# BULLETIN

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PLANT SCIENCE

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



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BOTANICAL SOCIETY OF AMERICA

At a recent department meeting, one of my faculty colleagues complained: "We used to be a teaching institution, but now the only thing that seems to count is research." That old dichotomy is rearing its ugly head again – teaching vs. research as competing interests. This perception is longstanding and widespread, across the range of institutions from two-year campuses to major research universities. Yet most of us can probably think back to our student days and identify at least one of our mentors who excelled at both. How appropriate that our upcoming conference**, Botany 2002 – *Botany in the Curriculum: Integrating Research and Teaching***, is focusing on the complementary nature of these two aspects of the work that many of us do! And what could be more appropriate for this issue of *Plant Science Bulletin* than to hear from two of our most distinguished botanical researchers/teachers?

Ray F. Evert was President of the BSA in 1986. I remember my surprise to have Ray in the audience the first time I presented a paper in the teaching section. This was about the time of the second edition of *Biology of Plants* (when Ray was brought on as co-author). I already knew his reputation as a botanical researcher, but I was just beginning to recognize his stature as a teacher of botany. I asked Ray to reflect on these two aspects of his career for this issue, to help set the stage for our August meeting in Madison.

Shortly after Ray accepted my invitation, I was please to receive an inquiry from another of our distinguished members. Arthur W. Galston was President of our Society in 1968 (and author of the text that introduced me to plant physiology as an undergraduate). In his note, Art expressed his appreciation for Lee Kass' article on "Ethics in Science" (*Plant Science Bulletin* 47(2):42-48) and wondered if we as a Society couldn't continue this dialogue on a regular basis. I asked him if he would make the next contribution. I think you will see in it a challenge to integrate bioethical concerns into the research, teaching, and especially service roles of our work as botanists in academe, government, or industry.

- editor

## Reflections

On January 11, 2001, I "retired" after forty-seven and one-half years of teaching, research, and service in academia. I reflect upon those years with deep satisfaction and seriously doubt that there is a better life than that of a university professor. How lucky can one be? During those years I was paid to do something I thoroughly enjoyed—interacting with bright young men and women and with research colleagues world-wide.

As a student myself, I was fortunate in having marvelous role models: professors and mentors of great integrity and stature who were committed to excellence in all of their personal and academic endeavors, and who regarded teaching as both a privilege and responsibility of the faculty. Excellent teaching and excellent research were regarded as mutually supportive activities.

When I first joined the faculty of the University of Wisconsin, Madison, it was common practice for older faculty members at meetings of the College of Letters and Science to eulogize the College and its mission: to provide a quality liberal arts education for all of its students, while at the same time pursuing creative research and providing public service. That mission was encompassed in the Wisconsin Idea: The boundaries of the University are the boundaries of the State. As a fledgling member of the faculty, it was quite clear what I should aspire to be.

It is difficult to know which I enjoyed more, teaching or research. I would never have wanted to pursue one to the exclusion of the other. I already miss having daily contact with students in classroom and laboratory settings. How can one grow old in thought or spirit when continually being stimulated by the


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youthful enthusiasm and creative ideas of young people? (Not that I consider myself an oldster by any means!)

Although I have enjoyed a fairly successful research career, I feel my greatest contribution has been made as a teacher through the classroom and via a textbook. I thoroughly enjoy spreading the good news about plants and looked forward each spring semester to teaching Botany 130, Introductory Botany. During the first lecture session of Botany 130, I acknowledged that many of the enrollees undoubtedly thought they were in for a boring course, but quickly assured them that by semester's end most would find Botany 130 their favorite course. More importantly, their perspective, appreciation, and enjoyment of the world about them would have broadened substantially. Judged from the course evaluations, my prediction proved true time after time. Most of the undergraduate botany majors at UW Madison come from our introductory courses, all of which are taught by dedicated faculty members, who also are accomplished researchers, with infections enthusiasm. I would be remiss not to acknowledge the enormous role played by our teaching assistants in these courses. It is they who conduct the laboratory sessions, which I regard as the most important component of any botany course. Hence, the success or failure of the course rests to a large extent in the hands of the teaching assistants.

The influence a teacher has upon his or her students reaches far beyond the classroom and subject matter. Students often look to their professors for encouragement and advice; for example, not to give up, not to drop out of school, that he or she has what it takes to succeed. Some time later you receive an invitation to a graduation party from a student you gave such advice and encouragement to four years earlier, or an autographed photograph inscribed "To the best coach I ever had," from a UW graduate and former member of the Badger football team in a Philadelphia Eagles uniform.

Much of my inspiration as a teacher has emanated from my research. How exciting it is to have been the first person to look upon or discover an object or phenomenon. That excitement carries over into the classroom, and one's students can sense it. I cannot imagine anyone sustaining himself or herself for very long as an effective teacher without a strong commitment to both teaching and research. My research on phloem and leaf-structure relationships included fruitful collaborations with colleagues from Canada, Germany, Sweden, Greece, Israel, South Africa, and Brazil. Such broadening experiences add to one's effectiveness as a teacher of both undergraduate and graduate students.

As a mentor to graduate students, research becomes a form of teaching. This is especially true with plant anatomy, for example, when mentor and student sit side-by-side studying the student's latest preparations—tissue sections on microslides or thin sections on grids—with light or electron microscope. As a graduate student I was the recipient of Katherine Esau's wisdom, knowledge, and insight during such sessions. In this manner I learned how to study my preparations, to find objects that might escape most viewers, and to interpret correctly developmental sequences. Of course, during such sessions, the conversation often wandered form botanical topics.

During my tenure at Wisconsin, I had the pleasure of serving as major professor for twenty-five Ph.D. students, and a fair number of M.S. students—as many as eight at one time. What fun. There never was a dull moment. With their varying personalities and backgrounds (from Pennsylvania to California, India and Thailand), these young scholars added vibrancy to the laboratory. All were bright, highly self-motivated, industrious, talented, and innovative—a recipe for accomplishment. Indeed, together we were able to accomplish far more than any one individual could hope to in a lifetime. We learned

from each other in the process. We were all teachers and critics, especially when practicing our presentations for Botanical Society meetings.. With few exceptions, all of these good people served as teaching assistants while at Wisconsin (several winning distinguished teaching awards) and went on to university teaching/research careers.

During the past decade much as been written about the necessity to promote excellence in teaching and to recognize teaching as a co-equal of research in hiring and promotion at research universities. From my own observations, it appears that many "non-research" colleges and universities must also address this issue. What progress, if any, has been made in this regard is not clear.

In an address delivered on November 5, 1990, during the Presidential Young Investigator Colloquium on U.S. Engineering, Mathematics, and Science Education for the Year 2010 and Beyond, Dr. Charles M. Vest, President of the Massachusetts Institute of Technology, stated in part "…let me begin with one simple statement. *Professors should profess.* It is hard to think of anything more illogical than to become a university professor if one does not want to teach. So if you do not want to teach, you should immediately look for another job."

- Ray F. Evert, Katherine Esau Professor, Emeritus, Department of Botany, University of Wisconsin, Madison, WI.

## SOME PRACTICAL BIOETHICS FOR BOTANISTS

Like scientists in all fields, botanists are being called upon these days to judge many scientific problems and public programs not only in terms of their scientific quality and feasibility, but also with reference to their ethical acceptability. For example, the question of whether we should use **genetically modified crops** (GMC's) produced by transgenic methods has elicited strong statements not only from individual scientists but also from a large number of scientific organizations. It should also not be surprising that politicians, public servants of various kinds and ordinary lay citizens are also weighing in with their opinions, which are frequently at odds with those of the scientific community. While scientists from different countries tend to have similar opinions on questions like GMC's, which have a scientific basis, the opinions of laypeople on such matters often reflect their local culture and mores more than science. Thus, while Western Europeans, who live in societies in which about 20% of the people are connected with agriculture, tend to oppose GMC's, in North America, where only 2% of the people are farmers, most tend to favor GMC's. This difference may also reflect the fact that while much of American agriculture occurs on very large, highly industrialized conglomerate farms, much more of European agriculture still occurs on relatively small holdings owned by individual independent farmers.

Thanks to the excitement generated by the **cloning** of animals and the possibility of the development of similar techniques for humans, we are getting used to the idea that we should not do everything that we know how to do. We need first to consider whether our action would violate some basic principle that we hold dear or, alternatively, whether it might cause more harm than good. Our decision on such matters reflects whether we follow a Utilitarian mode of analysis (basing our decision on the probable consequences of our actions) or a Kantian mode (based on our duty to act according to universal, generally applicable principles). Countries such as the United Kingdom and Sweden have moved to ban the reproductive cloning of humans, while permitting research on the therapeutic cloning of stem cells to replace defective cells of the body. This Utilitarian solution, which may favor progress in medicine, is in accord with the opinion of most scientists. The United States, on the other hand, has moved to discourage both types of cloning out of the Kantian concern that all cloning involves the destruction of embryos or embryo-like clusters of cells, and that permitting one form of cloning will lead inevitably to the other. Such action is interpreted as violating the principle of respect for the sanctity of the life of all individuals, even potential individuals.

Some ethical problems arise from consideration of whether inaction is preferable to awkward or inconvenient action, even when appropriate action would probably result in avoidance of harm or to obviously beneficial results. For example, what should you do if you become aware that a commonly employed chemical, about which you have detailed knowledge, is harmful to public health or to an ecological system? Further, what if speaking out on this matter would possibly alienate some powerful people who are in a position to benefit you or organizations to which you belong? Again, it will be helpful to refer to a specific case.

A recent issue of *Science* (Volume 296, No. 5567, pp.447-448, 2002) reports that the popular herbicide atrazine, at concentrations commonly found in the environment, converts male frogs into

hermaphrodites. At concentrations as low as 0.01 parts per billion, many of the amphibians developed both testes and ovaries, and at somewhat higher concentrations, testosterone levels in males dropped 10-fold, to levels characteristic of females. By this action, atrazine may be responsible for the recently noted global decline in the population of amphibians. If true, this finding might also have serious implications for human physiology. Since about 27 million kilograms of this chemical are applied annually to corn and other crops in the United States, some of it finds its way into surface water and groundwater, and might thus be consumed by humans. Could this possibly be related to the declining sperm counts reported among human males? Should individual botanists or botanical organization take any action about this situation?

Atrazine is already banned in many European countries. One might expect that this fact, plus the newer knowledge cited above, might provoke some action from American botanists and their professional organizations, because of their familiarity with the nature and action of herbicides. On the other hand, agricultural chemical companies, including the manufacturers of atrazine, have sometimes supported scientific research and organizations of botanists. What to do? How can we balance personal welfare against the public good? Clearly, scientists and their organizations find it easiest to act ethically when it clearly benefits them to do so. Thus, while they are happy to join the public battle to increase the federal allocation of money on behalf of botanical research, and to debate with those who oppose the genetic modification of crop plants, they may be less enthusiastic about opposing governmental or private entities whose financial support they both enjoy and covet. Bioethics does not point the way to any particular answer, but a proper ethical analysis should clarify the major issues at stake.

Another interesting dilemma surrounded the use of Agent Orange, which United States Armed Forces used so extensively as a defoliant during the Vietnam war. More than 70 million liters of this herbicide, containing more than 50 million kilograms of 2,4-D and 2,4,5-T, were sprayed over more than 4 million acres of countryside in the largest chemical warfare operation in history. There was, of course, a valid military objective used to justify its use: to defoliate the tree canopies hiding enemy activities on the Ho Chi Minh trail below, and to kill mangroves lining the estuaries below Saigon (now Ho Chi Minh City) which served as hiding places for enemy troops firing on our patrol boats. Whatever its military value, this campaign produced extensive ecological damage, little of which has since been ameliorated. Also, because all preparations of Agent Orange were contaminated with several dioxins, especially TCDD (2,3,7,8-tetrachloro-para-dibenzodioxin) which is teratogenic and possibly carcinogenic to rodents, primates and probably humans, it is likely that there are considerable public health consequences as well. We knew when we sprayed it that Agent Orange had never undergone toxicological tests to justify its use over densely inhabitated areas, yet several attempts at the time to get plant scientists to register a protest were unsuccessful. This was understandable because we were at war (albeit an unpopular one). Only the AAAS (American Association for the Advancement of Science) responded by the formation of a Herbicide Assessment Commission, whose reports led the National Academy of Sciences in turn to launch its own later study.

After the atomic bomb was exploded over Hiroshima, killing and maiming many thousands of people, a victorious United States responded to immediate medical needs by forming an Atomic Bomb Casualty Commission. Similarly, we helped in many ways to foster reconstruction of post-World War II Europe, and will probably do the same in Afghanistan when that country is stabilized. Yet we have never given substantial humanitarian aid for postwar recovery in Vietnam, presumably because we were not victorious in that war. In 1995, a full two decades after the end of the war, full diplomatic relations were established between the United States and the Socialist Republic of Vietnam, and very recently an agreement on trade was negotiated. Last month, the National Institute of Environmental Health Sciences (part of NIH) and its counterpart organization in Vietnam organized an international conference in Hanoi to examine the ecological and health consequences of the spread of Agent Orange and dioxin in Vietnam. A Memorandum of Understanding proposes a joint research program, two-way visits of personnel for research and training, and grants of money by the U.S. to facilitate the joint programs and the purchase of instrumentation. American botanists could play a large role in helping to understand and ameliorate the extensive ecological damage to upland forests and stands of mangroves.

It would seem ethically appropriate for relevant committees of American scientific organizations to keep an eye on developments in this area, and also to keep abreast of the undesirable side effects of some of the many organic substances used in horticulture and agriculture.

- Arthur W. Galston, Eaton Professor Emeritus, Department of Molecular, Cellular and Developmental Biology, Yale University, New Haven, CT 06520-8103


## CONFERENCE UPDATE BOTANY 2002
## Botany in the Curriculum: Integrating Research and Teaching

The Botanical Society of America (BSA) will hold its annual meeting at the Pyle Conference Center on the University of Wisconsin, Madison campus from August 2-7, 2002. In addition to the BSA, four other professional societies will participate in the BOTANY 2002 conference, including the American Fern Society (AFS), the American Society of Plant Taxonomists (ASPT), the Canadian Botanical Association / L'Association Botanique du Canada (CBA/ABC), and the Phycological Society of America (PSA).

In addition to the regular program, BOTANY 2002 will include a special FORUM focusing on botanical education and outreach. The FORUM will begin on Friday evening, August 2, with early registration and a light reception. The main FORUM program will occur on Saturday, August 3. The program will include a Keynote Address by textbook author Dr. Neil Campbell titled "Botany Education in our Schools and Colleges: An Optimistic Forecast," and an array of one-hour sessions. Although some informational sessions will be included, the program will primarily include interactive panel and roundtable discussions as well as breakout groups focusing on a range of topics. Individual sessions will be grouped within six topical themes, or 'threads,' that span the FORUM program. These include "Emphasizing Botany across the Curriculum," "Designing Investigative Laboratories," "Engaging Undergraduates in Research," "Developing Effective Teaching and Mentoring Skills," "Supporting Effective Teaching and Learning," and "Reaching Out beyond the Ivory Towers." The FORUM is

### Conference Overview
Botany 2002

Botany in the Curriculum: Integrating Research and Teaching

August 2-7, 2002

| | Friday August 2 | Saturday August 3 | Sunday August 4 | Monday August 5 | Tuesday August 6 | Wednesday August 7 |
|---|---|---|---|---|---|---|
| Daytime | **Field Trips** 2 Options | **Field Trips** 5 Options | **Field Trips** 11 Options | **Concurrent Paper Sessions and Symposia** Check website for list of sessions and schedule | | |
| | | **Forum** **Botanical Education & Outreach** | **Workshops** 16 Options | **Canadian Graduate Student Breakfast** | **MO Botanical Garden Breakfast** | **Miami Univ of Ohio Breakfast** |
| | | **Keynote Lecture** Dr. Neil Campbell | **Companion Tours** 2 Option | **Companion Tour** 1 Option | **Field Trip** 1 Option **Companion Tour** 1 Option | **Companion Tours** 2 Options |
| | | **Concurrent Sessions** Check website for list of sessions & schedule | **Society Meetings** Boards, Councils & Committees | **Plenary Symposium** **AFS Luncheon** **Economic Botany Luncheon** | **CBA/ABC Luncheon** **Conference-wide Poster Session** | |
| | | | | **PSA Special Address** Dr. Sylvia Earle | **BSA Special Lecture** Dr. Peter Raven | |
| Evening | **Forum** Early registration **Light Reception** | **D Forum Reception** | **Plenary Lecture** Dr. Martin Apple **All-Society Mixer** | **Paleobotanical Banquet & Auction** | **ASPT Banquet & Auction** **PSA Banquet** | **BSA & CBA/ABC Banquet** **All-Conference Social** |

sponsored in part by the National Science Foundation (NSF), the Council on Undergraduate Research, Project Kaleidoscope, and the Deep Gene Research Coordination Network.

On Sunday, August 4, sixteen hands-on workshops will be available as two-hour, half-day, and full-day events. This diversity will allow attendees in participate in multiple workshops, and/or participate in field trips. Two workshops are sponsored by the NSF and the Deep Gene Network, and these are free to registrants. All workshops are first-come, first-served.

Twenty one field trips are planned as full-day, half-day, and multi-day events, and these will visit a diverse set of sites and cover a broad range of topics. In addition, five local/companion tours will be available during the conference.
The Scientific Meeting will begin on Sunday evening with a Plenary Lecture by Dr. Martin Apple, President of the Council of Scientific Society Presidents, titled "Scientists' Obligations in the 21st Century." The Plenary Lecture will be followed by an All-Society Mixer.

The scientific sessions will begin on Monday morning, August 5, and continue through Wednesday afternoon, August 7. These will include numerous contributed paper sessions, a conference-wide poster session, and thirteen topical symposia, including the Plenary Symposium, titled "Evolution: Highlighting Plants." In addition, a BSA Special Lecture will be presented by Dr. Peter Raven, Director of the Missouri Botanical Garden, titled "Plants and People in the 21st Century." The scientific program will also include several other special addresses, including a PSA Special Lecture by Dr. Sylvia Earle, National Geographic Society, titled "Diving into the History and Possible Future of Plants in the Sea," as well as the Economic Botany Luncheon Lecture by Dr. Hugh Iltis, the BSA President-Elect's address by Dr. Scott Russell, and the ASPT President-Elect's address by Dr. Lynn Clark.

Several registration options are available. It's possible to register for the full conference, the educational Forum only, or the Scientific Meeting only. Early registration fees are good through July 1 and then fees increase until August 1, and then again for on-site registrations. Housing options include campus dormitories, conference centers, and hotels.

Please visit the conference web site for more information about registration, full details about the educational and scientific programs, and to read/search the more than 700 abstracts (**http://www.botany2002.org/)**.

## BSA MOVES HEADQUARTERS TO MISSOURI BOTANICAL GARDEN

A decision has been reached by the Executive Committee, on behalf of the Council of the Botanical Society of America, to relocate the BSA headquarters to the Missouri Botanical Garden (MBG) in St. Louis, MO, during the summer-fall of 2002.

The BSA will move into the Commerce Bank Center for Education, a MBG facility made possible by gifts from the William Kemper Foundation and Commerce Bank. The 58,000 square-foot building is to be renovated on Shaw Boulevard. The Center also will contain the Garden's expanded Education Division and its Stupp Teacher Resource Center, which will focus on enhancing math and science literacy for St. Louis school children.

The advantages of locating the BSA headquarters at MBG are numerous and include exciting opportunities for interaction and collaboration with other non-profit organizations devoted to research, education and outreach in plant biology. The Missouri Botanical Garden and the St. Louis area offer to the BSA excellent facilities, stimulating colleagues, a beautiful setting, and the opportunity to collaborate on new initiatives to advance botany locally, nationally and internationally.

"The location of the BSA on our [MBG] campus should strengthen the mission of both organizations and is another step in making St. Louis a world center for work in the plant sciences," said Dr. Peter H. Raven, director of the Missouri Botanical Garden. In addition to the BSA, MBG has completed an agreement with Sequoia Sciences, a San Diego plant sciences firm, who will expand its operations into the Commerce Bank
Center for Education.

The Missouri Botanical Garden encompasses a 79-acre world-class garden and the Monsanto Center, which houses its research division, the 5.7-million specimen herbarium, and the highly valued research library. The Garden is the coordinating center for the Flora of China project and plays a key role in the Flora of North America and Flora of Mesoamerica projects, among others. The Center for Plant Conservation, a national coalition of leading botanical institutions dedicated to preventing the extinction of native plants, is based at the Garden. The Garden operates the Center for Conservation and Sustainable Development, Gateway Center for Resource Efficiency, Litzsinger Road Ecology Center, and the 2,400-acre Shaw Nature Reserve. Washington University, Saint Louis University, and the University of Missouri-St. Louis have collaborative research programs with the Garden

and interact closely with botanists there and in the projects they conduct in 30 countries on every continent. The Donald Danforth Plant Science Center in St. Louis focuses on research in genetics, chemistry, cell biology, genomics and biotechnology. All of these institutions and organizations are working together to establish the "Bio-belt" in and around St. Louis, with the early emphasis on botanical science in its broadest and most encompassing sense.

## *Personalia*

### *In Memoriam:*

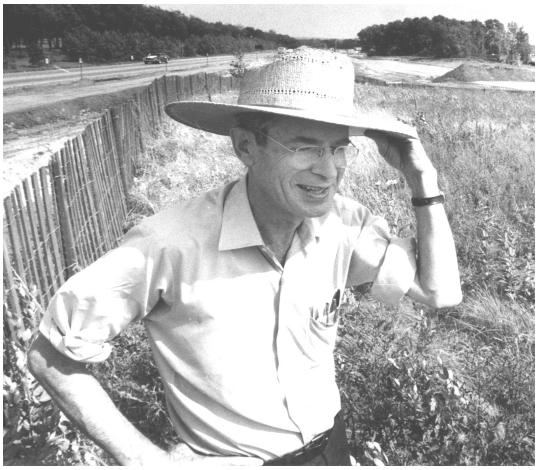


Photo courtesy of the University of Minnesota Archives

### Thomas Morley, Plant Taxonomist, 1917—2002

Dr. Thomas Morley, Professor Emeritus at the University of Minnesota, died Saturday, February 2, 2002, at his home. He was 85.

Morley received his A.B. (1940), M.A. (1941), and Ph.D. (1949) degrees in botany at the University of California, Berkeley. A scholar's son, his father, S. Griswold Morley, was the president of the Modern Language Association of America during the 1950s. Morley was predeceased by a sister, and is survived by her children and a brother.

Tom Morley joined the Botany Department (now Plant Biology) in the fall of 1949 to share in the teaching of taxonomy with Gerald Ownbey (then Curator of the herbarium). He was successful in helping recruit such distinguished faculty as Eville Gorham. After advising several graduate students, including Kingsley Stern, Lawrence C.W. Jensen, and Barbara Delaney, he retired in 1987

Morley was a specialist in the genera *Mouriri* and *Votomita* (tropical trees of the Melastomataceae) and he described several new species in these groups from central Amazonia, where he conducted field work around Manaus and Belem, Brazil. During his tenure at the U of MN, Morley also developed an extensive, firsthand knowledge of Minnesota's native flora. He revised and updated Frederic Clements' original *Guide to Spring Flowers*, which is now used as a standard spring text. And he co-authored (with Gerald Ownbey) the *Vascular plants of Minnesota: A checklist and atlas*, another seminal work for the state.

A strong advocate for the preservation of nature, Tom was a charter member of the Minnesota chapter of the Nature Conservancy and served on the board during the 1970's. He was also active in the Minnesota Native Plant Society, having a special concern for rare plants and serving as an early champion of buckthorn eradication in Minnesota natural areas. He enjoyed canoeing and was a generous contributor to the Friends of the Boundary Waters Wilderness..

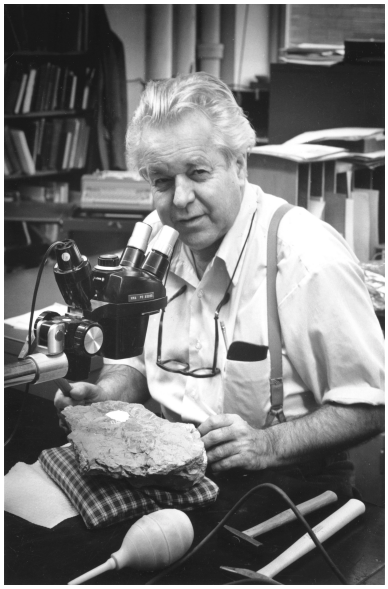
In retirement, Tom Morley maintained an office adjacent to the herbarium (of the Bell Museum of Natural History) in the Biological Sciences Building on the Saint Paul campus of the University. He was a familiar face around the department—remembered for his habit of walking to work each day across the expanse of experimental fields, even in the coldest of Minnesota winters. His daily routines contributed to the rhythm of life at the University, including his climbing the eight flights of stairs to his office, which he performed until the very day before his death. A soft-spoken and kind man, he will be missed by his colleagues.

The family asks that memorials be sent to the Lake Itasca Forestry & Biology Station, University of Minnesota Foundation, 200 Oak Street NE (Suite 500), Minneapolis MN 55455.

### Henry N. Andrews, Jr., Paleobotanist, Educator and Explorer, 1910-2002

Dr. Henry N. Andrews, Jr. 91, Professor Emeritus at the University of Connecticut and member, National Academy of Sciences, died March 3, 2002 in Concord, NH. He had lived in Sanbornton, New Hampshire since his retirement in 1975.

Henry was born in Melrose, MA June 15, 1910 and graduated from Melrose High School. He received his BS in Food Technology at MIT in 1934. He then spent a year taking courses in "things he was interested in" (plants and paleontology) under the guidance of Professor Ray E. Torrey at the University of Massachusetts. This led him to become



acquainted with Edgar Anderson, who offered Henry support for graduate study at Washington University. He received his MS and PhD degrees in 1937 and 1939, respectively, from Washington University, St. Louis, Mo., under the direction of Dr. Robert Woodson. During that time he also studied at Cambridge University with H. H. Thomas and worked at the British Museum of Natural History. He also studied fossil plants in Belgian coal mines, supported by a Gelgian American Educational Foundation fellowship. While at Washington University, Henry met Lib (Elisabeth Ham), whom he married in 1939.

Henry was appointed instructor at the Henry Shaw School of Botany at Washington University in 1940, where he established a dynamic and productive research program. He also joined the Missouri Botanical Garden staff as paleobotanist (1947-1964) and served for about five years as assistant to the director. He became the administrative head (The Dean) of the Botany Dept. at Washington University, and also served as a temporary staff member of the U. S. Geological Survey. He was a Fulbright lecturer at Poona University, India. Twice a John Simon Guggenheim Memorial Foundation Fellow, Henry also received a special Guggenheim award for exploratory research that led to his Arctic expeditions. Henry left St. Louis in 1964 to become Head, first of Botany (1964-67) and then of the Systematics and Environmental Section of the Biological Sciences Group at the University of Connecticut (1967-1970). He retired in 1975. He was elected to the National Academy of Sciences that same year.

Henry made major contributions to the study of Upper Carboniferous coal-ball plants in his earlier years, then shifted to investigating Devonian plants. Along with his students, Professor Andrews studied representative taxa of nearly every major plant group present in the Upper Carboniferous, often presenting a first modern description and assessment of their significance. Similarly, he published ground-breaking papers on first Late, then Early Devonian plants from the US and Canadian Arctic. Henry truly enjoyed natural history and exploration. He was a superb writer and educator. He published numerous papers and authored or co-authored four books, including a popular account about plant fossils, *Ancient Plants and the World They Lived In* (1947), a paleobotany text *Studies in Paleobotany* (1961), a profile of paleobotanists entitled *The Fossil Hunters* (1980), and, with P.G. Gensel, *Plant Life in the Devonian* (1984). Henry also prepared a comprehensive account of fossil ferns for the *Traité de Paleobotanique*, ed. E. Boureau (1971). He compiled and published two volumes of the *Index to Generic names of Fossil Plants* as part of his work with the USGS. In both his teaching and his writing, Henry demonstrated the love of exploration, curiosity and wisdom that marks his work and made his presentations about paleobotany and natural history memorable for students, colleagues and laypersons alike.

Henry was a member of the Botanical Society of America (recipient of the Merit Award, 1966, Chairman of the Paleobotanical Section), a Fellow of the Geological Society of America, a Fellow of the American Association for the Advancement of Science, a member of the Torrey Botanical Club (and assistant editor for several years), The New England Botanical Club, Sigma Xi, The Palaeontological Society, and the International Organization for Palaeobotany (served as Secretary and Vice-President). He also was an Honorary member of the Paleobotanical Society of India and a charter member of the Connecticut Academy of Science and Engineering. He was recognized on several occasions for his volunteer service, involving the interpretation or preservation of natural or historical areas/sites by the State of New Hampshire.

Henry and his wife Lib were well known for their wonderful hospitality wherever they lived, be it Missouri, Connecticut, New Hampshire, India, or England. They generously and graciously shared their knowledge, wisdom, and resources, hosting and helping colleagues, foreign visitors, students, friends, and family, thus touching the lives of many in numerous ways.

Henry is survived by two sons, Hollings T. Andrews of Gainesboro, TN (a botanist) and Henry N. Andrews III of Westfield, NJ; a daughter Nancy Andrews Adams of Sanbornton, NH, grandchildren Eric N. Andrews and Heather A. Pippin, a great-grandson, and cousins, nieces and nephews.

-Patricia Gensel

**Charles Rick , Plant Geneticist, 1915-2002.**

Charles Rick, a plant geneticist, long-time BSA member, and botanist recognized by many as the world's leading authority on the biology of the tomato, died Sunday, May 5, in Davis. A professor emeritus at the University of California, Davis, he was 87.

His family is planning a June open house in his honor for friends and colleagues. In accordance with his wishes, no formal services will be held. Something of a modern-day Charles Darwin and Indiana Jones combined, Professor Rick was equally at home in the classroom, greenhouse, laboratory and field. His research expeditions took him from the Galapagos Islands to high in the Andes, where he criss-crossed rugged terrain to collect hundreds of wild tomato species. These wild species contained a wide range of genetic variation that was missing from the modern domestic tomato.

During his career, he made landmark contributions in the areas of plant genetics, evolution, genome mapping and archiving the seeds of tomatoes and related plant species. In 1967, he was elected to the National Academy of Sciences, one of the highest honors for research scientists. "Among his colleagues, Dr. Rick was considered the quintessential scientist," said UC Davis professor John Yoder, chair of the Department of Vegetable Crops. "His passion was learning and discovery, not fortune or fame. He had a contagious enthusiasm for biology that impacted and motivated all who knew him."

Born in 1915 in Reading, Pa., Charles Rick grew up working in orchards and participating in nature studies through the Boy Scouts. He earned a bachelor's degree in horticulture in 1937 from Pennsylvania State University, where he met and married Martha Overholts. The couple then moved to Cambridge, Mass., where he earned a doctoral degree in genetics from Harvard University in 1940. He came to UC Davis in 1940 as a faculty member in the vegetable crops department, launching a career that would span more than 60 years.

A colleague soon suggested that Rick investigate what was wrong with "bull" tomato plants, vines that seemed to pour all of their energy into vegetative growth without producing any fruit. At first, the proposed project struck Rick as "a damn fool thing to think about," he admitted in later years. But he became convinced that the problem merited investigation and went on to discover a host of genetic conditions in the sterile tomato plants. He was able to identify the genetic causes for flower infertility and define several single-gene mutants that are now used to provide commercial hybrid tomato seed.

His studies led him to construct a genetic "linkage map" that pinpointed the locations of many mutant or variable genes on each of the tomato's 12 chromosomes. It was the beginning of his pioneering effort to map the tomato's entire collection of genes, now known as its genome. Professor Rick's early work laid the foundation for molecular maps that today make the tomato genome one of the best-mapped plant genomes. His efforts to identify the genetic basis of resistance to the nematode — a tiny worm pest — made it possible to develop nematode-resistant tomato varieties. Because the tomato has been so well characterized genetically, it now serves as a research model for plant scientists and can be more readily modified for commercial use.

In addition to his contributions to building a better understanding of the tomato as a crop, Professor Rick also made important contributions to the field of plant evolution. His research helped advance the understanding of the relationship between the geographic distribution of plant species and their ability to crossbreed with each other. His work also helped clarify the impact of flower structure on a plant's ability to crossbreed with other species. And his research on structure, crossability, native habitat and geographic distribution helped explain the evolutionary relationships among various tomato species.

In 1949, Professor Rick co-founded the Tomato Genetics Cooperative to encourage tomato researchers to communicate their findings and exchange information. He took sole responsibility for publishing the cooperative's report from its beginning in 1951 until 1981.

Perhaps one of his greatest contributions was in establishing and serving as curator for the Tomato Genetics Resource Center at UC Davis. The center is the largest known collection of tomato seeds in the world. Professor Rick devoted countless hours to collecting, cataloging, maintaining and distributing seeds from wild species and genetic stock. Many primitive varieties and wild species that were collected and maintained at the center are now extinct in their native habitats. Furthermore, many of the unique mutant tomato stocks developed by researchers throughout the world would have been lost without Rick's efforts to archive them.
His tireless efforts were recognized in 1990, when the center was renamed the Charles M. Rick Tomato Genetics Resource Center.

Professor Rick's legacy can also be found in several generations of plant geneticists whom he mentored. His students went on to lead major research institutes, serve as ministers of agriculture and work as faculty members at universities on every continent.

Over the years he received a host of prestigious awards. They included the BSA Merit Award in 1976, Alexander von Humboldt Award in 1993, the Filippo Maseri Florio World Prize for Distinguished Research in Agriculture in 1997 and induction to the American Society of Horticultural Sciences Hall of Fame in 1998.

Although officially retired from UC Davis in 1985, Professor Rick remained active in the field of plant genetics until the age of 85, when health difficulties interfered with his greenhouse and laboratory work. Usually sporting the trademark cloth fishing hat that he wore in both formal and informal settings, he was known as a modest person, full of amusing anecdotes. He had a passion for traveling, the arts, meeting new people and enjoying foreign cultures. He was preceded in death by his wife, Martha, and is survived by his daughter, Susan Rick Baldi, and son, John Rick, who are academics at Santa Rosa Junior College and Stanford University. He also leaves three grandchildren and one great-grandchild.

A scholarship fund is being established in Professor Rick's memory that will help support South American students and scholars interested in promoting biodiversity in the Andes. Contributions should be made payable to the Charles Rick Scholarship Fund and sent in care of Professor John Yoder, Department of Vegetable Crops, University of California, One Shields Ave, Davis, Ca. 95616-8687.

- photo and article courtesy of Pat Bailey, U.C. Davis DATELINE.

## Doebley Elected to National Academy

BSA member **John Doebley**, Department of Botany, University of Wisconsin, Madison, was elected to membership in the National Academy of Sciences. John received his PhD at Madison, in the laboratory of Hugh Iltis, before completing post-doctoral work at North Carolina State University. He has held faculty positions at Texas A&M University and the University of Minnesota.

**John Pruski** was hired in the fall of 2001 by the Missouri Botanical Garden (MO) as an Assistant Curator. As an Assistant Curator with a specialty in the Asteraceae (Sunflower family), his main responsibility is to coordinate, edit, and write treatments of the Asteraceae for the Flora Mesoamericana, including the web version of the Flora. Previously, Pruski wrote the Asteraceae for the "Flora of the Venezuelan Guayana" (Vol. 3: 1997, Missouri Botanical Garden Press), was a coauthor of "Index To Specimens Filed In The New York Botanical Garden Vascular Plant Type Herbarium" (1985, Meckler Publishing), and he was an Associate Editor of the journal Brittonia from 1983-1993. Formerly, he was employed by the United States National Herbarium of the Smithsonian Institution (US) from 1992-2001 and by the New York Botanical Garden from 1982-1992. Potential contributors to the Asteraceae in Flora Mesoamericana may contact Pruski directly at (phone) 314-577-0832 and (email) john.pruski@mobot.org.]

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Asteraceae Coordinator of Flora Mesoamericana
http://www.mobot.org/MOBOT/fm/

## Chicago Botanic Garden Science Initiatives Receive $400,000 from Bureau of Land Management

The U.S. Department of the Interior Bureau of Land Management (BLM) has awarded the Garden's Department of Conservation Science and the Institute for Plant Conservation Biology a total of $400,000 for use in conservation efforts.

The two separate grants include $300,000 for the development and implementation of a conservation internship program to assist BLM with Endangered Species Act consultations, and $100,000 to investigate genetics of threatened plant species in the Great Basis states of Oregon, Idaho, Utah and Nevada.

The Department of Conservation Science and the Institute for Plant Conservation Biology advances scientific research and teaching about the importance of conserving endangered plants and ecosystems. The Institute's work operates with several national and international organizations, including the Center for Plant Conservation (CPC), an international coalition of more than 30 botanic gardens and arboreta whose goal is to research and protect rare plants within their regions, and the Plant Conservation Alliance (PCA), a public/private partnership of 15 federal agencies and more than 175 non-federal cooperators.

Through its affiliation with PCA and CPC, the Garden will apply the $100,000 grant to genetics research of plant species of *Penstemon* and *Eriogonum* living in the Great Basin states. The results will serve as models for developing seed transfer guidelines for use in restoration and rehabilitation projects.

The $300,000 grant will be applied to the development of a Conservation and Land Management Mentoring Program, which begins this spring. The Chicago Botanic Garden, working in cooperation with BLM, will promote the conservation of threatened, endangered and sensitive species, and the management of their habitats on public lands. The Garden is recruiting nationally for 20 interns to participate in the program. Interns will possess bachelor's degrees and may be pursuing master's degrees or careers in environmental science and conservation biology. Interns will receive training from Garden scientists, and spend five months in BLM field offices working hands-on in the areas of endangered species planning, conservation and monitoring. "This program is designed to give students the theoretical background, as well as hands-on research and stewardship experience, which is necessary to conserve biodiversity," says Dr. Kayri Havens, director of the Department of Conservation Science and the Institute for Plant Conservation Biology. "The interns will work with BLM's endangered species biologists surveying, monitoring or collecting information on any of the 306 species listed under the Endangered Species Act that occur on the 264 million acres of public land managed by the Bureau of Land Management," said Peggy Olwell, manager of BLM's Endangered Species Program.

For additional information visit the Garden's Web site at www.chicagobotanic.org

## Claude E. Phillips Herbarium Receives Significant Book Donations

Dr. Robert F. C. Naczi, Curator of the Claude E. Phillips Herbarium at Delaware State University, has reported two significant book donations. The first is the international book collection of Dr. Fred and Mrs. Mary Hough. "Dr. Hough was an eminent pomologist at Rutgers University who introduced many new apples and other fruits to cultivation in this country. His wife, Mary, collected books on local floras and medicinal plants in their trips to Russia, Eastern Europe, China, and Brazil. Most of these books cannot be valued," says Dr. Naczi, "because they appear to be the only copies in the western world. The most significant books are those on fruits of the world, such as Ampelografia SSSR, a six-volume work on the grapes of Russia. This work was hand-carried out of Russia by the Houghs during the Cold War, and it is currently not listed in public libraries in North America, Western Europe, or Japan, so it is a real treasure in our collection."

"The other donation is part of the life-long collection of botanical and horticultural books from Dr. Arthur O. Tucker, Research Professor at D.S.U. Current valuation of the books donated in 2001 exceeds $10,000, so this is a significant gift. Dr. Tucker donated so many books that this gift represents the core of our library." The book collections are open to researchers by appointment, as is the collection of plant specimens in the Herbarium, by contacting either Dr. Naczi at 302-857-6450 or Dr. Susan Yost, Educator, at 302-857-6452.

## INVASIVE PLANTS: GLOBAL ISSUES, LOCAL CHALLENGES

October 27-30, 2002
Congress Plaza Hotel, Chicago, Illinois, USA.

The School of the Chicago Botanic Garden and the Garden's Institute for Plant Conservation Biology will present an international research symposium titles "Invasive Plants – Global Issues, Local Challenges," from Sunday, Oct 27 through Wednesday, Oct 30, 2002, at the Congress Plaza Hotel, Chicago.

Considered by scientists as one of the foremost threats to biodiversity, invasive species affect the world's environment and economy. According to researchers, invading non-indigenous species in the United States cause major damages and losses, adding up to more than $138 billion annually. About 42 percent of the species on the Threatened or Endangered Species lists are at risk primarily because of invasive species.

The symposium, one of several in the Chicago Botanic Garden's Janet Meakin Poor Research series, will provide leading international plant scientists and land managers with a forum for dialogue on issues related to invasive species, as well as an opportunity to strategize for improvement and debate methodology for reducing threats of invasivd plants around the world. Three days of programming will feature keynote speakers, concurrent sessions and workshops, as well as poster presentations and exhibits. A tour of the Chicago Botanic Garden's research facilities, natural areas and display gardens will be offered.

Program updates, including information on keynote speakers, session abstracts and registration information, is available at www.chicagobotanic.org/symposia, or by calling 847.835.8261. To submit a session or poster proposal, send an email to Kay Havens, Ph.D., Director, Institute for Plant Conservation Biology, Chicago Botanic Garden, khavens@chicagobotanic.org, or call 847.935.8378.

The Garden's Institute for Plant Conservation Biology, housed at the Chicago Botanic Garden, extends the Garden's conservation mission to contribute to the preservation of global biodiversity through the study and dissemination of information about endangered native plants and communities in the upper Midwest. The Janet Meakin Poor Research series is partially endowed by the friends of Janet Meakin Poor, a Chicago-area conservationist and landscape designer dedicated to preserving natural habitats.

## GENETIC ENGINEERING AND THE INTRINSIC VALUE AND INTEGRITY OF ANIMALS AND PLANTS

**Wednesday 18th to Saturday 21st September 2002 Royal Botanic Garden, Edinburgh, UK**

**Speakers:**

*Prof. Holmes Rolston III, Environmental Ethicist, Department of Philosophy, Colorado State University
*Donald Bruce, Church of Scotland Science Religion & Technology Project
*Craig Holdrege, Contextual Biologist, The Nature Institute, New York
*Prof. Howard Davies, Theme Leader "Genes to Products" Scottish Crop Research Institute, Dundee
*Ruth Richter, Plant Morphologist, Naturwissenschaftliche Sektion, Goetheanum, Switzerland
*Dr. Henk Verhoog, Bioethicist, Louis Bolk Instituut, Netherlands
*Dr. Harry Griffin, Assistant Director (Science), Roslin Institute, Edinburgh
*Timothy Brink, Development Manager, Demeter Standards UK
*Mike Radford, Animal Welfare Lawyer, Department of Law, Aberdeen University
*Christina Henatsch, Biodynamic Plant Breeder, Kultursaat, Germany
*Ton Baars, Senior Scientist, Animal Husbandry, Louis Bolk Institute, Netherlands
*Prof. Clive Spash, Socio-economist, The Macaulay Institute, Aberdeen
*Dr. Bruce Whitelaw, Molecular Geneticist, Roslin Institute, Edinburgh
*Dr. Johannes Wirz, Contextual Biologist, Naturwissenschaftliche Sektion, Goetheanum, Switzerland

**Who should attend?**

This multidisciplinary workshop has no single target group of professionals in mind. Instead we intend it to be of interest to people whose work or life brings them into contact with genetic engineering and its products or is likely to in the near future. People in the following subject areas among others will find this conference relevant: farming, pharmaceutical production etc in genetically modified (GM) animals and plants, environmental ethics, bioethics, marketing the products of GM organisms to the consumer, public perception of biotechnology; animal welfare, sustainable and organic agriculture policy making, opposing or supporting genetic engineering, plant/ animal breeding, rural

development socio-economics and governmental & EU policy making. The focus on the science on the last day of the conference aims to involve organismic biologists and molecular geneticists interested in the epistemological development and social impact of their subject.

For more information please see the workshop web page: http://www.anth.org/ifgene/2002.htm

or contact Ifgene UK co-ordinator:

David Heaf, Hafan, Cae Llwyd, Llanystumdwy, LL52 0SG, UK.. Tel/Fax: 01766 523181.
Email: 101622.2773@compuserve.com

Booking 2 April to 16 August 2002


The Third International Conference on the Comparative Biology of the Monocotyledons and the Fourth International Symposium on Grass Systematics and Evolution will be hosted by Rancho Santa Ana Botanic Garden on 30 March-5 April 2003. Topics will include morphology, anatomy, development, reproductive biology, molecular biology, cytology, genomics, genetics, biochemistry, paleobotany, phylogenetics, classification, biogeography, ecology, and data integration. Sessions will be devoted to particular groups within monocots and will provide a rare opportunity for researchers in diverse fields to interact, share ideas, and form collaborations. Visit www.monocots3.org for details.

### International Triggerplant Society

The International Triggerplant Society is now forming to promote the study of triggerplants (Stylidium; Stylidiaceae). These gems from Australia have a violent and actively resettable mechanism of pollination from which they get their common name. There are even gladular hairs which may point to carnivory—an ongoing study in Doug Darnowski's lab. Not quite endemic to Australia, the genus includes over 200 species with flowers raging in size from a few mm to an inch long. Colors include white, pink, purple, and yellow, with plants growing from the coldest alpine plateau in Tasmania to the steamiest tropical lowlands near Darwin. Information on triggerplants and on joining the society may be obtained at www.triggerplants.org or by emailing 1) Doug Darnowski (USA) at douglas.darnowski@washcoll.edu or 2) Greg Bourke (Australia) at sydneycarnivorous@hotmail.com. The Society will be based in Australia with webhosting and editing of its Bulletin in the USA.

## Positions Available

### PLANT BIOLOGIST

East Tennessee State University Biological Sciences Department, http:www.etsu.edu/biology invites applications for a tenure-track ASSISTANT PROFESSOR position, beginning 01/01/03. Ph.D. required by start date, post-doctoral experience preferred. Research specialization in any area of plant biology using modern research approaches; plant development especially encouraged. Demonstrable commitment to teaching and research required. Teaching duties include an advanced course in plant development, plant biology, and participation in general biology majors sequence. Will be responsible for developing active research program to include B.S. and M.S. students. Applicants with broad botanical training are especially encouraged.

Send curriculum vitae, transcripts, statements of teaching and research interests, and 3 letters of recommendation by 08/30/02 to: Dr. Cecilia McIntosh, Search Committee, Biological Sciences Dept., ETSU Box 70703, Johnson City, TN 37614. Phone (423) 439-5838. Fax (423) 439-5958. E-mail: mcintosc@etsu.edu **(AA/EOE)**

## BOSTON UNIVERSITY.

College of General Studies. We require a teaching generalist with an active research program. Ours is a rigorous two-year program with team taught courses in physical and biological sciences. Professors take full teaching responsibility for a group of 120 freshmen or sophomores in year-long introductory courses which include weekly laboratories. New faculty are supported by master teachers in an intensive learning environment. We hope to complement our current faculty with a chemist and/or organismic biologist. Contact Dr. Samuel Hammer at (617) 353-2915 and send letter, short discussion of teaching philosophy, most recent refereed publication, CV and three current letters of reference to: Search Committee, Division of Natural Sciences, College of General Studies, Boston University, 871 Commonwealth Ave., Boston, MA 02215.

## POSTDOCTORAL RESEARCH ASSOCIATE

**Group:** Biotechnology
**Function:** Research & Development
**Req Number:** mons-00000241
**Location(s):** St. Louis MO

**Responsibilities:**

A two-year postdoctoral fellow position is available immediately for developing, implementing, and applying advanced microscopy techniques to elucidating the ultrastructure of plants, seeds, weeds and other biological systems. Additionally, the selected individual is responsible for developing new methods to improve the sample preparation protocols of biological systems. The selected candidate will interact with multifunctional groups of scientists working on biotechnology projects.

**Required Skills:**

The position requires a Ph.D. in plant biology or a related field with experience in advanced electron and light microscopy techniques. A strong background and extensive experience in TEM, high-resolution cryo-SEM, and confocal laser scanning microscopy techniques are essential. Experience with gene transformation in plants is a strong plus. The following key competencies are desired: highly motivated and interested in developing new imaging technologies; good interpersonal, verbal and written communication skills; innovative and seeking opportunity to improve existing techniques and processes. To respond to this job contact: http://www.monsanto.com/monsanto/people/job_openings/default.htm **Monsanto values diversity and is an equal opportunity affirmative action employer.**

## DIRECTOR OF GRADUATE STUDIES PROGRAM
## The New York Botanical Garden

The New York Botanical Garden (NYBG) is seeking to hire a Director of Graduate Studies to operate its large, multi-institutional graduate studies training program, involving the education and training of Ph.D and Masters' students in systematic and economic botany. The Director participates in all aspects of the program and is a mentor to students as they prepare for careers in botanical sciences. Specific duties and responsibilities of this job include: administer the NYBG Graduate Program, involving building and maintaining academic relationships with City University of New York, Cornell, Columbia, New York University and Yale; advise current and prospective students in the various programs, and advocate for their interests both within NYBG and their respective universities; teach graduate level courses in an area of interest to the NYBG research program and coordinate curriculum development; represent the NYBG at professional meetings, and recruit students for the program; work with the Development Office to raise support for student fellowships and the program; and, although primarily an administrative position, the person is expected to maintain a research program as time permits.

Qualifications for this position include a Ph.D in botany or related field; teaching experience in a university setting; demonstrated administrative skills; superior interpersonal skills; demonstrated research skills, including an international research program and publications record; knowledge of Spanish and/or Portuguese is desirable.

Applicants should submit their letter of application, curriculum vitae, and the names of four letters of reference to: Human Resources Department, The New York Botanical Garden, Bronx, NY 10458 or e-mail to HR@nybg.org; fax 718-220-6504.

## EDITOR-IN-CHIEF of BioScience

The American Institute of Biological Sciences, a non-profit scientific association (www.aibs.org), seeks an Editor-in-Chief to join the staff of its peer-reviewed monthly publication, BioScience, in Washington DC. Responsible for the acquisition, selection, and peer-review of scientific manuscripts on a broad range of biological topics. Requires a Ph.D. in a scientific discipline commensurate with the AIBS mission and prior experience in scientific journal editorial operations. The successful candidate will be a team-oriented leader/innovator who thrives in a fast-paced environment, welcomes challenges, and seeks growth beyond the status quo. This is a full-time salaried position. Benefits include healthcare and retirement plan. Send cover letter, resume, and salary requirements to: Executive Director, attn. Editor Search, AIBS, FAX; 202-628-1509, rogrady@aibs.org, 1444 Eye St. NW, Suite 200, Washington, DC 20005. Closing date: when filled.

## POST DOCTORAL POSITION
## Mechanisms of Pierce's disease transmission in grape vines.

A postdoctoral position is available to a qualified candidate who has recently completed her/his PhD. Candidate will join a team of scientists at UC Davis studying Pierce's disease in grapes. The project concerns understanding the infection process and structural pathway of movement of the bacterium, *Xylella fastidiosa*, in infected grape vines. Qualified candidates should have experience in the study of plant anatomy and physiology and the application of various types of microscopy.

Starting date is July 1, 2002.

Contacts: Professor Thomas L. Rost, Section of Plant Biology; University of California, Davis, CA 95616; Ph. 530-752-0410; Fax 530-752-5410; Email tlrost@ucdavis.edu
OR
Professor Mark A. Matthews; Dept. of Viticulture & Enology; University of California, Davis, CA 95616; Phone: 530-752-2048; FAX 530-752-0381; Email mamatthews@ucdavis.edu

## POSTDOCTORAL POSITION
## University of Burgundy, Dijon, France

A postdoctoral position is available from September 2002 to conduct research in the area of signal transduction mechanisms of plant defence responses to pathogen infection. The research will focus on nitric oxide (NO) signalling and the characterization/identification of nitrosated proteins (Plant Cell 9: 2077-2091, 1997; Proc. Natl. Acad Sci. USA 95: 10328-10333, 1998; Plant J. 23: 817-824, 2000; Trends Plant Sci. 6: 177-183, 2001). Applicants should have a strong background in protein biochemistry and be familiar with protein immunodetection and purification. Salary will be approx 1800 Euros/month. Send curriculum vitae and three letters of reference to: **Dr. David Wendehenne, UMR 1088 INRA/Université de Bourgogne, BBCE-IPM, INRA, 17 rue Sully, BP 86510, Dijon 21065 Cedex, France, Email : wendehen@dijon.inra.fr.**

## Missouri Botanical Garden
## Senior Herbarium Assistant

Assists curator in ethnobotanical field research and training in Tibet (NW Yunnan) and potentially elsewhere. Work involves editorial assistance in writing scientific publications, reports and proposals. Assists researcher in gathering field data, bibliographic and electronic data, analyzing and reporting data.

Expedites and facilitates identification, labeling and storage of plant material entering herbarium. Performs various research activities according to the nature of the project. At present, the position is funded for three years.

Qualifications include Bachelor's degree in ethnobotany, botany, anthropology, or related field. Master's degree and training and experience in Ethnobotany preferred, along with previous field and herbarium experience. Knowledge of computer database and management and strong statistical analyses preferred; population modeling helpful. Familiarity with ethnobotanical literature preferred. Ability and willingness to travel required. Speaking knowledge of Chinese/Tibetan would be helpful.

REF: http://ridgwaydb.mobot.org/hrmweb/positions.asp

## Cultural Research Intern

DESCRIPTION:
QBG is seeking a cultural research intern who will assist the gardener-in-residence in ethnobotanical research among the many diverse communities of Queens. The intern will be involved in all aspects of fieldwork including making contacts in the community, interviewing informants, keeping notes, and creating photographic documentation of their work. She or he will be involved in the creation of new Garden publications that will focus on QBG's recent research efforts. Publication responsibilities will include the writing, design, editing, and printing of brochures and web-based publications. The intern will help develop and schedule lecturers for the Garden's public programs and special events. She or he will also be involved with other QBG projects and events as is necessary. Interns will represent QBG by providing information and assistance to our visiting public and community. Individuals must be self-motivated and detail oriented. In working with QBG's gardener-in-residence the intern will gain the experience of conducting ethnobotanical fieldwork in a highly diverse area of New York City. Position available immediately. Compensation commensurate with experience.

QUALIFICATIONS:
* Junior or Senior undergraduate, or graduate student, pursuing studies in cultural anthropology, ethnobotany, or related field preferred
* Anthropological/Ethnobotanical fieldwork experience highly desirable
* Excellent research skills
* Excellent writing, verbal and organizational skills
* Excellent computer skills (knowledge of Publisher, Quark, and web-based publishing a plus)
* Ability to work some weekends and evenings
* Fluency in an Asian language or Spanish a plus

Please mail or fax resume and cover letter to:

Erin Moriarty
Gardener-in-Residence
Queens Botanical Garden
43-50 Main Street
Flushing, New York 11355
Tel 718.886.3800 x224
Fax 718.463.0263
Email erinm@queensbotanical.org

# Special Opportunities

## Plants in Human Affairs (July 27 - August 17, 2002) on Hawaii's Big Island

The program consists of two courses of three credits each for a total of six credits. We strongly suggest that students register for both courses, but a single-course, three credit option is available. This program is being offered as an academic collaboration between the Kohala Center, located in Kameula, Hawaii, and the Center for Spirituality and Healing at the University of Minnesota.

Plants and Civilization, an introduction to the science of ethnobotany and the role of plants in human affairs and in the rise of civilizations, will be taught by Kathleen Harrison, M.A. Kathleen has worked in the field of ethnobotany for over 25 years, and is a co-founder of Botanical Dimensions, a non-profit research organization dedicated to the preservation, propagation and study of ethnomedically significant plants and their lore. Botanical Dimensions maintains a private medicinal plant preserve located on Hawaii's Big Island. Her course, Plants and Civilization, has been offered previously at Sonoma State University and has received excellent reviews.

People, Plants, and Drugs: An Introduction to Ethnopharmacology is the second course in the series and will be taught by Dennis McKenna, Ph.D. Dr. McKenna has worked in the interdisciplinary field of ethnopharmacology for over 30 years, and is best known for his interdisciplinary investigations of the Amazonian psychoactive drink, ayahuasca. His course, People, Plants, and Drugs: An Introduction to Ethnopharmacology, has been a regular course offering of the Center for Spirituality and Healing at the University of Minnesota since Spring, 2001.

Lectures and class sessions will be supplemented with frequent field trips, and guest presentations by distinguished authorities on Hawaiian and Polynesian ethnobotany will take maximum advantage of the unique learning opportunities offered by Hawaii's beautiful Big Island. It should be a very exciting three weeks! Please come join us.

Note: Enrollment is limited to 20 students, so be sure to register early. You do not have to be a student at the U. of Minnesota to register. Students at other schools can receive UMn credit that can be transferred to their home institution. Non-degree students are also eligible, and can register through continuing education. Contact Nancy Feinthel (612 624 5166) feinthel@umn.edu for details on how to register.

For more information on how to register for the course, the instructors, and for a detailed outline of the topics to be covered, visit our web site at http://www.csh.umn.edu/ and click on the link that reads " What's New" at the right of the page, then click on "Study in Hawaii" at the bottom of the "What's New" page. For convenience, a few links are included below to make it easier to find more information.

Dennis J. McKenna, Ph.D.
Senior Lecturer
University of Minnesota
Center for Spirituality & Healing
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Useful Links:

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Overview of Course: http://www.csh.umn.edu/Education/CSpH_5000/Hawaii/home.htm
Detailed Syllabus: http://www.csh.umn.edu/Education/CSpH_5000/Hawaii/syllabus.htm
Online Registration: http://www.onestop.umn.edu/schedule/shtml/courses.shtml?subjectCode=CSPH&myinst=UMNTC&term=1025&option=NO_LINK_TO_PLANNER

NOTE: To register for the full program online, you must register for both courses, CSpH 5000, # 90113 - Plants and Civilization for 3 credits, and for CSpH 5401, # 90115 - People,Plants and Drugs: Introduction toEthnopharmacology, also for 3 credits. A single $2000 fee covers meals and accommodations for the entire 6 credit, 3 week long program, but tuition is charged separately for each course. We strongly urge registrants to enroll for the entire 6 credit program!

More information, guidance on how to register, etc. contact Nancy Feinthel at the Center for Spirituality and Healing (612 624 5166) or via email at feinthel@umn.edu

Note: If you are a non-University of Minnesota student, or want to register for the course through continuing education, please contact Nancy Feinthel at the address above.

## THE RUPERT BARNEBY AWARD

The New York Botanical Garden is pleased to announce that Aaron Liston, currently at the Department of Botany & Plant Pathology, Oregon State University, is the recipient of the **Rupert Barneby Award** for the year 2002. Dr. Liston will be studying the phylogenetic systematics of *Astragalus* and *Trifolium*.

The New York Botanical Garden now invites applications for the **Rupert Barneby Award** for the year 2003. The award of US$ 1,000.00 is to assist researchers to visit The New York Botanical Garden to study the rich collection of Leguminosae. Anyone interested in applying for the award should submit their curriculum vitae, a detailed letter describing the project for which the award is sought, and the names of 2-3 referees. Travel to the NYBG should be planned for sometime in the year 2003. The application should be addressed to Dr. James L. Luteyn, Institute of Systematic Botany, The New York Botanical Garden, 200th Street and Kazimiroff Blvd., Bronx, NY 10458-5126 USA, and received no later than December 1, 2002. Announcement of the recipient will be made by December 15th.

Anyone interested in making a contribution to **THE RUPERT BARNEBY FUND IN LEGUME SYSTEMATICS**, which supports this award, may send their check, payable to The New York Botanical Garden, to Dr. Luteyn.

## GRANTS FOR BOTANICAL GARDENS AND ARBORETA

The Stanley Smith Horticultural Trust invites applications for grants for up to $20,000 for teaching and research in horticulture. Not-for-profit botanical gardens, arboreta, and similar institutions are eligible. The deadline for applications is August 15, 2002. For guidelines, contact William Louis Culberson, Ph.D., Grants Director, Stanley Smith Horticultural Trust, PO Box 51759, Durham NC 27717-1759, USA (e-mail wlc@pobox.com; tel. 919-660-7303).

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**Evolution of Wild Emmer and Wheat Improvement. Population Genetics, Genetic Resources, and Genome Organization of Wheat's Progenitor, Triticum dicoccoides.** E. Nevo, A. B. Korol, A. Beiles, and T. Fahima. 2002. ISBN 3-540-41750-8. (Cloth US $219.00.) 364 pp. Springer-Verlag New York, P.O. Box 2485, Secaucus, NJ 07096 - -The tetraploid Triticum turgidum group (AABB) plays a pivotal role in the evolution of wheats. This group contains a range of forms from wild emmer (T. dicoccoides or T. turgidum var. dicoccoides) through primitive cultivated emmer (T. dicoccum or T. t. var. dicoccum) to advanced cultivated durum (T. t. var. durum) and other cultivars with free-threshing grains. The emmer wheats are also the donors of the A and B genomes to hexaploid bread wheat (T. aestivum, AABBDD).

Eviatar Nevo and his associates in Israel have spent 30 years studying wild emmer and its relatives from every standpoint. This book presents their many findings, both new and previously published, and the findings of others.

The book begins with the cytotaxonomic and cytogenetic background of *Triticum*. The archaeology of the cultivated forms is reviewed. The geographical distribution of T. dicoccoides in the Near East from Israel north to Turkey and east to Iran is described.

Following this introduction is a large section describing population variation in wild emmer. Polymorphisms are found in allozymes and various kinds of DNA: RAPD, microsatellites, and ribosomes. Genetic variability is common. Furthermore, the frequencies of the variants in many cases are correlated with environmental variables when plotted on a macrogeographical or microgeographical scale. The best explanation for the observed variation patterns in many or most cases is control by natural selection, with or without the influence of other factors. The authors return to the modes of selection found to be operating in wild emmer in a final section of the book.

These findings have important practical as well as theoretical implications, as the authors point out. Much natural variation in domesticated wheats has been lost in modern cultivation and pure-breeding. But wild emmer maintains a rich pool of adaptive and preadaptive variations which can be tapped in the breeding of cultivated emmer and durum and their hexaploid derivative, bread wheat.

A third large section discusses variation in several physiological traits of emmer such as drought tolerance, salt tolerance, pathogen resistance, herbicide resistance, protein content of grains, etc. Some of this variation can be useful in wheat breeding.

A fourth section covers genome organization. The distribution of QTLs for agronomic traits among the chromosomes of the two genomes is shown, and genetic maps for molecular markers are presented. It is fascinating to see homologous genes on partially homologous chromosomes of the A and B genomes. Also very interesting is a comparison of the chromosomes of the A genome in wild emmer (AABB) with those in its diploid ancestor T. urartu (AA). The A chromosomes of wild emmer, unlike their counterparts in T. urartu, contain scattered segments of repetitive DNA derived from the B genome. Apparently DNA has infiltrated from B chromosomes into A chromosomes in tetraploid emmer since its formation. Little infiltration in the opposite direction from the A to the B genome has taken place. This process of intergenomic invasion has also been found recently in tetraploid cotton.

This book presents a tremendous amount of molecular and physiological information about wild emmer and places the information in an evolutionary-biological context. It shows how much can be accomplished by a multidisciplinary approach to the biology of a single plant species. – Verne Grant, Section of Integrative Biology, University of Texas, Austin, Texas 78712.

**The World of Clovers.** Gillett, John M. and Norman L. Taylor (Michael Collins, editor). 2001. ISBN: 0-8138-2986-0 (hardcover book plus CD ROM, US$149.99). 457 pp. Iowa State University Press, 2121 South State Street, Ames, IA 50014-8300 (www.isupress.com). — Since the genus *Trifolium* is my primary botanical interest, I looked forward to the publication of this book, the authors of which are some of the world's experts on the genus. I greatly anticipated seeing color photographs of many of the species I have not yet been able to see "in the flesh", so that I would be better able to identify them in the future. Having now seen the product, my excitement for it is a bit muted.

The book is a nice little volume (6 1/8" X 9 1/4"), well and attractively bound, and printed on glossy, acid-free paper. It begins with an introduction to *Trifolium*, and a relatively good set of references. Contents include good descriptive information for most taxa. The text for each species includes common names (where there are any), chromosome numbers (when known), life span, habit, flowering period, reproductive attributes, origin and distribution, and sometimes additional notes. There are expanded discussions of leaf, flower, and seed characteristics. Black and white photographs of plants and seeds illustrate most taxa. Species are discussed in alphabetical order, and each is presented in a two-page spread that is particularly attractive for some species, though the treatments vary widely from species to species. The CD ROM is organized in much the same way, with color photos of the plants and seeds.

The main strengths of this volume are the succinct descriptions and the very good seed illustrations. Seed of more species of *Trifolium* are illustrated in this volume than in any other source of which I am aware. This is very important for anyone attempting to identify clover seeds, especially those in the agriculture industry and agricultural inspectors checking for seed contaminants.

The main weaknesses of the volume are the lack of keys to species, the lack of photos of some species, the poor quality of at least some of the photographs, and the absence of an index. Keys based on vegetative and floral

characters should have been included, as should keys based on seed characters. Without these keys, the volume is much less useful than it could have been. Without keys, anyone working to identify clovers is forced to try to obtain a copy of the last monograph by Zohary & Heller (1984) and other monographic treatments of smaller groups of the genus published in journal articles. I also have some objection to the way the author ("authority") of each name is presented on the page opposite the name, rather than being given immediately after the epithet. The lack of an index might at first seem unimportant, but such an index would have been helpful in some cases, especially for species that were formerly (and commonly) known by names other than those used in the present volume. For example, how can *Trifolium tridentatum* be found if one does not know that it is now called *T. willdenovii*? Common names could also have been indexed for those not familiar with the scientific names.

With regard to the illustrations of each species, those for which no photo is given (47 out of 228 species, or over 20%), such as *Trifolium acaule, T. breweri, T. siskiyouense,* and so on) could have been represented by photos made from herbarium specimens. This would have been much preferable to a complete absence of any illustration. In other cases, such as those of *T. brandegei*, *T. latifolium,* and *T. lupinaster,* where a photo is given in the book, the quality is poor, either because the photo is out of focus, or the subject is too small to be of any use. The photos on the CD ROM do make up for the failings of those in the text, but this is not always the case. The seed photos are far superior, and in the main very good; since so few are published in other sources (such as Delorit & Gunn, 1986), this makes up for shortcomings in other areas.

The book is a bit overpriced, given its size and content. However, the CD ROM can be purchased separately for $99.99, and since all the information contained in the printed volume is on the CD, and since the photographs are better on the CD ROM, I suggest that it is the better format to purchase. — Michael A. Vincent, Curator, W.S. Turrell Herbarium (MU), Department of Botany, Miami University, Oxford, OH 45056.

Works cited:

Delorit, R.J. & C.R. Gunn. 1986. *Seeds of Continental United States Legumes (Fabaceae).* Agronomy Publications, River Falls, WI.

Zohary, M. & D. Heller. 1984. *The Genus Trifolium*. Israel Academy of Sciences and Humanities, Jerusalem.

**Cognitive ecology of pollination: animal behavior and floral evolution**. Lars Chittka and James D. Thomson. 2001. ISBN,0-521-781957 (cloth, US $ ) 344 pp. Cambridge University Press, 40 West 20th Street, New York, NY 10011. - Pollination biology can be studied from different perspectives. While some researchers investigate pollinator's physiology and proximate causes of behavior, others examine ultimate causes such as the evolution of floral characteristics in response to pollinator behavior. Both ultimate and proximate approaches can provide useful information to the study of pollination biology. To stress the importance and potential benefits of linking different traditions, this book presents both approaches side by side. The editors' goal is not to fuse or reconcile different approaches but to raise consciousness among pollination biologists about the potential benefits of such a fusion.

This book is comprised of 16 chapters, each written by different authors. Earlier chapters discuss how color vision, spatial memory, scent, and cognitive abilities influence pollinator preference and constancy. The first four chapters are devoted to bees, later chapters discuss hummingbirds, bats, and beetles, flies, moths, and butterflies (Chapters 7-9). You will learn about the different phases of bee memory; how bees use colors, shapes, and patterns to recognize a plant species; and how bees can subjectively estimate the value of pollen and nectar. Reading these chapters, you will better appreciate how scent, spatial memory, and other visual cues are used differentially by distinct pollinators to locate patches of flowers.

The subject matters of later chapters are more eclectic (Chapters 10-16). Topics include individual variation in pollinator behavior and its implication on selection of plant characteristics; frequency-dependent foraging behavior and the resulting frequency-dependent selection on floral characteristics; pollinator energetics, foraging currency, and efficiency of pollen transfer; and pollinator-mediated assortative mating and plant speciation; amongst others. While this book covers a wide range of subjects, the major emphasis is on pollinators. The effect of pollinators on plant characteristics is differentially discussed among chapters. When choosing subject for chapters, the editors selected work that stimulated them intellectually. While this represents a valid criterion, making better connections between chapters would have benefited the reader, especially between the last seven chapters.

Interesting ideas are presented throughout the book. It is suggested that floral diversity in communities may not result from pollinator preference of specific floral shapes but could be a way to increase pollinator selectivity. Indeed, data are presented that indicate how pollinator selectivity increases when floral types differ in multiple rather than in single traits. One author proposes the use of the honeybee's round dance as a quantitative measure of that bee's subjective appraisal of quantity and quality of pollen and/or nectar. It is also suggested that differences in behavior among individual pollinators may influence our interpretation of pollinator preference and of pollinator-driven selection on plant characteristics. It is stressed throughout the book that the concepts of pollination syndromes, of strong coevolution between pollinators and floral characteristics, and of plant speciation resulting from ethological isolation by pollinators, should be used with caution. Different authors discuss how the overall evi-

dence to support these ideas remains weak. For example, as pollinators are often generalists, the evolution of floral traits may not result from close coevolution between specialized pollinators and their flowers. Alternative explanations to adaptation and coevolution include phylogenetic history, phylogenetic constraint and chance. It is suggested that by considering these alternatives we will gain a better understanding of adaptation.

Despite the presentation of interesting ideas, some of the chapters are highly speculative, with little empirical evidence provided to support the ideas. While the presentation of new ideas is crucial to the development of a field of study, too strong an emphasis on speculations weakens a book. Is a whole chapter necessary to discuss how predation on pollinators may potentially influence pollinator behavior and plant characteristics? or the possible consequences of pollinator-mediated assortative mating for plant reproductive isolation? This high level of speculation combined with the lack of continuity, especially between the last seven chapters, weakened the book.

Appealing to different audiences is a difficult task. It requires a careful selection of subjects and presentation of the subjects at an adequate level. As a plant evolutionary biologist, I found it difficult to read through the levels of details presented in some of the early chapters, for example, the description of the different memory phases of bees, or the experiments to recognize the pattern recognition used of bees. The editors' goal was not to fuse or reconcile physiological and evolutionary studies but to raise consciousness about the potential benefits of such a fusion. Did the book reach this goal? Despite some weaknesses, this book represents a positive step in that direction. - Johanne Brunet, Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331

**Global Biodiversity in a Changing Environment: Scenarios for the 21st Century**. Chapin III, F. Stuart, Osvaldo E. Sala, and Elisabeth Huber-Sannwald (eds) 2001. ISBN 0-387-95286-1 (paper US$49.95) 376. pp. Springer-Verlag, 333 Meadowlands Parkway, Secaucus, NJ 07904.—I had an ulterior motive in asking to review this book. As preparation for a non-majors course called Biodiversity, I wanted a source of solid, defensible numbers and not another coffee-table book concerning the effects of global change on biodiversity. Numbers this book delivers, in spades. Thirty-six contributors from nine countries have put together a comprehensive, sobering compendium of predictions about the future of biodiversity in 10 biomes and habitats that are and will be variously affected by the components of global change. The goal of the volume, as most succinctly stated in the last chapter, is to present biodiversity scenarios for the year 2100. The data, modeling, and thinking used to develop those scenarios are described in a biome by biome survey, preceded by three synthetic chapters and followed by an excellent conclusion that both summarizes the preceding chapters and suggests the directions in which future research should head. The book has both detailed information and intellectual sweep, and should thus be useful to researchers and policy planners in the fields of conservation biology, ecology, and environmental science. Although a few of the chapters are densely packed, the unified approach and consistency of presentation also recommend the book to more general readers who want to learn and teach about the possible fates of biological systems under different levels of human impact.

After a brief introduction, the second chapter of the book threatens to overwhelm the unprepared reader with an acronym-heavy but ultimately informative account of modeling efforts to predict global responses of vegetation to climate change. For modelers, the chapter might have been improved by including a systematic (preferably tabular) comparison of what the various models used as input. For non-modelers, the chapter would have been improved by fewer acronyms and larger maps (which in gray scale and in their published size are indecipherable). In this regard, the color plates at the center of the book are also too small to be effective. However, the chapter does raise the important point that most models of vegetation change rely heavily on the use of plant functional types, suggesting that when and where plants perform according to or differently from their functional type continue to be valuable research questions.

The third chapter, by Rik Leemans, is one of the most powerful in the book. The alternative scenarios presented by Leemans illustrate the effects of intermediate versus low levels of human resource consumption on patterns of vegetation. Again, the maps aren't visually effective, but the tables clearly convey the consequences of different resource use with respect to such variables as vegetation type and percentage of non-domesticated land. For example, by the year 2100, non-domesticated land in the USA (currently 62% of its total land area) would be 60% under intermediate resource use and 70% under low resource use; for China, the current figure is 59%, decreasing in 2100 to 37% under intermediate resource use but 44% under low use. The chapter's last paragraph contains a sentence that deserves to be quoted in full: "The often-heard argument that such grim or doomsday scenarios do not become reality is not because they are unrealistic, but rather that it is the result of their convincing cases." Leemans himself makes just such a convincing case.

The following chapters describe the responses of various habitats (such as soil and moving fresh water) and biomes to five major drivers of global change: land use, climate, nitrogen deposition, biotic exchange (= chiefly invasive exotic species) and atmospheric $CO_2$. Of these chapters, two deserve special mention. Chapter 9, Mediterranean-Climate Ecosystems, by Mooney, Arroyo,

Bond, Canadell, Hobbs, Lavorel, and Neilson, is particularly informative due to its coverage of regions in both northern and southern hemispheres, allowing comparisons between the relative impact of such drivers as land use and climate change. For example, coastal California and Chile have similar vegetation yet different histories of land use and different amounts of climate buffering due to oceanic area. Thus, future land use change may have greater impact on Chile, whereas climate change may have greater impact on California. The unpredictability of precipitation changes is a large source of uncertainty in future scenarios, yet current projections of land use, temperature, and biotic exchange all point to Mediterranean-climate regions as losing a greater proportion of their biodiversity (chiefly plant diversity) than will other regions considered in the book.

The second biome chapter that stands out is chapter 7, Temperate Grasslands, by Osvaldo Sala, which also integrates information from both hemispheres (chiefly North and South America). Sala demonstrates that the five drivers of global change are likely to have nearly equal impacts on biodiversity in grasslands. In addition, he offers an intriguing but brief account of how grazing history on an evolutionary time-scale affects current and future responses of the vegetation to invasions and other disturbances. With respect to nitrogen deposition, Sala cites the work of David Tilman that demonstrates not only the effect of fertilization in reducing plant diversity but also the likely role of species redundancy in continued ecosystem function in the face of global change.

After the biomes and habitats have been assessed individually, the final chapter draws together predictions based on each biome's response to the five drivers of global change and presents them in bar graphs that are no less useful for having been published previously. An even more important element of this chapter is its analysis of possible interactions between the five drivers, that is, whether they are simply additive (no interaction), subsumed under the effects of the most important driver (antagonistic interaction), or multiplicative (synergistic interaction). The three maps reflecting these three scenarios, which have also been published before, are effective in color in the center of the book, and less effective in gray scale in this chapter. As the authors point out, research and modeling efforts should be devoted to determining the shapes of such interactions, for example, how nitrogen deposition in a particular biome might magnify the threat of invasive species. Finally, the book ends on a rather unusual note for a work that has so successfully demonstrated the value of a comprehensive, biome-level approach. Noting that management decisions are made at a relatively fine scale by people who are, for example, responsible for paddocks and watersheds, the authors suggest that research and policy decisions be directed at mitigating changes to local biodiversity. This book will provide an excellent starting place for anyone engaged or interested in such mitigation. - Gretchen B. North, Biology Dept., Occidental College, Los Angeles, CA..

**Introduction to the Exploration of Multivariate Biological Data**. Podani, János. 2000. ISBN 90-5782-067-6 (paper, US $ tk). *vi* + 407 pp. Backhuys Publishers, Leiden. — Like the canonical *Numerical Taxonomy* by Sneath and Sokal (W. H. Freeman, 1973), this book steers an intermediate course between detailed mathematical treatment of multivariate methods and a brief presentation of highlights appropriate to some specific set of biological applications. The result is a surprisingly (and sometimes distractingly) comprehensive review of available methods in taxonomy and ecology packed into just 400 pages.

Podani makes the claim that he intends the book for a wider biological audience, but his examples are almost all from the taxonomic and ecological literature (particularly the latter), and he provides few hints about how the techniques might be applied more broadly. In this respect, Sneath and Sokal do a little more, with a 16 page (outdated) chapter on applications of numerical taxonomy outside of biological systematics. In others, Podani has more thorough coverage, particularly on the early topics related to assembly of the data matrix: sampling, data types, and transformations. His pictorial representations of the latter are especially helpful for visualizing the effects of the wide range of transformations discussed. This thoroughness is characteristic of the book: treatment of available coefficients and procedures is, if not exhaustive, certainly more extensive than in other recent books on multivariate methods with the word "introduction" in their title. The advantage of such inclusiveness is that it allows the author to explore the theoretical foundations of the different coefficients and procedures and to evaluate their effectiveness.

Podani himself is an innovator in this field and he clearly feels that the standard approaches adopted in routine analyses could be improved. On the other hand, why dredge up so many forgotten approaches, some with no real advantage over more popular ones and a few of them never used by anyone but their original proposer? Even if an obscure coefficient is better than the standard repertoire of popular ones, is there much chance of displacing these? The inclusion of all of these extras adds a little confusion to the text and might make it harder for the novice to choose among alternatives were it not for three distinctive elements of the book that go some way to ameliorating these difficulties. Most conventional are a series of comparative tables and decision keys that at least help to avoid inappropriate uses of coefficients and procedures, even if they do not always give detailed guidance on choices among those that are appropriate. Some of the latter is provided in "imaginary dialogues" at the end of each chapter, which expand upon some of these issues and allow Podani to reveal where he has skated around some difficulties. The third helpful device includes the literature overviews at the end of each chapter. These provide a very good entry to classical and contemporary reviews of the topics covered in the chapters. They also summarize which of the covered coefficients and procedures are included in selected mul-

tivariate software packages. Both of these elements, the literature and software overviews, are obviously destined to rapid obsolescence in detail, but they are highly selective anyway and should retain considerable utility.

Another strong feature of the book is the range of topics covered in the nine chapters. In addition to the first chapter on sampling and data types, Chapter 4 on non-hierarchical classification and Chapter 9 on comparative evaluation of results are also relatively uncommon and welcome additions to the usual lineup of topics in numerical taxonomy texts. Also a little unusual is the assignment of matrix rearrangement to its own chapter, while all ordination methods are included in a single chapter. Rounding out the contents are chapters on similarity coefficients, hierarchical clustering, and cladistics.

I would have liked to have seen a section on 3 matrix analysis and more on morphometrics but it is remarkable how much was packed into this slender volume. Podani did his own translation of his Hungarian original. Although it is clearly not the work of a native speaker of English, the translation is fluent and readable with only the occasional striking incongruity. I like the book, but I am not sure exactly what to recommend it for. It would be suitable for a graduate course in multivariate systematics or quantitative ecology, if supplemented by readings of appropriate applications. It can also serve as a handy place to look up the details of some of the less frequently encountered coefficients and procedures, especially those published in the last 20 years (since Sneath and Sokal's summary). I will use it this way and perhaps, as a result, I will be more inclined to broaden my analytical repertoire and use some of the additional techniques that Podani describes so clearly. – James E. Eckenwalder, University of Toronto, Department of Botany, 25 Willcocks St., Toronto, Ont. M5S 3B2. Canada.

**Emanuel D. Rudolf's Studies in the History of North American Botany with an Appendix on the Relationship between Science and Religion**, R.L. Stuckey and W.R. Burk, eds. 2000. ISBN 1-889878-05-7 (paper, no price given). 376 pp. Botanical Research Institute of Texas, Fort Worth, Texas, USA. - Emanuel D. Rudolf was born in Brooklyn, New York in 1927. From his childhood on he developed a passion for books, and for the study of nature, especially of plants. Following service in the U.S. Army during WWII, Rudolf earned a B.A in Biology from New York University and a Ph.D. in Botany from Washington University, St. Louis, MO. The remainder of his life was spent teaching botany, conducting research primarily in the fields of lichenology and the history of science, collecting books, and writing; first at Wellesley College (1955-1961) and then at The Ohio State University (1961-1992). To quote from the book's Memoriam: "Known affectionately as 'Rudy,' he was a kind, generous and modest gentleman, who displayed good humor and good will. He was truly a valued friend, respected colleague, and eminent scholar, who gave much thoughtful counsel to his students and friends and showed genuine enthusiasm for life, science, and books." At the time of his death due to an automobile accident in June 1972, Rudolf left behind a collection of 53,000 books, numerous manuscripts and drafts of manuscripts, and an unfulfilled ambition to write a book on the popularization of botany. His friends and colleagues R.L. Stuckey and W.R. Burk, by assembling Rudolf's manuscripts together with new and thoughtful introductions to each, have fulfilled 'Rudy's' ambition.

The book begins with a thorough and skillful introduction to the 'Rudolf Papers,' i.e. to Rudolf's lifetime contributions to botanical history, whether published or not. The remainder of the book consists of 38 of Rudolf's manuscripts, each preceded by a brief introduction, with the papers organized into nine sections on various topics: Botany in Textbooks, Botany in Children's Books, Botanical Teaching, Botanical Educators, Botanical Illustration, Women in American Botany, Writing Shaw's Garden History, Writing Botanical History, and Relationships Between Science and Religion. The publisher and printer are to be commended for the production quality of the book, which is clearly and attractively typeset, and includes a wealth of line drawings and black and white photographs throughout, as well as a several pages of color plates of Emanuel Rudolf, his home and collections. The volume is published in the series *Sida, Botanical Miscellany* as No. 19.

The editors have done well to prepare for publication what in some cases were only partial drafts, fragments, marginalia, and collected references on a given topic. The introductions by R.L. Stuckey indicate clearly what Rudolf had completed at the time of his death, and what remained to be done. In several instances, what is presented as a single paper was actually cobbled together from multiple abstracts or papers written by Rudolf, with the editors' intent being to provide a summary of Rudolf's writings on a given topic. That this approach works as well as it does is a testimony to the editors' skills. They've produced a very readable and enlightening entrée to Rudolf's thoughts that only occasionally betrays its lack of continuity in authorship.

Rudolf's lifetime contributions to botanical history are worthy of such a handsome memorial collection. Those with interests in the history of North American botany and/or its popularization in textbooks and children's books are advised to read this volume. Those who have caught Emanuel Rudolf's book-collecting bug will want a copy of their own.- Jonathan Frye, Department of Natural Science, McPherson College, McPherson, KS 67460

**Lichens of North America**, by Irwin M. Brodo, Sylvia Duran Sharnoff, and Stephen Sharnoff - Even if you don't care one whit about lichens, you should buy this book for the photographs alone, spectacular fusions of science and art. The authors warn that "...the temptation to start [identifying a specimen] by leafing through the pretty pictures will be hard to resist." Indeed.

But then, it would be impossible not to care about lichens, ubiquitous composite organisms of fascinating biology and great ecological importance, once introduced to them by Lichens of North America. The 14 introductory chapters of "Part One / About The Lichens" give a beginner's introduction and cover such topics as morphology, reproduction, physiology, chemistry, ecology and environmental monitoring, distribution, ethnobiology, and taxonomy. In "Part Two / Guide To The Lichens" (the bulk of the book) are found keys to genera and species, genus and species descriptions, illustrations, and distribution maps. The book is broad in its coverage, though not exhaustive: more than 1500 "common, conspicuous or otherwise important" species and subspecies are included (of the approximately 3600 known for North America), with keys to 1050 of them and more than 800 of them with full descriptions and color illustrations. The geographic coverage is all of North America north of Mexico.

Lichens of North America is both well written and well edited, impressively so for a work of this type and magnitude. Brodo's prose is clear, engaging, even eloquent, making the text as enjoyable to read as the photos are to look at. The biology of lichens is presented in an evolutionary and ecological context, an approach that may seem obvious but should not be taken for granted. Indications of sound scholarship include every photo being supported by a voucher specimen, the long list of experts consulted, and the up-to-date taxonomy. Although the book had been in the making for over a decade, most modern and even the most recent generic concepts are adopted (e.g., the Cetraria complex). Organization at every level is logical and just plain sensible, from the division of the book into two parts to the alphabetical arrangement of genera and species. All of the species mentioned in Part One as examples are illustrated in Part Two. Throughout the book there is thorough cross-referencing, particularly important given that there is no subject index. Where a term is mentioned in one chapter, the chapter in which it is fully explained is indicated.

Both the glossary and the keys reference figures. Overall, the glossary is very complete, although the omission of epiphloeodal is puzzling given the inclusion of endophloeodal. The genus and species descriptions are thorough and clear, including (along with the actual description) the name of the photobiont (where known) as well as information on chemistry, habitat, distribution, and importance. Under "Comments" one finds mention of similar species as well as notes on how easy a species is to recognize or how likely one is to encounter it. The range of each species (or subspecies) is indicated on a map, much quicker and easier to read than any verbal description of distribution would be.

For the most part, the key couplets are of the sort that make using keys a pleasure: pseudocyphellae present vs. pseudocyphellae absent; thallus pale vs. thallus dark; on rock vs. on bark or wood; apothecial margin yellow or bright orange vs. apothecial margin black; spores halonate vs. spores not halonate; thallus PD- vs. thallus PD+ yellow or red-orange. The characters used in the keys are easily distinguished, such as color, chemical spot tests, habitat, and number of spores per ascus. Keying out a handful of specimens in different groups proved the keys as easy to use as they appeared.

Some of what I liked most about Lichens of North America is minor but I think not trivial. Running genus names at the bottom of the pages in Part Two was an excellent idea. I enjoyed the bits of poetry and other brief quotations at the beginning of each chapter (it seems that Thoreau had quite a bit to say about lichens!). There is much in this book to inspire further study, with the reader's attention drawn over and over again to what is not known about lichens. Perhaps most of all, I enjoyed the destruction of lichen stereotypes. Sure, we were all taught that lichens break down rock to form soil, but how many of us were taught that some lichens are actually important in stabilization of existing soil?

The three biggest shortcomings of Lichens of North America are due to editorial decisions. First, the book should have a subject index, the lack of which is only partly compensated for by the thorough cross referencing. Second, author names are not included with taxa names at the beginning of each description, but are included with the taxa names only in the "Index of Names." I have not been able to think of any good reason for omitting author names from the descriptions. It means that if you are keying out a specimen in order to put a name on a herbarium label or in a manuscript, your task will not be complete until you have turned to that name in the index to get the author name(s). Finally, there is no literature cited section, only "Further Reading and Bibliography," and that organized only loosely according to the subjects of the introductory chapters. This makes it difficult to find a reference actually cited or quoted in the text (though there aren't many of these). Related to this, I did not find full citations of the works quoted at the beginning of each chapter; a reader might want to track down the context in which Thoreau wrote, "Nature has a day for each of her creatures..."

My remaining criticisms are truly minor. In the section on how to use the keys it is explained that numbers in parentheses following a couplet number indicate the origin of that choice, a very useful feature when one is trying to work backwards through a key. According to the text, the originating lead is given in parentheses for leads originating more than two couplets away, but in fact this

is inconsistently so. For leads originating more than three couplets apart the originating leads are given consistently (I found only one omission and one error). But for leads originating three couplets away, the originating lead has been omitted more often than included.

Although in almost all cases the plates in Part Two are located very close to the descriptions they accompany, it would still be useful to have the plate numbers referenced in the descriptions, especially for cases where the plates are in a different order than the descriptions. A few plates are out of order in Part One, and one plate appears not to be cited at all. Finally, although both Raven's "Foreword" and Brodo's "Preface" mention Sylvia Sharnoff's untimely death, the cataloging information on the back of the title page indicates that she was still living at the time of publication.

Lichens of North America is a monumental work of major importance to our understanding of the biota of North America. The photographs, introductory chapters, and descriptions are all so well done that every page is a pleasure to read and look at. Accessible enough for amateur naturalists, detailed enough for professional lichenologists, this is a great book for anyone who loves nature.- Robynn Shannon, Dept. Ecology and Evolutionary Biology, U-3043, University of Connecticut, Storrs, CT 06269-3043.

**Plant Cell Biology**, Second Edition, edited by Chris Hawes and Beatrice Satiat-Jeunemaitre arrives as one of the many volumes in the Practical Approach Series by Oxford University Press. This series provides views of current knowledge and protocols in various areas of modern experimental biology, and this particular volume meets the goals of the series, with a few areas that could be improved. This work certainly does provide a practical guide to various areas of current research in plant cell biology. A variety of authors present a range of techniques including flow cytometry, microinjection, and electron microscopy.

Throughout, the book is peppered with useful protocols and informative micrographs, including some very attractive color confocal images. An introductory chapter presents the basics of light microscopy to the reader, a chapter which is preceded by a helpful list of the abbreviations used throughout the volume. Other chapters cover topics ranging from fluorescent probes to micromanipulation to electrophysiology, as well as other techniques.

The first edition of Plant Cell Biology was edited by Harris and Oparka and appeared in 1994. There have been significant changes in the tools and techniques used by plant cell biologists in that time—for example, the discovery of GFP was only announced in1994, but in this volume it receives an entire chapter. This makes sense given the role played by various versions of GFP for analysis of plant cells live and in real time. Some techniques previously covered in an entire chapter of the first edition—e.g. DNA-DNA *in situ* analysis—now occupies part of a chapter or a chapter renamed to reflect changes in terminology— *in situ* hybridization is covered in its various manifestations, such as RNA-RNA, not just DNA-DNA.

Plant Cell Biology, Second Edition, could use more micrographs, especially given the practical aim of this work. There are a reasonable number which illustrate the various techniques presented, but even more would help further to clarify techniques along with more photographs, as opposed to simple cartoon views, of experimental apparati. The protocols are well laid-out in gray-shaded boxes, and these represent an improvement on the protocols in the first edition in that they are better set off from the text by this shading. However, the user of the book will require some familiarity with basic techniques in a given subfield of plant cell biology in order to use the protocols, as in the pulling and coating of micropipettes for electrophysiological work.

The protocols presented here may not be sufficient to allow the reader, even a careful reader, to start doing the experiments using only the book as a guide. Some practical tips will have to be sought from experienced users of a given type of experiment. This book offers real value to all those working in plant cell biology, though access to the first edition may be important for certain techniques. One book cannot describe all techniques, especially if a current practical focus is the goal, and though a technique may not be widely used at the moment, it may return to greater importance at some future date.

This Second Edition should be found in all libraries of research institutions and in the personal libraries of plant cell biologists. It will be useful for obtaining protocols for teaching laboratories, especially advanced courses, and the introductory chapter of this second edition is an excellent basic review of modern light microscopy, especially as it applies to plants. – Douglas Darnowski, Department of Biology, Washington College, Chestertown, MD 21620.

**Regulation of Photosynthesis. Volume 11**. E-M. Aro and B. Anderrson, (Eds.) 2001. ISBN 0-7923-6332-9 (Cloth US$226.00) 613 pp. Kluwer Academic Publishers. P.O. Box 989, 3300 AZ Dordrecht, The Netherlands. - This is the eleventh book in a series titled "Advances in Photosynthesis and Respiration," the first of which was published in 1994. I would have assumed that the ten previous volumes covered every imaginable aspect of photosynthetic phenomena but the current volume impresses with the fact that there is still more to write on the topic. Doubtless, these are not the last six hundred pages we can expect on the general topic of photosynthesis. The series editor promises at least five upcoming volumes. This volume focuses on regulation systems in photosynthetic processes. Regulation, comprising a very broad set of biological responses, is discussed within an enormous and sometimes diffuse range of subjects. Predictably, protein and enzyme activities of chloroplasts are given full play. Genomics, gene expression, biogenesis, and acclimation modalities are also considered in detail. The chapters comprise both review articles and primary research and provide a real treasure of information, but the level may be out of reach of many readers.

Hundreds of references are cited in more than thirty contributions, representing what amounts to a gargantuan editorial feat. The book is not, as the editors suggest, suitable for advanced undergraduates. It is a highly specialized volume more appropriately aimed at a narrow readership of specialists. Like me, even professional botanists might find the book daunting without an avid interest in the finer details of say, electron transport, or a closely related research program. One wonders whether a new journal might not have been a better venue than a book series, but perhaps that is a moot point.

Along with the scientific precision apparent in these pages there is a commendable dose of passion. I read to my class of non-major undergraduates from one of the chapter introductions. The silence among my energetic sophomores indicated to me that they were transported, for however short a time, by the sheer magnitude of importance of photosynthesis expressed by the author. The transduction of light energy into chemical energy in chloroplasts and photosynthetic bacteria inestimably influences the biogeochemical face of our planet. Photosynthesis is the most important biological process in the biosphere and this book reflects some of our growing understanding of it. – Samuel Hammer, College of General Studies, Boston University, Boston, MA 02215.

**Flora of China. Volume 8, Brassicaceae through Saxifragaceae**. Wu Zheng-yi and Peter H. Raven, co-chairs of the editorial committee. 2001. ISBN 0-915279-93-2 (V.8), (cloth, US$85.00) vii+506 pp. Science Press (Beijing) and Missouri Botanical Garden Press (St. Louis). – This is the seventh volume of 25 projected text volumes (see http://flora.huh.harvard.edu/china/mss/news.htm). The taxa treated in the Flora include all native, naturalized, and non-native, economically important, cultivated vascular plants. The families are arranged according to a modified Englerian system, consistent with the Flora Republicae Popularis Sinicae (FRPS). This volume includes eight families currently assigned by the APG classification to three orders Brassicales (Brassicaceae, Bretschneideraceae, Morningaceae, Resedaceae), Caryophyllales (Droseraceae, Nepenthaceae), and Saxifragales (Crassulaceae, Saxifragaceae *sensu lato*).

The Chinese Brassicaceae include 102 genera (eight endemic) and 412 species (115 endemic). This is, of course, a very important family because of its many crop plants, ornamentals, and weeds. Fruit characteristics are essential in identification of genera. However, both a key to fruiting material and a key to flowering material are provided. The largest genera in China are *Cardamine* and *Draba* (both 48 species). The Brassicaceae are usually very well represented among naturalized/invasive species (Pysek 1998). For example, there are >110 naturalized species (>15% of the Brassicaceae) in North America (Kartesz and Meacham 1999). Interestingly, there are only <20 (<5%) naturalized species of this family in China. The rest of over 100 Brassicaceae weeds in China are native species. The situation is similar in many other "weedy" families in China. What is the reason? Is it biology, history, or still insufficient attention to naturalized species in this country?

The Bretschneideraceae are a family with only one species, *Bretschneidera sinensis*, a tree growing in S China, N Thailand, and N Vietnam. At least six different families from three orders have been considered as a home for this species. Now, however, it is quite clear that *Bretschneidera* together with *Akania bidwillii* (Akaniaceae) and Tropaeolaceae form a strongly supported subclade within Brassicales (Rodman 1998, Soltis et al. 2000).

Four other small families are included in this volume: Droseraceae(two genera and seven species), Morningiaceae (one introduced species), Nepenthaceae (one species), and Resedaceae (two genera, three introduced and one native species)

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One medium size family – the Crassulaceae – has 13 genera and 233 species (129 endemic, one cultivated and naturalized) in China. The largest genus here is *Sedum* (121 species, 91 endemic). The second largest genus is *Rhodiola* (55 species, 16 endemic). Obviously, these genera have the major centers of their diversity in the mountains of China.

The Saxifragaceae are the largest family treated in this volume (29 genera and 545 species, 354 endemic, seven introduced). It is well known that Saxifragaceae *sensu lato* is a highly polyphyletic assemblage, consisting of several separate evolutionary lines. Nevertheless, the family is treated here as the original Englerian unit, with the same sequence of genera as in FRPS. The most diversified genus is *Saxifraga*: 216 species (139 endemic). This means that about 50% of the species from this large genus grow in China! The second largest genus is *Parnassia*: 63 species, 49 endemic. (These numbers are in a substantial disagreement with Mabberley (1998) who reports only 15 species for *Parnassia* worldwide.)

The Flora of China is an impressive international achievement. The eighth volume (Vol. 6: Caryophyllaceae through Lardizabalaceae) was just published and more text volumes are in press. Hopefully, all volumes with illustrations, which are being published separately, will follow soon. - Marcel Rejmánek, Section of Evolution and Ecology, University of California, Davis, CA 95616.

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**Guide to Standard Floras of the World, second edition**. Frodin, D.G. 2001. ISBN 0-521-79077-8 (cloth US $240). 1100 + xxiv pp. Cambridge University Press, Cambridge, UK. - "Now when I was a little chap I had a passion for maps. I would look for hours at South America, or Africa, or Australia, and lose myself in all the glories of exploration. At that time there were many blank spaces on the earth, and when I saw one that looked particularly inviting on a map (but they all look that) I would put my finger on it and say, 'When I grow up I will go there'." - Joseph Conrad, *Heart of Darkness*, ed. Stanley Appelbaum (1902; reprint, Mineola, N.Y.: Dover Publications, 1990), p. 5.

Replace "map" with "flora" in the above quote, and you begin to capture the emotion one feels after browsing for hours in David G. Frodin's masterful "Guide to Standard Floras of the World." This is not a "telephone book" reference that one consults for a piece of information and then puts down; rather it is a work that is rich in botanical history, critical opinion, and glorious detail.

The book's subtitle "An annotated, geographically arranged systematic bibliography of the principal floras, enumerations, checklists and chorological atlases of different areas" accurately describes the scope of Frodin's work; however it does not begin to convey the wealth of information contained within its 1100 pages. From the well-chosen quotes prefacing each chapter, to the copious footnotes, the "Guide to Standard Floras of the World" is a major contribution to botanical scholarship.

Frodin divides the earth (and its satellite!) into a unique geographic hierarchy comprising divisions, superregions, regions, and finally "units" that correspond to the "states, countries of small or medium size, large provinces, or significant islands or island groups (p. 15)" for which floras are most commonly written. The bulk of the text is devoted to the descriptions of the standard floras, defined as the "current scientific work which yields the maximum information about the vascular plants of a given geographic unit (p. 12)." Frodin, however, does not limit himself to this rather restrictive coverage. With the aim of placing the standard floras into a historical perspective, he covers superseded floras, incomplete works, and many other ancillary publications. The descriptions of these are briefer, but still illuminating. References to taxonomic and floristic bibliographies are also included, as an aid to readers interested in descending deeper into the literature.

A typical entry includes the area ($km^2$) of the geographic unit, the number of vascular plant species, a brief historical account of its floristic literature, and citation of relevant bibliographies. Ongoing floristic efforts are also described. This is followed by the descriptions of the standard floras, with full bibliographic details, a concise description of their format and contents, and often some commentary. Distribution atlases, checklists, and works that have partial geographic or floristic coverage (e.g. woody plants) are subsequently described.

Most entries are accompanied by footnotes, which contain a significant amount of information. For example, the treatment of Division 1 (North America – north of Mexico) covers 99 pages, the notes fill another nine. I found myself reading the footnotes alone, for the fascinating historical details and biographical facts included.[1] It is clear that Frodin delights in what can be described as "botanical gossip," and the footnotes contain references to controversies, idiosyncrasies, and occasional hearsay (e.g. footnote 59, p. 717). Where else can one read about the floristic rivalries in Java and Illinois or the tortuous publication history and prospects for the completion of various unfinished floras?

Frodin cites published praise and criticism for many of the treated floras, but when that is lacking, he often adds his own evaluation of the works. To his credit, Frodin has examined almost all of them personally, clearly stating when he has not. Some of his strongest criticism is directed at works that are suspected of being "compiled," that is not based on original research and observations. In other instances he focuses on deficiencies of format (e.g. "too much white space" or "absence of illustrations") and editing lapses. Frodin is not overly generous with his praise, but he does characterize some works as "classic", "exemplary" or "truly significant" and points to others (e.g. California's Jepson Manual) as particularly successful formats that should be emulated.

The bibliographical and historical accounts are prefaced by three introductory chapters. The first describes the scope and structure of the work. The second chapter, "The evolution of floras" gives a fascinating account of the genre from the Renaissance to the present day (the 4th century Chinese text that is considered to be the oldest surviving flora is described under China). The third, "Floras at the end of the twentieth century: philosophy, progress, and prospects" should be required reading for all involved in floristic endeavors. Frodin stresses the fundamentally conflicting goals facing the flora writer: providing a means of plant identification accessible to all users vs. encyclopedic coverage of the plants of a region. His discussion of past and present failures and successes, and the differing challenges faced in temperate and tropical realms, is particularly insightful.

The book concludes with geographic and author indices, and two appendices that illustrate Frodin's passion for the process of information retrieval. One reviews the bibliographies, indices and library catalogs that cover the world floristic literature, and their relative utility in his own compilation. The other provides the abbreviations of serials cited. Consistent with Frodin's approach throughout the book, commentary is included, when "deemed necessary." Finally, a five page addenda fills in a few bibliographic omissions through 1999 along with "significant additions to the literature" published in 2000.

Frodin notes the popularity of the first edition (published in 1986) with reference librarians, and it is easy to see the reason for this. In its ability to recommend floras for any region of the world, this book is unequalled. In this capacity, it is useful to both librarians planning book purchases, and botanists planning excursions and expeditions. Furthermore, anyone who uses a flora can increase their appreciation and understanding of the genre by reading the introductory chapters and historical accounts. — Aaron Liston, Department of Botany and Plant Pathology, Oregon State University. listona@bcc.orst.edu.

[1] Following Frodin's approach, I will place my only criticism in a footnote: Cross referencing the notes to their original page would greatly assist browsers like myself.

**Handbook of Northwestern Plants**, revised edition. Gilkey, Helen M. and LaRea J.Dennis.2001. ISBN 0-87071-490-2 (paper), 494 pp. Oregon State University Press, 101 Waldo Hall, Corvallis, OR 97331-6407. -- This is a newly revised edition of a classic field guide to Washington and Oregon plants. Dr. Helen Gilkey," professor of botany and curator of the herbarium at Oregon State University, first published "A Spring Flora of Northwestern Oregon" in 1929, intended as she said "for botany students and individuals willing to use keys and learn basic scientific terminology". In 1947, she revised the work as a "Handbook of Northwest Flowering Plants" creating a year-round flora to appeal to a wider audience. A second edition appeared in 1951. In 1967 she and co-author, LaRea J. Dennis (then assistant curator of the herbarium) published a new edition with a new title "Handbook of Northwestern Plants" since it now included ferns and fern allies. Dr. Gilkey died in 1972, and further revisions of this book were done by LaRea Dennis in 1973 and 1980 to include many changes in nomenclature. In 1999, when the 1980 printing went out of print; this new edition was published to have the nomenclature conform to the latest scientific literature.

As in previous editions the geographic area covered "is roughly that of the rather natural floristic unit from the summit of the Cascade Range to the coastline of Washington and of Oregon as far south as the Umpqua Divide, about the southern limit of Lane County Oregon". The flora of northern Washington is excluded. It would have been helpful if an endpaper map was included.

Obviously, from the number of editions and revisions this book has been through, botanists, naturalists and interested laymen have found its keys workable and its coverage of species, while not entirely comprehensive, is adequate to make this very useful in the field. Not every species or genus is illustrated but there are usually one or two line drawings on each page. For illustrations of every species there is now the 5 volume Vascular Plants of the Pacific Northwest by Hitchcock et al. to turn to. Other floras covering this area are old and out of date; and recent popular guide books, though well illustrated with color photographs, do not cover enough species, or a large enough geographical area to make them practical.

The type faces selected make the book pleasant and easy to read; the keys to families, genera and species are simple with a minimum of technical language. Thirty years ago I lived in Idaho and botanized for twelve years, an easterner learning the western flora. I knew of the existence of this handbook, but did not obtain a copy at that time. If I were returning to the Northwest again I certainly would have a copy in hand and recommend it to anyone traveling to that part of the country. - Mary M. Walker, 14 Chestnut St., Concord, MA 01742-2609.

**Inventory of Rare and Endangered Plants of California (sixth edition)**. CNPS. 2001. Rare Plant Scientific Advisory Committee, D. P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA. 388pp. Softcover. ISBN 0-943460-40-9. $29.95+s/h. CNPS, 1722 J St, Suite 17, Sacramento, CA 95814, 916-447-2677, 916-447-2727 (FAX)—"For over 30 years, the CNPS Inventory of Rare and Endangered Plants of California has served as a forum for regular review of the status of rare plants by a broad body of field botanists and scientists, and as a means of bringing this critical information to the attention of our regulatory agencies as well as the concerned public."—David Tibor, CNPS Inventory Editor. This statement describes the purpose of the Inventory of Rare and Endangered Plants of California, one of CNPS's more important publications. This sixth edition is an update of the 1994 fifth edition with a much improved, easier to read format. The improvements are immediately obvious when you have the two editions side-by-side. Anyone working on the flora of California would want to have this book handy because it contains a wealth of information besides the lists of rare plants. For readers outside of California, several chapters would serve as terrific guides for other native plant societies, conservation groups, or state agencies in handling and developing rare plant data, policy, and research. This edition is better organized with some chapters moved from appendices to the main part of the text to improve flow. Most of the chapters are the same as those found in the fifth edition, but all have been updated. New additions include a chapter on rare Californian bryophytes by J. R. Shevock and an appendix that lists plants by common name. The chapters are organized into the sections Introduction to Rarity, State Level Policy, Federal Level Policy, and CNPS Guidelines and Policy. These are followed by the Inventory, the heart of the book. Each rare species is listed alphabetically with a summary of information including, scientific and common names, family, rarity codes (CNPS, R-E-D, CA state, and Federal), counties where each plant is found, a list of the USGS 7.5' quadrangle maps corresponding to range of the species, habitat with elevation, life form, blooming period, and any other notes on the biology of each species including threats and the citation for the original description. Taking a specific case, I compared the entries of *Delphinium luteum* (a federally endangered species I study) and in the new edition its entry reads much more clearly. Unlike in the fifth edition, CNPS now avoids awkward abbreviations, so readers will not have to flip to the inside covers or to the text as much to understand the entries.

There are several chapters that have a wider audience appeal. P. L. Fiedler's chapter on *Rarity in vascular plants* provides a clear and concise discussion of the definitions of rarity, the different forms of rarity, and potential causes of rarity. This chapter, accompanied with her and J. P. Smith Jr.'s *Bibliography for biology and conservation of rare plants*, provide a wealth of sources of pertinent literature that covers many aspects of plant conservation including: conservation biology, floras (but these are specific to California and the western US), floras of rare plants (again focusing on the western US), legal aspects, management, rare plant biology, and threats and values. *Conserving plants with laws and programs under the California Department of Fish and Game* by S. Morey and D. Ikeda is specific to California, but the information in this chapter could be used as a framework for other states or as a comparison for drafting legislation or missions for equivalent state agencies. J. A. Bertel et al.'s chapter on *The federal endangered species act and rare plant protection in California* is an excellent review of Federal-level definitions, protections, and processes involved with using the ESA to protect rare plants. The examples used are Californian plants, but the information is applicable in all states. In *CNPS botanical survey guidelines*, the issues of when a botanical survey is needed, who should do the survey, how they should do it, and what information should be collected are discussed and specific recommendations are made. Likewise, *CNPS policies and statements regarding rare plant*s discusses the specifics of mitigation, *ex situ* conservation techniques, plant collecting for education, collecting guidelines and documentation techniques, and nonvascular plants. These two chapters were written with California-specific legislation in mind, but they would serve as excellent models for developing such guidelines and policies in other states. Appendix VII is the CNDDB (CA Natural Diversity Database) California Native Species Field Survey Form that could serve as a model for groups developing a means for collecting such data. Although the sixth edition lacks the color photographs of rare plants, the line drawings by L. A. Vorobik scattered through out the book break up the text nicely. A digital version also exists (DOS only) for $195, with data updates ($95) required every 18 months.

Although I may be biased, from my involvement in updating data for this edition, anyone working with rare plants would find parts of this book useful. If you are running out of space in your personal library, I would strongly encourage your local library to obtain a copy.—Jason A. Koontz, Center for Biodiversity, Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, IL 61820.

**The Orchids of the Philippines.** Jim Cootes. 2001. ISBN 0-88192-516-0 (Cloth US$49.95). Timber Press, Portland, Oregon. – Author Jim Cootes has an intimate knowledge of the Philippine orchid flora having visited yearly since 1977 traveling throughout the islands of the archipelago in his search for plants. In addition, during preparation of the current volume, he has sought counsel from experts on orchids and from the orchid literature. All descriptions and photographs were made from living plants, many grown by the author or observed by him in the field. Cootes states the purpose of his book is for the

identification of Philippine orchid species: it does not contain descriptions of every native species. However, there is a checklist complete with binomials and authors, of all currently known Philippine orchid species.

Readers are oriented by a colored map showing the major islands of the Philippines chain followed by descriptions of the geography and physiography of the major islands and island groups. Climatic and floral zones are outlined with general habitat information. Major species in each floral zone are given as examples of what readers might be expected to find should they visit the area. A few paragraphs outlining how the book is to be used completes the introductory material.

Descriptions of orchids follow in alphabetical order for ease of location. Each described species is accompanied by a color photograph illustrating pertinent features for purposes of identification. Descriptions are loaded with useful information, details of which are seldom found consistently in similar works. Genera are always followed by fully spelled authors' names and an indication of the original source of the generic description is given. The meaning of the generic name is stated, the type of species given, the number of species noted, and the original place of publication appears followed by the meaning of the specific epithet. Species descriptions are thorough, and the habitat and distribution in the Philippines and elsewhere follow. Commonly there are notes referring to nomenclatural anomalies, especially interesting floral peculiarities, details of endemism, and observations on rarity, local distributions, and sometimes pollination syndromes and floral longevity.

A chapter on cultivation requirements completes the formal part of Cootes's book. There is a one-page glossary of terms, a list of references, and an elaborate appendix outlining the sections of the Philippine representatives of the genus *bulbophyllum* and *Dendrobium*, these two genera having the largest number of species among Philippine orchids. An extensive index to all species mentioned completes the volume.

Cootes's volume is an excellent introduction to the orchid wealth of the Philippines. It contains information of use to hobbyists and growers as well as to botanists. The consistency of data is a highlight of the work.

There are a few "bloopers" to be sure: *Grammatophyllum stapeliiflorum*is named for *Stapelia* because of "the resemblance of the blooms to some species of cactus" (*Stapelia* belongs to Asclepiadaceae) and *Appendicula buxifolia* is reported to have "grass-like foliage," instead of *Buxus*-like foliage. Pictures of flowers would have benefited by enlargement. But the few slips and photographic problems do not detract from the overall quality and accuracy of Cootes's efforts that are a genuine contribution to the orchid literature. – William Louis Stern, Department of Botany, University of Florida, Gainesville, FL, 32611.

**The Sunflower Family in the Upper Midwest. A Photographic Guide to the Asteraceae in Illinois, Indiana, Michigan, Minnesota and Wisconsin**. Thomas Antonio and Susanne Masi, 2001; ISBN 1-883362-11-3 (Hardbound, $48.00) 319 pp. The Indiana Academy of Science and the Chicago Botanic Garden. - - For many of us, finding the specific name for a local member of the composite family can be a very unpleasant task. The pocket field guides are too superficial, but the technical manuals require a careful examination of floral details that most of us would like to avoid. For amateur botanists, without good dissecting microscopes and unacquainted with the family's special terminology, this is an especially vexing problem. Worse yet, these damn comps are so colorful, and such a significant component of our midwestern landscapes, that they simply cannot be ignored. Finally, for those first venturing into the mysteries of this family (and some of the rest of us), here is a book that goes well beyond the field guides, but does not demand the expertise required to negotiate the technical literature. Clearly illustrating 150 species in the region, Antonio and Masi provide us with a colorful overview of our midwestern Asteraceae.

The book describes the family in a short introduction; keys, a glossary, pronunciation guide, listing of rare and endangered species, and references are in the back of the book. The body of the text covers the many species — grouped by flower color. Each species is given a double-page spread. On the left are the common and scientific names, together with a full-page image of the plant in its environment. The right-hand page gives a short description, habitat, flowering time, usefulness in the garden, range map, two or three small photos of floral or vegetative details, and a discussion that may cover a variety of subjects. Thus, each double-page spread gives a fine visual presentation of the species, concise and useful information, and a clear indication of its range throughout the upper Midwest. Both larger and smaller color photographs are effective in communicating what the species looks like in life. I cannot imagine a more "user friendly" approach to becoming aquainted with our midwestern composites.

However, there are a few caveats. At 26 cm by 19 cm in size, and with high quality paper, this book is not something you want to be adding to your backpack; it is heavy. And while a number of additional species are mentioned in the discussions, and over 300 species are covered in the keys, a substantial number of native and naturalized species are not illustrated. But overall, this is a splendid production. The design is clear and consistent, the photographs (by the senior author) are of outstanding quality, and the appendices provide ample ancillary information. Every library that intends to cover the natural environment of the Midwest should have a copy of this handsome book. — William Burger, Curator Emeritus, Department of Botany, The Field Museum, Chicago, IL 60605-2496.

**Trees and Shrubs of California.** Stuart, John D., and John O. Sawyer. 2001. ISBN 0-520-22110-9 (paper US$22.50) xii + 467 pp. + 40 color plates on 16 unnumbered pp. University of California Press, Berkeley. — This latest botanical entry in the handy California Natural History Guide series from UC Press covers just over 300 of the almost 700 native woody plants of the state and throws in just 7 naturalized species. Another 50 native species are mentioned briefly in remarks under related species. In its 400 pages of keys, descriptions, maps, and illustrations, it replaces some 550 pages in 5 predecessor guides that each treated only trees or shrubs alone in one of three more restricted regions: southern California, Sierra Nevada, and San Francisco Bay region. Both authors hail from Humboldt State University in northwestern California, a region not previously covered in the series. In the course of condensation, about 150 species treated in the previous books were dropped but 87 new species were added. Furthermore, descriptions here are fuller and more uniform than they were in the predecessor volumes and all species represented are keyed and mapped for the first time in the series.

I cannot say that I am terribly thrilled by these maps, however, which assign distributions to complete "ecological sections" of a U.S. Forest Service-derived "ecoregions" map of California, even if they occupy only a small corner of a section. The largely geophysically based mapping sections, part of a national hierarchical scheme, replace the more vegetationally oriented units of earlier plant guides, such as Introduction to California Plant Life, by Robert Ornduff (California Natural History Guide 35). On the positive side, these are the first published distribution maps for many species. Their relatively large size and the pre-established boundary lines make them unexpectedly easy to read. Having the naturalized species mapped along with the natives is a rare plus in a woody plant field guide. The line drawings, covering about two thirds of the included species, are all new and are generally effective at conveying the appearance of (usually) fruiting leafy twigs. The 40 color photographs, like those in previous volumes, contribute to the attractiveness of this guide but do little to enhance identification since those that are detailed mostly duplicate the features in the drawings.

If this guide had included all native woody species with the same level of detail presented here, it would have weighed in at very nearly a thousand pages — so much for a field guide. Hence some selectivity was essential or a book of the same size would simply have descended into little more than name-calling. What guided exclusion? Two categories often included in tree and shrub books were simply excluded *in toto*. One of these categories is that of subshrubs, which figure prominently in Native Shrubs of Southern California by Peter Raven (California Natural History Guide 15), but are not included in the tally of 700 woody species on which the estimate of 1000 pages was based. The other category is that of woody vines, which usually are included in tree and shrub guides and, unlike the subshrubs, could have been included here with profit and with little added length. Grape vines of *Vitis californica,* for instance, are rather conspicuous woody plants in much of California and have the added interest of a relationship with the state's major wine industry. For the rest of the omissions, conspicuousness, in one form or another, appears to be the major criterion for choosing some species over others. Thus trees fare far better than shrubs, with only a handful of rare species omitted, and these mostly denizens of the infrequently visited Channel Islands. Among the shrubs, those of the deserts are disproportionately ignored — but who can tell those twiggy, dried up bushes apart anyway? Within the deserts and outside them, more localized and rarer species are more likely to be left out. About 50 genera of shrubs, mostly small and mostly from the deserts, are left out entirely. Of the three largest woody genera in California, the second (*Ceanothus*, 42 species, 17 included) and third (*Ribes,* 31 species, 13 included) largest genera have about the same ratio of included species to the flora as a whole as the overall ratio for all woody species, while the largest genus, *Arctostaphylos,* is short changed with only 13 species out of 56. Perhaps this reflects the common prejudice that all manzanitas look alike.

There is a price to pay for omission, and that is that, using this book alone, you can never be sure that you have correctly identified any given shrub encountered (you are a little safer with a tree). For most of the genera that are included in the guide, the number of native species occurring in California is stated, so that you have a sense of what your chances are, except that you cannot even be certain that you have the right genus. More than one third of the shrub genera are missing and there is no indication of these in the keys, nor can you tell which families have genera missing. In fact, the families are recognized only in the checklist at the end. The genera (and species within them) are entirely alphabetical and devoid of familial affiliations within separate gymnosperm and angiosperm sequences.

On the whole, this book is suitable for the general audience for which it is intended. It has good compromise coverage of the native woody plants of the state, it is reasonably well-illustrated with nice drawings and photographs, and the keys are easy to use and are written in plain language that is tied to an illustrated glossary. It is standard field guide size and hence handy to take along on walks together with a bird guide. It could also be combined usefully with California Forests and Woodlands: a Natural History, by Verna R. Johnston (California Natural History Guide 58). Unlike most bird guides, this one does not include many of the naturalized aliens that are most prominent and conspicuous near the urban areas that house the majority of the people who are going to purchase it. How is the general user supposed to know whether a given bush is native or naturalized? Despite this, these users should still be able to identify the majority of the tree and shrub species that they encounter in any natural area near their homes. Good job. — James E. Eckenwalder, University of Toronto, Department of Botany, 25 Willcocks St., Toronto, Ont. M5S 3B2, Canada.

**Doing Science: Design, Analysis and Communication of Scientific Research**. Ivan Valiela. Oxford University Press 2001. ISBN0195134133 paperback 294 pages - Having taught a course in Scientific Communication for upper level undergraduates, I was very interested in reviewing this book, both for consideration as a textbook and as a resource for giving lectures. Valiela, a marine biologist, has assembled an interesting guide to the doing of science, drawing examples mainly from the environmental science/ecology literature. The book covers hypothesis testing, statistics, experimental design, writing, posters, talks, tables and figures, framed by some essays about the purpose of science and its role in society.

The first section of the book addresses a topic that is usually treated separately from issues concerning communication: hypothesis testing and statistics. Selecting this topic to lead the book is a very wise decision, as it forms the basis for what scientists do. Although these topics are critical, their treatment is characterized by a sometimes irritating mix of detail and generality. Although the author points out that "...this is not a book on statistics, but rather an introduction to principles (not to techniques) of doing science, " some details are more prominent than others. For example, explicit formulas for estimating mean squares for two-way ANOVAs under different model types are sandwiched between a very cursory discussion of fixed and random factors and an insufficient description of differences between Type I and Type II errors. The author is to be commended for including nonparametric and randomizing approaches in his discussion.

The next third of the book is devoted to speaking and writing about science, both in peer-reviewed papers as well as for grant proposals. The section on writing provides some important guidelines about streamlining scientific writing, along with some examples of common errors and some various ways to revise statements to make them more compelling. Unfortunately, the section reads more as a list of rules than as an essay on writing. This section is sprinkled with interesting tidbits about authorship, writing abstracts, the explosion of written communication, languages, and author order. The section on visual aids for talks and for the ways to set out posters is a bit skimpy, as the explosion of digital projectors and the prevalence of PowerPoint has brought bad design decisions to light more than ever.

The final third of the book is devoted to graphical aspects of scientific communication tables, figures, and critique of examples from the literature. An entire chapter is devoted to tables, which seems slightly unnecessary, but is amply compensated for by the excellent treatment of graphical methods to show data. Especially interesting is the "rogues gallery" of suboptimal figures, demonstrating graphs that could more effectively communicate their point. It would be valuable for these figures to be reworked in a better way, but this might make a good exercise in a classroom setting.

This book is generously sprinkled with interesting and relevant details and examples. Although it might not make a very good textbook, I will certainly use it as an important reference for future versions of my course.- Laura Hyatt, Department of Ecology and Evolutionary Biology, State University of New York at Stony Brook, Stony Brook, NY 11794-5245 email: lhyatt@life.bio.sunysb.edu

**Gregor Mendel & The Roots of Genetics**. Edelson, Edward. 2001. ISBN 0-19-515020-1 (Paper US$11.95) ISBN 0-19-512226-7 (Cloth US$24.00) 105 pp. Oxford University Press, 198 Madison Avenue, New York, NY 10016-4314. – Part of the "Portraits in Science" Series, this book is targeted toward readers in middle school through lower-division undergraduate. It does a very good job of providing a brief biography that places Mendel into the perspective of his time and situation and emphasizes those factors that enabled him to succeed with his science. For precisely these reasons it is also useful for those of us who teach students at these levels. It provides a succinct historical background that will help us relate Mendel's work to our students. For instance, everyone knows that Mendel was a monk and eventually became abbot of his monastery, but I did not appreciate the incentives that drove him - - to provide a stimulating intellectual life freed "from the bitter struggle for existence." As another example, I knew that he did not pass his teaching certification exams, but this was several years after he entered the monastery where his primary assignment was to teach classics and mathematics at a local school. As a result of this failure he was sent to the University of Vienna for two years to study natural history and prepare to retake the exams. He studied plant physiology and cytology with Franz Unger and physics with Christian Doppler (Doppler effect). He also met Karl Naegeli and began a correspondence that lasted for years. It was not just the famous pea genetics paper that Mendel sent to Naegeli and that went unappreciated, but in fact, much of what we know of Mendel's lifetime of work is based on letters exchanged with Naeglei. This includes genetics experiments on other plant species as well as other work in natural history. The final two chapters go beyond Mendel's life to the rediscovery of his work at the turn of the 20th century and the discovery of the chromosomal, and ultimately molecular, basis of inheritance. The book would be good supplemental reading for any introductory biology course (for both students and instructors!). – Marshall D. Sundberg, Department of Biological Sciences, Emporia State University, Emporia, KS 66801.

## Books Received

If you would like to review a book or books for PSB, contact the Editor, stating the book of interest and the date by which it would be reviewed (1 February, 1 May, 1 August or 1 November). Send E-mail to sundberm@emporia.edu, call or write as soon as you notice the book of interest in this list because they go quickly! Ed.

**Andre Michaux in Florida: An Eighteenth-Century Botanical Journey.** Taylor, Walter Kingsley and Eliane M. Norman. 2002. ISBN 0-8130-2444-7/ (Cloth US$39.95). 288 pp. University Press of Florida, 15 NW 15th St., Gainsville, FL 32611-2079.

**Artemesia**. Wright, Colin W. (ed.) 2002. ISBN 0-415-27212-2 (Cloth US$65.00) 344 pp. Taylor & Francis Books Ltd. Thompson Publishing Services, Cheriton House, North Way, Andover, Hampshire, SP10 5BE. United Kingdom.

**Crop Improvement: Challenges in the Twenty-First Century.** Kang, Manjit (ed). 2002. ISBN 1-56022-905-5 (Paper US$41.96) 389 pp. Food Products Press, 10 Alice Street, Binghamton, NY 13904-1580.

**The Cycads.** Whitelock, Loran M. 2002. ISBN 0-88192-522-5 (Cloth US$59.95) 532 pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**The Desert Smells Like Rain**. Nabhan, Gary Paul. 2002. ISBN 0-8165-2249-9. (Paper US$16.95) 148 pp. The University of Arizona Press, 355 E. Euclid, Ste. 103, Tucson, AZ 85719.

**Dirr's Trees and Shrubs for Warm Climates: An Illustrated Encyclopedia**. Dirr, Michael A. 2002. ISBN 0-88192-525-X. (Cloth US$69.95) 448 pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**The Environmental Effects of Transgenic Plants: The Scope and Adequacy of Regulation.** National Research Council. 2002. ISBN 0-309-8263-3. (Cloth US$49.95) 320 pp. National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20055.

**The Evening Garden: Flowers and Fragrance from Dusk till Dawn.** Loewer, Peter. 2002. ISBN 0-88192-532-2. (Paper US$17.95) 272 pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**Experimental Design and Data Analysis for Biologists.** 2002. ISBN 0-521-81128-8 (Cloth US$110.00) ISBN 0-521-00976-6 (Paper US$45.00) 537 pp. Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211.

**A Field Guide to Tropical Plants of Asia.** Engel, David H. and Suchart Phummai. ISBN 0-88192-542-X (Paper US$19.95) 280pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**Generic Tree Flora of Madagascar**. Schatz, George E. 2001. ISBN 1 900347-82-2. (Paper) 477 pp. Royal Botanic Gardens, Kew and Missouri Botanical Garden, 4344 Shaw Blvd., St Louis, MO 63110.

**Handbook of Plant Growth: pH as the Master Variable.** Rengel, Zdenko (ed). 2002. ISBN 0-8247-0761-3 (Cloth US$175.00) 446 pp. Marcel Dekker, Inc. Cimmaron Road, P.O. Box 5005, Monticello, NY 12701-5185.

***In vitro* Plant Breeding**. Taji, Acram, Prakash Jumar and Prakash Lakshmanan. 2001. ISBN 1-56022-908-X. (Paper US$29.95) 167 pp. Food Products Press, Inc. 10 Alice Street, Binghamton, NY 13904-1580.

**The Jepson Desert Manual: Vascular Plants of Southeastern California**. Baldwin, Bruce, G., Stevbe Boyd, Barbara J. Ertter, Robert W. Patterson, Thomas J. Rosatti, and Dieter H. Wilken (eds), Margriet Wetherwax (managing ed.). 2002. ISBN0-520-22775-1 (Paper US$35.00) 640 pp. University of California Press, 2000 Center St., Suite 303, Berkeley, CA 94704.

**The Lessening Stream: An Environmental History of the Santa Cruz River.** Logan,

Michael F. 2002. ISBN 0-8165-1586-7 (Cloth US$35.00) 320 pp. The University of Arizona Press, 355 S. Euclid Ste. 103. Tucson, AS 85719.

**Methods in Comparative Plant Population Ecology**. Givson, David J. 2002. ISBN 0-19-850562-0 (Paper US$45.00) 344 pp. Oxford University Press, 2001 Evans Road, Cary, NC 27513.

**Mints: A Family of Herbs and Ornamentals.** Lawton, Barbara Perry. 2002. ISBN 0-88192-524-1 (Cloth US$27.95) 272 pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**Molecular Analysis of Plant Adaptation to the Environment.** Hawkesford, Malcolm J. and Peter Buchner. 2001. ISBN 1-4020000-162. (Cloth US$88.00) 276 pp. . Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands.

**Molecular Systematics and Evolution: Theory and Practice**. DeSalle, R., G. Giribet and W. Wheeler (eds) 2002. ISBN 3-7643-6544-7 (Cloth EUR 104.00) 320 pp. Birkhauser Verlag AG, Viaduktstrasse 42, CH-4051, Basel, Switzerland.

**Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants.** Prasad, M.N.V. 2002. ISBN 1-402004680 (Cloth US$147.00) 432 pp. Kluwer Academic Publishers B.V. P.O. Box 989, 3300 AZ Dordrecht, The Netherlands.

**Plant Pathogenesis and Resistance**. Huang, Jeng-Sheng. 2001. ISBN 0-7923-7118-6 (Cloth US$230.00) 691 pp. Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands.

**Plants and People of Nepal.** Manandhar, Narayan P. 2002. ISBN 0-88192-527-6. (Cloth US$69.95) 636 pp. Timber Press, Inc. 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527.

**Plant Roots: The Hidden Half (3rd ed)**. Waisel, Yoav, Amram Eshel and Uzi Kafkafi. 2002. ISBM 0-8247-0631-5 (Cloth US$175.00) 1120 pp. Marcel Dekker, Inc. Cimmaron Road, P.O. Box 5005, Monticello, NY 12701-5185.

**Plant Viruses as Molecular Pathogens**. Kahn, Jawaid A. and Jeanne Dijkstra (eds). ISBN 1-56022-895-4. (Paper US$59.95) 530 pp. Food Products Press, 10 Alice Street, Binghamton, New York 13904-1580.

**Significance of Gluthathione in Plant Adaptation to the Environment.** Grill, Dieter, Michael Tausz, and Luit J. De Kok. 2001. ISBN 1-40200-178-9. (Cloth US$87.00) 262 pp. Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands.

**Transgenic Plants and Crops**. Khachatourians, George G., Alan McHughen, Ralph Scoraza, Wai-Kit Nip and Y.H. Hui (eds). 2002. ISBN 0-8247-0545-9 (Cloth US$225.00) 876 pp. Marcel Dekker, Inc. Cimmaron Road, P.O. Box 5005, Monticello, NY 12701-5185.

**Triggerplants**. Darnowski, Douglas W. 2002. ISBN 1-877058-03-3. (Paper) 92 pp. Rosenberg Publishing Pty Ltd. PO Box 6125, Dural Delivery Centre, NSW 2158, Australia.

**Westcott's Plant Disease Handbook, 6th ed**. Horst, R. Kenneth. 2001. ISBN 0-792386-639 (Cloth US$299.95) 1008 pp. . Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands.

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