BULLETIN

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PLANT SCIENCE

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

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Editorial Manager for Plant Science Bulletin is now live. To submit manuscripts for consideration please go to:http://www.editorialmanager.com/psb/. We encourage all of the membership to register as potential manuscript reviewers by visiting that site and clicking on "Update My Information." This is especially important for members of the Teaching, Historical, and Economic Botany sections who are under-represented in the current AJB reviewer data base.

We also encourage all members of the society to consider nominating individuals for the various society and sectional awards listed on the facing page. It is important to recognize botanical colleagues for the fine work they do and especially to support younger botanists in the early stages of their careers. If you search previous issues of PSB (it is searchable on the BSA web site) for previous award winners, you will notice that certain schools and certain nominators are consistently recognized. It may be that we have only a few star programs, but it is more likely that this pattern results from a relatively few individuals committed to promoting botany at their institutions. Become one of the few! Botany needs you!

In this issue we recognize two eminent botanists who were leaders in the field, the systematist Armen Takhtajan and the anatomist Vernon Cheadle. In both cases the authors go beyond the botany to provide interesting perspectives of the life situation and personal character of these inspiring botanists. Read and enjoy.

-the Editor

News from the Society

BSA Awards

One of the most important aspects of BSA membership is having the opportunity to award peers and/or student members for outstanding efforts in support of our mission via the Society awards program. To access the award information, please go to www.botany.org/awards/.

Please take the time to use this valuable benefit over the next few months as we ask for nominations for the 2011 awards. Promoting botany and botanists is your privilege and responsibility.

Awards Open through March 15, 2011

-Merit Award

-Charles E. Bessey Teaching Award

-Grady L. Webster Structural Botany Publication Award

-John S. Karling and the BSA Graduate Student Research Awards

-Undergraduate Student Research Awards

-Genetics Section Graduate Student Research Awards

-Young Botanist Awards

Awards Open through April 1, 2011

-Jeanette Siron Pelton Award in Experimental Plant Morphology

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-Darbaker Prize in Phycology

Student Travel Awards for Botany & Economic Botany 2011, Open through April 10, 2011
-Vernon I. Cheadle STA

-Triarch "Botanical Images" STA

Section Student Travel Awards
- **-Pteridological Section & American Fern Society**
- **-Developmental & Structural Section**
- **-Ecological Section**
- **-Genetics Section**
- **-Mycological Section**
- **-Phycological Section**
- **-Phytochemical Section**

BSA Corresponding Members Outside of the award program, the Botanical Society is active in honoring Botanists where ever possible. The most prestigious form this takes is when a member like you nominates an overseas colleague as a BSA Corresponding Member. **For many years this honor was limited to 50 people but in 2006, the Society removed this limit to make it more available to deserving international botanists.** Corresponding membership in the BSA is an internationally recognized honor, and is particularly important today with the ease in building relationships in a virtual world. Please take the time to consider nominating your international colleagues for the important distinction of being a BSA Corresponding Member. For details see: www.botany.org/about_bsa/corresponding_members.php

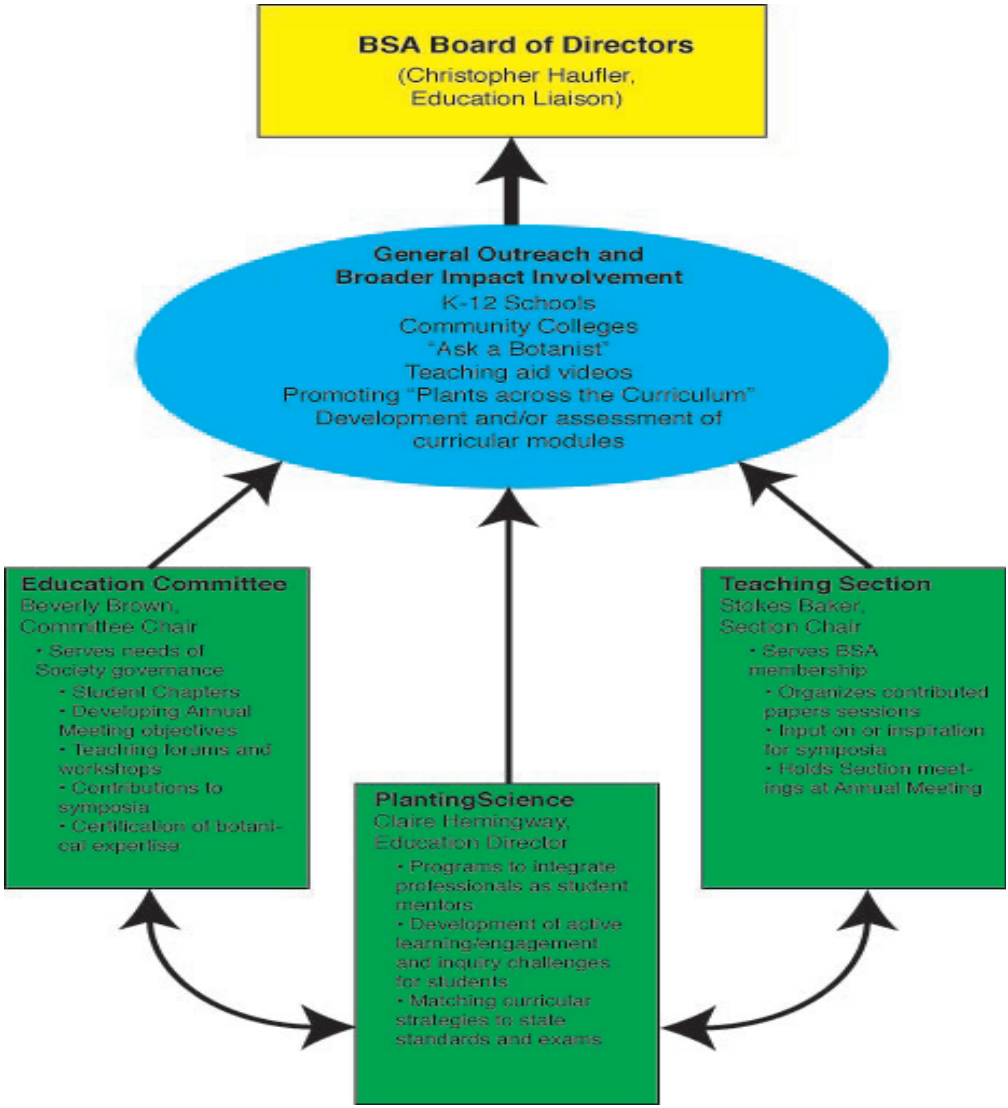
Good Green Teaching Colleagues

The 2009 BSA Education Summit report, available at:
http://www.botany.org/bsa/membership/council2010/DAL-Education.pdf

The Education Summit was conceived as a way to gain better perspectives on the various education activities in the BSA and to parse the BSA education objectives into the best hands to ensure that progress is made. Based on the Strategic Plan that is guiding the future of the BSA, we focused on what we can and should do to meet the goals that have been established. We also discussed the roles of the different education-oriented entities in the BSA and developed action plans to achieve the goals that we established. Below, these action plans are developed as recommendations.

The strategic plan emphasizes that the BSA should seek to provide botany resources for teachers. We concurred and discussed the best ways to meet this plant information expectation. To meet the goal of locating and engaging BSA experts who can contribute facts and information about plants, we noted that the plans for the new Membership Directory will include opportunities to collect and display such information about members. The Directory will be searchable for membership expertise.

To gather information about experts who will identify gaps in existing instructional materials, **we recommend** developing a new box on the



abstract submission form for the annual meeting. This box would solicit information from "experts" on the nature and progress on the "broader impacts" component of funded research projects. We reasoned that BSA members with active, well supported research programs would be the ones with the "broader impacts" statements and plans. With information about ongoing activities, we should be able to discover what ongoing education projects might be made more public and could provide topics for education symposia and workshops at the annual meeting. This will also meet the goal of fostering collaboration among BSA members to share information and ideas about education initiatives.

Claire Hemmingway guided a discussion of PlantingScience progress and new objectives. She noted that summer institutes, held at Texas A&M University, provided opportunities for exploring active learning activities and conducting focus groups with teachers to help them implement these active learning possibilities. She also discussed expanding the roles of mentors in helping to initiate and conduct experiments with teachers and students, and she introduced how video clips

were helping teachers gain a better understanding of some concepts and methods. Claire provided information about a goal of the PlantingScience program to help teachers learn how to cover the field of biology using plants (*"Planting across the curriculum."*). Assessment of the program is essential, but has been challenging and is still an elusive ultimate goal. She noted that questionnaires provided to participants as well as Pre-and Post testing of students was involved as was tracking teachers and their successes with the program in their classes. Carol Stuessey has been the point person in developing a plan to develop meaningful and effective assessment of the program so that its contributions can be fully demonstrated. **We strongly encouraged** progress on this important component of PlantingScience so that the program could have more promise of integration with state standards and testing. We also noted that continued and expanded funding for PlantingScience was likely to depend on well-documented and analyzed evidence of its effectiveness.

Bill Dahl reported on recent discussions in Washington, DC involving the Obama administration's response to the current nationwide scientific literacy crisis. Politicians are seeking ways to generate more science teachers who will incorporate more inquiry methods in student learning. Interdisciplinary society participation has been sought through the coordination of fields and programs represented by members of the Council of Scientific Society Presidents. This group is pushing plans for a "Science Week" program to highlight progress and goals for future science education.

We discussed options for developing outreach by BSA professionals to students in their local city and regional neighborhoods, and that this has been supported in some instances by NSF funding. We noted that such outreach might be best targeted at making connections between 4-year colleges and the Community Colleges where an offer of expertise is likely to be well received. **We recommended** establishing information on the membership form to ask whether individuals would be open to inquiries from their community to answer science questions and serve in an "Ask a Botanist" capacity. The BSA could function as a clearinghouse and communication hub for making such connections. These connections might also lead to more community college professionals seeking membership in the BSA. We also noted that the BSA may be able to serve as a place for certifying the quality of on-line courses, helping students know which courses will provide the education outcomes that they seek.

Chris Martine discussed his success in establishing a student chapter of the BSA, getting students involved with neighborhood activities and involving them in service to the community. **We recommend** having a workshop on student chapters at the annual meeting.

We considered it to be a valuable BSA contribution for us to develop assessments of teaching modules, but we wondered how to generate funding for such assessments. We already have some PlantingScience modules and curricula that meet some state standards and the goals of assessment tests of students. But we need more of them for teachers to use as well as for the education of new teachers (pre-service training).

We recommended building on the fine work of Chris Martine, who has developed videos to inform children about aspects of science in general and botany in particular. To develop this agenda, **we recommend** providing opportunities at our annual meeting to conduct video interviews with experts attending the meeting. Not only would this help to explore topics that might be expanded into new video segments, but it would also discover which BSA colleagues are ideally suited for this video medium, and whose research might be used to illustrate science principles and practices. We might also be able to develop "How To" videos of various techniques and procedures.

We devoted some discussion to the opportunity for certification of individuals as "Botanists." We concluded that we need to review the competencies necessary to be certified. Robynn Shannon commented that the Ecological Society of America has developed a certification program and we might be able to learn from their efforts and adopt some of their

methods. **We recommended** forming a committee to explore these options and develop recommendations that would be reviewed by the Education Committee and ultimately forwarded to the Board of Directors for discussion and implementation. Members of that exploration committee could include Marsh Sundberg (who has been working with the National Forest Service to develop a certification option), Robynn Shannon, Krissa Skogen, and Bill Dahl.

Through the meeting, we devoted time and thought to exploring and defining the roles of the Education Committee and the Teaching Section of the BSA. After considerable discussion, we concluded that the Education Committee meets the governance function in education for the BSA, i.e., implementing the educational mission of the BSA and recommending policies that will help the BSA achieve its education mission. Thus, the Education Committee would be charged with organizing society-wide education initiatives at annual meetings (such as opportunities for workshops and forums on education). The Teaching Section would function to serve the members of that section, by organizing contributed papers sessions and symposia of interest to those members. Thus, both the Education Committee and the Teaching Section provide vital and complementary contributions to the BSA and its members. **We recommend** that special attention be paid to appointing Education Committee members so that those interested in meeting BSA education goals will be involved and **we recommend** appointing a member of the Teaching Section as an ex officio member of the Education Committee. Normally, this would be the Chair of the Teaching Section, but another individual may be appointed as appropriate.

We note that the we are working toward achieving the strategic goals established by the BSA strategic planning committee and we are now poised to have a better sense of how to coordinate and develop cooperation among the various components of the BSA that address education aspects of the Society.

I personally thank the members who took time out of their obviously busy schedules to attend this Summit and contribute their expertise and perspectives on education and the BSA. We certainly had a productive and valuable meeting that should translate in an improved and invigorated education mission of the BSA.

Respectfully submitted,

Chris Haufler, Board of Directors Member associated with BSA education

BSA Science Education News and Notes

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

PlantingScience — BSA-led student research and science mentoring program

PlantingScience Online Mentored Inquiry Session.
"We posted our research question on our wall and we are ready to get to work."

"Hello!! I can't wait to meet the mentors and start this project. I'm not very good with science so hopefully I will learn a few new things!!"

"… Plants are so interesting at first i didnt think i would like this class but the more i got into it the more i liked it! … We posted our ideas for our experiment. Let us know what you think!"

"We have everything in order for our experiment. I'm getting excited I can't wait to find out how it turns out. Maybe then I can get the answer I'm searching for. Does moisture in the soil affect plant life? Well the research will tell all soon enough"

Students share their excitement with scientist mentors as the fall 2010 session kicks off. By the time the online session ends in November we expect 25 schools from 14 states across the

nation to take part, including 4 middle schools, 20 high school classes, and one university. This session marks the largest array of inquiry modules available (the Wonder of Seeds—seed germination and seedling growth; Power of Sunlight—photosynthesis and respiration; Foundations of Genetics—traits, variation, and environment in Rapid Cycling *Brassica*) and in field testing (Where does pollen come from?—pollen and pollination; Celery Challenge—osmosis, diffusion, and transpiration; C-Fern® in the open—sexual reproduction and alternation of generations).

Thanks to the many students, teachers, mentors, and societies whose contributions make PlantingScience a vibrant online learning community! Each fall and spring PlantingScience offers a two-month window of opportunity for student-teacher-scientist interactions during an online mentored inquiry session. Each academic year, the Botanical Society of America and the American Society of Plant Biologists sponsor members of the Master Plant Science Team, a cohort of mainly graduate students and post-doctoral researchers who make an extra time commitment to mentoring in both sessions. And each year the program continues to grow and partnerships among collaborating organizations strengthen.

Congratulations to the 2010-2011 PlantingScience Master Plant Science Team! The Botanical Society of America is pleased to sponsor: **Lorraine Adderly, Rob Baker, Kate Becklin, Amanda Birnbaum, Angelle Bullard-Roberts, Katie Clark, Rafael de Casas, Morgan Gostel, Melissa Gray, Eric Jones, Allison Kidder, Hayley Kilroy, Laura Lagomarsino, Chase Mason, David Matlaga, Arijit Mukherjee, Kelly O'Donell, Taina Price, Emily Sessa, Kate Sidlar,** and **Lindsey Tuominen**. The American Society of Plant Biologists is pleased to sponsor: **Robert Barlow, Erica Fishel, Betsy Justus, Sasha Ricaurte, Kaiyu Shen,** and **Madhura Siddappiji**.

Welcome to the **Canadian Botanical Society** joining this fall as partner society. The individual contributions of the >400 volunteer mentors and the collaboration among >14 scientific societies and organizations makes PlantingScience an unprecedented effort to connect science experts with classrooms and support botanical literacy. What a phenomenal response to Dr. Bruce Albert's 2003 call to the BSA for scientists to meaningfully engage with K-12 education to address science literacy!

We invite you to follow fall student projects in the Research Gallery at www.PlantingScience.org. After a short winter break, the spring 2011 session will run from 14 February to 15 April 2011. Please join us again this spring to spark students' enthusiasm for investigating science and plants.

USA Science and Engineering Festival.
A celebration of science is taking place with the aim of reinvigorating our nation's youth in science, technology, engineering, and math. The **USA Science & Engineering Festival** highlight is an expo on the National Mall in Washington DC on October 23 & 24. Executive Director Bill Dahl and BSA members staffed booth 1006 in the Andrew W. Mellon Auditorium to share the excitement of **PlantingScience** and society happenings with festival participants.

http://www.usasciencefestival.org/

Science Education Bits and Bobs
Reports Tracking College Readiness to Completion — Several recent reports and programs address segments of the pipeline issue with a focus around the critical college years. Readers will find a mixture of hopeful and disheartening statistics. A common finding is that how students are prepared for college through their high school classes makes a difference.

2010 College-Bound Seniors Who Take Core Curriculum Score Higher on SAT. The College Board reports record-breaking number of students in the class of 2010 took the SAT, and they provide data showing a clear effect of rigorous high school coursework on student SAT results.

http://www.collegeboard.com/press/releases/213182.html

Mind the Gaps: How College Readiness Narrows Achievement Gaps in College Success by ACT finds that high school course work, both core curriculum and additional science and

math courses, are significant factors related to college success. The report also describes contributions of high school indicators to improving college success among underrepresented minority students and economically disadvantaged students.

http://www.act.org/research/policymakers/reports/mindthegaps.html

Taking the Next Step: The Promise of Intermediate Measures for Meeting By Jobs for the Future reinforce the importance of data, data, and data in documenting and understanding the pathway from pre-college coursework to college degree completion. Key milestones, multi-institutional projects, and the importance of institutional support for data use are discussed.

http://www.jff.org/publications/education/taking-next-step-promise-intermediate-me/1136

Finishing the First Lap: The Cost of First Student Attrition in America's Four Year Colleges and Universities by American Institutes for Research reports that nationwide 30% of first-year college students do not continue. This high dropout rate has enormous implications for the students' lives and cost state and federal taxpayers over $9 billion for appropriations to higher education.

http://www.air.org/news/index.cfm?fa=viewContent&content_id=989

To compare graduation rates or cost per degree among colleges or across US States, visit the College Measures interactive website, which draws on *Finishing the First Lap* report:

http://collegemeasures.org/

The Community College Link to Degrees and Careers — Community colleges have traditionally served as important conduits for diverse student populations seeking a four-year degree or place in the workforce. The role of community colleges has received additional attention and funding from the local to the national level.

Learn about the White House's initiative *Skills for America's Future* to improve partnerships between community colleges and businesses.

http://www.whitehouse.gov/blog/2010/10/04/building-skills-america-s-future

Read a perspective of meeting challenges through 2-year and 2-year college collaborations.

George Boggs 2010. Growing Roles for Science Education in Community Colleges. *Science* 329: 1151-1152

Editor's Choice

Bean, T.E., G.M., Sinatra, and P.G. Schrader. 2010. **Spore: Spawning Evolutionary Misconceptions?** *Journal of Science Education and Technology* 19(5):409-414.

The authors examine how evolutionary content is depicted in the video game Spore and offer teaching strategies to address misconceptions that may be reinforced through computer simulations.

Dewprashad, Brahmadeo. 2010. **More to the Color of Roses than Meets the Eye**. *Journal of College Science Teaching* 40: 66-69.

This organic chemistry demonstration can easily be adapted to introductory botany, horticultural botany, or economic botany courses at the lower division college level - - as well as K-12! Floral pigments, isolated with hot isopropyl alcohol, are used to "paint a picture" on a piece of filter paper. A variety of acidic and basic solutions are then used to "develop" the picture in multicolored hues.

Eyster, L. 2010. **Encouraging Creativity in the Science Lab: A series of activities designed to help students think outside the box**. *The Science Teacher* 77(6):32-45.

This article emphasizes student ideas that inhibit creativity and teaching tips to overcome these and offers a seed germination and growth chamber set up sample "solve it" activity.

Frisch, J.K., Unwin, M.M., and George W. Saunders. 2010. **Name that Plant! Overcoming Plant Blindness and Developing a Sense of Place Using Science and Environmental Education.** In A. M. Bodzin et al. (eds.) *The Inclusion of Environmental Education in Science Teacher Education*, Part 2: 143-157.

This book chapter takes up Wandersee and Schussler's cause of addressing plant blindness. Ideas for nature-based outdoor

experiences for K-12 classes are offered.

Ilkorucu-Gocmencelebi, S. and M. Seden Tapan. 2010. **Analyzing students' conceptualization through their drawings.** *Procedia Social and Behavioral Sciences* 2: 2681-2684.

Less than 45% of fifty preservice primary teachers in Turkey asked to draw a flower as part of a study on assessing student conceptualizations were able to label the flower correctly. The authors also report that flowers that were drawn more accurately were also more comprehensively labeled.

Kazilek, C. 2010. **Ask A Biologist: Bringing Science to the Public.** *PLoS Biology* 8(10): e1000458. Doi:10.1371/journal.pbio.1000458
Dr. Biology's Pocket Seed Viewer, an online collection of data, images, and animations that support student investigations of seed germination, is featured in this review article about the Ask A Biologist website.

Mentors and teachers who have students investigating the PlantingScience Wonder of Seeds module may find seed information both the Eyester and Kazilek articles of interest.

Morris, Amy. 2010. **Investigation of Essential Oils as Antibiotics**. *The American Biology Teacher* 72: 499-500.
Traw, M. Brian and Nancy Gift. 2010. **Environmental Microbiology: Tannins & Microbial Decomposition of Leaves on the Forest Floor.** . The American Biology Teacher 72: 506-511.

These two articles in the October issue illustrate two plant applications of the traditional "antibiotic disk" experiment used in microbiology. The second has the advantage of having students produce their own extracts for testing against bacteria. The first follows up on several recent reports of the antibiotic properties of spices, especially those in use in the cuisine of hot climates.

Thompson, S. 2010. **Classroom Terraria: Enhancing Student Understanding of Plant-Related Gas Processes**. *Science Scope* 33(8):20-26.

This article addresses common student conceptions about plants through extended observations following initial middle school student speculations about what will happen to a plant sealed in a jar.

See Ecological Restoration Volume 28, Number 2, June 2010 for a special theme on education and outreach in ecological restoration.

View all titles in JNRLSE Volume 39 at http://www.jnrlse.org/issues

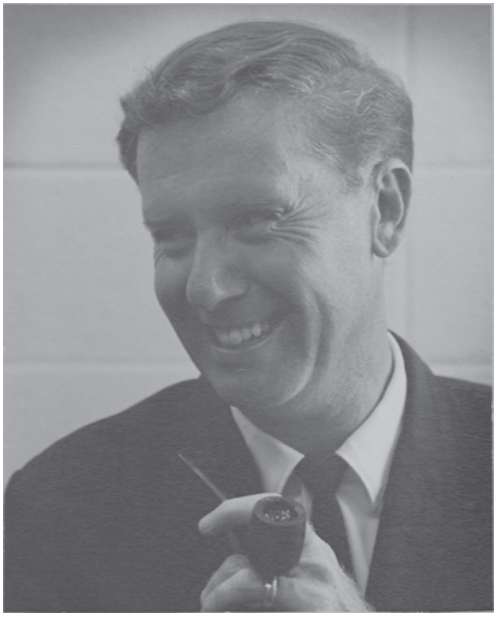
In Memoriam

Lawrence Joseph Crockett (1926-2010)

The City College of New York lost one of its most beloved teachers last spring. Professor Emeritus Lawrence J. Crockett died of complications of Parkinson's disease and cancer on June 8, 2010 in San Antonio, TX.

Larry Crockett was born in Brooklyn, New York on September 3, 1926. He attended Columbia College as an undergraduate on a scholarship, and earned his degree in 1949. Following service in Korea in the early 1950s, he continued his studies at Columbia, this time as a graduate student under Dr. Edwin B. Matzke, earning his MA (1954) and PhD (1958).[1] His first publication, *A Study of the Tunica Corpus and Anneau Initial of Irradiated and Normal Stem Apices of Nicotiana Tabacum L,* appeared in the Torrey Botanical Society's Bulletin in 1952[2]. In 1958, he authored a study on the irradiated stem apex of *Coleus blumei*.[2] Subsequent research on the same species resulted in another paper in the American Journal of Botany.[3] His interest in the unusual resulted in yet another paper, this time on *Stylites*[4]. During that time he also taught botany at Barnard College (1955-1959). From 1959-1961 he taught botany at Fairleigh Dickinson University in New Jersey. Larry joined the faculty of the Biology Department of The City College of New York (CCNY) in 1961**,** where he taught courses in vascular and nonvascular plants in addition to field botany. When the CCNY Urban Landscape Program was introduced he also taught budding landscape architects in a course specifically designed for them. While at CCNY he served as a member of the school Senate from 1968-1971, as Deputy Chairman of the Biology Department from 1969-1972, and was also a member of the Faculty Council from 1968-1969.

Crockett was a member of the Botanical Society of America (BSA) and served for many years as Business Manager (1961-1972) of the American Journal of Botany (AJB) and also as Business Manager (1961-1964) of the Plant Science Bulletin (PSB). From the early 1960's to the mid 1970s he served the BSA as a member of the editorial board of the AJB and



Lawrence J. Crockett (ca. 1970) at Brookhaven National Laboratories

the PSB. He was an active member of the Torrey Botanical Club (now the Torrey Botanical Society), serving as its president twice (1970, 1985), and regularly organizing programs for its members. He also wrote twenty articles, several of them in two parts, entitled "*On the Trail of John Torrey"* which highlighted significant achievements and episodes in the life of one of America's most celebrated early botanists. All were published in the Bulletin of the Torrey Botanical Club.[5] In addition, he coauthored several papers and presentations with other noted scholars.[6,7] Over the years his work has been cited many times by numerous researchers. Larry also served on the Steering Committee for the Centennial Celebration of the New York Botanical Garden. He authored *"Wildly Successful Plants: a Handbook of North American Weeds"*, published in 1977 and recently reprinted. In 1989 he appeared twice on Cable TV on the interview program WORLDWISE, speaking on the topic of "Evolution of Photosynthesis and its Effects on the Living World" and, on a later show, on "Seeds and Civilization."

Above all, Larry loved teaching, and it was as a teacher that Larry might have made his most valuable contribution to biology and his students. His enthusiasm for botany was infectious, and stimulated many who had resisted even taking a botany course into making it their life's work. One of us (LBK) recalls begging the dean at CCNY to waive the botany requirement because she saw no relevance to her major in Zoology. His wise refusal of her request became a turning point in her career as she became mesmerized by Professor Crockett's lectures and devoted her future to Plant Biology. Another of us (ESC) became a horticultural librarian. Yet another (ML) is on the faculty of the University of Texas at San Antonio. Larry was an absolutely spellbinding lecturer. Many of his students have gone on to become well known researchers, and some became members of the National Academy of Science. He received the Charles Edwin Bessey Teaching Award from the Botanical Society of America in 1984 and won the Outstanding Teacher Award of CCNY in 1988. Larry was also so honored by the American Association for Higher Education in 1989. He managed to meld botany and history in a way that brought new life to both. His writings on the flora of the Unicorn tapestries at the Cloisters of the Metropolitan Museum of Art in New York City brought him international recognition, and are just two examples of Larry's ability to connect science with art[8,9]. It comes as no surprise that he was once a member of the Renaissance Society of America. He was a true Renaissance man, and an accomplished scholar of the history of science as well as botany.

Other examples of his talent for melding history with botany took the form of writing and acting in plays about noted scientists. His *"Market Day in Delft: An Hour with Henry Oldenburg and Antony van Leeuwenhoek"* and *"An Evening with John Torrey"* were produced at many universities and professional meetings, including the International Congress of Protozoology, the BSA, the New York Microscopical Society, as well as on the campus of CCNY. BSA members may recall our current PSB editor, Marshall Sundberg, as he played Henry Oldenburg opposite Larry's Leeuwenhoek at the American Institute of Biological Sciences meeting in Knoxville, TN, in August 1984. Perhaps the only play which he wrote and in which he performed that did not touch upon his botanical interests was *Alexander VI*: *The Bull of the Borgias.* It was

performed several times for various audiences, but most memorably for the public at the Cathedral of St. John the Divine in upper Manhattan in the early 1970's. The noted drama critic for *The New York Times*, Clive Barnes, attended the performance and reviewed it very favorably in that newspaper, which Larrycherished for many years.

What was it like to be a student of Dr. Crockett? Enrolling in Field Botany at CCNY meant enrolling in a never-to-be-forgotten adventure. When, during the first meeting of the field botany class, he informed us that over the course of the semester we would learn to recognize and name about 500 plants, we sat in disbelief. But he was right. Local botanical gardens and beaches, New York State bogs, the New Jersey Pine Barrens, the Sharon Audubon Nature Sanctuary in Connecticut, even New York City's own Central Park were all fair game for Larry's weekly field trips. Rain or shine we tramped through mud, sand, and dirt, and occasionally fell into one of the quaking bogs that brought botany to life for us.

When we weren't wading through surf grabbing pieces of algae and learning about *Rhodophyta*, or marveling at a tiny *Drosera* or the walking fern, *Asplenium rhizophyllum,* we were trying (in vain) to keep up with Larry as he plunged ahead into yet another of Nature's collections of local plants. Specimens gathered were passed back from the front of the often single-file column to those bringing up the rear, by which time the plants looked very sorry indeed. All were carefully collected in plastic bags and reexamined as we took our buses and subways back home at the end of the day. But he was right – we *did* learn the scientific names of close to 500 species – and remember most of them to this day. Even now, when purchasing plants at local nurseries, it's likely that most graduates of his course still ask for composites, grasses, trees, shrubs, etc., by their scientific name before buying them; daisy, foxtail, oak or beach plum simply won't do.

We can think of no greater tribute to a teacher than the letter found in his CCNY file from Paul Friedberg, the Director of what was then the CCNY Urban Landscape Program: "...students...would move mountains and perform incredible feats to get into your class. Furthermore, when I indicated [to them] that you would be teaching the Plant Materials course directly for the Landscape Program, there was a roar of approval and delight...one or two students that have already had the course said they felt cheated..." Likewise, Karl J. Niklas, a past Editor-in-Chief of the AJB and a past president of the Botanical Society of America, said of Larry "He was the most splendid teacher and kindest human being I've ever known. He inspired generations of students to follow in his footsteps. I should know. I was one of them! Those of us who had the privilege of having him as an instructor will always cherish our memories of his fabulous lectures and the warmth of his personality. He made us want to become botanists and teachers by virtue of his boundless exuberance and obvious delight in the study of plants".

Larry was cared for in his last years by his former student and great friend, Michael Laverde, and is also survived by his former wife, Edith Crockett. He will be deeply missed. A website has been set up to which friends and former students may post their remembrances, both personal and professional. The name of the site is www.larrycrockettinmemoriam.org, and this tribute will be the first posting. Please send what you would like to have posted on the website to: edith@waterfordconnection.com. The site will remain active for two years and its contents archived at the Hunt Institute for Botanical Documentation in Pittsburgh, PA.

Edith S. Crockett, The Waterford Foundation, Waterford, Virginia
Jane Gallagher, The City College of New York, City University of New York
Lee B. Kass, Cornell University
Michael Laverde, The University of Texas at San Antonio

(End notes)

1 Crockett, Lawrence J. Zonation and Tunica Corpus Relationships in the Stem Apex of Coleus blumei, Benth., Before, During, and After Irradiation with Cobalt-60. PhD thesis, Columbia University, 1958.

2 Crockett, Lawrence J. In: *Bulletin of the Torrey Botanical Club*, 1957, Vol. 84(4):229-236.

3 Crockett, Lawrence J. Effects of Chronic Gamma Radiation on Internal Apical Configurations of Vegetative Shoot Apex of Coleus Blumei. *American*

Journal of Botany, 1986, 73(5): 265-268.

4 Crockett, Lawrence J. Stylites of Peru – A Living Fossil. *Garden Journal*, 1967, Vol.17 (1): 26-27.

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6 Crockett, Lawrence J and Myron C Ledbetter (Abstract). Association of Microtubules With Early Wall Formation In Zoospores of Marine Alga *Cladophora gracilis*. *American Journal of Botany*, 1970, Vol. 57 (6): 741.

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Personalia

Dr. Peter Raven receives the William L. Brown Award for Excellence in Genetic Resource Conservation

Dr. Peter Raven, President Emeritus of the Missouri Botanical Garden, has been chosen as the 6th recipient of the William L. Brown Award for Excellence in Genetic Resource Conservation. The biennial award recognizes the outstanding contributions of an individual in the field of genetic resource conservation and use. The award is made possible through the generous support of the Sehgal Family Foundation, in cooperation with the family of Dr. William L. Brown. In choosing Dr. Raven as the 2010 winner, the award committee acknowledges a lifetime spent working to preserve the world's plant resources, upon which all life on Earth depends. Dr. Raven will receive the award prior to his keynote address to the 2011 meeting of the Botanical Society of America to be held in St. Louis July 10-13, 2011.

For more information, please visit www.WLBCenter.org/award.htm.

Friedman named Director of the Arnold Arboretum

Evolutionary biologist to join Faculty of Arts and Sciences

William "Ned" Friedman has been named the new director of the Arnold Arboretum. He also will be a professor in the Faculty of Arts and Sciences. On Nov. 4, Friedman will deliver a lecture at the Harvard Museum of Natural History on "Darwin's 'Abominable Mystery' and the Search for the First Flowering Plants."

William "Ned" Friedman, an evolutionary biologist who has done extensive research on the origin and early evolution of flowering plants, has been appointed director of the Arnold Arboretum.

Friedman, set to start on Jan. 1, will be the eighth director of the Arboretum, which is

administered by Harvard's Office of the Provost. He also will be a tenured professor in the Faculty of Arts and Sciences. His priorities include strengthening ties between the Arboretum and the Cambridge campus and working closely with the Arboretum's neighbors in Jamaica Plain and Roslindale.

"Ned's appointment underscores Harvard's commitment to integrating the incredible resources and opportunities presented by the Arboretum with the important work of our scientists here in Cambridge," said Provost Steven E. Hyman. "As an FAS faculty member, Ned will be a part of the Harvard community. As director of the Arboretum, he will seek closer ties, not only with our Cambridge campus, but also with the city of Boston, the Arboretum's home."

Friedman has been a professor of ecology and evolutionary biology at the University of Colorado since 1995. As professor of organismic and evolutionary biology at Harvard, he will conduct research in the new Weld Hill Research and Administration Building at the Arboretum and teach at Harvard's Cambridge campus.

Part of Boston's Emerald Necklace of parks, the 265-acre Arboretum, founded in 1872 and designed by Frederick Law Olmsted, is free and open to the public every day of the year. Its programs and events include lectures and community outreach initiatives in neighboring schools.

"Professor Friedman's appointment creates an exciting opportunity to connect the unique resources of the Arnold Arboretum in Boston to the plant science research and education occurring on our Cambridge campus," said Jeremy Bloxham, FAS dean of science. "Ned's teaching and leadership will facilitate closer linkages between the educational and research possibilities the Arboretum presents and the innovative scholarship of our faculty and students."

Friedman's research has focused on patterns of plant morphology, anatomy, and cell biology. He was recently acclaimed for his discovery of a new type of reproductive structure in an ancient flowering plant that may represent a critical link between flowering plants and their ancestors.

Friedman also has a keen interest in the history of science, particularly the intellectual history of evolutionism. He has designed and taught courses on the life and work of Charles Darwin and other historical figures, and lectured on the subject at natural history museums and other venues.

On Nov. 4, Friedman delivered a lecture at the Harvard Museum of Natural History on "Darwin's 'Abominable Mystery' and the Search for the First Flowering Plants." He plans to launch a Director's Lecture Series at the Arboretum that will make accessible to the public cutting-edge research by leading scientists from Harvard and around the world.

"I am thrilled to be able to welcome a diverse group of audiences to the Arnold Arboretum, one of the world's leading resources for the study of plants, and help integrate it more deeply into the research and teaching missions of Harvard University," said Friedman. "I am also deeply committed to building on the Arboretum's robust history and its ongoing programs to enhance a neighborhood resource that brings the world of biodiversity to Greater Boston."

Friedman is the author or co-author of more than 50 peer-reviewed publications, and serves on editorial committees for the *American Journal of Botany*, the *International Journal of Plant Sciences*, the *Journal of Plant Research*, and *Biological Reviews*. He is a member of the **Botanical Society of America**.

Friedman received a bachelor's degree in biology from Oberlin College in 1981, and a doctorate in botany from the University of California, Berkeley, in 1986. He is a fellow of the Linnean Society of London, and a 2004 recipient of the Jeanette Siron Pelton Award, granted by the Conservation and Research Foundation through the Botanical Society of America. In 1991, he received the Presidential Young Investigator Award from the National Science Foundation. Friedman spent his early career in the Botany Department at the University of Georgia before joining the faculty at the University of Colorado.

Special Opportunities

New Non-Profit Directly Links Donors to Researchers

Seeks Submissions from Scientists in Need of Project Funding SciFlies.org creates a new public funding mechanism for science discovery and innovation

St. Petersburg, Fla. - (Sept. 24, 2010) - Scientists and researchers seeking additional funding sources for projects that will enhance their research goals now have an alternative resource for the money they need to propel their projects forward: the general public. SciFlies.org, a new non-profit organization created to connect research projects with thousands of small donors who wish to support them directly, is now accepting submissions from scientists and researchers. Any scientist or researcher affiliated with a university or research institution is invited to visit www.sciflies.org to register and fill out the research application. Once a project is submitted, it will undergo a review for scientific merit and public readability before going live on the site. The formal launch of SciFlies.org to the general public will be announced in November 2010.

“SciFlies provides one of the most significant new avenues for funding research, development and innovation in 50 years,” said David Fries, co-founder and chief science officer of SciFlies.org. “As someone who has been writing grants and raising funds for my research projects and those on which I¹ve been part of a team, I know how frustrating it is to have vital discovery and proof of concept work held up for want of a few thousand dollars.”

Fries, who is on the faculty of the University of South Florida¹s College of Marine Science and has spun out several successful entrepreneurial companies from technologies developed there, knows all too well how a lack of steady funding can interrupt the progress of scientific discovery. To address this need, he partnered with veteran nonprofit and political fundraiser Larry Biddle and regional technology industry advocate and communications strategist Michelle Bauer to develop the model for SciFlies.

The way SciFlies works is simple. Scientists complete an application that allows them to present their project needs and goals in terms that the general public will understand. An individual page on SciFlies.org is set up for each project in categories such as medical and environmental research so that the public can select projects based on their personal interest. Donors can then make direct, tax-deductible contributions to the projects of their choice through the site. The funds are deposited directly into the foundation accounts of the university or research institution with whom the scientist is affiliated for direct disbursement once the fundraising goal is achieved.

The funds generated from the public donors can be used toward students, staff, equipment or access to data or facilities that are needed to complete the project.

“I believe that the funding mechanism SciFlies offers will not only facilitate the advance of research and discovery, but also change the public perception of how scientific research works,” Fries continued. “SciFlies will spur more public interest in the fields of science and technology by building meaningful relationships between the public and scientists who are solving the world¹s challenges.”

SciFlies handles the transfer of all gifts from donors to the researchers¹ institutions. At this time, individual project requests are set at a minimum of $5,000 and will not exceed $100,000 per year. Requests that are greater than $50,000 will require a phased approach. An option for multi-year proposals is planned for the future.

About SciFlies.org

SciFlies makes science happen by accelerating research and development projects that lead to new discoveries and innovation. Our grassroots approach and micro-donation model showcases vetted and qualified research projects from across all fields of scientific inquiry, allowing anyone, anywhere to directly support research they care about. SciFlies¹ goal is to foster ongoing citizen engagement with science and technology,

building meaningful relationships between the public and scientists working to solve the world¹s medical, environmental, engineering, and other challenges.

For more information, visit www.sciflies.org.

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.

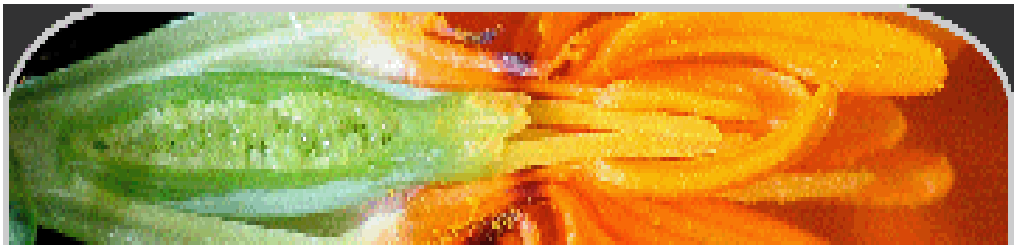
micro MORPH

Dear colleagues,

microMORPH is pleased to announce a funding opportunity for graduates students, postdoctorals, and assistant professors in plant development or plant evolution. $3,500 is available to support cross-disciplinary visits between labs or institutions for a period of a few weeks to an entire semester. We are particularly interested in proposals that will add a developmental perspective to a study of evolution of populations or closely related species. We are also interested in developmental studies that will incorporate the evolution of populations or closely related species. The deadline for proposals is December 15th, 2010. More information about the training grants and the application process may be found on the microMORPH website:

http://www.colorado.edu/eeb/microMORPH/grantsandfunding.html

These internships are supported by a five-year grant from the National Science Foundation entitled microMORPH: Molecular and Organismic Research in Plant History. This grant is funded through the Research Coordination Network Program at NSF. The overarching goal of the microMORPH RCN is to study speciation and the diversification of plants by linking genes through development to morphology, and ultimately to adaptation and fitness, within the dynamic context of natural populations and closely related species.



The microMORPH RCN promotes and fosteres cross-disciplinary training and interaction through a series of small grants that allows graduate students, post-doctoral researchers, and early career faculty to visit labs and botanical gardens as well as attend scientific meetings.

Award Amount

Each Year, microMORPH is able to fund five graduate student, post-doctoral, or early career faculty cross-training research opportunities for up to $3,500 to cover travel, lodging, and pier diem.

Evaluation

The next microMORPH Cross Disciplinary Training Grant Deadline is December 15th, 2010. Evaluation of grants begins the day after they are due. Submissions are accepted until all annual funds have been committed.

Application Materials

1) A letter from the prospective host lab (indicating a willingness to host consensus about the proposed activities of the visitor, and an explicit statement acknowledging that the host lab understands that the microMORPH RCN funds may not be used to underwrite the proposed research activities).

2) A letter from the Applicant detailing research plans and interaction

3) A proposed budget for travel costs, per diem, lodging, and meals.

Each letter must be no more than three pages. The applicant letter must specifically document the fact that the training opportunity is cross-disciplinary between an organismic and a molecular laboratory studying plant developmental evolution. By NSF rules, the budget may not be used to directly fund costs associated with the proposed research activities (e.g., supplies).

How to Apply

All application materials must be emailed as attached .pdf or Word documents to William (Ned) Friedman, ned@colorado.edu.

Proposal Evaluation

Two members of the steering committee (one organismic and one molecular) and a third individual from outside the core participants (chosen by the steering committee) are charged with evaluating applications.

Courses/Workshops

Experience in Tropical Botany

Harvard University Summer School, in collaboration with The National Tropical Botanical Garden announces the following course in 2011.

Dates: June 1 – June 30 2011
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 Kenan Teaching Laboratory at The Kampong (wet bench and microscope facilities) and be accommodated at the comfortable Tyson dormitory (of Scarborough House) on the same property.

Course title: Biology S-111. **"Biodiversity of Tropical Plants"**

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

"Biodiversity" is commonly interpreted as a catalogue of species richness in a given environment and how it might be preserved, but it can mean much more if an investigation considers not just the ***systematics***, of the organisms in a given area, but their ***biology***, i.e., structural features in relation to developmental and functional processes. Clearly biodiversity in this broad context can be studied best in the tropics, where diversity is richest.

South Florida offers a sampling of this richness, conveniently located in the continental United States. And the course offers an opportunity at many levels to become more familiar with tropical plants and their biological mechanisms.

The course is intensive and intended to present an overview of the rich plant diversity in natural environments (e.g. The Everglades National Park, Biscayne Bay National Park) and especially the rich collections of introduced tropical plants at collaborating Institutions, notably Fairchild Tropical Botanic Garden and Montgomery Botanical Center, Coral Gables. Here we have an estimated 10,000 species representing most major biological groups of plants. For example, there are well over 500 species of palms (tropical icons) available, and over 100 plant families not represented in natural environments in the United States.

Emphasis is on morphology and anatomy in a systematic and 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 plant families (especially the iconic Arecaceae) 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. Laboratory work emphasizes anatomy and dissection of fresh material, using implements ranging from chain saws to scalpels, leading to microscopic study in a well-equipped laboratory.

There are no prerequisites but 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 (as undergraduates) plan to do so in the future.

Students will be required to register with The Harvard Summer School and will receive 4 credits.

Estimated Cost: Harvard Summer School Tuition ($2,580); travel to and from Miami; Kampong accommodation at $25 per day; self catering.

Tuition and Travel scholarships may be available for qualified students.

Dead-line for application: April 15 2011. Early application is recommended

For further information:-
P.B. Tomlinson at the above Miami address, or, Harvard Forest, Harvard University, 324 N.Main St. Petersham MA 01366
e-mail: pbtomlin@fas.harvard.edu
And Harvard Summer School on-line in 2011

Reports and Reviews

Armen Takhtajan – In Appreciation of His Life

Peter H. Raven and Tatyana Shulkina, Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166, USA

Takhtajan was a giant both in the field of botany and as a human being; he will long be remembered as one of the most illustrious and effective botanists who ever lived. Over the course of his long career of scholarship, he was known and revered throughout the world for his scholarly contributions as well as for his unceasing desire to bring together people and ideas from everywhere, so that we collectively could produce the very best results of which we were capable. He not only saw these relationships clearly but also gave us a personal model of the way that scholarship and the community of scientists, working together, transcends national boundaries and rivalries and unites us in caring for the world on which we all depend for our existence.

As a scholar, Takhtajan made critically important contributions to our understanding of the evolutionary relationships of vascular plants and to our understanding of their origins differentiation, and paths of migration and dispersal around the world. He based his conclusions not only on the characteristics of the plants he knew so well, but also on an encyclopedic knowledge of the literature of botany and biology and on the connections that he nurtured with botanists all over the world. He was a philosopher who approached the field of biology in a thoughtful and traditional way, offering us deep and original insights into many areas of science.

Tahktajan was of course Armenian to his core, born June 10, 1910, at Shusha in Nagorny Karabakh, in the Caucasus; he loved the people and plants of the whole Caucasus region and especially of Armenia. He came

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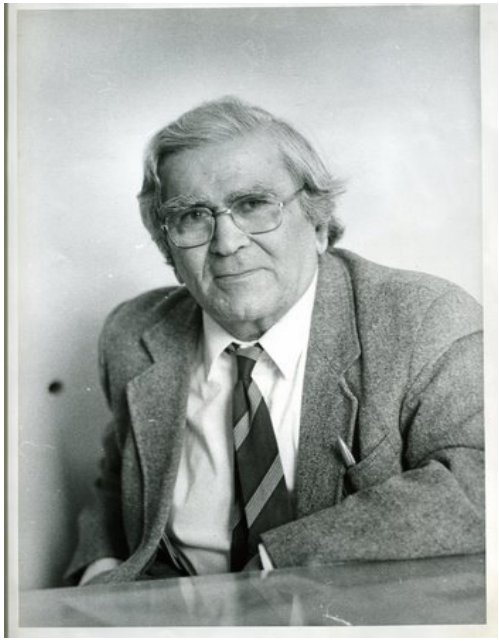


from a well educated family. His grandfather was a journalist, his father, Leon Meliksanovich Takhtajan, was a specialist in agriculture, educated in Leipzig, and trained as an agriculturist in Switzerland, France, and Great Britain. He knew various European languages and spoke also Russian, Georgian, and Armenian at home. Armen's mother was descended from the nobel Lasarev' family that played an important role in the education of the Armenian people. Armen himself attended elementary and high schools in Tbilisi, capital of Georgia; the city was a cultural center of the Caucasus that time. After school graduation he came as a volunteer to Leningrad State University where he spent there one year, returning to the Caucasus to complete his studies. Takhtajan graduated from the Institute of Subtropical Economic plants (Georgia) in 1932 (that institute no longer exists). During his academic years his teachers were: V.L. Komarov (in Leningrad), D.N. Sosnovsky (Tbilisi), and A.K. Makashvili (Tbilisi). When he started working he met N.I Vavilov and N.I. Troitzky. All of these outstanding botanists are famous in Russia and they contributed much to the advance of the field. Starting in1935, Takhtajan was employed as a senior researcher at the Yerevan Biological Institute; in 1943 – 1948 he served as director of the Institute of Botany, Armenian Academy of

Sciences. In his teaching and research at Yerevan State University, he followed the genetic results of Morgan and Mendel, politically banned from the Soviet Union at that time. Consequently, he was discharged from his academic position in 1948 – it was Lysenko time. He was 38 years old. By then, however, Takhtajan was already well known and appreciated in Russia, and his Russian colleagues helped him obtain a new position at Leningrad State University.

On returning to Leningrad in 1949, he became a professor of the Leningrad State University; in five years he became the head of the Paleobotany Laboratory at the Komarov Botanical Institute, where he was Director (1976-1986) and adviser until his death (11.13. 2009). All this time he developed his ideas strongly from a world perspective, and eventually became a great Russian botanist whose works and personality were known throughout the world. Takhtajan formed strong linkages everywhere he traveled and beyond, kept his foreign colleagues aware of the important Russian literature, and brought home ideas from all countries. For his colleagues in St. Petersburg, he was indeed a fellow Russian.

Armen Takhtajan's life spanned a difficult period of Russian history, and his life was not easy. He used to joke that his life spanned the period from Rasputin to Putin, and he lived through Revolution, repression, World War II, Lysenko, and the Cold War.

He could survive all these tumultuous and difficult periods not only because he had a strong will, but especially also because he had a wonderful wife. Alice Takhtajan (Davtjan) was his best friend: they lived together for 57 years. She was a very intelligent, delicate woman, who left her career in mathematical linguistics in order to help her husband. She devoted her life to him and to their three children.

Through all of the troubled periods that he endured, Takhtajan never sacrificed his scientific integrity. From 1954 onward, for some 55 years, he was associated with the Komarov Botanical Institute, where Director Pavel Baranov, a courageous and principled man, hired him and a number of others who had lost their positions and fallen into disfavor because of Lysenko's influence. At the Institute, Takhtajan continued making great contributions to the science of botany and to the development of the work of the staff. He found this Institute's large and very rich herbarium, library **and unique living plant collections** essential to the full development of his thoughts, an incomparable resource on a global scale.

Over the years, he devoted himself to developing the classification of angiosperms, a field that had been somewhat neglected and undervalued for decades. Takhtajan found inspiration from his collaboration with colleagues working in many divisions in the Komarov Institute, including those concerned with fields such as paleobotany, biosystematics, palynology, and morphology and anatomy. In turn, he was able to suggest interesting problems with a bearing on understanding the relationships of different groups, bringing all of the new knowledge to bear on his major synthesis. Thus his interactions with his colleagues enriched his scientific efforts and those of the colleagues as well. **The research of many Russian scientists benefited greatly from his advices.**

Takhtajan's ideas about the relationships of vascular plants were first presented in his work "Correlations of ontogenesis and phylogenesis in higher plants," published in 1943. The degree of synthesis amounted to a novel approach to the problem, one that proved fruitful over the decades to come. He admired the works of the brilliant synthesizer Kozo-Polyansky, who in 1924 had written a very important work on symbiotic relationships among organisms. These ideas clearly helped Armen Takhtajan to think more deeply and imaginatively about phylogeny and philosophy. We are glad that a translation into English of Kozo-Polyansky's thoughtful book, important in the history of biology, has been published. Takhtajan's successive contributions to plant phylogeny continued with his publication in 1954 and 1959 with *Die Evolution der Angiospermen*, in 1967 *A System and Phylogeny of the Flowering Plants*, in 1987 *System Magnoliophytorum,* in 1997 *The Diversity and Classification of Flowering Plants*, and in 2009 *Flowering Plants.* Throughout the 60 years that he studied plant phylogeny, he exhibited his skills **and extraordinary memory**

as a synthesizer, bringing new findings from many fields to bear on his conclusions and presenting fresh hypotheses for further consideration in each of his works. By the end of his career he regularly took molecular data into account in modifying his early ideas. He also readily learned about the power of computers and data bases, using them to provide further information for his studies and to form his ever-evolving conclusions.

Deeply knowledgeable about plant structure, Takhtajan formulated a number of macroevolutionary hypotheses, such as those concerning heterobatmy and heterochrony, which have inspired thoughtful discussion by scholars such as Agnes Arber and Steven Gould. He concluded that herbaceous plants had originated as a result of neoteny, an idea that has been partly accepted by others. He produced a novel classification of gynoecia and their placentation, and critically evaluated such areas as the structure of inflorescences and the evolution of pollen grains. He analyzed the origins of monocot leaves, with their characteristic parallel venation, and attempted to explain the processes by which they were formed. Because of his wide knowledge of both Russian and world literature as well as his outstanding personality, Takhtajan was able to bring scholars everywhere into contact, foster their cooperative efforts, and inform their studies with new knowledge.

Peter Raven first met Armen Takhtajan in 1971, when he was a member of the faculty at Stanford University, and, like others who knew him, was immediately deeply impressed with his humanity, friendly personality, and the depth of his scholarship. At his invitation, Raven participated in the International Botanical Congress here in 1975, developing a symposium on the symbiotic original of organelles such as mitochondria and chloroplasts, and thus fostering the ideas of Kozo-Polyansky that Armen had appreciated so deeply. During the last 30 years of his life, he enjoyed visiting and studying at The New York Botanical Garden and the Missouri Botanical Garden, where colleagues were inspired by him and came to love him and his wife Alice. We are delighted that we will be able to produce an English version of the second edition of his book, “Towards Universal Science,” a book that will bring his general and philosophical views about the philosophy of science. Charles Jeffrey has done a good service in translating this book and thus making Takhtajan’s views available to a wider audience than it had been previously. In the book, Takhtajan seeks to formulate the general laws governing the organization, structure, and transformation of systems common to all sciences and operative at all structural levels. He hoped that tectology would become the basis of a new world view of science as a whole and a powerful force for the integration of scientific knowledge and its utilization for mankind.

What will be the future trends in areas of interest to Armen Takhtajan, and how did his studies contribute to the ways in which they will develop?

First, of course, is his significant contribution to the internationalization of science, which has helped us all realize that ideas and scientific progress know no boundaries. We are together engaged in an endless search for knowledge that humans have known from the time of their origins and will go on as long as our species exists on earth. In science, we find a common language that enables us to communicate with and understand one another in ways and for purposes that are deeply important for us all.

Second, with respect to the overall features of evolution and the patterns that we are coming to understand better with every passing year, Takhtajan emphasized the discontinuities in the system – important times of evolutionary change that have altered the patterns of development of life on earth, often not continuously but abruptly. His appreciation of the ideas about the roles of symbiosis in the origin of eukaryotic cells that were enunciated early in the 20th century by Kozo-Polyansky and other Russian philosophers of biology helped greatly in what has now become a general acceptance of this phenomenon. The study of the kinds of abrupt transitions in evolutionary history is being actively pursued at present and helps us critically to illuminate the features of life on earth as we see it now.

Third, with respect to biogeography, Takhtajan’s amazing knowledge of plants and other organisms around the world made it possible

for him to interpret patterns indicative of the history of various groups of living organisms. The general acceptance of the mechanism of plate tectonics and the explanation that it provided for the current positions of the continents and the timing of their past positions has made possible a greater understanding of the patterns of life, a story that continues to be developed strongly, especially in the light of an improved understanding of the fossil record and of the relationships of organisms as time goes by. Takhtajan's division of the world into biogeographical patterns was based on his extensive knowledge and has proved useful since it was first proposed.

Finally, concerning angiosperm phylogeny, it must be said that our current ability to determine readily base sequences in DNA has given us an enormously useful tool for analysis, one that was not available for most of Armen Takhtajan's life. As I mentioned above, he began to use data of this kind in preparing his last comprehensive work, and doubtless would have used it extensively if he had lived longer. Today the Angiosperm Phylogeny Group, version III, is the authoritative synopsis of flowering plant relationships. What should be noted here, however, is the remarkable job that Takhtajan did in analyzing relationships in the light of much less information that we have available today.

Of particular importance were the studies that Takhtajan stimulated or used of particular kinds of characters, such as pollen morphology or embryology, and the ways in which he used them in determining relationships. These studies are of lasting value, particularly in view of the numerous examples of parallel or convergent evolution in angiosperms. In many cases, careful study either confirmed the observed homologies as a true indication of shared ancestry – synapomorphies – or demonstrated their artificial nature when they were examined in detail. Contemporary classifications of angiosperms, based at their core on results from molecular biology, provide a means for comparing the evolution of particular characteristics of angiosperms in different phylogenetic lines (clades). For such studies, earlier results are of fundamental importance and usefulness; the extent of the published record is so great that it would be impossible to duplicate the results *de novo* in any reasonable length of time.

Overall, botany and biology are in a period of unprecedented growth, and the future is very bright indeed. Plant growth and development, genetics, genomics, proteomics, metabolomics, and epigenetics are producing results that were literally unimaginable when Armen Takhtajan took up his position in Leningrad in 1949 or when Raven entered university four years later. At that time, we were stymied by the lack of techniques to help us delve more deeply into the development and functioning of individual organisms. The unraveling of the genetic code in the 1960s, the first transfer of a gene into the genome of an unrelated species in 1972, the widespread use of transgenic organisms in medicine, agriculture, and to produce our foods (beer, cheese, and many crop plants and some domestic animals) in the 1990, and the dazzling array of techniques that have helped to understand the functioning and relationships of organisms to a depth that would have been unimaginable 50 years ago – these are all remarkable landmarks of our era. We can confidently predict many additional stunning advances in the years to come, as we unravel the mysteries of the nervous system, of the brain, and of a modern view of epigenetic phenomena that seem to defy the laws of genetics in ways that would have been rejected our of hand even a decade ago. Advances in instrumentation have been of central importance in achieving these great advances in our understanding of biology, and they will be of fundamental importance in the future as well. Of central importance in the years to come will be the full development of the techniques that enable us to produce genetically modified organisms, of great use in adapting to the needs of a rapidly changing world in which many people are poor and hungry. One thing of which we can be sure: if Armen Takhtajan had been a young man now, he would have taken full advantage of the possibilities presented by all of these marvelous advances!

In a broader picture, we live in a world inhabited by four times as many people as when Armen was born. Globalfootprint.org estimates that we are using 160% of the productive capacity of the earth, far beyond any condition that can be

considered sustainable. In the 400 human generations since our ancestors developed crop agriculture and domesticated animals, our numbers have grown from a few million people to more than seven billion, and continue to grow. Our levels of consumption and urbanization mirror and even exceed our growth in numbers, so that the world's ecosystems are deeply stressed. Although our system of nation states may not be the most suitable for solving the many problems that confront us and achieving sustainability, attain it we will, either in relatively good condition or with our life support systems wrecked. General conceptual systems – complex thinking of the kind that Armen Takhtajan loved to develop – will be necessary to understand what we confront and to manage it for our common advantage.

Armen Takhtajan was a lifelong learner, a man who was always pleased with new discoveries and new knowledge and the opportunity that he had to incorporate them into his thinking. Russian science has been a strong contributor to world science for many, many years, but translation problems and other barriers have tended to slow the recognition of results of great importance. This problem has been exacerbated by the often highly philosophical character of the analyses of many problems in areas where Russian scientists have made great contributions. The organization of thoughts in different ways by people with diverse cultural backgrounds is one of the greatest assets we have as human beings, but care must be taken to work together patiently with mutual respect and patience to ensure that everyone benefits as much as possible. In this respect, Armen Takhtajan's unquenchable zeal for life and lifelong search for knowledge made him an exceptional bridge between Russia and the rest of the World, with great advantage to all parties involved. In conclusion I would like to hope that the passion and humanity that he exhibited in such abundance will continue to inspire us all to find common ground in our universal quest for scientific knowledge, a trend that will both improve our lot and bring us closer together in developing science for the sake of human progress. We need one another more than ever before in human history, and must find ways to work together ever more effectively in the future. In doing this the illustrious career of Armen Takhtajan provides of great example.

Among his publication are: more than 300 scientific papers, 20 books. He was a Chief Editor for "Flora of Armenia" (10 volumes), "The Life of Plants" (3 volumes), "Comparative Seed Anatomy" (6 volumes), "Conspectus of Caucasian Flora" (3 volumes). Armen Takhtajan was an Editor in Chief for Botanical Journal (Botanichesky Zhurnal) from 1978 – 2000.

Armen Takhtajan received honors:

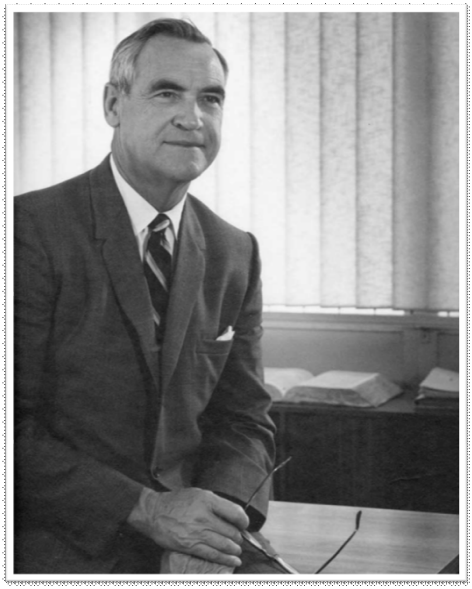
In 1947 - Honorary Diploma of the Government of the Armenian Soviet Republic,
In 1966 – Birbal Sahni Medal (India)
In 1969 – V.L. Komarov Aword (Presidium of the Academy of Sciences USSR)
In 1970 – Order of Red Banner of Labor
In 1975 – Order of Red Banner of Labor
In 1977 – Medal der Deutsche Akademie Naturforscher Leopoldina (Germany).
In 1981 – Award of the Soviet Union Government
In 1990 – Allerton Medal and Award of the National Tropical Botanical Garden (USA)
In 1990 – Order of Hero of Socialist Labor
In 1997 – The Henry Shaw Medal (The Missouri Botanical Garden, USA)
In 1997 - The H. Allan Gleason Award (The New York Botanical Garden, USA)

In 1966 Armen Takhtajan became a Member of the Academy of Sciences of the Soviet Union
In 1967 Takhtajan was elected member of Linnaean Society, London
In 1971 he became an Academician of the Armenian Academy of Sciences
In 1972 elected an Academician of the Academy of Sciences of the USSR.
in 1973 – President of the Botanical Society of the USSR until 2000.
He was a member of many scientific societies, including a corresponding member of the Botanical Society of America.

Thoughts on Vernon I. Cheadle

Ray F. Evert, Professor Emeritus
University of Wisconsin
and
Natalie W. Uhl, Professor Emerita
Cornell University

Vernon Irvin Cheadle was born in Salem, South Dakota on February 6, 1910, and grew up on a farm there. He and his twin sister, Vivian, weighed only three pounds each at birth. At the time, it was questioned whether either of them would survive. Indeed they did, and Vernon, metaphorically, grew into a giant of a man, and the personification of excellence and integrity. This is a story about a poor country farmer's son who became one of the great leaders in the history of the University of California System.



Vernon was characterized by one of his associates at the University of California-Santa Barbara (UCSB) as a "Renaissance man, a mind-and-body kind of guy." While in high school, Vernon lettered in basketball, football, and track and field. In 1926, during their senior year, he and his brother Jack led the Salem High School basketball team to the state championship, and then went on to place third

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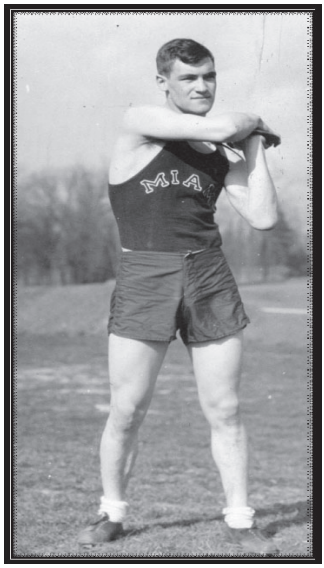


in the National High School Tournament held in Chicago. The entire state of South Dakota celebrated the team's accomplishments.

Following high school, Vernon and Jack attended South Dakota State College for one year and then transferred to Miami University in Oxford, Ohio. A Professor Arthur Evans at South Dakota State had accepted an offer from Miami and suggested that the young Cheadles should come along with him. While at Miami, Vernon lettered three years in basketball and track and field. In 1932, he graduated magna cum laude with a B.S. in Botany and was elected to Phi Beta Kappa. He then moved on to Harvard, where in 1934 he received an M.S., and then in 1936, a Ph.D. in Botany.

Vernon wanted to be a physician but could not afford to go to medical school. He borrowed money to go to Harvard. Life there was not easy for him. He lived in the attic of a house within walking distance of the campus and paid for the room by doing chores for the owner. He rarely had more than one meal a day.

Vernon's Ph.D. thesis dealt with secondary growth in monocotyledons and, after graduation, he planned to continue research on their vasculature. Following receipt of his Ph.D. in the spring of 1936, he set off on a collecting trip for monocotyledons in Cuba. While there he received an offer to join the faculty of Rhode Island State College (now the

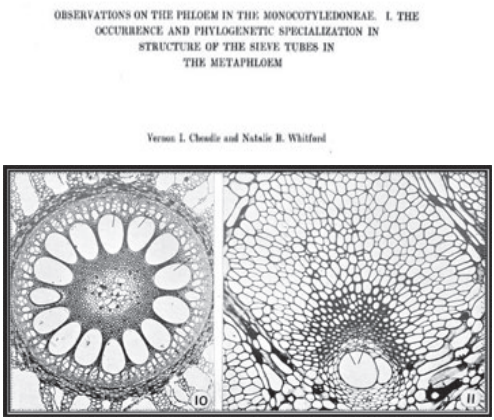
University of Rhode Island) beginning in the fall.

Professor Harold Browning, a distant cousin of Natalie Uhl, was chairman of the Botany Department then. Natalie noted that Browning was very formal and believed in properness and discipline, and that the small town of Kingston was not an easy place to gain acceptance for an energetic young man. On one occasion Vernon received a lecture about the proper behavior for a junior faculty member after he was seen drinking beer at a bar in the nearby town of Wakefield. He also was spoken to about not attending church on Sunday after he and Natalie had been out collecting specimens on a Sunday morning. Natalie said Vernon's immediate reaction was that he could communicate with God equally as well in fields and woods.

Natalie first met Vernon as her instructor in Botany 1, the first part of a year-long course required for all Agriculture and Science Majors. She found Vernon formidable in that he was young, energetic, and demanding unlike some of the older more relaxed members of the department. When Vernon managed to get some money for student help, Natalie began working for him, some ten hours a week as a lab tech. After she graduated, she worked full-time for two summers and part of a third. Natalie noted that Vernon and she were hard working and enthusiastic and always joking, but with a serious undertone. Vernon had no office at first. Later he had a desk in a closet used for storing supplies. He worked late into the night, part of the time making slides of plant materials for the Conant Microslide Company in Ripon, Wisconsin, in an effort to pay back his student loan.

Natalie reminisces about the good times they had in those early years with a small group of students interested in plants. There were picnics—steak roasts in areas along the highways and lobsters on the beach—and swimming in the ocean and in fresh water ponds. Natalie recalls a trip to a brook in Hope Valley where Vernon told her to wade in for *Elodea*. Shedding her shoes and socks, and holding up her skirt, she ventured forth with Vernon cheering from the bank. Sunday mornings hunting monocotyledons were followed by "blue Mondays" as Vernon sat with Gray's manual and she cut, fixed, and aspirated the collections.

Incidentally, the data gathered while Natalie worked with Vernon resulted in three co-authored papers published in the *American Journal of Botany*. The first, shown here, was published in 1941, the other two in 1948. In the first paper, Vernon and Natalie reported on the



OBSERVATIONS ON THE PHLOEM IN THE MONOCOTYLEDONEAE. I. THE OCCURRENCE AND PHYLOGENETIC SPECIALIZATION IN STRUCTURE OF THE SIEVE TUBES IN THE METAPHLOEM

Vernon I. Cheadle and Natalie B. Whitford

evolutionary specialization of the sieve-tube elements in the metaphloem of the monocotyledons. They found that specialization progressed from the leaf toward the root; that is, the most highly specialized sieve-tube elements occurred in the leaves, and the least highly evolved sieve-tube elements in the roots. Thus, the direction of specialization of sieve elements in the metaphloem turned out to be opposite that in which the evolution of the tracheary elements occurred in the metaxylem of monocotyledons.

Bob Lepper, a fellow botanist at Rhode Island, introduced Vernon to Mary Low. Mary was teaching third grade at West Kingstown, a small town about five miles from Kingston. They were married on December 23, 1939.

Natalie noted that Vernon was always interested in obtaining food—perhaps having had only one meal a day in grad school being a factor. They picked blueberries and grapes in the wild. The first year Vernon and Mary Low were married, they canned 48 jars of blueberries. Vernon thought that was just fine, about one pie per week. As World War II came and meat was difficult to obtain, Vernon said to Natalie's father, a farmer, "suppose I buy a pig, you raise it and we'll divide it." Her father, well known for his New England sense of humor, and looking somewhat askance at college professors anyway, was quick to respond "What do I get out of this—the company of the pig?"

In 1942, Vernon was appointed Chairman of the department and Director of the Graduate Division at Rhode Island. His extraordinary talent and ability as an administrator became evident to those around him. During that same time he was an enormously productive teacher and researcher. He served as such until 1952, except for a commitment with the Navy in Pacific Theater during WWII from 1944 to 1946.

Natalie noted that Vernon brought many things to Rhode Island, most especially excellence and broadening contacts with other universities, and that from the beginning it was clear he was especially talented in relating to and working with people.

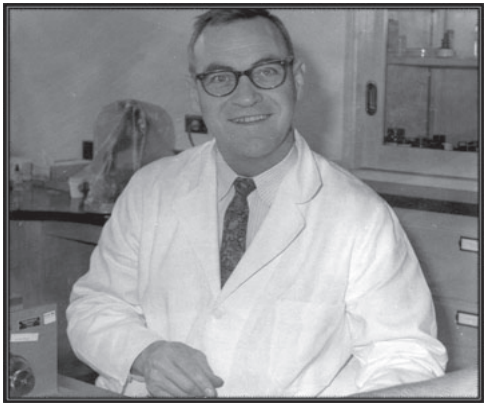
Another undergraduate botany major at Rhode Island during Vernon's tenure there was Arthur Kelman, who virtually revered Vernon. Arthur, who became a distinguished plant pathologist and served as Chair of the Plant Pathology Department at the University of Wisconsin-Madison, told the story of proudly showing Vernon an examination paper on which he received a 96. Vernon's response was "Why not a hundred?" Some insight into Vernon's philosophy of education can be obtained from a couple of short paragraphs in a Guest Editorial he wrote for the Beacon—the student newspaper—published April 2, 1948.

The price of learning is hard work. It is harder for some than for others, but there is no real scholar or even truly educated man who is not an industrious soul. All others fail themselves in some degree.

It is the faculty's business to help students to help themselves in learning, particularly over the period of time in which they are attempting to gain that threshold of learning that will provide them with self-sustaining motivation. Courses of study should be constantly in a state of revaluation to further this end. If students, on the other hand, are not willing to pay the price, they impede the progress of education for others, clutter up the scene, and occupy places that others more willing should have.

In 1950-51, Vernon spent a sabbatical year at the University of California, Davis, working with Katherine Esau who shared his interest in vascular tissues, especially the phloem. While at Davis, the quality of the man shone through. The folks there were impressed not only with his research, teaching, and administrative credentials, but also with his interest in students and the warm response he received from them. Davis was a small institution at the time and the

botany faculty, in particular, were uniquely concerned for their students. Shortly after he returned to Rhode Island he was invited to return to Davis as chairman of the department. Ray recalls that he first met Vernon Cheadle—Dr. Cheadle then—in the Fall of 1954, shortly after he arrived in Davis to begin graduate studies. Cheadle was in the small departmental office in the botany building, which at the time was a converted garage. After shaking my hand and welcoming me, he proceeded to tell me what a wonderful place Davis is. After all, it was during his sabbatical year at Davis that Bill was conceived. He had a son and I was looking at a very proud father.



During Ray's four years at Davis, he and the Cheadles developed a lasting friendship, and he had the opportunity on many occasions to observe Vernon's relationship with Mary and Bill—how devoted and caring he always was. Mary was involved in a number of volunteer activities, a prelude to her many activities as the wife of the Chancellor at UCSB. Ray remembers Vernon emphasizing how important it is for one's wife to have the opportunity to make her own contributions to society, not to be bound solely to her husband's activities. This was sound advice for a youngster from the anthracite coal region of Pennsylvania, where the contrary condition was more common at the time.

At Davis the Cheadles had a house on a large lot just off campus where they entertained the botany graduate students each semester. Not surprisingly, much of the back yard was devoted to a large vegetable garden with corn, tomatoes, beans, carrots, and broccoli among others. One summer, while the Cheadles were on vacation, Ray was charged with keeping the garden watered and the large tomato worms under control. Well, three days before the Cheadles were to return he watered the garden thoroughly for one last time. Shortly afterward the infamous north winds began and down came the corn. Gads, what will Dr. Cheadle's reaction be when he sees this? Much to his surprise and relief, the intercalary meristems at the base of the stalks went into action and within two days–just in time–the stalks were upright. Ray never mentioned the incident to Vernon.

During the last two of his four years at Davis, Ray served as Vernon's teaching assistant in the introductory botany course for two-year students. Vernon wrote model examinations. Ray recalls his amazement when he first saw one of Cheadle's examinations because it contained all of the attributes Ray had been taught in a course on Testing and Measurements. (he received his bachelor's degree in Secondary Education in 1952 at Penn State.) Finally, Ray was asked to take a hand at writing one of the exams. He remembers that after considerable time and effort, he presented the exam to Vernon who scrutinized it very carefully and then asked "Is this the best you can do?" Vernon expected excellence. He was not always subtle in making the point, but he was always effective. For the next two years Ray wrote all of the exams for the course.

It was important to Vernon to interact daily with students, staff and faculty. Attending the morning coffee break was important to him because it afforded him an informal atmosphere for communication. He went out of his way to make everyone feel appreciated, and he meant it. Once when Ray was writing a note on the blackboard requesting that the janitors not erase some art work, Vernon saw the note and said, "Ray, change that to custodian. It's is a more dignified title than janitor. These folks are very important to us."

As the time approached for Ray to leave Davis for Montana State College (now Montana State University) in Bozeman and his first job, Vernon came to him one day and said "Ray, you'll never

make it to Bozeman in that Hudson of yours. Why don't go to Bank of America and apply for a loan? I'll co-sign it for you." Ray recalls that this resulted in the purchase of his first new car, a Borgward named Isabella. The day Ray left Davis, the Cheadles were the last folks to whom he said good-bye. Mary presented him with a shoofly pie (she knew it was one of his favorites) and two thermos bottles full of coffee. Vernon gave him an envelope containing a twenty dollar bill.

In 1962, Vernon was appointed Chancellor of the University of California at Santa Barbara, and a year later Dr. Esau moved to Santa Barbara so they could continue their collaborative research. Although they continued to work together, Vernon's major effort during his 15 years as Chancellor was in laying the foundation for a first-class research university. Under his leadership and vision UCSB underwent remarkable growth and attracted a critical mass of distinguished scientists and scholars. As Chancellor, another of Vernon's principal concerns was the students—all aspects of

their well- being. During his entire tenure, he held breakfast meetings twice monthly with student representatives at the Chancellor's residence on campus. He retired as Professor and Chancellor Emeritus in 1977, and immediately returned to the laboratory full time, literally. He spent five days a week in the laboratory and often worked on weekends. He simply could not learn enough about the tracheary elements in monocotyledons. It was while returning home from the laboratory that he suffered a stroke that led to his death on June 23, 1995.

Vernon served as President of the Botanical Society of America in 1961, and received the Merit Award of the Society in 1963. The Certificate of Merit read " *for his deep and abiding interest in science, his service to biology through untiring efforts to promote scholarly teaching and research, and for his major contributions to the interpretation of the evolution of vascular tissue in the monocotyledons and the structure of phloem in the dicotyledons."* Vernon was a fellow of the American Association for the Advancement of Science, the California Academy of Science, and the American Academy of Arts and Science. In 1964 he received Honorary Degrees from Miami University and the University of Rhode Island. In 1978 he was elected to the Miami Athletic Hall of Fame and in 1990, he broke the world record in the discus throw for his age group at the Masters Track and Field Meet. Vernon and Mary celebrated their 50th wedding anniversary in 1989.

Vernon Cheadle never neglected his family nor his friends, who were legion. He had an enormous, positive impact on all who knew him well, especially yours truly. He cared, he shared, and he led by example.

Acknowledgement: Thanks to Laurie Hannah at the Cheadle Center for Biodiversity and Ecological Restoration, UCSB, who scanned these slides.

-Editor's note. Additional information about Dr. Cheadle can be found on the BSA web site under: Vernon I. Cheadle Student Travel Awards:http://www.botany.org/awards_grants/detail/cheadle.php;

Plant Science Bulletin. 1995. 41(3):48
http://www.botany.org/PlantScienceBulletin/psb-1995-41-3.php#cheadle

and the website for the The Vernon I. Cheadle and Katherine Esau Structural Botanical Collections at: http://ccber.lifesci.ucsb.edu/

Books Reviewed In this issue:

Introduction to Conservation Genetics, 2nd Ed. Frankham, Richard, Jonathan D. Ballou, and David A. Briscoe. 2009. ISBN 978-0-521-70271-3 (Paperback US$75.00) 618 pp. Cambridge University Press, The Edinburgh Building, Cambridge CB2 8RU, UK.

Although courses in conservation biology and population genetics are available in many universities today, the intersection of the two fields is often left to journal clubs and specialist researchers. Frankham et al. published the first edition of their textbook *Introduction to Conservation Genetics* eight years ago, in effect advertising the existence of this interdisciplinary field to a broader audience of students. The newly updated edition I review here builds upon the strengths of the first edition to promote a solid understanding of research on and encourage additional interest in the influence of genetic factors on species conservation effectiveness.

The updated text contains four major chapter groups centered on basic introductory material on the topic's relevance, theoretical evolutionary genetics, the genetics of small populations, and practical genetic management issues for conservationists. The authors provide chapters tailored for students, complete with introductory lists of vocabulary terms (also highlighted in the text and fully defined in the Glossary) and section summaries in the margins. Review questions, chapter summaries, applicable software packages, and additional references (fully cited in the References at the end of the book) appear at the end of each chapter. Karina McInnes's illustrations allow readers to visually connect theoretical material to both charismatic and lesser-known endangered species.

The authors have developed new chapters on population genomics and the impact of invasive species, as well as shorter sections on topics such as landscape genetics. Both of the chapters are nice additions, allowing the updated text to keep up with recent findings and to draw connections between conservation genetics and other research areas. Because

evolution, population genetics, and conservation management can be so highly intertwined, there is a good deal of cross-referencing throughout the book. At times this can become a bit distracting because the reader is sent flipping through pages to recall earlier material, but it also helps strengthen the connections between different points – a strategy that cognitive research is beginning to suggest may be more effective for long-term retention than a strictly linear presentation.

The authors have made worthy efforts to avoid "plant blindness;" for example, they address the relevance of mating patterns and polyploidization to concerns such as inbreeding depression. Invertebrates and at times microbes also receive attention alongside the more-expected cheetahs and California condors. The treatment of practical issues in genetic management tied together all previous information and demonstrated its use for both *in situ* and *ex situ* conservation programs. This sort of information is not often covered in traditional courses centered on theory, so it effectively highlights the applied nature of this research area.

Overall, the second edition of *Introduction to Conservation Genetics* should provide an excellent basis for developing an introductory graduate or upper-level undergraduate course on conservation genetics. Instructors should also be able to incorporate some material into more general courses on conservation biology, population genetics, or evolution. Although I had trouble following a few mathematical transformations, I agree with the authors that a basic understanding of statistics and Mendelian genetics should be sufficient to understand the material; the text should be accessible to undergraduate biology majors. However, the utility of this new edition is not limited to classroom instruction. Scientists looking to learn more about this research area can use it to gain a basic foundation, and specialists will find it a handy tool for quick cross-referencing of the field's primary literature.

-Lindsey K. Tuominen, Warnell School of Forestry & Natural Resources, The University of Georgia, Athens, GA 30602

The Kingdom Fungi: The Biology of Mushrooms, Molds and Lichens. Stephenson, Steven L. 2010. 272 pp + plates. Timber Press, Portland and London.

Nestled between two magnificently lurid stinkhorns on opposing sides of the dust jacket, this smallish hardcover offers a broad view of the fungi intended for "the general naturalist, amateur mycologist or interested layperson..." While mushroom field guides abound, the particular focus of *The Kingdom Fungi* is less frequent and therefore particularly welcome. The biologically informed reader may be deceived by the title, however. The book actually treats a diversity of organisms traditionally included in mycology courses, including the oomycetes, myxomycetes, dictyostelids and protostelids (but not the acrasids for some reason) as well as the "true" fungi. In short, the author is not at all concerned with the fungi as a kingdom or lineage but rather as a broader biological concept. He dutifully indicates which groups are not true fungi, but does not discuss their relationships elsewhere in the diversity of life. This omission seems particularly conspicuous after repeated references to the formerly recognized class Phycomycetes. Several chapters are organized with taxonomic subheadings, but only for the true fungi. There are no cladograms in *The Kingdom Fungi*, and phylogenies are not discussed.

The subtitle gives a better idea of what this book is about, although the treatment of biological topics is selective. There is no discussion, for example, of the cell biology, population biology, genetics or biochemistry of fungi. On the other hand, their diverse lifestyles, their broad ecological importance, and their remarkable symbioses with other organisms are well-covered. In a few instances these treatments

seem too brief even for a short volume; endophytic fungi, for example, are dispatched in a very few sentences. But by and large this focus is the book's strong suit.

Some chapters are also named or organized counterintuitively. The chapter entitled *A Diversity of Form and Function* actually deals only with ascomycetes, and those ascomycetes with the most complex fruiting bodies are not even treated there but are instead dealt with in a following chapter. The trichomycetes, non-flagellate symbionts found within arthropod digestive tracts, are introduced unexpectedly in the chapter on *Fungi that Live in Water*.

The presentation of biological information in books intended for non-specialists is often a delicate calculation of what needs to be explained or passed over in order to be informative yet reader-friendly. Whether *The Kingdom Fungi* does this effectively will have to be judged by its intended readership. A fair amount of life cycle detail is provided, but explanations of the underlying biological concepts are limited. Although clarified to some degree where introduced in the text, many of the technical terms employed — *monokaryotic*, *mitosporangium*, *meiosporangium*, *progametangium*, *prozygosporangium* to name just a few — do not appear in the book's rather limited glossary. The expression "sexual spores" should be explained or the newcomer will inevitably think it refers to gametes (another concept not defined in the book). While "water molds" are introduced and discussed using this term alone, later chapters refer to these organisms as oomycetes. The term *phylogenetics* is likewise used but not explained (not in the glossary either). But I comment from the perspective of a biology and botany instructor; the author may well be a better judge of what his targeted readership already knows. Correct singular and plural forms of Latin- and Greek-derived terms are fastidiously indicated in the text.

The complete absence of drawings or diagrams in this volume may at times be problematic for the reader inexperienced in mycology or general biology. The explanation of clamp connections and their formation (p.102), for example, is unintelligible without illustration. On the other hand, the book's 124 color photographic illustrations are for the most part excellent and informative. They are grouped in two fascicles of plates, a somewhat less convenient format than integration of figures with the text, but one that undoubtedly helped keep down the cost of this book. Included are infrequently seen, *in situ* images revealing the buried larval prey from which *Cordyceps* fruit bodies emerge, ambrosia beetles within their fungus-lined tunnel, and long-rooted *Termitomyces* mushrooms. There are also excellent light micrographs of basidia, asci, nematodes trapped by predatory fungi, and *Pilobolus* sporangiophores, among others. None of the images in this book includes any indication of scale, which sometimes reduces their usefulness.

Some inaccuracies occur in the discussion of the relationship between lichen fungi and their algal symbionts. Lichen "haustoria" have not been shown to have any specific role in transfer of nutrients. In symbiosis, the algal cell membrane simply leaks carbohydrate polyols, which the fungus absorbs. The "haustoria" of most foliose and fruticose lichens studied are slender protrusions of fungal hypha that do not actually make contact with the algal cell membrane or even fully traverse its cell wall. Full penetration and destruction of algal cells has been observed mainly in laboratory synthesis experiments and to a more limited extent in simple crustose lichens; it is not believed to provide the main sustenance of the lichen fungus. The recent edition of *Lichen Biology* (2008, edited by T.H. Nash) includes mention of these issues, and would be a valuable addition to the present book's reference list.

Many works directed toward the broader, non-scientist public omit citations of literature, perhaps on the supposition that they may be distracting. Others do include such citations, either in the text or in a chapter-by-chapter appendix, in order to give the reader the opportunity to follow up on any topic that captures his attention. *The Kingdom Fungi* does not seem to follow a consistent policy on this issue. Much of the information is imparted without any reference to the literature, yet citations do appear here and there with no discernible pattern.

Thus, for example, the fascinating details of symbiotic fungus cultivation by attine ants, termites and ambrosia weevils are treated in six pages without a single literature reference, while elsewhere a citation is given in support of the passing observation that *Trametes versicolor* has been used as an ornament (Aurora 1979). In other instances, researchers and institutions are mentioned directly in the text. An eight-page list of references (without chapter indications) is provided at the end of the book.

Occasionally, the writing style distracts ("...literally stumbled on the fact..." "...extremely deadly..."), and several times sidetracks to personal anecdotes that don't successfully contribute to the narrative. There is a two-paragraph digression on an obscure science-fiction novel about viruses that attack grasses, of unclear relevance to the subject of wheat rusts. A paragraph devoted to the circumstances of the author's first-hand observations of studies being carried out on anther smut / pollinator interactions ends without the reader being told what insights were gleaned from that experience.

Imperfections notwithstanding, *The Kingdom Fungi* is an informative, nicely illustrated and modestly priced book that conveys the great diversity and general importance of fungi in the ecosystem. Many non-specialist readers curious to learn about what fungi do for a living are likely find it useful.

-William B. Sanders, Florida Gulf Coast University.

Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada. Tiner, Ralph W. 2009. ISBN 978-155-489-666-8 (Paper US$29.95) 416 pp. University of Massachusetts Press, P.O. Box 429, Amherst, MA 01004.

Ralph Tiner is a nationally recognized authority on wetlands. His expertise is derived from over four decades of work in the field during which he has published numerous important works. His latest book, The ***Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada*** is a much needed update and expansion of his 1987 work—the *Field Guide to Coastal Wetland Plants of the Northeastern United States*.

In this new edition, Tiner has increased the geographical range covered by the guide, updated the nomenclature, expanded plant descriptions, added more wetland types, and expanded from the plant realm to include common macroalgae and algae. Tiner also has increased the number of species described from about 150 to 349. Within each description, he has provided lists and brief descriptions of similar species to supply a more complete compilation of the 700 species one may come across in the tidal wetlands of the northeastern United States and Canada.

The field guide begins with an introduction of the author, descriptions of the three major tidal wetland types, and an overview of plant characteristics. In the descriptions of the wetland types, Tiner details the typical features of each, including hydrology, salinity, and common vegetation. He also describes the habitats within the general wetland types. The descriptions are quite general, but ideal for the scope of the book and the target audience. However, these tidal wetland descriptions are essential to the book because most of the plant keys are divided into groups based on seven wetland habitat types, unlike the previous version in which the keys were grouped by plant characteristics. In this section, he also provides nice figures, illustrated by Abigail Rorer, to accompany the textual descriptions. The overview of plant characteristics is a typical field guide description of form, leaf shape, flowers, and other morphology.

Tiner provides 13 dichotomous keys based on either habitat types or a combination of habitat type and plant form. The characteristics used in each couplet are extremely basic and ideal for the non-specialist. There is no jargon, and where botanical terminology would be used in other manuals, Tiner provides the reader with familiar terms, such as "felty" or "lettucelike," for example. Most of the keys end with a list of genera, and the reader needs to look at the plant descriptions to identify the species.

The plant description and illustrations are grouped by the wetland type and morphology according to the keys. The descriptions are those typical of other guides, providing important and diagnostic morphological features, flowering period, habitat, wetland indicator status, range, and a list of similar species. Rorer's illustrations of the plants and their flowers, when applicable, are simple and clear.

The field guide ends with lists of locations and maps of state and provincial coasts where one can see the tidal wetlands—an excellent feature of the guide. A brief glossary and complete index of species is also provided.

The biggest drawback to this field guide is the oversimplified key. The reader first needs to know the wetland habitat type from which the plant sample was taken; however, it may be difficult to the non-specialist to distinguish wetland types, especially in the transitional zones. Once the habitat type has been determined, the reader can proceed through the keys. As mentioned above, Tiner directs the reader through the couplets that terminate with a list of genera. Often between 9 and 13 genera are listed. It is then the reader's responsibility to read each of the listed descriptions to identify a specimen to species. It would be more efficient to provide an all-inclusive key or a minimal number of keys based on plant form rather than habitat type. The keys should then terminate at the species level. This would reduce the reader's need to flip back and forth between many descriptions and illustrations searching for diagnostic characteristics.

This weakness does not result in the total downfall of the guide. The ***Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada*** may prove useful to the hobby naturalist and day tripper—the intended audience of the guide. Botanists, ecologists, and other specialists are definitely better off using other resources.

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A Fifth Checklist of Tennessee Vascular Plants by Edward W. Chester, B. Eugene Wofford, Dwayne Estes, and Claude Bailey. 2009. ISBN 978-1-889878-26-3, 102 pages, (paperback $20.00 US), Botanical Research Institute of Texas (Brit Press), Fort Worth, Texas, USA.

Floras are not static. Introduced species, changing climate, human impacts, among other factors, contribute to changing floras. Improved sampling techniques and greater accessibility into remote areas contributes to more accurate floral lists. A Fifth Checklist of Tennessee Vascular Plants by Edward W. Chester, B. Eugene Wofford, Dwayne Estes, and Claude Bailey, provides an updated floral list of 2874 vascular plants known from Tennessee: 2439 native and 435 naturalized. All four authors are associated with Tennessee universities or colleges. The book is dedicated to Augustin Gattinger (1825-1903) and Aaron J. Sharp (1904-1997) who compiled the first three checklists of Tennessee vascular plants.

Tennessee possesses five physiographic provinces, three major river systems (the Mississippi, Cumberland, and Tennessee rivers), and great variations in geology, topography, and climate. In the introductory section of this text, the authors described how their new checklist would help document the tremendous biological plant diversity and the myriad of macro- and micro habitats within Tennessee. The authors utilized information from the previous four lists in compiling their data. The first three checklists were a compilation of monocots and dicots and are mostly of historical interest; the Gattinger lists were compiled in 1883 and 1901 and the Sharp list was compiled from 1956 – 1960. The fourth checklist, published by Wofford and Kral (1993),

contained voucher specimens and county distribution and maps of 2785 plants, including ferns, gymnosperms, and angiosperms. Chester *et al*. (2009) explained that the purpose of the fifth checklist is two-fold: "1) to update the 1993 checklist; and 2) to provide a baseline list for production of a manual of the Tennessee vascular flora". More than 170 state records have been added to the 1993 list in the Fifth Checklist. New records were obtained from field, herbarium, and lab studies, and from volumes published by The Flora of North America project, The United States Department of Agriculture (USDA), and the National Resource Conservation Service (NRCS).

In the opening pages of this book, the authors explain that their new checklist evaluates previously reported non-native taxa for naturalization. Their criterion is based on Nesom's (2000) definition for naturalization: "non-native species accidentally or deliberately introduced into the flora, now reproducing and maintaining viable populations for year to year and dispersing without human intervention beyond the population or populations of original establishment". Chester *et al.* determined that these criteria must be met for ten years in order for a plant taxon to be included in their list. Additionally, the authors placed more than 350 non-native taxa reported from the state, on a "Watch List"; these particular taxa are not considered to be naturalized and are not currently listed as part of the state's flora at this time. Although "Watch List" taxa require additional monitoring and research, these taxa are documented at the end of each species list under the appropriate family. A four page table, at the end of the introductory section, summarizes the number of families, genera, native and introduced species, and total number of species under major categories - pteridophytes, gymnosperms, monocotyledons, and dicotyledons.

The checklist spans 63 pages (p. 7 to 70) and is divided under the four major categories denoted above. Within each category, families are arranged alphabetically and are written in bold font. Circumscription of angisoperm families follows the Angiosperm Phylogeny Group II. The common name for each family follows and also is designated in bold font. Genera and species are given alphabetically under each family and their common names are provided. Sometimes major literature citations are associated with species listings. Major synonymies, family realignments, and taxonomic and nomenclature changes are provided, making this checklist especially useful. For example, "see Cleomaceae" is listed by the former family Capparaceae and "see *Comptonia"* is listed next to *Myrica*. Places of origin for each naturalized taxa also are specified. To help clarify naturalized taxa from native taxa, the authors preceded the name of each naturalized taxon with an asterisk (*). A literature report that lacks a known voucher, such as *Crataegus austromontana*, is denoted by an exclamation mark (!). The checklist also incorporates (written in bold font) the status of various species if they are endangered, threatened, or of special concern. A dash with modifiers such as commercially exploited, or possibly extirpated when applicable may follow these status reports. Additionally a federal listing follows a state listing when applicable; these include "Listed Endangered", "Listed Threatened", or "Candidate Species".

An appendix consisting of 21 pages (p. 71-92) contains an alphabetical listing of questionable pteridophytes, gymnosperms, and angiosperms that are not included in the current checklist but that have been reported from Tennessee. More than 175 taxa are considered to be extirpated from Tennessee. For example, *Trillum underwoodii*, which currently exists in Alabama, Georgia, and Florida, was attributed to exist in Tennessee in earlier reports. A ten-page literature cited list comprises the remaining part (p. 92-102) of this reference. Although this reference is devoid of photographs, the internet website http// tenn.bio.utk.edu/ contains more than 7000 images and distribution maps for each taxon listed in this text.

This book is small and light-weight, making it a useful for field excursions. Professionals, students, and all others with an interest in the conservation, ecology, and systematics of the Tennessee vascular flora will find it indispensable.

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The Timber Press Dictionary of Plant Names. von Erhardt, W., E Götz, N. Bödeker and S. Seybold. A. J. Coombes (ed.). 2009. ISBN 13: 978-1-60469-115-3 (cloth US$39.95) 920 pp. Timber Press, 133 SW Second Ave., Portland, OR 97204.

The Timber Press Dictionary of Plant Names is based on the 18th (2008) edition of the *Zander Handwörterbuch der Pflanzennamen*, but revised by a team of botanists and plant taxonomists for an English-speaking audience. First published in 1927, it follows the International Code of Botanical Nomenclature (ICBN). It contains entries for over 20,000 plants including the common names of both cultivated varieties and wild species in English, French, and German.

This single volume contains a wealth of information and considerable attention to depth and scope. After an historical chapter describing the originator (Dr. Robert Zander) and past and present contributors and editors, it begins with an introduction to botanical nomenclature. This second chapter also includes very practical pronunciation guide, descriptions of classification within kingdom Plantae, and what governs the ICBN (Vienna 2006), followed by a chapter on cultivars and the International Code of the Nomenclature of Cultivated Plants (ICNCP).

Chapter 4 is entitled "How to use the book" and, as the title suggests, describes the coding system and format of the dictionary entries, as well as an overview of geographic distributions and the classification system used for vascular plants. Given the very large number of entries, a system of abbreviations and a description of technical terms are provided. As one might expect, I found myself flipping back to these pages each time I looked up a particular entry in the alphabetical listings that followed. Future editions of this dictionary would benefit from having the edges of these pages highlighted (like they do with the three sections of vernacular names tabbed in a latter section of this book) to assist in finding this section. Alternatively, this list of abbreviations could be combined with the key to the symbols used in the alphabetical listing of species, found immediately preceding their entries on page 58, or even on the inside of the book covers, for easier reference.

The amount of detail found in the individual entries is impressive and includes the botanical authority, cold-hardiness (according to USDA Hardiness Zones), cut flower use, decorative fruit use, endangered species status (according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES), flowering time, foliage type (deciduous, semi-evergreen, evergreen), fragrance value, geographic distribution, garden habitat (rock garden, water, window box), growth habit (climbing, creeping, aquatic), life cycle (annual, perennial), medicinal properties, number of species in the genus, synonyms, toxic properties, and type of plant (perennial, shrub, tree, succulent).

There are three dozen symbols used throughout the individual entries, making it awkward to have to keep referring to the key, but certainly understandable given the sheer number of entries. The advantage of using these symbols is clear, however, since without them the size text itself would be even more cumbersome, and costly.

Following the alphabetical entries are the tabbed lists of vernacular names in English, French, and German, cross-referenced to Latin names. The text then includes a particularly useful section listing authority names, strictly following Brummitt and Powell (1992) for standardized abbreviations. This list also includes the birth and death years of the author or, if unavailable, the years when the author was active and/or publishing. At over forty pages, it is particularly useful as a dictionary within a dictionary. The text concludes with a dozen pages of related reference texts (including floras, cultivated plants by group, digital materials, and recommended internet sites) and three maps to correspond with the geographical abbreviations used in the body of the dictionary.

Having worked over the years with a number of cultivated varieties, non-native introductions, and threatened or endangered species, I was curious to see how comprehensive this reference text is for the species with which I am familiar. I was pleased to see entries for some

of them; however, at the same time I was disappointed at the omissions of a few of the threatened species. Being more of a geneticist/physiologist, with much less of a background in taxonomy, I would see myself using this dictionary only occasionally, however. The flyleaf recommends this book to "anyone with an interest in plants." I would narrow that endorsement a bit and suggest that it is more tailored to botanists, advanced horticulturists, field researchers, and individuals who find themselves working with a variety of plant species on a regular basis. It would not be an interesting "read" for the average home gardener. It would, on the other hand, be a very valuable addition to an academic reference library and botanical gardens, both for its scope and price. There are many plant dictionaries on the market, each with its own focus, from those limited to specific plant families or habitats, to those targeted to home gardening. Compared to similar plant dictionaries of very broad scope that can cost well over a thousand dollars, *The Timber Press Dictionary of Plant Names* is a very affordable addition to any library.

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Catalogue [of the] 13th international Exhibition of Botanical Art & Illustration. Bruno, Lugene B. 2010. ISBN 978-0-913196-84-7 (Paper US$25.00) 198 pp. Hunt Institute for Botanical Documentation, 5th Floor, Hunt Library, Carnegie Mellon University, 4909 Frew Street, Pittsburgh, PA 15213-3890.

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