may be subtitled "twist and shout" (be sure to check Hangarter's web page to see what the Science Museum of Minnesota did with images of these "dancing plants!")

Visitors are next confronted by a panel of classical still life paintings – an artistic favorite because, as the artist Georgia O'Keefe noted, "plants don't move." But what? The cut tulips in the center start to move!! Hangarter also worked with the IU music department to compose an appropriate sound track. Specific tones were assigned to data from actual research spread sheets describing the plant movements. The resulting score accompanies the video image.

Phototropism in corn is the subject of the "Sensing and Responding" panel. Here the exhibit pays tribute to Darwin's *The Power of Movement in Plants* with diagrams and explanation of how Darwin plotted the nutation movements of growing scarlet bean plants. (Hangarter suggested that morning glories work very well for students trying to replicate Darwin's work).

In the section on "Orchestrating", timelapse photos are used to illustrate the complete lifecycle of *Arabidopsis* from seed to seed. For "Microprocessing" tobacco cells are used to illustrate ultrastructural movements associated with cell division. "Unseen Acts" shows the growth of roots, both elongation and branching, through agar medium, and "The Power of Plants" uses contributed still images to represent what "power of plants" means to different artists.

Finally, "Photosynthesis" is a memorial to how plants "concentrate all that dilute stuff - - CO_2." Standing on a pedestal in a classical Greek temple is a flask of chlorophyll extract, illuminated by fiberoptic light and fluorescing red. The effect is an artistically striking composition with an underlying message of the significance of plants for life on earth.

As an encore, Hangarter presented the short web version of his award-winning movie on the 2004 episode of the 17-year Cicada cycle. (A botanist – produced and filmed documentary funded in part by an NSF grant to another botanist – Keith Clay!) This clip is also available on the Hangarter web page.

For a brief biography of Roger Hangarter, see http://www.2006.botanyconference.org/EducationalForum/Roger.php

-Marsh Sundberg

A Century of "Botanical Opportunity:" Building on the Past, Providing for the Future

Presidential Address

Christopher Haufler, University of Kansas

As I was pondering appropriate words to accompany this evening's festivities, I thought back over the time that I have been attending Botany Banquets, and realized that I have been present for about one-third of the 100. Thinking back over the more than 30 banquet addresses that I have enjoyed, I found that they could be placed into three overlapping categories: ***Reviews***, ***Overviews***, and ***Previews***. Reviews generally provide a historical perspective on a topic or event or field – how we reached the state of understanding that we have. Overviews develop a set of commentaries and contemporary understandings of a field – they provide us with a snapshot of a discipline or they place a field into context with a discussion of the latest findings. Previews generate ideas for the future and make forecasts for the course of our science. Some recent examples illustrate the different kinds of addresses to which we have been treated. For his banquet address in 1986, Ray Evert delivered a review of the life and contributions to science and education that Kathryn Esau made. In 1998, Carol Baskin reviewed the 30 years of meetings she had attended, the fun she had at meetings, and the new perceptions, knowledge, and friends she had gained in the process. In 1999, Doug Soltis gave an overview of the enormous impact that DNA sequencing had made on understanding plant phylogeny, and emphasized the distinct teamwork approach taken by botanists in developing and analyzing these data bases. In 2002, Scott Russell gave an overview of both the state of the BSA and of his explorations of sexual reproduction in plants. In. 2003, Linda Graham showcased vertical studies of two liverwort species and gave a preview of how we should be considering the way that organisms can be used as the focal point for bringing different methods to bear on a series of open questions, from the molecular to the ecological level. At the 2004 meetings, Alison Snow suggested ways that botanical topics can be promoted in the popular press, and showed how the public can be made aware of the progress of research and education involving plants.

But has this been the pattern since the origin of the Botanical Society? To discover what the founders presented after their banquets, I consulted the archives. Probably to no one's surprise, what I discovered is that even my most distant predecessors also offered Reviews, Overviews, and Previews. Originally, it was the retiring president who gave the banquet address, and some of these provide fascinating glimpses of the state of science and the society at the time. They also demonstrate how little we have progressed, and yield some clear perceptions of the personalities of our founding fathers (and they were all fathers – the first woman president of the BSA was Margaret Clay Ferguson in 1929). For a review, we can look at the address that Lucien Underwood gave after the second BSA banquet. Underwood reviewed "The Last Quarter – a reminiscence and an outlook". Using strong language (that seemed to be his trademark), Underwood emphasized how far the science of botany had come in 25 years. At the same time that his remarks are historically valuable, the realization that little has changed over the past 100 years can be quite depressing. Consider Underwood's observation that at the end of the 19th century, "Evolution was some unholy doctrine about monkeys that contradicted the bible." Sounds scarily familiar today, doesn't it! He also noted that, "scarcely anyone looked at botany as a serious subject." It was "a harmless elective at misses' boarding schools." What Underwood was reviewing at the start of the 20th century has returned as a feature at the start of the 21st century. History does repeat itself, perhaps especially in science.

As an example of an overview, consider that of Robert Harper, a professor at the University of Wisconsin whose specialty was the study of coenobic algae. In particular, he focused on the development of the cellular network in the genus *Hydrodictyon*. Developmental processes were debated and the hypothesis of preformation and epigenesis were still in vogue. While acknowledging that what appears to be demonstrated by these algae may not hold in more complex organisms, he showed that regeneration of the growth form of the algae did not require one to assume pre-formed organization in the egg.

The preview I will feature is the very first Botany Banquet address, given by retiring president William Trelease. This address provides perspectives on the origins of the BSA and shows both how little has changed and how far we have come in the past century. In his address, Dr. Trelease sought to reach out to "the large and growing number of young botanists who may be expected to look to this society for a certain amount of help and inspiration," and I would like to do the same this evening.

In expanding his topic of "opportunity," Dr. Trelease divided his comments to focus on opportunities for institutions and opportunities for individuals. The rule at this point in history appeared to be that colleges and universities were primarily places of learning, not research, and museums and botanical gardens focused on displays rather than discovery. Trelease predicted that, "we have before our eyes the spectacle of a gradually unfolding class of institutions in which investigation is not only tolerated but expected." He noted, however, that to provide the opportunity necessary to generate an atmosphere conducive to research, investment in equipment would be necessary. Although many institutions had equipment devoted to helping students learn, more specialized instruments were necessary to generate opportunities for innovative research. Trelease also recognized that the nature of scientific equipment was changing saying that equipment for research experimentation "should be regarded as transient, perishable material." This seems pretty forward thinking for the time, and it certainly holds true today.

In his address, Dr. Trelease provided perspectives on the resources available to promote research in botany, and suggested what future progress was likely. Even at that time, Trelease found it necessary to compare basic and applied science, and show how studies in fields such as botany relate to more marketable enterprises. He said, "nearly every great manufacturing or commercial advance has grown out of a succession of obscure discoveries made by the devotee to pure science." Another important "opportunity" that Trelease identified was the herbarium, as well as the capacity to invest in living collections to provide researchers who anticipate working with plants. Wisely, Trelease recognized that living collections could only be modest in size and transient, devoted to a particular project for a defined amount of time. Coordinated with the availability of living collections, Trelease opined that research institutions will need to provide, "very liberal opportunities for its staff to visit even distant regions for the study, in their native homes, of plants which cannot be cultivated."

Addressing the individual, Trelease thought that researchers should be broadly trained, and should use that broad foundation as a basis for thoughtful specialization. To the students in the audience, he stressed the value of comprehensive training across the sciences. Trelease emphasized that, "the student cannot afford to devote more than about one-half of his undergraduate time to a single study like botany." He noted such training should provide "for a lifetime of more or less uninterrupted opportunity for unearthing the wealth of discovery."

Despite recommending broad training, even a century ago, he saw that the expanding wealth of information could be debilitating, and individual research agendas needed to be focused and narrow. He also emphasized that a brick-by-brick approach to building the research edifice was more profitable and successful than trying to discern the next great breakthrough and hoping for giant leaps of research progress.

Summarizing what Trelease saw as botanical opportunity as the Botanical Society of America was launched, he stressed the need for institutions whose main mission was research. In such places, facilities to produce and house specialized equipment for modern research would be provided, and funds would be available to support research efforts, including both field and laboratory components. Trelease also saw a great need for training new generations of botanists. He emphasized that the best scholars were those that were broadly trained and who were taught to think critically. He saw that one of the best ways to foster the kind of learning that would result in excellent new botanical researchers was for current researchers to bring their expertise into the classroom. Clearly Dr. Trelease made good sense and his view of the future was insightful and forward thinking.

One of the elements that Trelease did not see was the impact that breakthroughs in research technology and analytical methods would have on shifting the direction of knowledge accumulation. He was correct in thinking that in biology the availability of dramatically different new questions was not likely, but burgeoning new techniques that allowed different approaches to answering those questions did keep changing the way that knowledge accumulated, and provided often dramatic new answers to old questions.

Trelease also missed how the explosion of new research institutions would promote increasing specialization in plant research. As more and more different ways to approach the study plants were discovered, it was no longer possible to establish a comprehensive understanding of botany writ large. In fact, a prominent element of scientific progress during the 20th century was the disintegration of botany. The amalgamation of fields and societies that became the Botanical Society of America a century ago (including the Society for Plant Morphology and Physiology and the American Mycological Society) demonstrated early on that there were different perspectives and approaches to the study of plants. What began as a joining of forces to provide a united force for the future did not last.

When the BSA was founded, degrees at major institutions were offered in Botany, Zoology, and Microbiology (then called Bacteriology). With an increase in the number of research scientists, knowledge about the biological world expanded. However, as the accumulation of data exploded, so did the field of botany. More and more groups splintered from the original BSA, and that trend continues. Today, accepted fields in biology include cellular, molecular, developmental, genetical, evolutionary, ecological, and other disciplines: at the same time, degrees in botany have become rare.

A second trend that pervades the first century of the BSA is the search for the "magic bullet," the ultimate technique that will provide answers to life's persistent questions. Beginning with the visualization of chromosomes and the study of meiotic behavior, chromatography and electrophoresis allowed biologists to study the micro and macro molecular composition of plants. Today's reigning "magic bullet" is nucleic acid sequencing. The emergence of these techniques spawned new disciplines as well – how many Departments of Molecular Biology do we have in the country today, departments that are based on a technique, not a discipline or a set of organisms? This trend can have the adverse effect of changing biologists into technicians rather than allowing them to be creative scholars. Fortunately, institutions that have protected a more whole-organism approach have thereby maintained a focus on "question" oriented approaches to research.

Part of the problem that botany has faced relates to the organisms themselves. Plants do not have soft fur and big brown eyes, and (except for carnivorous plants) lack the "oh, gee, wow!" factor that many animals possess. Thus, botany has always attracted fewer undergraduate majors than Zoology. Even at the level of public awareness, our neighbors are simply less well informed about the sophisticated science that botanists perform. When someone says "botany," the regular reaction is to see a hobbyist who identifies wild flowers rather than a serious research scientist. Zoology is a much "cooler" topic; even the most renowned botanists are often seen as the "nerd" scientists, and are not accorded the same prestige as scientists who work on animals.

As the 20th century progressed, botany faded as an acceptable field at major research institutions. Looking back at the early part of the 20th century, botany was one of the primary subjects that attracted students to biology. But by the middle of the century, botany began to disappear as an undergraduate major and an academic department. To be fair, so did Zoology. Biologists currently in control of disciplinary nomenclature appear more comfortable tied to disciplines such as biochemistry, genetics, ecology, or systematics than focusing on any one set of organisms.

For much of the 20th Century, the BSA tracked the fortunes of the field of botany, building strength through the middle of the 20th century, and showing disturbing plunges in membership in the 1970s. In the last 20 years of the century, as more and more fragmentation and splintering of biology continued, the BSA has assumed a role as a coordinator of botanical research and teaching. By pulling together national and international botanical endeavors, the BSA retained lost momentum, rechanneled its outreach and synthesis efforts, and emerged more stable and ready for the new millennium.

At the start of the 21st century, biology continued its headlong charge toward greater specialization, and there is even more pressure for coordination and integration. Consider just one topic, specializing on the cellular details of plants. My survey indicated that there are now at least five professional journals that seek research publications on the study of plant cells: (1) *Plant cell,* (2) *Plant, cell and environment,* (3) *Plant cell reports,* (4) *Plant and Cell Physiology*, and (5) *Plant cell, tissue and organ culture*. I'm not trying to pick on those who study the plant cell, but there seems to be more call than ever for the BSA to continue and expand its role as an umbrella society dedicated to keeping the focus on the forest, even though the number of trees just keeps getting larger.

In the last section of my address, I will develop some observations and suggestions on ways that botany and botanists might adapt to the future. Given my emphasis so far on the culture of biology and our society, I will comment on two general aspects of research and make some observations about the role that plants may be able to play in education.

My comments so far have emphasized general trends in the way that botany and the study of plants have changed through the last century, and the observations and suggestions I will make are similarly broad. Focusing first on research trends, I'd like to think we have disintegrated biology far enough and it would be best if we could find more and better ways to generate more integration. Toward this end, botanists could promote the organism as an organizing principle in achieving integration of the many and varied lines of evidence that have developed. In part, of course, this is an ongoing activity. Whenever we revise our hypotheses about the trajectory of morphological change in response to new insights from DNA sequence data, we are coordinating these two lines of inquiry. But it seems to me that we could expand the extent of this coordination by placing the whole organism at the center and capitalizing on the ways that organisms contain and connect the many approaches and lines of evidence that have been accumulated.

Consider, as a "random" example, a fern. Its distinctly different life history stages (gametophyte and sporophyte) compartmentalize different aspects of the physiology, development, and reproductive biology of the species and allow these perspectives and processes to be integrated in providing a full picture of the organism. Considering the whole organism can also provide links between ecological pressures that yield adaptational change and systematic perspectives on the history of the species. From these studies emerges a well-explicated and integrated view that knits together the many specialized components, from genetics and cellular details to ecological responses and phylogeny. Such an integration demonstrates well how the component approaches benefit from shared knowledge, e.g., how an understanding of phylogenetic relationships can help to interpret apparent adaptations and put physiological features and developmental stages into historical context.

Turning from "vertical" integration across different elements of an organism to "horizontal" integration within a discipline, it would appear that some disciplines lend themselves particularly well to bringing together contributions from disparate sources. Consider **development**. This discipline focuses on the transmission and expression of information from its source in DNA to its ultimate display as a fully functional organism. No wonder that developmental biologists consider themselves as geneticists as well. Integration of this kind is vital if we are to understand and explain how organisms are more than just a sum of their parts.

In a similar way, **evolution** is also a remarkably integrative discipline, encompassing studies at the nucleotide level, the individual, the population, the species, and, ultimately the classification of life on earth. But very few (if any) evolutionary biologists are able to integrate the full reach of evolution, and once again I recommend that we consider ways to take advantage of the breadth of disciplines like evolution to develop more fully rounded views of the natural world.

To achieve this level of integration will, I think, require a new level of cooperation, reaching across borders that have resulted from the specialization of biology into pigeonholes that have canalized our field and put blinders on individual workers. Fortunately, some efforts to reverse this trend are already in place. Over the next three years, the BSA will be meeting with sister societies and thus providing opportunities to break down walls that have challenged cooperative endeavors. In 2007, we will meet with the American Society of Plant Biologists, in 2008 with the Canadian Botanical Association/L'association Botanique du Canada, and in 2009 with the Mycological Society of America. We should capitalize on these all too rare opportunities for building bridges and cooperative endeavors. Sponsoring cross-cutting symposia would be a first step. In planning for our meetings, we should also continue to reach out to other professional societies and seek opportunities to meet with them.

Throughout the history of the science of botany, the most innovative progress has been made by individuals capable of sitting on the interface between two major disciplines. Two that come to mind as representing the wave of the future are Evolutionary Developmental Botany, or Evo-Devo, and the study of Plant Speciation. Both of these interdisciplinary fields demands attention across fields, and develops hypotheses that require the investigator to be broadly trained. In the case of evo-devo, investigators are using new methods of tracing the developmental pathways that give rise to morphological features and then showing how the control of these pathways provide insights on often very deep relationships between major lineages. The process of speciation, meanwhile, requires that the investigator make connections between the ecology of populations and the genes controlling change. Studies of how new lineages are initiated requires the investigator to study both the internal genetic constraints and the environmental pressures that influence change. Breakthroughs in either evo-devo or speciation will lead to novel insights in a broad range of major fields, and I'm sure there are other such interdisciplinary fields that are only beginning to emerge.

Turning briefly to our responsibilities and opportunities in education, we live in precarious times. Unfortunately, the emphasis on research that Trelease and others saw as important to advance science has had the side effect of diverting our most creative thoughts and a majority of our time in pondering the next frontier in our disciplines. As a result, we neglected education and have generated too many generations of scientifically illiterate citizens. Time does not permit me to explore the origin and evolution of this very real and potentially disastrous problem, but it seems clear that in the future we must divert more of our time and energy into helping the public understand what science is, how it differs from belief systems, and why it is so important as we advance into the 21st century. The good news is that both commercial and individual efforts are being made to develop plant tools that can be used to provide students with a solid understanding of science as a process. Especially as issues of using animals experimentally remove them as appropriate models in teaching, plants emerge as ideal organisms whose biology allows exploration of questions about physiology, biochemistry, genetics, development, ecology, evolution, etc. Members of the BSA should turn some of their attention to developing laboratory teaching activities that exploit the unique features of plants for instructional purposes. Members of the BSA are in the best position to know what elements of science can be demonstrated most appropriately by plants. We are the ones to suggest ways to involve students in inquiry activities involving plant models.

One solid example of how the BSA can foster learning about science using plants is already an ongoing enterprise. Many of you are already aware of an initiative now called "Scientific Inquiry through Plants" and soon to be known as "Planting Science" that has been spearheaded by the BSA. This is also an opportunity for more research botanists to get involved as resources for teaching science in one of the many schools participating in the program. Please consider investing in the future of science education by acting as a scientific expert and mentor by answering questions crafted by K-12 and undergraduate students. The BSA is providing all the logistics of electronically linking schools and teachers with plant researchers, all you need to do is volunteer. Becoming involved is as easy as visiting the BSA web site and contacting the BSA Education Director, Claire Hemmingway.

The BSA is sponsoring a number of different inquiry topics, one of which is currently active (The Wonder of Seeds) and a second (The Power of Sunlight) will be activated soon. If you have other ideas that might serve as models for developing students' understanding of science and research, please consider contributing them.

Through the Planting Science program, students are given the opportunity to learn about how science works and how scientists conduct research. Establishing this kind of habit of mind can help to transform young minds and can help to promote the sense of curiosity and the excitement of discovery that has propelled all those in this audience into a life of learning about how plants function, interact, and evolve. Based on public perceptions and the general lack of appreciation of science (it has been estimated that only 17% of US adults is capable of reading and understanding the science section of the New York Times!), we need to revise our priorities to help emerging generations truly learn about science as a way of knowing about the world.

I'd like to end this presentation by proposing a theme for the BSA of "**Growing Together**." As a society, we have opportunities to move us into the next century with vitality and vigor, and with plans to engage all aspects of what we can and should try to accomplish. By developing more disciplinary integration, we will grow together as a cohesive force for the future. If this integration becomes a paradigm for accomplishing creative science, together we will grow in size and importance. We certainly are a society for all botanists, and we need to consider more intensively how to develop interconnections among individuals and disciplines that will encourage greater originality. We are also a society that can contribute to the general public by reaching out to the community and informing them of the power of plants in their lives. As I have tried to emphasize, we are a society for fostering education innovation. We need to stay alert to opportunities for encouraging students to become the next generation of creative scholars, and plant examples can lead that charge. And, finally, we are the scientific society that promotes plants as powerful research and education exemplars. We are the ones to promote all things green, and we are the ones to reach out to our microbial and zoological neighbors and help them realize the opportunities for exploring plants. As Kermit the frog has intoned,

"It's not that easy being green;
Having to spend each day the color of the leaves.

But green's the color of Spring.
And green can be cool and friendly-like.
And green can be big like an ocean, or important like a mountain, or tall like a tree.

When green is all there is to be
It could make you wonder why, but why wonder why?
Wonder, I am green and it'll do fine, it's beautiful!
And I think it's what I want to be."

Slides of the talk are available at:
http://www.botany.org/history/2006Banquetaddress.php

The Lessons of History: A Historian Reflects on 100 Years of American Botany

Plenary Address, Botany 2006
Vassiliki Betty Smocovitis

see:
American Journal of Botany 93(7)942-952
and slides at:
http://www.botany.org/history/CentennialAddress.pdf

Honoring the Past- Building for the Future

Remarks of Peter Raven during the BSA Strategic Planning Discussion of that name

When my mother's ancestors, starving survivors from the ill-fated Donner Party, stumbled out of the snows into the foothills of the Sierra Nevada not far from here in 1847, they could scarcely have imagined that 22 years later the transcontinental railroad would extend from coast to coast, or that 56 years later the Wright brothers would be taking off in powered flight at Kitty Hawk. Even less could they have know that 66 years after the Wright brothers' flight, Neil Armstrong would be walking on the moon, or that in the early 21st century, information would dominate all aspects of human endeavor, and that the organization of that information would be of critical importance for everyone. Progress in every field has been explosive, and we can legitimately have no reason to imagine where the future might lead.

Halfway through the hundred-year history of the Botanical Society of America, in the mid-1950s, I was taking my first courses in botany at Berkeley. Able teachers including Herbert Mason, Lincoln Constance, Leonard Machlis, Johannes Proskauer, Adriance Foster, and Carl Sauer were doing their best to tell me about all the wonderful progress that had been made in botany, and I was absorbing this fund of new knowledge as well as I could, driven by my fascination about plants and everything that had a bearing on understanding them. A decade later, when I was preparing the first edition of my botany text, I was amazed by what had been learned in that relatively short interval. And now, I can best express my feelings about the wonderful state of botanical knowledge, so well illustrated by the proceedings of this excellent meeting, in the words of Chris Somerville, who wrote in commenting on what I might have to say today, "I feel overwhelmed in an exhilarating kind of way by the rapid rate of progress. My general feeling is that major problems are being solved every day."

It seemed strange when I was at Berkeley that the importance of DNA was not properly appreciated and taught, but in fact, it was not so strange: it was not until the unraveling of the genetic code in the early 1960s, and the demonstration of how the transcription of proteins actually worked, that we began to accept the basic tenets of molecular biology as central to the whole field of biology. We could scarcely imagine in those days what would be learned about hormone action, growth, or all the other important fields that we studied, and certainly few of us had any premonition of the massive changes that would alter the face of the globe over the past 50 years.

The world population in 1950 was approximately 2.5 million people; in the ensuing years it has grown to an estimated 6.5 billion! We were probably using about 50% of global productivity then on an ongoing basis, whereas now our rate of use is estimated at 120%. With half of the world's people living on less than $2 per day and one out of eight literally starving, the combination of population numbers, consumption levels and technology is literally reducing the productive capacity of the earth to lower and lower levels with every passing day. Why do we seem to care so little? I really became aware of these problems along with Paul Ehrlich and other colleagues at Stanford about 40 years ago. Gradually it became apparent that we were driving species to extinction at an ever-increasing rate, higher by 2-3 orders of magnitude than anything experienced for the past 65 million years, and that the cost of our existence on earth was rapidly becoming an insupportable burden.

But what have we learned about botany over these years? There are so many surprises and important discoveries that I can only offer a few here.

The complete sequencing of the genomes of different plants began in 2000, with *Arabidopsis*, which was shown minimally to be of ancient hexaploid derivation, even though it has the smallest genome in flowering plants. Complete genomic sequences were soon added for rice, poplar, the lycophyte *Selaginella*, with tomatoes, maize, wine grape, and the legume *Medicago* soon to follow. These sequences have made it possible to identify the gene corresponding to a mutation in Arabidopsis within a few weeks of the formation of a segregating population between a plant containing a mutant allele and the wild type. The DOE Community Sequencing Program has also supported the ongoing sequencing of genomes of major sections of genomes in manioc, potato, tobacco, *Mimulus guttatus*, *Sorghum bicolor*, *Capsella bursa-pastoris*, and *Arabidopsis lyrata*, a perennial congener of *A. thaliana*.

The large amount of related activity at this meeting, evident in the pages of any journal in the field, reminds us that the "$1000 genome" is going to become a reality sooner rather than later. As costs decrease rapidly, we will have greatly enhanced ability to assess variation within and among populations, thus making it much easier to learn about adaptation in plants and to conserve them. The papers given here on *Vanilla* by Ken Cameron and on palms by Carl Lewis remind us of the great utility of these approaches, and the rapid growth of similar applications, which could not have been imagined five years ago, is assured.

The information gained from genomic studies soon will make possible a rigorous study of the evolutionary history of key innovations in plant evolutionary history such as vascular tissue, leaves, seeds, and flowers. It will also make possible the determination of the genetic basis of significant innovations in the features of mutant individuals and different species and genera of plants. Elegant QTL work in *Mimulus* has documented the genetic basis for species differences. And, genomic studies have also led to a better understanding of the genetics of domestication, particularly in maize, where key genes have been identified and results of selection for a chromosome region documented (selective sweeps).

Also discovered during the last few years is the fact that plant disease-resistant proteins (R proteins) usually detect pathogens indirectly by the damage they do to host cell components, rather than by identifying the pathogen's molecules directly. Recent studies have shown that at least one case of "non-host resistance" (i.e., in which a plant species does not allow growth of a particular pathogen species) is due to active resistance mechanisms encoded by multiple genes. This raises the possibility that it may be possible to engineer stable non-host resistance into crop species.

Of fundamental importance has been the independent discovery by two groups of investigators of the receptor for auxin, which was discovered some 80 years ago-the first plant hormone to be described. This receptor has turned out to be an *Arabidopsis* F-box protein (one of about 700 such proteins in *Arabidopsis*). Such proteins act in eukaryotic organisms to target regulatory proteins for degradation in a signal-dependent manner. This finding – a beautiful piece of work on a long-standing problem- hints at how plant cells "sense" and respond to this protein, and thus provides a key for investigating the action of plant proteins in general. Recently, the signaling mechanism by which plant sense and respond to gibberellin has also been found to involve an F-box protein, suggesting that the phytohormones may act via similar mechanisms.

Of special significance has been the identification of a molecule, called FT, that has all the hall marks of the hitherto elusive florigen, and published in three articles in Science last year. The FT gene is induced in leaves within hours after plants receive a stimulus that promotes flowering, and its product, the FT protein, acts at the growing tips of the plants to activate the flowering process. The gap between the two sites is bridged through movement of FT RNA from the leaf to the growing tip.

The role of micro-RNA's which was poorly understood in 1999, has now been shown to be important in many aspects of plant growth and development.

Transcription factors and other proteins have been shown to move in a regulated way through plasmodesmata, the "plant information superhighway," by Bill Lucas at the University of California – Davis.

Jeff Palmer and his colleagues have demonstrated the massive horizontal transfer of mitochondrial genes from diverse land plant donors to the basal, New Caledonian angiosperm *Amborella*, a startling discovery whose significance for plant evolution in general and mode of origin are receiving further studies in the Palmer laboratory.

Plant phylogenetic studies have expanded rapidly in precision and in coverage of different groups. Careful developmental studies linked with comparisons of the genetic basis for the patterns observed have much to offer in understanding the relationships of plant groups at all levels, and the basic patterns of relationship that have been emerging over the past 15 years or so – often radically different from what had been suspected earlier - - appear durable. Informative studies of fossil plants have begun to teach us much about the nature of the earliest angiosperms. Along the way, numerous discoveries in the fossil record have proved patently false the conventional wisdom when I was a graduate student that there simply could not be enough fossil flowers to make any difference in our understanding of angiosperm evolution. Some of the earliest fossil flowers apparently represent entirely extinct major taxa. By the mid and late Cretaceous, ancient taxa with clear relationships with groups such as *Chloranthaceae* and other extant angiosperm clades appear. The resolution of such fossils will provide interesting results for years to come.

The Angiosperm Phylogeny Group (APG) has contributed much to the establishment of monophyletic groups in angiosperms, a trend obviously beneficial to the establishment of sound classifications with predictive value. The phylocode, with its cognitive formlessness, has provided a way of organizing information that some students of phylogeny have found useful, but, in principle, since it does not indicate the relationships of taxa nor help us locate information about them, it has not been widely accepted.

Notable in recent years has been the steady growth of the Tree of Life Project, which will provide a sound basis for understanding the relationship of major taxa within the next few years. Numerous surprises, such as the rooting of the Equisetales within the ferns, and controversially, the Gnetales within the confers, will clearly be encountered along the way. With respect to the latter hypothesis, in which Gnetales are seen as sister to Pinaceae, there has been much doubt, but further critical evaluation is clearly necessary in view of the material presented.

In terms of the material available for systematic botany and its availability, the total number of plant specimens in the world's roughly 3,000 herbaria is growing at the rate of about 10 million specimens per year, with approximately 345 million specimens in the world's herbaria today. The total number of distinct vascular pant species validly described has not been reliably estimated but there are clearly at least 325,000 of them, with what I would estimate as 100,000 more still to be named and defined. Over 100,000 species are cultivated in botanical gardens already, and the gardens themselves have grown by about a third over the past decade, with about 2,700 operating today.

Major increases in the availability of information about plants on the World Wide Web foretell even greater increases in such useful information in the future. For example, the African Plants Index now includes high-resolution images of about 80% of the types of African plant species, and will go on-line later this year; and a similar project for the types of Latin American plants, again backed by the A.W. Mellon Foundation of New York, is getting underway this summer.

The literature of systematic botany is likewise becoming available on line: the Missouri Botanical Garden's *Botanicus* project, funded by the Keck Foundation and the Institute of Museum and Library Services, has already recorded over 350,000 pages of pre-1923 systematic literature in a searchable format, with 2,500 additional pages being added each week. In this way, the complete literature of systematic botany will be come universally available relatively soon. All of the *Botanicus* information is linked to the Missouri Botanical Garden's *Tropicos* data base, the most comprehensive and widely consulted data base on plants.

At the same time, the accelerating effects of habitat reduction; the widespread and growing presence of alien invasive species; the gathering of plants in nature for personal use and commercial purposed; and global warming combined threaten to eliminate two-thirds or more of all plant species during the course of this century. Following a call for increased efforts to conserve the world's plants at the 1999 International Botanical Congress in St. Louis, a Global Strategy for Plant Conservation was approved within the Convention for Biological Diversity in 2002. The Global Strategy then established specific, ambitious goals for the preservation of plant diversity that are intended to be met by 2010. The efforts made to realize these goals are clearly having an important impact on plant conservation throughout the world, starting with our knowledge about the amount of diversity that exists.

Transgenic crops have now been grown on more than 1 billion acres (in aggregate) throughout the world, amounting to approximately and eighth of the total cultivated land globally. More than a decade of experience has demonstrated no damage related to the cultivation of these crops, which have offered proven economic and environmental benefits. Even more impressive gains are in sight for the decades to come. Plants that exhibit improved levels of cold, freezing, salt, and drought tolerance have been developed and are expected to improve crop productivity in regions where it is limited by these factors. Although investigations continue, there seems little doubt that the intensive production of adequate supplies of food on the least amount of land possible will contribute a great deal to the preservation of biodiversity at a time of maximum threat to its continued existence.

The appearance of the Millennium Ecosystem Assessment in 2005 documented the fact that human beings over the past 50 years have degraded ecosystems more rapidly than any earlier time, allowing major increases in human well-being but at the same time rapidly diminishing the benefits that future generations will be able to obtain from ecosystems. Achieving the Millennium Development Goals will require significant changes in policies, institutions, and practices, but few nations seem ready to embrace these changes fully and certainly they have not been accepted as a basis for action here in the United States.

As scientists and informed citizens, we must give the global situation our most serious attention. We live in a more diverse world today than will ever exist again, but our efforts will play a major role in shaping the contours of that future world and the opportunities that its citizens will enjoy. As botanists, we have a great deal to contribute, and exciting future discoveries await us in all of the subfields of our discipline.

Acknowledgements: Brent Mishler, Sir Peter Crane, Michael Donoghue, Peter Endress, Pat Holmgren, Elizabeth Kellogg, Elliott Myerowitz, Dan Nicolson, Jeff Palmer, Walt Reid, Chris Somerville, Peter Sevens, Marc Van Montagu, Mathis Wackernagel, Peter Wyse Jackson are among those who contributed to the version of a similar paper that I presented to the International Botanical Congress in Vienna last summer, and Barbara Schaal, Jeff Palmer, Chris Somerville, David Dilcher, and Elizabeth A. Kellogg added information to the remarks I have offered today.

Awards

The Botanical Society of America MERIT AWARD

The Merit Award is the highest honor given by the Botanical Society of America. It is given in recognition of outstanding contributions to the science of botany. This year we are pleased to honor:

Dr. Ruth Stockey, University of Alberta

Dr. Ruth Stockey is recognized for her contributions to paleobotany, especially to our understanding of the anatomy and development of fossil conifers and angiosperms. Dr. Stockey has been a member of the Botanical Society of America for more than 30 years. She began her research career elucidating the structure and development of fossil conifers and is recognized as the world's expert in this area. Since moving to the University of Alberta, she has concentrated on anatomically preserved fossil angiosperms, providing data on floral structure, development, and phylogeny in these ancient plants. Her research has been supported by the Natural Sciences and Engineering Research Council (NSERC) of Canada for more than 26 years. Dr. Stockey is truly an "ambassador of botany" and is involved in collaborative work with colleagues around the world; her letters of support came from five countries! She is an enthusiastic teacher and her support and training of students is exceptional—one student began research in her laboratory in high school, and received her Ph.D. this year. For her many contributions to paleobotany, including her dedication to training the next generation of botanists, the BSA is proud to recognize Dr. Ruth A. Stockey with its highest award.

Dr. Barbara Webster , University of California, Davis

Dr. Barbara Webster is recognized for her many contributions to plant development and structure. Her early work focused on abscission and senescence in higher plants, and included anatomy, ultrastructure, histochemistry, and physiology, as well as experimental work, especially on the genus Phaseolus. Beginning in the 1970s, Dr. Webster began to concentrate more on reproductive biology, but she has contributed to a wide range of topics, including nitrogen fixation in the legumes, environmental stress, and yield of crop plants. Her impressive publishing career spans more than five decades and includes more than 100 published papers and book chapters; her research has been supported by the National Science Foundation, the USDA and USAID. Dr. Webster was truly a pioneer in advocating for increased participation of women and minorities in science, and has served as a role model and mentor to both undergraduate and graduate students in plant biology. She is a fellow of the American Association for the

Advancement of Science and the American Society for Horticultural Science, served as Treasurer and President of the Botanical Society of America, and has served as Associate Vice-Chancellor for Research at the University of California, Davis since 1989. As one letter writer noted, "It is hard to believe that Barbara has not already received this award." For her numerous contributions in many arenas to the field of botany, the BSA is proud to recognize Dr. Barbara D. Webster with its highest award.

Jeanette Siron Pelton Award

The **Jeanette Siron Pelton Award** is given for sustained and imaginative productivity in the field of experimental plant morphology.

Dr. Tobias Baskin, University of Massachusetts, Amherst is the 2006 awardee. Dr. Baskin is recognized for his research into how plants control their shape via cellulose microfibrils and the microtubule cytoskeleton. He has made fundamental contributions to our understanding of how local cortical microtubule organization is related to microfibril orientation, which constrains cell and, ultimately, organ growth in longitudinal and radial directions. He has combined physiological, cytological, ultrastructural and genetic approaches to his studies of cell growth, and is credited with important innovations of microscopic techniques. Dr. Baskin is currently investigating the interaction of specific proteins with cortical microtubules, the plasmamembrane, and the cellulose synthase complexes in the membrane, to critically evaluate his proposed model of cell wall control of its own microfibril orientation. This award is from the Conservation and Research Foundation, based on the nomination by the BSA Pelton Award Committee, and includes a check and a certificate. This award also includes a Jeanette Siron Pelton Award Address,which will be given at the Botany 2007 conference in Chicago, Illinois.

Darbaker Prize

The Darbaker Prize is given each year in memory of **Dr. Leasure K. Darbaker**, for meritorious work in the study of microscopic algae.

Dr. Charles Delwiche, University of Maryland at College Park is the 2006 awardee. The award recognizes his excellent research on a wide variety of algae, resulting in significant contributions to the literature in many fields. These include molecular systematics and genetics of green algae and dinoflagellates, genomics of microalgae, molecular evolution of microalgae, and structure and function of microalgae.

The Henry Allan Gleason Award

Each year The New York Botanical Garden presents the Henry Allan Gleason Award for an outstanding publication in the field of plant taxonomy, plant ecology, or plant geography.

Dr. Michael G. Simpson is the Gleason Award recipient for 2006 for his book, Plant Systematics, published by Elsevier Academic Press. This publication, many years in the making, represents a masterly treatment of vascular plant groups and the principles of plant systematics as well as incorporating the latest concepts in phylogenetics and methodologies. It is erudite and most importantly - user friendly, especially for students. This text will serve as the standard for many years to come.

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 Lawrence Memorial Award for 2005 goes to **Eric Schuettplez**.

SPECIAL AWARD

The Botanical Society of America presented a special award to **Dr. Edward Schneider** , BSA Past President, expressing gratitude and appreciation for outstanding contributions and support for the Society. Ed has provided exemplary contributions to the Society in terms of leadership, time and effort.

SPECIAL AWARD

The Botanical Society of America presented a special award to **Dr. David Spooner**, BSA Immediate Past Secretary, expressing gratitude and appreciation for outstanding contributions and support for the Society.

Charles Edwin Bessey Award (BSA in association with the Teaching Section and Education Committee)

Dr. W. Hardy Eshbaugh, Miami University, Oxford, Ohio, Professor Emeritus, Department of Botany. The nomination letters indicate that Hardy has advanced and broadened botany education for several generations of Miami University students. He pioneered the development of field courses ranging from introductory level formal courses to public outreach for retirees. We thank him for his 33 years of formal teaching and his continuing efforts to bring additional understanding of the natural world to the public at large.

Dr David W. Lee, Florida International University, Miami, Florida. Peer nominators wish to recognize life-long effort and creativity demonstrated by Dr. Lee teaching of botany and advocacy for botanical education. His unique career path began in 1970. It has included extensive research and teaching in the tropics, as well as academic positions in the United States. We thank him for sharing his love of botany and his desire to communicate about plants to students and the public in uniquely effective methods.

Conant "Botanical Images" Student Travel Awards
This award provides acknowledgement and travel support to BSA meetings for outstanding student work in the area of creating botanical digital images.
Jay F. Bolin, Old Dominion University - Frist Place, Submission #5 - $500 Botany 2006 Student Travel Award
Anna Jacobsen, Michigan State University - Second Place, Submission #1 - $250 Botany 2006 Student Travel Award
Ryan McMillen, Southern Illinois University - Third Place, Submission #14 - $100 Botany 2006 Student Travel Award

Isabel Cookson Award (Paleobotanical Section)
Established in 1976, t he 2005 Isabel Cookson Award, recognizing the best student paper presented in the Paleobotanical Section, is awarded to **Selena Y Smith** of the University of Alberta, for the paper entitled "*Fossil perianthless Piperales: a saururaceous inflorescence and flowers with in situ pollen from the Princeton Chert.*" Co-author was **Ruth Stockey** .

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 Jan. 16, 2003 in Santa Barbara, CA, 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. **Yannick Staedler**, from Universität Zurich, is the 2006 Moseley Award recipient, for his paper "Floral architecture and phyllotaxis in Calycanthaceae (Laurales)" Co-authors were Peter H. Weston, Peter K. Endress.

Developmental & Structural Section Student Travel Awards
As voted upon by the membership of the section in 1996, an annual drive will be initiated to generate contributions from the sectional membership. These support student attendance at the annual meetings of the Botanical Society of America. Donations will be solicited in units equivalent to the current student registration fee (this year, for example, $200). In essence, each contributor will effectively sponsor the attendance of one or more students.
Lara Strittmatter
Athena D. McKown
Cary Pirone
Theresa Meis Chormanski
Anna Jacobsen
MacKenzie Taylor
Theresa Meis Chormanski
Garbiel Johnson

Physiological Section Student Prizes - Best Paper
Sarah Kimball, University of California Irvine
For her talk "*Physiological Differences Maintain Species in a Natural Plant Hybrid Zone.*." Her co-author was **Diane R. Campbell**.
Ken Moriuchi, Florida State University
For his talk "*Genetic differences in patterns of growth, development, and plastic response to environmental quality in a perennial plant.*."

Physiological Section Li-Cor Prize
Erika Sudderth, for her talk "*Physiological performance of C_3, C_4, and intermediate Flaveria species in the Tehuaca• Ln Valley of Mexico.*" Her co-author was **Noel M. Holbrook**.

Southeastern Section Student Travel Award
Brent A. McMillan, Old Dominion University, Advisor: Dr. Lytton Musselman

News from the Society

BSA Science Education News and Notes

BSA Science Education News and Notes is a quarterly update about the BSA's education efforts and the broader education scene.

PlantingScience Presentations Around the Country
PlantingScience had a strong presence at the National Association of Biology Teachers meeting in Albuquerque October 11-14. We contributed a poster in the K-12 Outreach mini-symposium and hosted a hands-on workshop. ASPB/Paul Williams and AIBS graciously distributed our program flyers at their booths.

Participants in the program are also taking the message to their local communities. Dr. Rahmona Thompson of East Central University gave a presentation on PlantingScience at the Oklahoma Science Teachers Association. Barbara Schulz, Carol Packard, and one of Carol's Sister's Middle School students spoke about their involvement in the program at a central Oregon Rotary Club meeting.

In this issue of News and Notes, we feature the Botanic Gardens Conservation International (BGCI)'s final statement from the first U.S. plant-based Conservation Education Symposium, which is printed in its entirety. For more on the BBGI, visit http://www.bgci.org/us

Statement from BGCI's U.S. Symposium on Plant Conservation Education

1. The U.S. Symposium on Plant Conservation Education brought together delegates from botanical institutions, conservation NGOs, environmental education organizations, and the business sector to assess the status of plant conservation education in the United States.

2. The Symposium was held on Plant Conservation Day, May 18, 2006, at the United States Botanic Garden in Washington, D.C. The Symposium was sponsored by Botanic Gardens Conservation International, with support from HSBC's Investing in Nature program.

3. At the Symposium, the participants highlighted examples of best practice in plant conservation education and charted new directions for advancing the field.

The Symposium

4. Acknowledged the important role U.S. educators at plant conservation education institutions can play in helping achieve Target 14 of the Global Strategy for Plant Conservation.

5. Reaffirmed the critical role of education in conserving plant diversity around the world.

6. Recognized the strength and history of current plant conservation education programs in the United States, as well as the skill and commitment of plant conservation educators.

7. Highlighted the variety of high-quality plant conservation education programs at plant conservation education institutions and other education sites nationwide. These programs included eco-mentoring for teens; environmental problem-solving and arts competitions; local stewardship networks; place-based education programs; print and electronic publications; elementary and secondary school programs; public awareness events and celebrations; citizen science projects; special exhibits and interpretation; and professional development courses and training.

8. Affirmed the importance of direct, personal experiences with plants in effecting plant conservation awareness and action.

9. Acknowledged that the plant conservation message is not being widely heard by the general public, largely due to the strength of competing messages from mass media and consumer culture.

10. Recognized the importance of governmental support for plant conservation education activities and institutions.

11. Noted the decline in the number of botany and taxonomy courses in higher education.

12. Acknowledged the risk of overwhelming audiences with the enormity and urgency of the plant extinction crisis, especially during a time of other social and environmental challenges.

13. Noted the common public misperception that plants are a "completely renewable resource" and replaceable, and therefore not in need of conservation.

14. Stressed the benefits of conserving plant diversity, including benefits to human well-being and ecosystem services.

New actions and urgent priorities

15. Called on public gardens to emphasize the importance of their role in plant conservation and to be models for ecological sustainability.

16. Identified the need for a coordinated national campaign with a highly visible spokesperson to raise public awareness of plant conservation. This campaign would include:

- a logo or symbol
- a memorable slogan or message
- a simple, direct statement of goals
- guidelines for action
- American Public Gardens Association guidelines for standardized plant collection labeling
- major promotion of Plant Conservation Day
- a lobbying mechanism in Washington, D.C.
- engagement with regional plant societies
- support for citizen science monitoring and data reporting programs
- stories about plants that communicate relationships, continuity into the future, nurturing of the young, hope, and reverence for larger meaning
- training and education of urban planners and architects.

17. Identified the need for a common, consistent message from plant conservation education institutions.

18. Recognized the importance of media outreach and increased media coverage of plant conservation efforts.

19. Urged plant conservation education institutions

to create plant-based programs at non-plant-based partner sites (e.g. art museums, historical sites, natural history museums, etc.) for Plant Conservation Day 2007 and beyond.

20. Reiterated the need for increased funding for plant conservation education programs and staff.

21. Noted the need for increased local and national government lobbying by botanical institutions and networks in order to promote leadership for plant conservation at the highest levels.

22. Stressed the importance of creating outlets to showcase successful plant conservation efforts.

23. Called for the creation of a standardized, approved classroom curriculum focusing on plant conservation.

24. Stressed the need for engaging individuals in plant conservation by identifying relevant and practical examples of action.

25. Urged the coordination of future gatherings of plant conservation educators.
May 18, 2006 – Washington D.C.

Symposium participants

Anders Back, *American Public Gardens Association*
Sue Bennett, *Anacostia Park/Kenilworth Aquatic Gardens*
Patsy Benveniste, *Chicago Botanic Garden*
Stefan Bloodworth, *Sarah P. Duke Gardens*
Diana Bramble-Delajara, *Smithsonian Institution Enid A. Haupt Garden*
Kathleen Bucco, *National Park Service*
Jeri Deneen, *Deneen Powell Atelier, Inc.*
Jeremy Edwards, *City of Falls Church (Va.)*
Christine Flanagan, *United States Botanic Garden*
Rosemary Ford, *Washington College / Botanical Society of America*
Deborah Chollet Frank, *Missouri Botanical Garden*
Barbara Franklin, *Pine Island Designs*
Shelley Gaskins, *Smithsonian Institution*
Patricia Harrison, *Botanical Research Institute of Texas*
Rebecca Horner, *U.S. National Arboretum, ARS, USDA*
Brian Johnson, *Botanic Gardens Conservation International*
Rory Klick, *American Community Gardening Association*
Nancy Knauss, *Phipps Conservatory*
Gary Krupnick, *Smithsonian Institution*
Barbara Kurland, *Brooklyn Botanic Garden*
Olivia Kwong, *Plant Conservation Alliance*
Linda Lucchesi Cody, *U-M Matthaei Botanical Gardens & Nichols Arboretum*
Barbara Major, *U-M Matthaei Botanical Gardens & Nichols Arboretum*
Ray Mims, *United States Botanic Garden*
Viveka Neveln, *American Horticultural Society*
Mary O'Neill, *Middle Patuxent Nature Center Foundation*
Katie Palm, *United States Botanic Garden*
Diane Pavek, *National Park Service*
Douglas Rowley, *National Park Service*
Dan Shepherd, *Botanic Gardens Conservation International*
Paul Spector, *The Holden Arboretum*
Lacey Stokes, *Stephen F. Austin State University Horticulture Department*
Sandy Tanck, *Minnesota Landscape Arboretum*
Kimberly Winter, *North American Pollinator Protection Campaign*

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.

Editor's Choice. Botany in Science Education Journals

Gallucci, Kathy. Learning Concepts with Cases. *Journal of College Science Teaching* 36(2): 16-20. Case studies are a pedagogical tool that promotes student interest in critically thinking about a mysterious problem related to a concept being investigated in the course. One of the cases examined in this article relates to neurotoxins associated with cycad roots eaten by the Chamorro, the indigenous people of Guam.

Killingbeck, Keith. Field Botany and Creative Writing. *Journal of College Science Teaching*. 35(7):26-28. Killingbeck encourages students to write creative pieces about botanical subjects encountered during laboratory and field experiences. These are "published" in weekly "Plant Notes."

Wandersee, James H., Renee M. Clary and Sandra M. Guzman. A Writing Template for Probing Students' Botanical Sense of Place. *The American Biology Teacher* 68 (7): 419-422. The authors introduce a simple writing strategy that they've successfully used with biology students in community colleges and a research university to identify prior connections students have with plants. These connections can serve as a foundation for better student understanding of botanical concepts in the introductory biology course.

News from the Sections

Historical Section News and Announcements

The BSA Historical Section has established the Emanual D. Rudolph Award for the best student paper on a historical subject in botany to be awarded at the next annual meeting. Please encourage your undergraduate and graduate students to consider presenting a paper on a historical subject in Botany to be eligible for this honor.

It is time to elect a new chair of the BSA Historical Section. Please nominate yourself or choose a colleague from the BSA Directory, which lists 78 members of the Historical Section. Please submit nominations to:

Lee Kass, section Chair
(lbk7@cornell.edu).

Announcements

In Memoriam:

A Brief Appreciation of David Lloyd, Preeminent Evolutionary Botanist

The botanical community lost one of its most creative, original and influential members when David G. Lloyd, Professor Emeritus of Plant Science, University of Canterbury, died on May 30, 2006. David condensed his wide-ranging research interests into three broad categories: reproductive biology of plants, including breeding systems and pollination biology; general theory of natural selection; and evolution and reproduction of New Zealand plants. David made significant, often revolutionary advances in each of these areas.

David Graham Lloyd was born in Manaia, on the North Island of New Zealand, on 20 June 1937. He earned a scholarship to the College (now University) of Canterbury in Christchurch, graduating in 1959 with first class honors in Botany. Funded by a prestigious Frank Knox Fellowship for overseas study, he then left New Zealand for the first time in order to pursue graduate work at Harvard. His dissertation on the evolution of selfing in the eastern North American genus *Leavenworthia* (Cruciferae), supervised by Reed Rollins, initiated his life-long interest in the classic Darwinian question of self- and cross-fertilization. David's theoretical work on mating systems produced a number of his most cited papers, and later expanded to include broader theoretical issues such as uni- versus biparental reproduction. During his field work in the American southeast David developed a taste for *Carya illinoensis* nuts. From then on, pecans from the States were always a welcome gift to him.

Returning to New Zealand in 1964, David obtained first a research fellowship and later a faculty position at the University of Canterbury, where he remained until his unfortunate early retirement. His first major research project there addressed another classic Darwinian question, the variety of plant sexual systems (hermaphroditism, monoecy, dioecy, etc.). David's empirical studies on *Cotula* (now *Leptinella*, Asteraceae) began an extensive body of work that eventually established him as the leading authority on the ecology and evolution of plant sexual systems.

David's interest in the wide variety of sex expression he observed both among and within individual plants led to what I believe is his most original, and revolutionary concept, that of the quantitative nature of plant gender. He defined the functional gender of an individual plant as its relative genetic contribution to the next generation via pollen and ovules, and phenotypic gender as the plants relative investment in reproduction via maleness (production of pollen) and femaleness (production of ovules or seeds). With this quantitative concept of gender, David was able to take a fresh and incisive look at sexual systems, noting that the fundamental distinction is not between strict hermaphroditism (perfect flowers only) and dicliny (various forms of monoecy and dioecy), but rather between monomorphic systems in which the gender varies more or less continuously (e.g. hermaphroditism, monoecy, andromonoecy, gynomonoecy), and dimorphic systems in which the distribution of gender among individuals in a population is bimodal (e.g. dioecy, gynodioecy, androdioecy).

David realized that the adaptive significance of non-hermaphroditic sexual systems and a number of other floral traits couldn't be explained solely by selection to avoid selfing. With his former student Colin Webb, David argued that dichogamy (temporal separation of pollen presentation and stigmatic receptivity), herkogamy (spatial separation of anthers and stigmas), and heterostyly (morphs with reciprocal anther and stigma positions) are mechanisms for avoiding sexual interference (pollen-stigma interference), or interference between the pollen donating and pollen receiving functions of flowers.

David was committed to living and working in New Zealand. Although he occasionally groused about limited funding and the difficulties and expenses of publishing and traveling overseas, I doubt that he could have been truly happy anywhere else. Except for his Ph.D. work and relatively brief trips to Wales, Costa Rica, New Caledonia, and Spain, he did all of his field work in New Zealand. His focus on the flora of New Zealand and his independence probably helped him develop his most creative insights. From an early point in his career, his theoretical work extended beyond evolutionary botany to broader considerations such as the evolution of sex, allocations to competing functions, and size-number tradeoffs.

David formally mentored nine graduate students and guided four official post-docs, as well as a number of botanists and evolutionary biologists at various stages of their careers who traveled to Christchurch for extended visits. Working with David was never dull. Even in the field, he was always trying out new ideas, refining older ones, or commenting on others' work. In 1985, David, Pete Lowry and I spent three weeks examining the floral biology of New Caledonian Araliaceae. My field notebook from that trip is crammed with hasty notations of the tentative conclusions and new hypotheses that David, fueled by breakfasts of robusta coffee, croissants, juice and jam, developed and constantly modified as we made new observations. David garnered several fellowships and visiting professorships that allowed him to teach graduate seminars, attend meetings and symposia, and deliver lectures overseas. In 1990 he was invited to present the G. Ledyard Stebbins Lecture for the annual meeting of the BSA. He received numerous international honors, including election to corresponding membership in the BSA and foreign honorary membership in the American Academy of Arts and Sciences. He was the seventh New Zealander to become a fellow of the Royal Society of London.

In December 1992 David suffered severe neurological damage that left him blind and paralyzed. He was forced to retire from active teaching and research, but he continued with his theoretical work as best he could. He died peacefully, at home with his family. His funeral was on June 3.

A thorough, analytical review of David's scholarly work and assessment of its impact will soon appear as the first chapter of "*Ecology and Evolution of Flowers*" (edited by L. D. Harder & S.C.H. Barrett, Oxford University Press, 2006). I am grateful to Spencer Barrett and Lawrence Harder for sharing a draft of that chapter for preparation of this note. A symposium titled "Tribute to David Lloyd's research on reproductive strategies: his insights and their ongoing impact" will be part of the joint meeting of the Society for the Study of Evolution, Society of Systematic Biology, and American Society of Naturalists, June 16 -21 2007, in Christchurch. A memorial gathering of David's scientific family is also planned for that time.

-Mark A. Schlessman, Professor of Biology, Vassar College

Marie Scott Standifer- d.July, 2006

Marie Scott Standifer had many jobs. She worked on a potato introduction project, and diseased rice plants, morphology and anatomy of squashes and cucumbers, and stubby root nematodes on roots. She worked at several achaeological sites: Poverty Point, St. Peter's Cemetary, Cowpen Slough, and Josh Paulk. At LSU her studies in botany and archaeology ensured her place in the specialized field of archaeobotany.

Shirley Tucker describes Marie's projects in Archaeobotany:

1. Charcoalized wood. While in the department of Anthropology, Marie tried to study the anatomy of charcoalized wood, a very difficult matter because cell structure, if it persisted at all, was badly distorted. She and Leon spent a sabbatical in England that permitted Marie to consult with archeologists (Gordon Hillman) and botanists (Barbara Pickersgill) at the University of Reading and plant anatomists at the Royal Botanic Gardens, Kew. No one was able to help much with the charcoal, but Gordon Hillman encouraged her to specialize on identification of vegetative plant material (fibers, wood, bark), since unlike most archeologists, she knew plant anatomy. Seeds and fruits had been the primary type of evidence previously used from archaeological sites, but a great deal of plant material recovered is vegetative and so much more difficult to identify without wide knowledge of plant anatomy.

2. Marie's first project upon returning to LSU was one of attempting to identify fibers of an 800-year old fishnet recovered from Bayou Jasmine, a bog near Covington. In her typically thorough fashion, she used many anatomical techniques including scanning electron and light microscopy to characterize the cordage fibers. She narrowed the fibers down to aerial roots of a monocot plant. After that she collected more than 100 plants that were possibilities, and made slides of the roots for comparison. Although she determined that the source was probably a grass or sedge, the exact identification remains a mystery.

3. Marie identified charred edible tubers from an archeological site. The tubers turned out to be those of *Apios americana*, a vine of the bean family common in Louisiana, but rarely thought of as an edible. She and Bill Blackmon in Horticulture brought the plant into cultivation, and provided tubers for consumption around campus.

4. Marie worked with Jenna Kuttruff in the Department of Human Ecology to identify the fibers used to make primitive sandals found in a cave in Missouri. Radiocarbon dates for the fibers, ranged from 5205 BC – AD 855. Marie was able to identify the material used as the fibrous leaves of *Eryngium yuccifolium* (Rattlesnake Master), a plant native throughout the southeastern and central U. S. Unusual hairs and the shapes of cells in the leaf margins made identification of the source of the fibers possible. Marie and Leon transplanted *Eryngium* from several places in the southeast, and found differences in quality of the leaf fibers at different seasons of the year. This suggested that the Indigenous Americans were aware of the best times of year to harvest the leaves.

The work on *Eryngium* is to be published in a Festschrift for Gordon Hillman, who had inspired and encouraged her to specialize on vegetative plant remains.

-Shirley C. Tucker, University of California - Santa Barbara and Louisiana State University

Personalia

Award Named for Leading Crop Geneticist to go to NIH'S "Medicine Man" - Gordon Cragg

Gordon Cragg, a leading proponent of the screening of plant materials to identify therapeutic drug compounds, received the Wm. L. Brown Award during a symposium honoring Dr. Cragg at the Missouri Botanical Garden.

On Nov. 10, the William L. Brown Award for Excellence in Genetic Resource Conservation was presented to Dr. Gordon Cragg, former chief of the Natural Products Branch of the Developmental Therapeutics Program at the National Cancer Institute (NCI). The award ceremony took place during a symposium, Realizing Nature's Potential: The Once and Future King of Drug Discovery, to be held in honor of Dr. Cragg, Nov. 10 and 11 at the Missouri Botanical Garden in St. Louis. As part of the two-day tribute, leading research scientists from academic and corporate programs presented the results of cutting edge science in the natural products field. The proceedings of the symposium will be published as a Festschrift volume.

Not long ago, the idea that the wealth of genetic information stored in wild crop relatives ought to be preserved was widely underappreciated. Thanks to the efforts of Dr. William L. Brown, plant geneticist and former head of Pioneer Hi-Bred International, Inc., the importance of plant genetic diversity came to be generally acknowledged. During his tenure as the chairman of the National Academy of Science's Board on Agriculture, from 1983-1988, Dr. Brown helped shape U.S. policy on the preservation of plant genetic resources, sustainability of agriculture, as well as soil and water conservation.

Dr. Cragg was for many years the head of NCI's Natural Products Branch. Throughout his career, Cragg has championed the preservation and study of plants, since they are the source of the chemical compounds that form the basis of many therapeutic drugs. Dr. Cragg's conception of nature as a repository of invaluable genetic material is thus very much in line with Dr. Brown's views. Thanks to Dr. Cragg, the importance of conservation came to be recognized throughout the National Institutes of Health. He is the fourth person chosen to receive the William L. Brown Award.

The William L. Brown Award recognizes the outstanding contributions of an individual in the field of genetic resource conservation and use. It is administered by the William L. Brown Center for Plant Genetic Resources at the Missouri Botanical Garden and is made possible through a generous endowment from the Sehgal Family Foundation, in cooperation with the family of Dr. Brown. Previous recipients botanist and discoverer of roughly one third of all known varieties of potato; Dr. Calvin Qualset, founding director of the University of California's Genetic Resources Conservation Program; and Henry Shands, current director of the USDA's National Center for Genetic Resources Preservation.

Timothy Motley to Old Dominion University and Norfolk Botanical Garden

Dr. Timothy Motley has accepted the newly endowed chair as the J. Robert Stiffler Distinguished Professor of Botany in the Department of Biological Sciences at Old Dominion University http://sci.odu.edu/biology . He will also be directing the scientific program at the Norfolk Botanical Garden http://www.norfolkbotanicalgarden.org . Tim has spent the last seven years as a curator in the Lewis B. & Dorothy Cullman Program for Molecular Systematic Studies at the New York Botanical Garden where his research focused on plant evolution and phylogeography in the islands of the Pacific Ocean and the systematics or the Rubiaceae and Loganiaceae. Tim and two of his former graduate students Hugh Cross and Nyree Zerega have recently edited a volume, *Darwin's Harvest*, about using new approaches to the study of crop plant evolution http://www.columbia.edu/cu/cup/catalog/data/023113/0231133162.HTM . At Old Dominion University Tim will continue to conduct systematics research on island plant species and on the Rubiaceae and Loganiaceae. Recent projects include research on the unique flora of Rapa Island in French Polynesia, Galapagos *Borreria* radiations (Darwin's true passion), and DNA fingerprinting and phytochemistry of the botanical herbal, black cohosh. Contact information: Department of Biological Sciences, 110 Mills Godwin Building/45th St, Old Dominion University Norfolk, Virginia 23529-0266, Email: tmotley@odu.edu.

Courses/Workshops

Experience in Tropical Botany

Harvard University Summer School, in collaboration with The National Tropical Botanical Garden announces the following course in 2007.

Dates: June 11 to July 6, 2007
Location: The Kampong Garden of the National Tropical Botanical Garden,
4013 Douglas Road, Coconut Grove, Miami
FL 33133

The Class will use the newly constructed teaching laboratory at The Kampong (wet bench and Microscope facilities) and be accommodated in comfortable dormitory style housing in the same location (Scarborough House).

Course title: "Biodiversity of Tropical Plants"
Instructor: Professor P.Barry Tomlinson
Professor of Biology *Emeritus*, Harvard University &Crum Professor of Tropical Botany, National Tropical Botanical Garden.

The course is intensive and intended to present an overview of the rich diversity of tropical plants in natural environments (e.g. The Everglades National Park, Biscayne Bay National Park) and especially rich collections of introduced tropical plants at collaborating Institutions, notably Fairchild Tropical Botanical Garden and The Montgomery Botanical Center.

This tropical resource is unmatched elsewhere in the Continental United States.

Emphasis is on morphology and anatomy in a systematic but also functional context and involves both field and laboratory study. The course structure is extensively enquiry based and is intended to develop skills in investigative techniques and philosophical approaches which can be applied subsequently in Graduate Study. Students are introduced to many tropical plan families and such topics as, e.g., tree architecture, pollination biology, the morphology of vines and epiphytes as well as distinctive tropical ecosystems like seagrass meadows and mangroves.

Admission to the course depends on some demonstrated previous familiarity with at least elementary Botany and is intended to cater for students who are already enrolled in a graduate program in Botany or Biology or plan to do so in the near future.

Students will be required to register with The Harvard Summer School and will receive 4 credits.
Cost.: Harvard Summer School Tuition; travel to and from Miami; Kampong accommodation at $25 per day. Tuition and Travel scholarships may be available for qualifying students.

For further information:-
P.B. Tomlinson at the above Miami address,
e-mail: pbtomlin@fas.harvard.edu
And Harvard Summer School on-line.

Positions Available

Assistant Professor in Plant Biology

The Department of Plant and Microbial Biology at the University of California, Berkeley, has an opening for an Assistant Professor (tenure track) position (nine-month appointment) starting July 1, 2007. Applications are invited from outstanding individuals using functional genomics,computational biology, proteomics or metabolomics, or a related approach, to study fundamental aspects of modern plant physiology and/or biochemistry at the molecular, cellular, organismal orsystem level.

The successful candidate, who will hold a faculty position at the University of California, Berkeley as well as an appointment at the Agricultural Experiment Station, will be expected toestablish a vigorous, independent, and externally-funded research program. In addition, thecandidate will participate in graduate instruction and training, teach a modern course in plantbiology, and integrate into additional University and Departmental instructional and research programs. Applicants must have a Ph.D. degree, suitable postdoctoral or academic experience, and a strong research publication record. A curriculum vitae, a statement of current and future research interests, a statement of teaching experience and goals, and three letters of reference must be received by November 30, 2006 to:

Chair, Plant Biology Search Committee
Department of Plant and Microbial Biology
University of California, Berkeley
111 Koshland Hall
Berkeley, CA 94720-3102
and/or
PB-Recruitment@nature.berkeley.edu
(electronic submission of .pdf files preferred)

Refer potential reviewers to the UC Berkeley Statement of Confidentiality found at:
http://apo.chance.berkeley.edu/evalltr.html

Applications submitted after the deadline will not be accepted.
The University of California is an Equal Opportunity/ Affirmative Action Employer

Partnerships for Enhancing Expertise in Taxonomy (PEET)

We are sending a reminder that the National Science Foundation's program Partnerships for Enhancing Expertise in Taxonomy (PEET) is running a competition for 2007. The deadline for proposals will be **Monday, March 5**. The PEET program supports projects that work on understudied groups of organisms, and is an effort designed to encourage the training of new generations of taxonomists and to translate current expertise into electronic databases and other formats with broad accessibility to the scientific community. The PEET program is a biennial competition that has been in existence since 1995. To date 70 projects have been funded through the PEET program. Significant infrastructural developments (e.g., museum collections, databases) and international collaborations distinguish all the projects. We invite you to view the solicitation (announcement NSF 04-606; http://www.nsf.gov/pubs/2004/nsf04606/nsf04606.htm) for further details on the program and proposal guidelines.

Please note that the Cognizant Program Officer since Dr. James Rodman's retirement is now Dr. Juan Carlos Morales (sbbi@nsf.gov).

Systematic Biology and Biodiversity Inventories
Juan Carlos Morales, Patrick Herendeen, W. Carl Taylor, Gera Jochum

Plant Evolutionary Genetics Assistant/Associate Professor

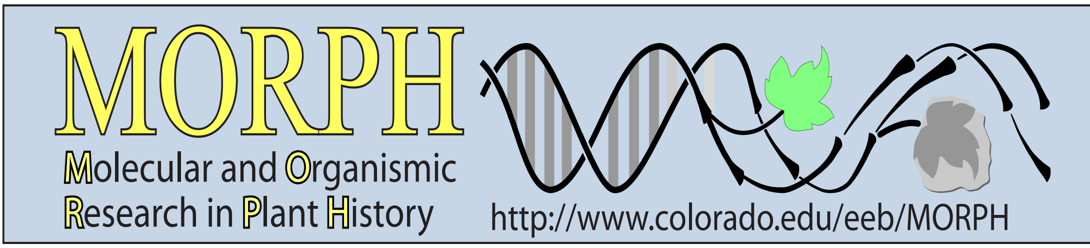
The School of Biological Sciences at Washington State University in Pullman, WA invites applications for a full-time tenure-track position in Plant Evolutionary Genetics to begin August 2007 at the Assistant or Associate Professor level. Applicants should have ability and potential for outstanding teaching and for maintaining a strong empirical research program in plant evolutionary genetics, focusing on questions that complement our faculty's strengths in population and ecological genetics, evolutionary ecology, molecular evolution, systematics, ecology, and physiology. Candidates pursuing rigorous, theory-driven empirical research on plant evolutionary genetics using sophisticated quantitative skills are particularly encouraged to apply, as are individuals who are effective communicators with broad knowledge of plant biology and interests in collaborative research and training. Required qualifications include an earned doctorate at time of application, a record of research accomplishment commensurate with rank in plant evolutionary genetics, and a commitment to teaching excellence in undergraduate and graduate courses. Successful candidates will be expected to develop and maintain a vigorous, independent research program supported by extramural funding, train graduate and undergraduate students, participate in graduate and undergraduate teaching including a graduate course in population genetics and shared responsibilities for undergraduate courses in general genetics or evolution, and advance the college's commitment to diversity and multiculturalism.

To apply, send a letter of application addressing qualifications, curriculum vitae, statements of research and teaching interests, and a list of names, addresses, and telephone numbers of at least three references. Arrange for at least three letters of reference to be sent directly to the Search Committee. These letters of reference should clearly address your research potential, teaching and communication skills. Send all materials by November 13, 2006 to:

Plant Evolutionary Genetics Search Committee
c/o Linda Larrabee
School of Biological Sciences
P.O. Box 644236
Pullman, WA 99164-4236
larrabee@wsu.edu
Phone: (509) 335-5768
Fax: (509) 335- 3184

Full notice of vacancy can be viewed at http://www.chr.wsu.edu/vacancies.asp. EEO/AA/ADA

Award Opportunities



MORPH plant evo-devo training grants

The MORPH Research Coordination Network provides support for cross-disciplinary training of undergraduate students, graduate students, postdoctorals, and early career faculty (assistant professors) between organismic (neobotanical and paleobotanical) and molecular labs. These visits range from a few weeks (to learn specific techniques) to a semester (to complete the equivalent of a lab rotation and take coursework not available at the home institution). This funding opportunity is open to US citizens or students and faculty currently working at U.S. institutions with an interest in bridging the gap between organismic and molecular aspects of the evolutionary developmental biology of plants.

CLOSING DATES:

Assistant professors Postdoctorals Graduate students	November 1, 2006
Undergraduates:	March 1, 2007

Applications will continue to be accepted until all annual funds have been committed.

Application guidelines: http://www.colorado.edu/eeb/MORPH/grants.html

For more information, contact Professor William (Ned) Friedman: ned@colorado.edu

MORPH website features

MORPH-hosted lab pages for faculty, postdoctorals, and graduate students

Upcoming plant evo-devo symposia

Evo-devo job listings

http://www.colorado.edu/eeb/MORPH

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 post-doctoral candidates. Information and application instructions are available on the Harvard Forest web site (http://harvardforest.fas.harvard.edu). Annual deadline for applications is February 1st.

Student and Postdoctoral Opportunities in Plant Developmental Evolution

Students: Students interested in pursing research in plant developmental evolution are encouraged to apply to the PhD program in Ecology and Evolutionary Biology at the University of Kansas to work in the lab of Dr. Lena Hileman. Applications are due in early January, 2007. Graduate students in the Hileman lab will have the opportunity to work on ongoing projects in the lab, and/or to develop their own research projects under the supervision of Dr. Hileman. For more information, please contact Dr. Hileman (lhileman@ku.edu), or visit the Hileman lab web page at: http://www.peoplelu.edu/~ihileman/

POSTDOC: Applications are invited for a postdoctoral researcher to participate in an NSF funded project in the lab of Dr. Lena Hileman at the University of Kansas.

The major goals of the project are to use both expression and functional analyses to 1) determine the extent to which the genetic network establishing bilateral flower symmetry has diversified among close relatives of the model species, *Antirrhinum majus* and 2) determine the specific role that dorsal identity genes have played in shaping dorsal petal morphology and variation in stamen number among close relatives of *Antirrhinum majus*. For more information, please visit the Hileman lab web page at http://www.peoplelu.edu/~ihileman/

Specific skills associated with the project include gene isolation (PCR/cloning), mRNA expression analyses (quantitative rtPCR, *in situ* mRNA hybridization), functional characterization of gene products (using a transient, reverse-genetic approach, Virus Induced gene Silencing, in non-model species), assessment of gene trees (phylogenetic analysis), basic plant care in greenhouses/growth chambers, and supervision of undergraduate students.

Candidates will be required to have completed a PhD in Plant biology Evolutionary biology, cell/Molecular Biology or a related field.

The ideal candidate will have a background in plant biology, be creative, enthusiastic and highly motivated to pursue studies on the evolution of floral development, have excellent molecular genetics kills with preference given to candidates with previous experience in plant gene expression and/or functional approaches.

For more information, or to apply, please submit applications by email, including a CV, statement of research interests and the names (and email contact information) for two references to Dr. Lena Hileman (lhileman@ku.edu).

Books Reviewed

Green Inheritance: Saving the Plants of the World. The WWF Book of Plants Huxley, Anthony revised by Martin Walters, foreward by Sir David Attenborough. 2005. ISBN 520-24359-5 . (Paper $29.95). 192 pp. University of California Press (Gaia Books), Berkeley, CA 94704.

Green Inheritance, the WWF Book of Plants was first published in 1984, a 2nd edition in 1992, and in 2005 this 3rd edition with its desperate and eloquent plea for people of the world to act now while there is still time "to save our plants, upon which all life depends"…"we are squandering this inheritance in ignorance, in thoughtless impatience and greed, failing to appreciate either the beauty or the value of what we destroy. The aim of this book is to show before it is entirely too late just how rewarding our inheritance is to mankind, what potential it has, how it cannot take much more punishment, and to seek ways to save what remains". (pg. 21).

Huxley's beautiful writing, with superb clarity and simplicity, tells us the complex story of the plant world and its relation to people throughout time. Fortunately his text has been preserved, line for line, page after page although on the cover of the book it states that this is "a completely revised and expanded edition of the *WWF Book of Plants"*. The number of pages has remained the same in all 3 editions, but a smaller typeface in the new edition permitted the addition of updated or rewritten material on such topics as climate change and global warming, genetic modification of plants, organic farming, plants useful for treating HIV/AIDS, fair trade, benefit sharing, the threat to wood resources. Statistics are updated throughout the text. The revisions blend well into the original text. Diagrams have all been redrawn to show their statistics more clearly. The profuse and beautiful illustrations, carefully chosen to integrate with the text, are all retained, though the captions have been rewritten, where necessary, to include new facts and figures. Anthony Huxley died recently but in my review I use mostly present tense, since the book is directed not to past problems but to present ones and the futurewe face if we do not address these problems. Huxley organizes the book into eleven chapters in which he has condensed the entire history of plants and their relation to humanity. In all of the topics he illustrates by practical examples what has or can been done to alleviate problems.

Chapter 1."The Green Inheritance" states the number of plants is now estimated to be 422,000 species vs. the earlier estimate of 380,000 species. Huxley discusses their adaptations to their varied environments; general distribution and diversity; their vast range of forms; how plants serve our needs; the rôle of plants in the web of life.

Chapter 2. "Guardians of the Environment ." "Plants provide the fabric of our landscape, the home for all animal life" and are…"guardians of air, climate and soil". He tells how plants interact with all these. The section on climate change and global warming emphasizes new thinking on this topic.

Chapter 3. "Green Travellers" tells how plants are dispersed: the usual seed mechanisms; plants dispersed by geology (continental drift); how humans have carried crop plants world-wide; and the latest worry—invasive plants.

Chapter 4. "Our Daily Bread". Of the 50,000 species of edible plants recorded, only about 3000 are widely accepted, only 150 are cultivated to any extent (pg. 53). Huxley gives a concise history of the use of plants for food. A section on organic farming is added. The chapter points out that "modern agriculture is dependent on vast energy consumption"; and that "high dependency on chemicals" increases continually (pg. 75). Such practices may be acceptable in the U.S. and Canada but are not possible in the Third World. He notes that "fewer than 20 crops supply over 80% of the world's needs." Thus there is a decline in variation and crops are much more susceptible to epidemics or diseases always with the looming possibility of catastrophic losses (pg. 79). There is a need to find new crop plants that do not require such energy output, new underutilized plants which can be improved and made acceptable to feed the increasing numbers of mankind. Many suggestions are made of plants to meet these needs.

Chapter 5. "The Spice of Life" presents the long history, replete with examples, of specialty foods; flavorings; chocolate, coffee and tea; plants used in alcoholic drinks; drugs. stimulants and hallucinogenic plants; perfumes and cosmetics.

Chapter 6. "Green Wealth." Energy from plants; extraction of coal and oil with much destruction of habitat; biomass production; composting; need for more recycling ; use of other substances than wood especially in paper-making; ways for sustainable use of forests.

Chapter 7. "Green Medicine." An important chapter especially since up to 80% of the world's people rely on traditional, mostly plant- based, medicines for their primary health care, in contrast to the U.S. where we are so dependent on expensive chemical compounds for our drugs albeit we have a renewed interest in herbal medicines. Some 35000 plants are used for medicine, 7500 in India alone. There are plants with contraceptive uses and those that provide help in treating patients sick with HIV/AIDS. There is great need for conservation of these plant resources which are often being exterminated in the wild, such is the demand. We need to document the uses by indigenous peoples before that knowledge accumulated over hundreds or thousands of years, is lost forever.
[Your reviewer would like to interject a personal study made over the past 12 years on the small, dry Island of Anguilla, in the Lesser Antilles. Of a total flora of 545 species some 194 species are recorded as having a medicinal use somewhere in the world; of these 58 are, or recently have been, used on the Island but now only by the elder population. The younger generation is rapidly losing this knowledge; it is much easier to go to the drugstore to get a pill, and less time- consuming, than to brew a tea of the right amount and combination of several plants gathered outside. And habitats for any plants are being destroyed right and left by development.]

Chapter 8. "Objects of Beauty". The history of gardens; floral decorations in art, pottery, buildings; ornamental plants and the beginnings and growth of international trade; single plants-lilies, tulips, roses; present day over-collecting in the wild, a very real problem.

Chapter 9. "Plants and Society". The enormous knowledge peoples used to have of how to utilize a plant for every aspect of living: e.g. the date palm, the coconut palm, bamboo. The enormous need to preserve this knowledge before it is lost forever; the current issues of fair trade and benefit sharing.

Chapter 10. "Improving the Resources". "Few people realize how vital wild plants ands primitive crop plant varieties ('landraces') are to plant breeders". Our future depends on "the untried virtues they may offer of disease resistance, drought or salt tolerance, ease of harvesting or soil improvement" (p. 161). Need for "in-situ 'on- the -spot' conservation—protected areas like nature reserves and national parks." and ex-situ conservation such as in gene banks; genetic modification and the problems it raises; bio-engineering.

Chapter 11. "Saving the Plants that Save Us." The assault upon of plants is occurring world-wide.

Pollution of the air, especially acid rain and desertification are degrading vast areas on the earth.

"Much of the destruction borders on the irrational. It has indeed been called subsidized vandalism". ..."The impact of machinery on the worlds wildlife… most of all in the last 20-30 years has to be compared with the greatest cataclysms of the geological past.

The species of plants being extinguished by our activities today represent the genetic heritage of aeons; their demise represents biological massacre. The destruction of forests and other natural habitats stops evolution dead in its tracks. As the great biologist Professor Edward O. Wilson has said, the event 'our ancestors will most regret is not limited nuclear war, nor energy depletion, nor economic collapse, but the loss of genetic and species diversity'.

Because this loss will take millions of years to compensate for-longer perhaps than the span of humanity itself." (p. 178)

"If the destruction continues unabated the earth will become largely covered with crop plants and then probably barren lands with catastrophic effects on the life-support system of planet earth and the future well-being of its inhabitants". (p. 185)

In 1999 at the International Botanical Congress in St. Louis MO I remember the very bleak and glum picture the major botanical speakers painted of the future of plants. In this profound book on a profound subject Anthony Huxley expresses the strong hope that the efforts of the international conservation organizations, working together will finally convince governments that they must find the political will to work together to plan not just for the immediate present but for the future to save our plant heritage. The final three pages of the book "A Future for Plants" lists the key facts we must know; four key aims for conservationists, a global strategy, twelve key targets to achieve by 2010, a ranking of the most important major habitats of the world under "Global 200" and the selection and mapping of 34 biodiversity hotspots to concentrate efforts on. Twenty-two conservation organizations are listed.

This book should be in every library in the country: public, high school, and college. Biology classes in high school and college should use the book actively. The need for all to be aware of the dangers the plant world faces is absolutely necessary if we are to give our governments the will to act.

-Mary M. Walker.

Island: Fact and Theory in Nature. Lazelle, James. 2005. ISBN 0-520-24352-8 (Cloth US$49.95) 402 pp. The Univeristy of California Press, 2120 Berkeley Way, Berkeley, California. 94704

Upon receipt of *Island: Fact and Theory in Nature* by James Lazelle, I was expecting a text-book like read, an endeavor to which I was not looking forward. However, to my pleasant surprise, Lazelle's writing feeds the imagination, taking the reader with him to the British Virgin Islands through an in-depth tale of geologic and biologic history to the present, of the BVI archipelago. He also includes his input on the future well-being of the BVI inhabitants and what actions need to be taken to mitigate protection of the habitat and corresponding species. Lazelle states that he has "…written this book for people like me: those interested in the natural world and living things" (p. XIV). Although Lazelle's primary focus is the astounding diversity of the fauna, especially iguanas and lizards, and flora on Guana, he very explicitly describes the species on other BVI islands, creating a background for understanding the movement of species between the islands.

Island: Fact and Theory in Nature is laid out in such a manner as to present the reader with different ways of viewing the diversity of the BVI, including theories, ideas, and even mathematical representations and models of species indices. Even for those who are not statistically or mathematically inclined, Lazelle presents the information in easy to understand descriptions without necessarily "dumbing" the content down, thus making the reader feel comfortable in their reading. He starts by describing the models and data in a specialized manner, and then takes a step down a level for the general lay-man. Lazelle even admits to his own mathematical pitfalls and often reminds the reader that he had requested the help of mathematicians to check his formulas. Being able to admit one's drawbacks in a discipline helps in creating a feeling of trust in the credibility of the author by their readers. The one aspect of the formulas I found to be a little frustrating is how Lazelle seems to flip-flop between the American and the metric system, otherwise, no other discrepancies really seem to "pop out".

Lazelle has a bit of quirky sense of humor that catches the reader off guard, an enjoyable and almost stereotypical characteristic of a naturalist.

Lazelle sets the tone of the literature by starting with the different ways we can look at diversity through richness, indices, rarefaction, communities, and *glitteralities*, which he describes as "glittering generalities…about biodiversity look pretty at first glance but usually turn out to be soft, squishy semi-truths so vague as to be trivial" (p. 3). Lazelle presents views of biodiversity by other naturalists and biologists to prepare the reader for the end of the book where he describes his beliefs and views. He then delves into the marking, capturing, and data collection of organisms, then to analyzing the data for spatial distribution, life histories, and communities. After he has set the backdrop, Lazelle goes into the idea of Great Guania and his views of how the BVI was once a single landscape that eventually broke into islands and how the species of Great Guania have since dispersed to the archipelago. This section also goes into all of the current data collected on species of the BVI from reptiles and amphibians to birds, insects, and flora. While taking in all of the information presented, the reader no longer feels as though they are reading about a place that is out of reach, but rather, a familiar place, much like a place in a childhood memory. Finally, the last section of the book is a presentation of Lazelle's work in conservation and restoration of certain species and habitats on the BVI, and his ideas on how to maintain diversity of the native species on the BVI.

Although *Island: Fact and Theory in Nature*, a fairly lengthy book at 334 pages, the reading is enjoyable, fascinating, and entertaining. The different topics of focus can fulfill the interests of all naturalists. The literature is thick with information, though not overwhelmingly so, on studies and research conducted in the British Virgin Islands… a truly great read.

-Crystal Schiffbauer, Fairbanks, Alaska

Metacommunities, Spatial Dynamics and Ecological Communities. Holyoak, M., M. A. Leibold, and R. D. Holt (eds). 2005. The University of Chicago Press, Chicago.

This book is primarily about among trophic-level species interactions that are structured spatially and hierarchically, from populations to metaecosystems. A metacommunity is defined as a set of local communities linked by dispersal. Species interactions and dispersal within a metacommunity are conceptualized under four perspectives. The patch dynamic perspective invokes competitive-colonization tradeoffs or predator-prey relationships among interacting species distributed among homogeneous local communities. The species sorting perspective invokes niche assembly among interacting species as they disperse among heterogeneous local communities. The mass effects perspective is a multispecies version of the source-sink dynamic, where dispersal from good to poor quality local communities affects local communities in the short term. The neutral perspective assumes ecological equivalence among species such that each is on a random walk to extinction. The among trophic level focus of this book, however, precludes the implementation of the original intent of neutral theory. Neutrality is simply regarded as a null hypothesis. These four perspectives are not necessarily mutually exclusive. Dispersal at some intermediate level enables niche assembly (species sorting), for example, but at some higher level can swamp local adaptation (mass effects).

Following the introduction (chapter 1), the book opens with two chapters on core concepts, followed by chapters on empirical, theoretical, and emerging perspectives. Core concepts (chapters 2 and 3) include, for example, a patch occupancy model developed for multiple species, mutualism models, a food chain model developed for the metacommunity, and island biogeographic (neutral) expectations of species-area relationships for higher trophic levels normalized against those for lower trophic levels. The empirical perspectives (chapters 4-9) illustrate metacommunities with examples of spatially patchy food webs or taxonomic assemblages. Case studies involving butterflies and their plants and parasites (chapter 4), metacommunities confined to pitcher plants (5), mites among moss carpets and fragments (6) beetles among eucalypt or pine forests and fragments (7), zooplankton among turbid- versus clear-water ponds (8), and invertebrates among ephemeral coastal rock pools (9) illustrate how spatial and temporal metacommunity structure can be analyzed. In general, the neutral perspective of metacommunities was seldom supported by these empirical studies. One study (9) came down in favor of species sorting, three (6-8) explained their metacommunities ultimately by mass effects, and the remaining two (4-5) didn't conclude by choosing one of the four metacommunity perspectives as explanatory. The theoretical studies (chapters 10-13) explain how species coexistence models have grown in complexity during the history of community ecology (chapter 10), patch occupancy models can include persistent communities of competitive species that variously occupy individual patches (11), and that interactions among species and between species and their environments lead to nonlinear responses that result in persistence and coexistence (12), the latter of which is supported by experimental studies (13). The emerging perspectives (chapters 14-20) include how to choose among the different hypotheses of metacommunity diversity and dynamics (i.e., patch dynamic, species sorting, mass effects, and neutral perspectives; chapter 14), implement population genetic models to describe and understand the origin and maintenance of species diversity in a metacommunity (15), study interactive habitat selection by guilds of potentially many species (e.g., aquatic beetles, tree frogs) of a metacommunity (16), detect whether local diversity is dispersal limited via niche assembly and thus not a fractal representation of regional species diversity (17), study the flow of energy, materials, and organisms across ecosystem boundaries to gain a metaecosystems perspective (18), understand the potential of ecosystems to have an "adaptive response" with a local environmental change, whereby, for example, joint increases in plants and herbivores prevent either from becoming relatively more abundant (19), and study biogeographic parameters (e.g., edge effects, fragmentation) that can effect metacommunity trophic interactions, including predator-prey relationships (20). The final two-page Coda itemizes the major findings of the book, which provide potential discussion topics for group readers.

Metacommunities does not have a strong evolutionary scope. Phylogenetic methods, including analysis of community phylogenetic structure, analysis of traits, or independent contrasts, are rarely, if ever, mentioned. Such phylogenetic methods can analyze the fit of an organism to its environment at any hierarchal scale by examining the match in the distribution of species traits to a local environment. Similarly, implications of speciation in the metacommunity are lacking. When cryptic species are detected within a higher trophic level, a food web is merely converted to a food chain. The effects of speciation in the pitcher plant at the longitudinally-restricted southern end of its distribution on the inquiline communities are dismissed. The positive relationship between latitude and inquiline invertebrate richness, however, could well be a function of the less restricted distribution of the pitcher plant to the north.

Testing for the effects of biogeographical parameters (e.g., area, distance, position, isolation, etc.) on biodiversity is integrated poorly into the general themes of *Metacommunities*. Holt and Hoopes (chapter 3) present a general species-area model for among trophic levels, and conclude that area generally has a greater effect on species richness at low trophic levels; this model is not elsewhere mentioned. Testing for the effects of metacommunity fragmentation on species richness of mites and on relative species abundance distributions of rock pool invertebrates is exceptional to chapters 6 and 9, respectively. McPeek and Gomulkiewicz (chapter 15) make a sound argument for the significance of ecological drift in metacommunities that likely will never attain evolutionary equilibria; the implications are ignored in summary chapters. Probably because of the lack of attention to really biodiverse systems, *Metacommunities* generally treats Hubbell's (2001) neutral theory as a null model. The neutral theory of biodiversity and biogeography was developed to test for the effects of biogeography on biodiversity, and specifically for highly biodiverse systems within a trophic level or taxonomic group. It was also developed to explain the origin and maintenance of biodiversity using stochastic models originally designed to explain mutation and genetic drift. A reader of *Metacommunities* would have no idea of this original intent, especially that the neutral theory of biodiversity was designed for the study of high biodiversity within narrow ecological confines. Darwin failed to explain the origin and maintenance of biodiversity using his concepts of individual struggle and the principle of diversification. Hubbell puts forward the first fruitful alternative and *Metacommunities* refers to it as a null model in the sense of "nothing going on."

Metacommunities is directed towards graduate students and other researchers in ecology and evolution, particularly those with an interest in community or ecosystem ecology. The abundant terminology and conceptual issues that are presented in tables and text require a good background in community ecology. In contrast to other metacommunity approaches, *Metacommunities* leads the way in how to study species interaction that occur among trophic levels and that have fractal, geographic, or temporal structure. If you are interested in complex deterministic models to which complexity can be readily added, you should consider reading about this generally among trophic level approach to the study of the metacommunity. If you are interested in stochastic models to which complexity is added sparingly, you should consider Hubbell's complementary within trophic level approach.

-Matthew Lavin, Department of Plant Sciences and Plant Pathology, Montana State Univesity, Boseman, MT

Reference
Hubbell, S. P. 2001. The unified neutral theory of biodiversity and biogeography. Princeton University Press, Princeton, USA.

Plant-Pollinator Interactions: from Specialization to Generalization. Waser, Nickolas M. and Jeff Ollerton (eds). 2006. University of Chicago Press. $45.00 (USD) paperbound, ISBN 0-226-87400-1, xii + 445 pages.

Seldom does one wax poetic about an edited volume arising from a symposium at a large national meeting. This volume edited by Nick Waser and Jeff Ollerton is a glorious exception. They have compiled a rich set of papers, from diverse authors, all delivering a single unified message. What makes this even more amazing is that authors used different formats and even clearly showed disagreements with one another.

Yet, this volume is coherent and peppered with numerous references between the chapters. Read this book and soak in the wealth of details and perspectives.

All chapters were initially presented at the Ecological Society of America's 2002 annual meeting in a symposium titled "Specialization and Generalization in Pollination Systems", although curiously the editors failed to mention this. The volume is divided into three equal-length sections titled the ecology and evolution of specialization and generalization in pollination, community and biogeographic perspectives, and applications in agriculture and conservation. These are roughly on evolutionary, community, and human ecology. The editors contributed introductory remarks to each section, as well as a pair of bookends that serve as prologue and epilogue to the entire volume.

Despite the wide variety of backgrounds of the contributors, there was unanimity on two essential points. First, all contributors agreed that defining specialization of pollinator-plant interactions requires context, i.e. defining the spatial, temporal, and taxonomic scales over which a given researcher is working. As Paul Simon (1973) quipped about high-density urban life, "One man's ceiling is another man's floor." Second, all contributors agreed that a specialised pollinator can pollinate generalist plants, while specialists plants (i.e. those relying on only a few pollinators for seed set) can be pollinated by generalists pollinators. Reciprocal specialisation cannot and should not be considered the norm. It was a joy seeing these two points made from so many different perspectives.

Although papers in this volume were state-of-the-art, they lacked mathematical sophistication. This implies that the authors focussed on biology, in lieu of mathematics. There were some obvious foibles, such as one chapter that repeatedly referred to scalars as eigenvectors rather than eigenvalues. To be constructive and not overly picky, I want to focus on the quintessential notion of quantifying degree of specialization across an ensemble of interacting pollinators and plants.

Several authors discussed connectedness of plant-pollinator interactions, but only cobbled together suboptimal methods for quantifying connectedness. This is strange insofar as off-the-shelf mathematical tools exist, such as cut sets and mutual entropy. Jordano et al. came close to the graph theoretic notion of cut sets, but they redacted vertices rather than edges from the graph of interactions. Several authors mentioned niche breadth and overlap as a proxy for connectedness. Mutual entropy provides a robust measure of niche breadth and overlap (Colwell & Futuyma 1971 *Ecology*), as well as a robust measure of specialization or generalization of pollinator-plant interactions (Gorelick et al. 2004 *Am. Nat.*). Yet the contributors to this volume only mentioned marginal entropy, which is really only useful when dealing with a single entity. Shannon (1948 *Bell Sys. Tech. J.*) showed that mutual entropy is needed for quantifying interactions between multiple entities. In addition, other useful mathematical methods probably still need to be developed. For example, level of connectedness almost certainly depends upon whether one is a taxonomic lumper or splitter, although none of the contributors tried to gauge this sensitivity. Therefore, when quantifying pollinator-plant interactions, it would be useful to have phylogenetic comparative methods on bipartite graphs. My suspicion and hope is that the field of plant-pollinator interactions will advance in leaps and bounds once the methods discussed in this volume are coupled with improved mathematical methods.

My biggest problem with this volume is that the title was misleading and should have been "angiosperm-pollinator interactions". Gymnosperm pollination was never mentioned in this volume, even though most (all?) cycads and many gnetophytes are insect pollinated. Gymnosperm-pollinator interactions would have allowed for many independent tests of the hypotheses presented in this volume. I was especially surprised about this omission after noticing acknowledgement of Irene Terry, who has published seminal papers on weevil and thrip pollination of cycads. But, alas, this is a minor complaint and should not detract from the beauty and coherence of this volume.

This volume explicates many fascinating open research questions, a veritable windfall for nascent graduate students. Research on pollinator-plant interactions is important enough that Waser, Ollerton, and the other contributors should seriously contemplate reconvening in a few years to put together yet another, updated volume on this subject. If it is half as good as their current volume, every ecologist and pollination biologist should read it. Until then, we will all have to read the current marvellous volume.

-Root Gorelick, Department of Biology, Carleton University, Ottawa, Ontario K1S 5B6, Canada

Armitage's Native Plants for North American Gardens. Armitage, Allan M. 2006. ISBN 0-88192-760-3 (hardcover, US $49.95). 451 pp. Timber Press, Portland.

As a response to the growing interest in gardening with native plant species, Allan Armitage has written a book primarily for gardeners "who would love to try some native plants but don't know where to start." He should consider that goal reached with flying colors.

Hardcore native plant lobbyists, however, should be warned. Armitage is not catering to you with this book. You will find very little support here for the idea that native plants are better for North American gardens than exotic ones. Nor will you come across any text decrying the use of non-native species in the home landscape. Rather, the author is transparently clear that although he loves native plants, he sees them as an obvious compliment to their non-native garden companions. In fact, his personal version of "Don't tread on me" seems to be "Don't tell me what I can't plant in my garden." That said, Armitage makes such a strong case for native plants (and does it with such flair and insight) that this book cannot help but become standard issue for even the most radical of native plant enthusiasts.

The majority of the 451 pages are used for species profiles arranged alphabetically by genus. Any herbaceous plant (including many ferns) growing in North America before the arrival of Europeans was considered eligible for inclusion, but only the species that are available to some degree in the nursery trade are described. For each species profiled, the author provides quite a bit of background information and commentary accompanied by the native range of the species, the conditions it favors and any particular maintenance requirements. Many species are illustrated with a photograph taken by the author; these are good (though not great) and generally provide a fair sense of what the flowers and growth habit of each species look like.

Armitage does not advocate the harvesting of wild plants for the garden (he cites *Trillium* and *Cypripedium* as the genera that have been most abused in that regard) so a good measure of the text is spent on how to acquire them in the horticultural trade. Every species treatment also includes a section on recommended propagation, which for me is the best aspect of the book. Gardeners inclined to grow their own native plants can find specific directions for getting young plants started, whether by seed or spore germination, starting cuttings or making divisions. In fact, the inclusion of this information elevates this book beyond the popular literature and makes it quite useful for botanists wishing to propagate research plants.
All of the commonly planted native wildflowers are featured, but for every *Echinacea* or *Gaillardia* (blanket flower), there is a profile for some uncommonly cultivated species of *Gentiana*, *Nemophila* or *Saururus*. Armitage also includes native plant cultivars, a potentially controversial move he defends early on in the book. Whatever your stance (and your definition of "native"), it's still pretty neat to find out that there are things like a bright pink double-flowered cultivar of *Anemonella thalictroides*. And who knew there were so many available cultivars of native asters? Certainly not me.

The appendix consists of contact information for native plant nurseries and native plant societies, a few pages of helpful web resources and a batch of useful plant lists. Recommendations are made for native plants that are drought-tolerant, water-loving, attractive to butterflies and hummingbirds, resistant to deer and rabbit, and appropriate for varying degrees of sunlight. What is missing from this list of lists is the first thing that I was hoping to find when I picked up the book: a table showing some of the most commonly encountered (some might say "overused") exotic garden plants and the native plants that might make ample replacements for them in one's landscape plan. By far, the question I am asked most frequently when I suggest native plant gardening to a friend or colleague is, "Okay, so what looks like (insert name of exotic plant here)". Not finding an easy reference for that question in this book was a real disappointment, and its inclusion likely would have found a large and appreciative audience among modern gardeners.

In the preface, Armitage describes a sentiment shared by many of us in botany, as well as among gardening enthusiasts more generally: when we encounter an attractive or interesting species in the wild, we want it in our garden. What follows in the text is the compelling prospect that there are many native plants deserving of this desire. *Armitage's Native Plants* is likely to be a benchmark publication for a modern wave of gardening, where scores of "new" native plant species (and their cultivars) not only become more popular with gardeners and but also become more readily available through the retail trade. Both would be positive outcomes.

- Chris Martine, Department of Biological Science, Plattsburgh State University of New York, Plattsburgh, NY 12901.

Food Plants of the World. An illustrated guide. Van Wyk, Ben-Erik.2005. ISBN 978-0-88192-743-6 (hardback 39.95 US$) 480 pp. Timber Press, Portland, Oregon, USA

Probably among the most important expressions of globalization and human constant migration is the shape and features of the food trade in developed nations. Today, main ingredients for cuisines from distant countries are rather easily obtained in markets located for example in small cities in Canada and the United States, allowing for an interesting manifestation of identity and culture. The title of this book attracted my attention due to the fact that, both as an inmigrant in the States and with a love for cooking, I have witnessed for almost 20 years, the changes in the availability of food staples from my country, such as quinoa, aji (Andean chili peppers), purple corn, and freeze-dry potatos.

Van Wyk elegantly introduces in this book 354 plants under nine different categories, including cereals, pulses, nuts and seeds, fruits, vegetables, and spices. This book is aimed to the non botanists, "food enthusiasts", and I will add for those that would like to obtain a glimpse of the features, variation, distribution, history, cultivation, and uses and properties for the most widely trade species. Photographs for each plant and details of the parts used are of high quality. Also included are an overview of nutrients, a table of the nutritional value of the species and region of origin discussed in the text, a glossary and a selected list of references, together with an useful index.

This book includes a summary of the regions of diversity of cultivated plants by A.C. Zeven and J.M.J de Wet (1982), emphasizing on the main crops and the probable beginning of agriculture. Then develops a definition for each category and a list of taxa citing both scientific and common names. The presentation of the plants is arranged alphabetically by scientific name, under which common names are included. I found that although the introduction mentions the use of several languages, most taxa only include common names in English and a few in German. One example applies for the case of the two species of *Capsicum* that do not contain any of the names cited by S. Rehm (1994) or listed in GRIN (http://www.ars-grin.gov/cgi-bin/npgs/html/taxecon.pl).

The importance of plant resources for food and related uses as commodities has also increased dramatically in tropical South America, and several species are not considered in this publication, especially among palms. For example, the Organization Treaty for Amazon Cooperation has published one important overview for fruits and vegetables (TCA 1996), where *Mauritia flexuosa* L.f. (aguaje, moriche, muriti, morichepalme) and *Euterpe precatoria* Mart. (açaí) are among the most important palms used in the region (see also IPGRI, http://www.ipgri.cgiar.org/Regions/Americas/programmes/TropicalFruits/Detail.asp). Some other species are not mentioned despite the fact that the genus is treated with other examples, such as *Pouteria lucuma* (Ruiz & Pav.) Kuntze (Lucmo, lúcuma) or *Myrciaria dubia* (Kunth) McVaugh (camu camu, arazá de água), both of which are traded mostly to Europe and Japan.

This book could be a useful reference together with other sources especialized in popularizing the features of particular types of food, such as those illustrated guides on spices and herbs. The nicely organized one page presentation for each species facilitates its consultation.

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Handbook of Medicinal Plants. Yaniv, Z and U, Bachrach (eds). 2005. ISBN 1-56022-995-0 (soft: alk. paper) ISBN 1-56022-994-2 (hard: alk. paper). xix + 500 pp. Food Products Press ®, The Harworth Medicinal Press®, Imprints of the Harworth Press, Inc. New York, London, Oxford.

Medicinal plants are still a very important source material for the drug industry, although the industry is continuously developing more and more synthetic medicines. Moreover, the importance of medicinal plants is unquestioned in ethnobotany, folk medicine and phytotherapy in different parts of the world. From this point of view the handbook is interesting and has a large circle of potential readers.

The handbook edited by Yaniv and Bachrach is interesting and presents medicinal plants through the eyes of different writers. The book contains five parts containing 21 different chapters. The parts following the introduction present trends and challenges in phytomedicine and cover (1) the history of the use of medicinal plants, (2) technologies in medicinal plant research, (3) latest developments in medicinal applications and, (4) hopes and challenges connected with the use of medicinal plants. There are 25 contributors of the book. The reader can also find information on the authors, a preface and an index. There are also excerpts of pre-publication reviews, commentaries and evaluations written by professors from Israel, Turkey and Canada. These commentaries are only positive and seem even to be even worshipful.

Many books on the subject have been published in recent decades. There are also many handbooks for the students of medicine and hobbyists. Yaniv and Bachrach's work can be useful for the readership. It presents the general problems connected with medicinal plants instead of a detailed presentation of the plants and their compounds. On the other hand, this method of presentation can lead to places where there is not a sufficiently deep or academic analysis. The reader thus tends to believe that the statements of the authors are not fully discussed. However, the book is easy to read, not difficult and will probably strongly motivate the reader.

What can the reader find in this book? Firstly, strong arguments that phytomedicine will also be important in the new millennium. A trend in phytomedicine is the use of new plant origin bioactive compounds with the potential for chemical modification, which will broaden phytomedical importance. Molecular biology will be used in this process and the pharmacological profiles of these compounds will be screened using new research equipment and new technology. Moreover, a description of the history of the application of medicinal plants in China and of traditional Chinese drugs produced from medicinal plants are presented. African and native American medicinal plants are also discussed and the etnobotany and ethnomedicine of the Amazonian Indians are illustrated. Furthermore, there are also descriptions of ethnomedicine and ethnobotany in the ancient Mediterranean areas and among the Australian Aborigines. Secondly, the book discusses and describes the production and breeding of medicinal plants. Moreover, the biotechnological methods used in medicinal plant improvement are noted. The reader can also find descriptions of *in vitro* cultivation of medicinal plants. Thirdly, the book try to present the latest development in medicinal applications, especially in the prevention and treatment of cancer, heart diseases, infections, metabolic diseases, and disorders of the gastrointestinal tract and central nervous system. Fourthly, the book discusses the present problems connected with the use of medicinal plants, phytomedicine and biodiversity, some problems connected with quality control, clinical use and ethnopharmacy.

The book is interesting and provides substantial material on the subject. Readers expecting detailed information on bioactive compounds in medicinal plants will probably be more critical than those interested in a general view. Potential criticism on the book is connected to some of the terminology used. Such terms as *phytomedicine* and *pharmacology* seem to be used interchangeably in many places. There is no explanation of how *medicinal plant* is to be comprehended in the book. Is the soy-bean a medicinal plant or a food plant with functional potential? The traditional use and historical view of medicinal plants seems to be the better part of the book. Although the handbook examines medicinal plants with only a basic critical eye, it is very important and useful for everyone interested in the subject.

-Dr. Tadeusz Aniszewski, Associate Professor in Applied Botany, University of Joensuu

Planting Design: Gardens in Time and Space. Oudolf, Piet and Noel Kingsbury. 2005. ISBN 0881927406 (Cloth US$34.95) 176 pages. Timber Press, 133 S.W. Second Avenue, Suite 450, Portland, OR.

The title of this book suggests that time and space in garden design will be the main topics. Oudolf and Kingsbury, who are professional landscape architects, instead weave a bit of time and space into a somewhat unstructured (though generally interesting) book-length essay on what appears to be everything they have ever thought about in designing gardens. One ambitious goal of this book is to explore the possibilities of combining principles of garden design with principles of ecology to establish the best possible practices for landscaping on both a public and private scale. Most of their points are illustrated with very colorful pictures of landscapes from several places in the world, though they often repeat pictures of some of their favorite gardens from different angles to illustrate different concepts.

The authors recognize ecological processes without expecting the planted landscape to be a reproduction of a natural landscape limited only to native plantings. They emphasize various elements of conventional ecology in a garden context. They define biodiversity as the use of a variety of plants in a way that recognizes the microhabitats of the site and which appeals to a greater variety of wildlife. They use the ecological concept of limiting factors to describe the importance of understanding climate and other elements of the site. Plant survival strategies (competitors, stress tolerators and ruderals) inform the type of plants used in a design.

Less conventional is the use of the term visual ecology used to describe how a garden fits into a site and whether one senses, for example, that wildly colorful bougainvillea's belong in a Mediterranean climate landscape.

Also specific to garden design is their concept of dynamic planting which recognizes that even artificially constructed landscapes will change in time through a process that is conceptually similar to succession in ecology. Their stated plant-centered approach to garden design requires a commitment to understanding the effects of time on a garden in a way that is not so important in a design based on inanimate aspects of a garden such as paving, decking and rock placement. The successional process for gardens, unlike natural succession, can be changed or even restarted if the often unintended results are not pleasing to the designer after several years. The authors clearly find fascinating the changes caused by the plantings themselves such as trees and shrubs as they age, perennials as they expand, and self-sowers as they appear in new "undesigned" places.

Predicting and perhaps controlling the somewhat unpredictable directions a plant-centered garden design will go after the initial planting seems to be an area of research they would like to pursue. However, they note that basic ecological requirements of ornamental perennial and grasses seem to be known for only a few of the more popular planting materials.

Landscape architectural design and planning concerns are described in depth and great detail several chapters. There is emphasis on the usual spatial concerns of garden designers such as lawns (they'd like to see less lawn in the landscape), borders, paths, formal and informal plantings. While this is not intended to be a "how to" book, there is a chapter on how to design a garden using ecological and aesthetic criteria and the authors do seem to have a selection of planting materials they favor. These appear in different lists which can actually be useful to an individual gardener. For example, you have plants to look up at, look through, look over, and look down on. Many of these same plants are also classified according to season of interest, whether they make good underplanting for trees, whether or not they are hardy, and whether they are robust, long-lived plants. Garden maintenance follows planting with the case made that understanding garden plant ecology can limit maintenance costs especially in public gardens.

Had this book been limited to the sections on planting design in time and space, Oudolf and Kingsbury would probably have been more successful in presenting their truly thought-provoking approach to landscape and garden design, both public and private. However, forays into design principles and challenges of maintenance in public parks where funds are limited should perhaps have been the basis for another interesting book. It seems that the authors are just bursting with ideas and tried to include them all. I enjoyed the book, but trying to follow the arguments for designing in space and time was a bit challenging.

-Joanne Sharpe, Coastal Maine Botanical Gardens, Boothbay Maine

Plant Biotechnology; Current and Future Applications of Genetically Modified Crops. Halford, Nigel. 2006, ISBN 0-470-02181-0 (hard cover $135.00), 493 pp, John Wiley & Sons Ltd. The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.

The book "Plant Biotechnology" by Nigel G. Halford focuses on three major themes: Part I discusses the historical perspectives up to the current status, Part II focuses on new development and potentially new areas of plant biotechnology, and Part III analyses safety concerns and regulation of plant biotechnology. Individual and team contributors to the book treated their respective topics well. Pertinent issues are well handled, making the book both interesting and educational for the reader.

In Part I, Dr. Halford and other contributors examine at the journey from primitive selective breeding to modern genetic modification. Dr. Halford offers insights into landmark historical events, including the invention of agriculture through Darwinian and Mendelian times, to the work of Watson and Crick, and finally to the work of Stanley Cohen and the ultimate birth of modern biotechnology as we know it today. The growth and acceptance of plant biotechnology in the USA, China, and South America contrast sharply with the resistance of European Union (EU) governments and open hostility of UE residents towards the new technology.

In Part II, current technologies and their potentials in pursuing what may be considered new directions in plant biotechnology are discussed. Former documented successes have served interests of growers and seed and herbicide companies, whereas new or future concerns will look at technologies/and or applications of such technologies that would benefit the consumer. The term "natraceuticals" is explained throughout this section. This term implies the need to improve the nutritional values of crops and to neutralize known allergens in food crops. Ongoing efforts to improve salt and drought tolerance in crop plants, and the attendant technical and physiological challenges to such efforts are also addressed.

As did all other technologies, plant biotechnology came with both promises and concerns. Part III assesses concerns and perceived or real risks of plant biotechnology. The fear of food allergens, horizontal flow of genes to weed plants, harm to non-target insects and negative environmental impact are among the top concerns addressed. Strategies taken to address these and many other concerns in the USA and EU countries are discussed. The need for risk assessment and regulation are adequately advocated by Dr. Halford.

This book offers a rare opportunity for students and instructors of plant biotechnology to gain the full width and depth of the important issues surrounding the subject from experts in the field. It takes the user a few levels above and beyond the here and now concerns of laboratory and classroom type issues. The author clearly highlights the current place, future promises, and controversies surrounding plant biotechnology. The need for robust risk assessment and regulatory mechanisms are not only explained, but negative effects on the advance of plant biotechnology in the EU are pointed out. Students of plant biotechnology who read this book will benefit from its clear sense of direction of plant biotechnology and its past achievements. Additionally, students will better understand the types of regulatory minefields in existence, particularly in the EU. To that end, this book will make a useful supplement to a class text. Its availability will help plant biotechnology students and instructors operate with a broad understanding of the pertinent issues surrounding the technology. Its availability in college and public libraries will allow undergraduate and graduate students to learn more and possibly erase some misconceptions about this subject.

This book was well-written with minor exceptions. Possibly future editions of this text will eliminate some of the repetitive sentence structure apparent in section 2.9 "Engineering Fungal Resistance in Crops" by Dr. Maana Struiver. Several sentences in this section begin with the word "Interestingly". The use of synonyms or variable phrases with the same meaning could help alleviate this minor problem.

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Biology of the Plant Cuticle: Annual Plant Reviews, Volume 23. Riederer, Markus and Caroline Müller (eds). 2006. ISBN 1-4051-3268-X (Cloth US$249.99) 384 pp. Blackwell Publishing Professional, 2121 State Avenue, Ames, IA 50014-8300.

In recent years, a vast accumulation of data from studies in diverse disciplines: plant biochemistry, plant physiology, ecology, molecular biology, plant pathology and microbiology have illuminated our understanding about the fine structure of the plant cuticle and its surface, the composition of cuticular waxes and the biosynthetic pathways leading to them. Biology of the Plant Cuticle enumerates these major developments in this important interdisciplinary area. It brings together wide-ranging and distinct views of the subject and substantially advances plant biology, by giving a broad picture of the impact of the plant cuticle on biotic interactions with the ecosystem. Now, for example, the physiological role of the plant cuticle, primarily to prevent water loss, is associated in some cases with the preference behavior of an insect (Müller, this volume, pp. 416-417).

Studies assessing the impact of UV radiation on plant life have emphasized the role of the cuticle and underlying epidermis as optical filters for solar radiation. There are now solid investigations concerning the diffusive transport of lipophilic organic non-electrolytes across the plant cuticle. A new model explains the diffusion of polar compounds and water across the cuticle. In the context of plant eco-physiology, cuticular transpiration helps to explain leaf-water relations. We realize new roles in relation to the cuticle in plant development and pollen-stigma interactions. It increases our understanding of the cuticle as a specific substrate for the interactions of the plant with microorganisms, fungi and insects.

This book appears to be an expansion of the review article: Plant Surface Properties in Chemical Ecology published by coeditors Caroline Müller and Markus Riederer (2005). Their book opens with a review of the biology of the plant cuticle, by Editor Riederer. The arrangement of the chapters provides coverage first about the plant organism itself: the fine structure of the plant cuticle, the cutin biopolymer matrix, the composition of plant cuticular waxes, biosynthesis and transport of plant cuticular waxes, optical properties of plant surfaces, transport of lipophilic non-electrolytes across the cuticle, characterization of polar paths of transport in plant cuticles, cuticular transpiration, and the cuticle and cellular interactions. Interactions between plant and external organisms follow, i.e., microbial communities in the phyllosphere, filamentous fungi on plant surfaces; and plant-insect interactions on cuticular surfaces, by Editor Müller, brings the book to a close. A number of citations in various chapters, to research about the role of glandular plant trichomes in diverse plant species attracted my specific interest.

All authors are unmistakably experts in their respective fields, and the editors assembled top quality international representation, adding to the breadth of their volume. There are contributions from Britain, Canada, France, Germany, Italy, Japan, the Netherlands, Scotland and the USA. It is a pleasure to study this meticulously edited volume, because each chapter is so well-organized and thoroughly documented with ample references. Research scientists and professionals from diverse disciplines, both academic and from the industrial sectors will derive benefit from this book.

-Dorothea Bedigian, Research Associate, Missouri Botanical Garden

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Müller, C. and M. Riederer. 2005. Plant Surface Properties in Chemical Ecology. Journal of Chemical Ecology 31: 2621-2650.

Cecropia. Flora Neotropical Monograph 94. Berg, C. C., & P. Franco Rosselli. 2005. ISBN 0-89327-461-5. 230 pp. New York: The New York Botanical Garden Press.

One of the first plant sights to greet the visitor to the American tropics are the floppy handlike green-and-silver leaves of the roadside trees belonging to the genus *Cecropia*. One soon learns that these trees embody several marvels of tropical biology: *Azteca* ants inhabit the stems of the *Cecropia* trees, feeding on food bodies that the plant provides and defending the tree against all comers, animal and vegetable alike; bats swoop in at dusk to take the fruits, while toucans and other birds dine on them by day; sloths literally hang out on the candelabra-like branches, where they may be readily seen. Remarkably, there has been no guide to the diversity and natural history of these plants, but a recent contribution to the Flora Neotropica series by Cornelis C. Berg and the late Pilar Franco Rosselli now fills this void.

The work follows the basic FNM format en route to its description of the 61 species (all Neotropical) recognized, presenting information about morphology and anatomy, reproductive biology, ecology, distribution, uses, and conservation. Nine keys, separated by geographic area, are provided to assist identification. In addition, there is a key to members of the nine species of the problematic and widespread *Cecropia peltata* group. Distribution maps are provided for all species, and over half of the species are illustrated with fine line drawings by Hendrieke Berg (Voss) (with smaller contributions from H. Rypkema and T. Schipper). The Systematic Treatment forms the bulk of the volume, and is followed by the bibliography and List of Exsiccatae. A surprise awaits in the closing pages of the work: a chapter on “Cecropia and its biotic defenses,” provided by Diane Davidson, discusses the ant-association of *Cecropia* in detail and places it in a context of modern evolutionary ecology.

Cecropia suffers from some of the same difficulties of study that accompany palms: the massive leaves and inflorescences are difficult to sandwich into a plant press, and three-dimensional characters of growth habit vanish in the process. The stipules, important for identification purposes, fall off quickly. The plants are dioecious so that collecting both staminate and pistillate flowers requires attention to more than one tree (and some of them are 40 m tall!). The aggressive ant inhabitants further dissuade the would-be collector. Thus the genus, despite its ubiquity, was not well represented in herbaria at the outset of the authors’ study. Between them, the two authors made nearly 550 new collections representing 54 of the 61 species recognized, a remarkable achievement that testifies to the field knowledge of the plants that informs this monograph. Tragically, the junior author died in an accident while making a *Cecropia* collection.

I learned a couple of surprising things in my perusal of the book. First, not all *Cecropia* species are weedy; in fact, the authors limit the “weedy” characterization to only seven species. The remaining species are habitat specialists of various kinds, some of them inhabiting limited geographic areas. Second, not all *Cecropia* species are always tenanted by *Azteca* ants: a few species have *Azteca* ants, but only in certain parts of their ranges, several species are inhabited by ant species of genera in three other subfamilies, and nine species seem not to house ants at all! There is clearly more to the evolutionary story of this seemingly tidy co-evolved system than has yet been told, and the monograph provides a guide to what to look for next.

Those using this book to identify *Cecropia* specimens should be mindful of a few limitations of the work. One is that the distribution maps do not follow the alphabetical sequence of the species descriptions and illustrations, but instead are grouped into four non-alphabetical plates placed near the beginning of the Systematic Treatment. Another is that the geographic keys do not include species from just over the borders in neighboring geographic areas: *Cecropia obtusa*, for example, has been collected throughout the Guianas up to the border with Venezuela, yet is not included in the key to Venezuelan species; *Cecropia angulata* is almost certain to occur in northern Brazil, occurring as it does in the border areas of neighboring Venezuela and Guyana, yet is not included in the key to species from Amazonian Brazil. Thus plants from border areas should be sought in keys for adjacent areas as well. Of similar concern is the multiple appearance of species in some of the keys: in the key to Peruvian species, the admittedly polymorphic *Cecropia angustifolia* keys out in *six* places. Only time and use will show if this keying strategy is effective. Finally, it would have been helpful to have a few more of the common species illustrated, in particular *C. sciadophylla*, one of the commonest species in South America (and one of the few antless species, so lacking trichilia), and *C. pachystachya*, another common South American species.

On the whole, this is an impressive achievement and an excellent contribution to our knowledge of Neotropical plants. It should serve as a stimulus to more intensive study of the biology and evolution of this fascinating genus.

-David Johnson, Department of Botany-Microbiology, Ohio Wesleyan University, Delaware, OH 43015

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Breeding Field Crops 5th ed. Sleper, David Allen and John Milton Poehlman. 2006. ISBN 0-8138-2428-1. (Cloth US$ 84.99) 448 pp. Blackwell Publishing, P.O. Box 570, Ames, IA 50010-0570.

Deforesting the Earth: From Prehistory to Global Crisis – An Abridgment. Williams, Michael. 2006. ISBN 0-226-89947-0 (Paper US$25.00) 520 pp. The University of Chicago Press, 1427 East 60th Street, Chicago, IL 60637-2954.

Dictionary of Plant Tissue Culture. Cassells, Alan C. and Peter B. Gahan. 2006. ISBN 1-56022-919-5. (Paper US$29.95) 265 pp. Food Products Press, 10 Alice Street, Binghamton, NY 13904-1580.

Disease and Insect Resistance in Plants. Singh, Dhan Pal and Arti Singh. 2005 ISBN 1-57808-412-1 (Cloth US$85.00) 417 pp. Science Publishers. Post Office Box 699, Enfield, New Hampshire 06784.

Edible Medicines: An Ethnopharmacology of Food. Etkin, Nina L. 2006. ISBN 0-8165-2093-3 (Cloth US$50.00) 304 pp. The University of Arizona Press, 355 S. Euclid Avenue, Suite 103, Tucson, AZ 85719.

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