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To begin this issue it is timely to reflect on some of the challenge presented to the BSA membership in the very first article published in *Plant Science Bulletin* 1(1):1-4, 1955. In "The Challenge to Botanists" Sydney S. Greenfield, Chairman of the Committee on Education, rued that "On the whole, botany has not kept pace with the expansion of the other sciences, and in some cases there has been a decline if not an elimination of botany from the curriculum. . . With regard to the general public, we need to stimulate and conduct presentations of interesting news items and stories that will lead to widespread understanding of the significance of plants and plant studies." The *Plant Science Bulletin* was seen as a tool that could help to remediate the problem.

Professor Greenfield passed away in April of this year.

The feature article in this issue is in the spirit of promoting public appreciation of plants, and hopefully will serve as an additional incentive for you to participate in Botany 2003, July 26-31 in Mobile, Alabama..

Our annual meeting brings us to within an hours drive of the "Charm Spot of the Deep South." This is a fitting appellation for the beautiful Bellingrath Gardens and Home on the Isle-Aux-Oies (Fowl) River near Theodore, Alabama. The site of the gardens was originally a semi-tropical jungle and Spanish moss-draped live oaks still tower over the formal plantings in many of the gardens, along the trails, and around the Great Lawn. The Camellia Arboretum, containing more than 1000 varieties, is said to be the most complete collection of its kind in the world.

I hope you enjoy this brief biography of the founders and history of the development of the Bellingrath Gardens and Home. -editor

Walter and Bessie Bellingrath

The year 2003 brings a centennial of the arrival to Mobile of one of its most generous citizens of the 20th century, Walter Duncan Bellingrath. Mr. Bellingrath moved from Montgomery, AL to establish Mobile's Coca-Cola bottling franchise that year. Although that franchise dates to 1902, little had been done with it before Walter Bellingrath arrived in town.

Mobile in 1903 was a prosperous city. New construction downtown had brought the Bienville Hotel (1900), the Masonic Temple (1901) and the new City Bank Building was nearing completion on Royal Street under a new architect in town, George B. Rogers.

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Mr. Bell located his one man operation on Water Street and hit the pavement trying to get restaurants, general stores and saloons to carry bottled Coca-Cola. There were numerous soft drinks on the market and what is now America's most popular soft drink was largely unknown outside larger metropolitan areas where soda fountains originally were the only source for the beverage.

Slowly but surely business picked up. At first Walter Bellingrath was a one man operation. He would sterilize the bottles and refill them using a foot-powered machine to affix the metal crown caps. He would pack them in wooden cases and haul them in a mule drawn cart to their destination, pick up the empty bottles for refill and head back to Water Street. The hours were long and it was an uphill battle to get many retailers to even try a bottle.

Bessie Morse Bellingrath

By 1905 Mr. Bell had been able to set up an office in his bottling plant and hired a stenographer, Bessie Morse. They were married the following year. Mr. Bellingrath always credited her with his success in life while adding that God had been very good to him.

The newlyweds set up housekeeping in a rented cottage on St. Anthony Street. By the end of the decade the couple had purchased a large house at 60 South Ann Street in a house built by architect George B. Rogers. Mr. Bellingrath wrote his mother soon after their move that their new home was in one of the best newer sections of town and that he was very proud of it.

In 1910 a new Coca-Cola plant was constructed on the northeast corner of Royal and St. Anthony streets. The two story brick building had every modern convenience and newspaper ads invited Mobilians to see the sanitary conditions where "the contents of a bottle of Coca-Cola never come in contact with human hands." This building had the distinction of being the first in the south constructed for the sole purpose of bottling Coca-Cola and related beverages.

Following Doctor's Orders

World War I meant wartime shortages of sugar, a key ingredient in Coca-Cola syrup. Mr. Bellingrath had worked hard to get his customer base established only to have a short supply of his product. The stress took its toll on his health, and he went to see his physician, Dr. Paul McGehee.

Bayou Boardwalk

Dr. McGehee's father had been minister to the Mr. Bellingrath's inlaws over at St. Francis Street Methodist and apparently the two knew each other well by 1917. Mr. Bell had mentioned during the exam that he had come across an abandoned fishing camp down on the Fowl River which he would like to purchase but just couldn't swing it. The young doctor looked at his patient and said he had the diagnosis: "Learn how to play."

The bottler was puzzled until the physician admonished him to go and buy that fishing camp and relax. His health problems would improve with a little fishing and quiet. That advice was all an anxious Bellingrath needed and he bought his camp.

Walter Bellingrath purchased a piece of property on a bluff overlooking Fowl River which contained two run down camp houses. With the help of his father-in-law, Capt. Sewell Walker Morse, a retired shipwright, the cabins were repaired and made ready for company.

As the twenties arrived Coca-Cola sales skyrocketed. The sales of bottled Coca-Cola in the United States rose 65 per cent between 1923 and 1928, and have surpassed fountain sales ever since. Mr. Bell was one of the first bottlers to introduce the six-pack carton and his then revolutionary idea of heavy marketing in the winter to promote Coca-Cola as a year-round beverage was copied by other bottlers around the country.

The fishing camp was called "Bellecamp" and became the scene of houseparties for the Bellingraths and their guests. A generator was eventually installed which gave the couple lights but water for many years had to be hauled from a riverside well in buckets.

The First Bellingrath Garden

The garden at 60 South Ann became so filled with flower beds that Mr. Bellingrath purchased a vacant lot behind the house and extended the driveway to Bradford Avenue. Large specimen azaleas were hauled in and attractively placed in a well clipped lawn.

When word spread about the beautiful garden behind the house the couple generously told Mobilians that they were welcome to drive through to admire it and such a drive became a Sunday ritual for many families. During the height of azalea blooms the Bellingraths often had to station a household servant in the drive to help untangle traffic!

It wasn't long before the flower beds at 60 South Ann were filled to capacity but that didn't slow Bessie Morse Bellingrath as she collected a growing number of large and unusual old azaleas from Mobile and Baldwin counties. The overflow began to trickle south to "Bellecamp" with excellent results.

In 1927 the Bellingraths returned from a lengthy European tour. After touring numerous gardens and estates in England and on the Continent, Mrs. Bellingrath was determined to create a country estate from the fishing camp. She hired George B. Rogers to assist in an over all plan for the Fowl River property and his relationship with the Bellingraths would last nearly twenty years until his death in 1945.

right: Courtyard, Bellingrath Home

The original camp house had already been replaced by the "Lodge" with a stone fireplace and cathedral ceiling in the early twenties. Rogers developed a series of flagstone pathways radiating away from the structure and covered a muddy artesian well with the Fountain Plaza. Water is carried by gravity down to the riverfront where it cascades down through the Grotto which was completed on February 28, 1931.

The Public Discovers the Gardens

By the following Spring the property was prepared to host a national garden club group and Mr. Bellingrath invited Mobile to come out the following day to enjoy the azaleas. The city of Mobile turned out in anything on wheels to come and see the estate everyone had been talking about. Roads were jammed and the city police reportedly had to be called to assist county authorities in untangling the traffic.

Oriental Garden

Walter and Bessie Bellingrath were astounded at the turnout. They had visited Charleston and enjoyed its ancient Magnolia Gardens and recently opened Middleton Place and decided to give the Gulf Coast its own version of these famed gardens. In 1933 a small admission was charged and for the first two years the gardens were only open in the Spring.

By 1934 the couple announced that the gardens would be open twelve months. That meant that they would spend a great deal more time at their river retreat and they decided to build a year-round residence.

The Bellingrath Home

Architect George B. Rogers had laid out the gardens with fountains, a lake and bridge, conservatory and waterfront grotto. The couple asked him to design a new home to be built to the north of the Lodge. He termed the structure "English Renaissance" noting that it was a design incorporating the various architectural styles developed along the Gulf Coast. The fifteen room house was completed in 1935 and contains 10,500 square feet.

Mrs. Bellingrath had been collecting antique furniture, silver and crystal for many years but her shopping increased as her home neared completion. She traveled often to the better shops along New Orleans' famed Royal Street as well as being assisted by antiques dealers across the deep south. According to Mrs. Bellingrath's nephew, Ernest Edgar, Jr., these purchases were always made by check. Each check was made payable to "cash" so Mr. Bell was always in the dark about what an item cost!

Years later when Mr. Bellingrath was asked by garden visitors how much all of that beauty had cost his response was the same: "I don't know and I hope I never find out."

Bessie Morse Bellingrath died in February, 1943 and was laid to rest at Magnolia Cemetery near her parents, a brother, and nephew. She had ordered the handsome granite enclosure from the McNeel Marble Company of Marietta, GA which billed her the sum of $4,475.00 in 1940. After her death Mr. Bellingrath completed the columned backdrop to this impressive space. The six fluted columns reportedly cost $6,000 each, although no invoice has been uncovered to verify this sum.

Mr. Bellingrath surmounted this monument with "Bellingrath-Morse" to give the honor due to his late wife whom he was always quick to give credit for his beloved Gardens to his dying day. "These Gardens were my wife's dream," he would say, "and I always wanted to make her dreams come true."

A Foundation is Formed

Shortly after his 80th birthday in 1949, Walter Bellingrath set up a foundation. Having had no children he was determined to find a way to protect his wife's dream for the enjoyment of the public. He transferred his assets into the non-profit trust with

any profits not needed for the upkeep of the gardens and home to benefit Central Presbyterian Church, St. Francis Street Methodist Church and Southwestern College at Memphis (now known as Rhodes College), Huntington College in Montgomery and Stillman College in Tuscaloosa.

His choice of beneficiaries reflected his deep Presbyterian roots and honored his wife's family who were Methodists. The foundation was charged to maintain his beloved gardens and magnificent home "as a fitting memorial to my wife."

Just days after his 86th birthday in August of 1955, Walter Duncan Bellingrath died. His funeral took place at Central Presbyterian and he was interred beside his beloved wife.

Today the only memory of the Bellingraths within the city of Mobile is the impressive lot at Magnolia Cemetery. Mr. Bell's Coca-Cola plant was torn down for the new F.B.I. headquarters. The handsome house at 60 South Ann Street which the couple took such pride in, was demolished for a church expansion. Only the impressive carriage house survives, surrounded by a vacant lawn where thousands of Mobilians once admired the blooms driving everything from Model-T's to Packards.

Bellingrath Gardens and Home stands as a tribute to a remarkable couple whose fortunes changed Mobile for the better. In 1938 a bronze plaque was secretly installed at the Gardens and when the couple returned from a New Orleans trip they discovered hundreds of people waiting on them. That plaque, dedicated to the couple reads in part,

Erected in grateful appreciation by their fellow citizens in recognition of ***Their faithful and untiring effort for the up-building of Mobile***

-Tom McGehee

Photos with permission of the Bellingrath-Morse Foundation.

r. Bellingrath and Architect, George B. Rogers (far in hand), at groundbreaking for the Bellingrath home in 1935.

News from the Society

Botanical Society of America 2003 Darbaker Prize in Phycology

The Botanical Society of America is accepting nominations for the 2003 Darbaker Prize in Phycology. This award is presented for meritorious work in the study of microscopic algae, based on papers published by the nominee during the last two full calendar years (2001-2002).

The award is limited to residents of North America, and only papers published in the English language are considered.

Nominations for the 2003 award should include a list of all of the nominee's work to be considered for the 2001-2002 period, and a statement of the nominee's merits addressed to the committee.

Nominations for the 2003 Darbaker Award should be sent by June 1, 2003 to:

Robert Bell
Department of Biology
University of Wisconsin-Stevens Point
Stevens Point, WI, 54481
fax (715) 346-3624
email rbell@uwsp.edu <mailto:rbell@uwsp.edu>.

2003 Botanical Society of America Outstanding Young Botanist Award Recipients

A. Certificate of Special Achievement

Name	Institution
Berger, Brent	Oklahoma City University
Bernacki, Steven	James Madison University
Budke, Jessica	Miami University
Cacho, Ivalu	National Autonomous University of Mexico
Carrino, Sarah	Miami University
Chapman, Eric	Miami University
Dozier, Melissa	Carleton College
Estes, L. Dwayne	Middle Tennessee State University
Hoggard, Tim	Rhodes College
Hsu, Eric	Cornell University
Keogh, Matt	Rhodes College
McGinty, Meghan	Univ. of California, Davis
Melillo, Amanda	Virginia Tech
Millar, Katherine	Southern Illinois University, Carbondale
Millet, Benjamin P.	Truman State University
Mulac, Kitty	University of Akron
Raines, Steven	Miami University
Ramsey, Amy	University of Oklahoma
Root, Heather	Cornell University
Roth, Kelly	Miami University
Ryerson, Kirsten	University of Colorado, Boulder
Schenk, John	Oregon State University
Smith, Steven A.	Sarah Lawrence College
Theiss, Katherine	Willamette University
Wacholder, Brent	Eastern Illinois University

B. Certificate of Recognition

Name	Institution
Boutin, Alison	Miami University
Elam, Caitlin	The University of the South
Hatfield, Emerin	Willamette University
Hesselbrock, Sharon	Miami University
Hugie, Josie	Miami University
Kester, Lauren	Chatham College
King, Brian	Miami University
Kominskey, Emily	Truman State University
Lewis, Robin A.	Miami University
Meyers, Stephanie A.	Miami University
Nagy, Eric	Miami University
Neubig, Kurt	Louisiana State University
O'Brien, Sean	Southwestern University (Texas)
Tyson, Jon	Miami University
Weaver, Scott	Ohio University
Wright, Justin	Miami University

News from the Sections

Botany In Flux At ASB 2003

During the 64th annual meeting of the Association of Southeastern Biologists (ASB) in April, co-sponsored by the Southeast Section of BSA, a symposium brought forth the familiar themes of plant blindness, zoochauvanism and plant neglect while raising questions about the future of field botany.

The symposium **"The Crisis in Field Botany: Loss of People and Knowledge"** began with a look at the past through an historical retrospective: Lawrence Stritch asked the audience to look back at their botany teachers, to the teachers of those teachers and so on, back as far as **Carolus Linneus** if possible**.** He suggested we examine our own botanical lineage, insisting that this knowledge of predecessors would help us understand our present roles but more than that it would help us see "our responsibility to ensure that the next generation of field botanists who will replace us will have the opportunity to find an institution of higher learning and the botanists from which to learn their craft" (Stritch 2003). Wayne Owen of the USDA discussed preparing for a career in field botany. He stressed the importance of communication skills, especially for dealing with broad audiences of varying backgrounds that are so prevalent in bureaucratic institutions today. He also noted the importance of good partnership management skills for any well prepared field botanist, saying that "your success is often influenced by the degree to which the public-at-large and the local community value botanical resources" (Owen 2003). Marshall Sundberg described how the preliminary results of his own work showed a decrease in the number of botany departments and botany classes in colleges and universities. He challenged listeners to respond with more data to help complete the picture. He noted that, while botany graduate students are down from 1968, the number is up since 1980 and asked where these new interests might lie. Dr. Sundberg warned of the upcoming retirement of this generation of botany teachers, reminding the audience that the teacher is likely one of the most critical variables in influencing students' interests and the career path that they pursue. Two other talks of interest in the symposium mentioned the need for well-trained field botanists in the profit and nonprofit sectors. Mary Klein, speaking for NatureServe, a non-governmental conservation organization based in Arlington, Virginia, said that "field experience is critical" with plant identification being the most important issue, and said "it is much harder to fill job openings now than it was a decade ago" (Klein 2003). Dennis Michael sounded a similar note, insisting that the field botanists who make the decisions must be able to apply their knowledge quickly, given the pace of dealings in the world today, and not take ten years to run controlled studies. "The front line decision makers need to have the knowledge and experience of the old time field botanists that were part taxonomist, part ecologist, part naturalist, and full time communicators" (Michael 2003). He brought up the point of a deficiency of botany programs again, asking the audience where these people would be trained. Mr. Michael rounded out the light tone of the day-long meeting by playing George Jones' country-western hit song "Who's Going to Fill Their Shoes?"

"The Crisis in Field Botany" differed from other symposia at the conference because it ended with an hour-long round-table discussion that allowed presenters to address more questions and give the material more context. Most seemed pleased with the results of the symposium.

The Potential Newcomers

Even as the discussion continued in the "Crisis" symposium, it was difficult to see a "crisis"in other areas of botany, at least by looking around other rooms at the conference. Perhaps the crowds were a little bigger in some of the "Animal Biology-Ecology" talks. Maybe. There was a healthy enthusiasm at all of the botanical poster sessions and paper presentations.

The ASB conference, with its relatively easy-going atmosphere, proved to be a good place for the young researcher to build experience presenting and there were numerous young researchers to take advantage of that opportunity. Botanically oriented themes included: listing and mapping invasive species' ranges, habitat boundary assessment, various species response to fire, clonal structure and somatic mutation, chemical attractants, conifer cones from the Cretaceous and demographics of particular endangered species, just to mention a small part of an excitingly varied patchwork.

All these talks exuded energy and enthusiasm and none were "dry, complicated and uninteresting," as has been suggested of botany in general by *American Biology Teacher* columnist Maura Flannery (Flannery 1987).

Concluding Remarks

Perhaps the most obvious missing thing at the conference was the presence of these newcomers in the conference's three symposia dealing with

botany - or *all five* symposia in general. While there were many young scientists embracing botanical topics in paper presentations and poster sessions, the audiences in the symposia were a mix of older academics and other professionals. Perhaps this was because these symposia were scheduled as large groups of longer talks and so may have been less inviting. Or perhaps it was because the symposia were scheduled at the same time as the poster sessions, some paper presentations and a few of the field trips.

The Association of Southeastern Biology's 64th annual meeting, held in Washington, DC, may have been, in some small sense, a reflection of what was discussed at the "Crisis in Field Botany" symposium: perhaps there has been a drop in pure botanical interest as a result of zoochauvanism and plant blindness among other causes, in that many paper presentations with botanical themes had an ecological or genetic thrust to the research. Regardless, many good questions did result.

-Mark Lewis
hemlockmark@hotmail.com

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In Memoriam:

William Louis Culberson 1930-2003.

It is with great sadness that I report the death of William Louis Culberson, distinguished Lichenologist, prominent botanist, and treasured friend of us all. He fought cancer for several months and died in his sleep with his beloved wife, Chicita, at his side on February 8, in Duke University Hospital. He was 73.

Bill received his B.S. degree at the University of Cincinnati, influenced greatly by E. Lucy Braun and Margaret Fulford, who steered him into Lichenology. He studied at the Université de Paris, where he received an M.S. (Diplômé d'études Supérieures) and a Ph.D from the University of Wisconsin, where he worked with John Thompson. Before coming to the Department of Botany at Duke University in 1955, he was a post-doctoral at Harvard University.

Bill had the good fortune to meet Chicita in a German class at the University of Cinciinnati and they both were overwhelmed with each other. He persuaded her to come to Wisconsin and get an M.S. in chemistry while he pursued his Ph.D., which she did. This was the beginning of an incredible collaboration in lichen chemistry and taxonomy. It was more than a simple collaboration: it was a union of old-fashioned love and scientific talents. I don't think either could have had the success they

produced without the other. They were a remarkable team in all respects.

I won't detail all of Bill's honors, There are many. He was President of the Botanical Society of America and the American Bryological and Lichenological Society and was editor of both journals of the two societies. He taught lichenology for many years at Duke and inspired students in many other fields. A note from Marshall Crosby is typical of the responses: "His lichen class was one of the best courses I took at Duke, and he helped tremendously with my developing interests in editing and bibliography." Bill was a linguist. Unlike most American scientists, he was fluent in French and German. He knew Latin and wrote all of our Latin diagnoses. I don't know what we will do without him.

What many of you might not know about Bill was his dedicated interest in all aspects of horticulture and gardens. He was director of the Sarah P. Duke Gardens for 20 years and greatly expanded and improved it, notably by the addition of a magnificent Asiatic garden, now named for him. He rescued it from an ordinary Kodachrome garden to a real Botanical Garden! In addition to these outside activities, Bill produced more than 100 scientific papers in lichenology and among other things, wrote a beautifully written article for each issue of Flora, the Garden's publication. It is hoped that these articles will be put together in a book.

Bill is survived by his wife, Chicita, and a family of devoted friends in the Department of Biology at Duke University. A commemoration will be held at the Sarah P. Duke Gardens at a date to be announced. Donations can be made to the Gardens or to the American Cancer Society.

Please grieve with us. Sincerely. - - Lewis Anderson.

Sydney S. Greenfield, 1915-2003.

I am saddened to report the death of Professor Sydney S. Greenfield. Professor Greenfield died on April 1st in Jersey City after a long battle with abdominal cancer. He was 87. He is survived by his sister, Pearl Goldman of Berkeley, California; two nephews, Robert Goldman of Berkeley and Stephen Goldman of Culver City, and three great-nephews.

Professor Greenfield was born on November 28, 1915 in Brooklyn. He graduated from Brooklyn College, where he earned the designation Fellow in Biology. He taught Biology at the Harlem Evening High School while pursuing his graduate work at Columbia University. For his masters program, he followed several lines of research including "Responses of Seedlings to Heteroauxin" and "Comparison of morphology and anatomy of *Dryopteris* hybrids with parental species".

Professor Greenfield completed his doctoral dissertation at Columbia under guidance of Professor S. F. Trealease, one of the pioneers in plant physiology. Greenfield's dissertation was entitled: "Effects of inorganic compounds on the inhibition of photosynthesis in *Chlorella.* After defending his dissertation, Greenfield assumed the position of Research Associate in Botany at Columbia, where he continued his research with Professor Trealease on the effects of selenium and sulfur on plant growth. This work led to a number

of classic publications in the field of inorganic nutrition of plants.

In January of 1946 Greenfield joined the faculty of the University of Newark, which became a part of Rutgers University in June of 1946. Upon joining the faculty, Professor Greenfield was single-minded in pursuing his goal of developing a strong program in botany in Newark. He continued his research on selenium and selenium /sulfur interactions in plant growth and development in a laboratory at 40 Rector Street, the old Ballantine brewery. Indeed, it was Professor Greenfield who established the concept in Newark of the researcher as teacher. His work from Rutgers was widely recognized and resulted in numerous monographs and publications in scientific journals.

However, so many of us will recall Professor Greenfield for his teaching. Shortly after arriving in Newark, Professor Greenfield assumed responsibility for the introductory biology classes, which he shared with Professor John Keosian, who was, of all things, a zoologist. Professor Greenfield soon developed a comprehensive botany program here. He introduced the first botany courses in Newark and he developed a comprehensive undergraduate botany major, still being offered for our undergraduates. He designed courses that stressed the relationship between plant structure and function. He also took great interest in developing new and innovative courses including Economic Botany. Professor Greenfield earned a richly deserved national reputation for his outstanding botany teaching.

As an active member of the Botanical Society of America and a tireless advocate for the teaching of botany, Professor Greenfield chaired the Botanical Society's Committee on Education. He was a founder and Editor of the *Plant Science Bulletin*, a publication of the Botanical Society. He chaired the Committee on the Role of Botany in American Colleges and Universities, whose primary responsibility was to advocate for the importance of botanical education in the liberal arts colleges and to fight for the preservation of the plant sciences at colleges and universities in the United States. Professor Greenfield gave numerous lectures to national organizations, including the American Association for the Advancement of Science, the Torrey Botanical Club, the American Institute of Biological Sciences, the National Education Association, and the Council for Basic Education.

Professor Greenfield was also engaged in the Newark community. As a resident of the city until the mid 1980's, Professor Greenfield served on the Cultural Affairs Committee of the Newark Chamber of Commerce. For many years he served on the Newark Cherry Blossom Festival Committees. As an active member of the New Jersey Academy of Sciences, he was a driving force behind the plan, still a dream, for a state Botanical Garden in Newark. He curated a major exhibition and lecture at the Newark Public Library entitled "The Eternal Garden, from Ancient Time to the Great Botanical Gardens of Today."

In 1984 Professor Greenfield retired from the faculty, however he continued to teach his beloved Economic Botany course (and to infect undergraduate students with his fascination and love of plants) until 2001, marking 55 years of teaching at Rutgers-Newark. Up until this January, Professor Greenfield was frequently seen on campus attending seminars and talking with faculty and graduate and undergraduate students. He was strongly committed to encouraging young people to follow careers in botany. Through his generosity, the Sydney S. Greenfield Botany Fellowship was established. This fellowship is awarded annually by the plant biology faculty of the Department of Biological Sciences to encourage our brightest students to pursue careers in botany through graduate study. There have been eight recipients of the Greenfield Fellowship and it is a fitting legacy to Professor Greenfield and the tradition of botany at Rutgers-Newark.

Charming, tenacious, witty, but most of all committed, Professor Sydney S. Greenfield was one of the dynamic founding fathers of the Rutgers-Newark campus.

-Edward G. Kirby, Professor of Botany and Acting Dean of Faculty

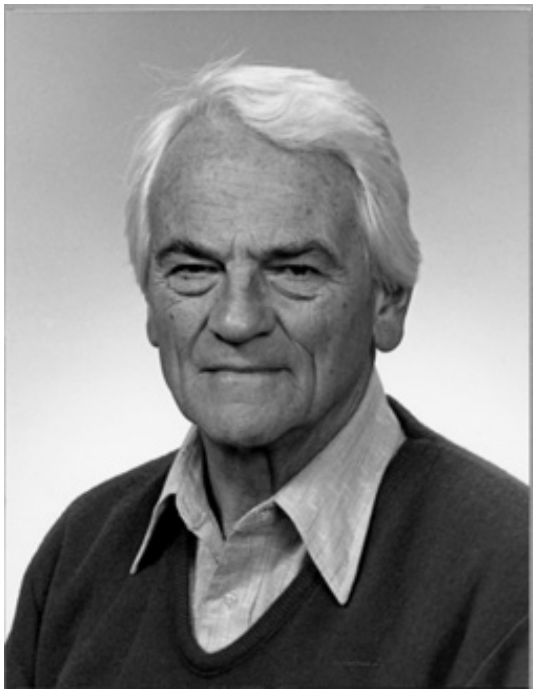
Charles Heimsch 1914-2003

Charles Heimsch, one of the pillars of the Botanical Society of America, died in Moscow, Idaho, on 23 April 2003; he was born in Dayton, Ohio, on 4 May 1914.

Heimsch graduated from Miami University with a Bachelors in Botany (1936), while excelling in football and golf, and from Harvard University with a Masters (1939) and Ph. D. (1941) in Botany. After a post doctoral period on a Harvard Traveling Fellowship at the University of California at Berkeley, he started his academic career at Swarthmore College from 1942-46, the last two years of which he spent on a National Defense Research Committee (Office of Scientific Research and Development) in Washington, DC. After a year at Amherst College, he then taught for 13 years at the University of Texas in Austin where he was promoted to Professor in 1953. In 1959, he responded to his alma mater's call (especially from Ethel Belk) for a chairman of Botany at Miami University and led the department beyond the renowned bachelor's program and masters program into a doctoral program and more than doubled the number of faculty; the first Ph. D. was granted to John Byrne, Charlie's student. He retired in 1981 as an Emeritus Professor, although he continued to teach part-time for several years. In his honor, there is a Charles Heimsch Conference Room in Pearson Hall on Miami's campus and a Charles Heimsch Graduate Award in Botany at Miami. He also received Miami's Benjamin Harrison Award for his national contributions to higher education.

Charlie was very actively involved in the BSA, serving as Treasurer (1963-64), Vice-President (1971), President (1972), Program Director (1979-1981), and Editor-in-Chief of the American Journal of Botany (1965-1969). He was named a BSA Merit Award Winner in 1985 and received a special commendation in 2002. He was clearly one of the stalwarts of the Society for parts of 8 decades, 1930s, 40s, 50s, 60s, 70s, 80s, 90s, and 2000s. In the past year, at age 88, he was helping the Society in a fund raising capacity.

The students he either influenced or directed at bachelor, masters, and doctoral levels



included Arif Hayat, Billy Cumbie, Fred Rickson, Karl Mattox, Terry Webster, Pat Paden Phillips, Calvin Smith, Tom Taylor, Graves Gillespie, John Byrne, Jim Seago, Russell Camp, Deepa Biswas, Mike Harrington, Eric Young, Joe Armstrong, Ed Tschabold, Tom Pizzolato, and Lynn Libous, among others. During his years at Miami, he taught general botany, plant anatomy, and an early course in economic botany. He carried his long interest in teaching over to his Botanical Society endeavors, and he was long known for attending sessions of the General, Developmental, and Developmental & Structural sections at the annual meetings, which he rarely missed. He was a coauthor of a talk on teaching plant anatomy given at the 1946 BSA meetings (Livingston and Heimsch, 1946, abstract) and coauthored one of the first plant photo atlases for teaching (Lee and Heimsch 1962). Students, in particular, could count on his presence – through his last meetings in Madison, WI, 2002.

Charlie's research in systematic plant anatomy began with wood anatomy (e.g., Heimsch and Wetmore 1939, his first published research article; he used Jr. in those early years), and his major work followed shortly thereafter (Heimsch 1942). His research expanded into both developmental and systematic studies of roots in the late 1940s. He made a mark in root biology with two early papers. His study on barley root tissue development became a standard (Heimsch 1951). However, a little paper (Heimsch 1960), which he actually started many years earlier, on tomato root cortex development as related to phloem position initiated a host of studies by others on the relationship between nutritional supply and root growth and by his own graduate students on the root apical meristem and cortex development (e.g., Hayat and Heimsch 1963; Byrne and Heimsch 1970; Armstrong and Heimsch, 1976; etc.). This tomato research was also part of a much larger study that he had started sometime before 1956 on the patterns of root apical meristem organization in dicots. The first full report of the systematic root meristem study was finally presented in 2002 by former student, Jim Seago, at the BSA meetings in Madison, WI, with coauthor Charlie in attendance. Charlie had worked with Seago on the draft of the manuscript for this research as recently as November 2002.

Charlie was an avid golfer, maple syrup producer, and ardent Miami alumnus, but most of all Charlie loved his family (Richard, Carolyn, and Alan, six grandchildren and three great grandchildren) and botany.

Donations may be made to the Charles Heimsch Memorial Fund at the Miami University Foundation, 725 E. Chestnut St., Oxford, Ohio, 45056.

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Armstrong, J. E., and C. Heimsch. 1976. Ontogenetic reorganization of the root meristem in the Compositae. American Journal of Botany 63: 212-219.

-James L. Seago, Jr. and Joseph E. Armstrong with help from Richard Heimsch, Thomas N. Taylor, Hardy Eshbaugh, and others.

THE RUPERT BARNEBY AWARD

The New York Botanical Garden is pleased to announce that Jason Alexander, currently a graduate student in the Department of Botany & Plant Pathology, Oregon State University, is the recipient of the **Rupert Barneby Award** for the year 2003. Mr. Alexander will be studying the systematics of various species of *Astragalus* in the western United States.

The New York Botanical Garden now invites applications for the **Rupert Barneby Award** for the year 2004. 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 2004. 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, 2003. 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.

Klemmer Named Manager, Center for Teaching and Learning, Chicago Botanic Garden

Cindy Klemmer has been appointed to the position of manager, Center for Teaching and Learning, at the Chicago Botanic Garden. The new Center for Teaching and Learning consolidates the staff, expertise and resources of the former departments of School and Teacher Services, and Youth and Family Programs. In her new position, Klemmer is responsible for the development, delivery and evaluation of the Chicago Botanic Garden's educational programs for school students, teachers and youth, both on-and off-site.

Klemmer recently completed her Ph.D. from Texas A&M University, where she conducted research assessing the effect of school gardening programs on the science achievement of elementary students. While there, she also served first as garden programs facilitator and later as county horticulturist for Texas A&M's Department of Horticultural Sciences and the Texas Agricultural Extension Service. She also has an M.S. in public horticulture administration from the University of Delaware through the Longwood Graduate Program, and a B.S. in horticulture from Texas A&M University.

As children's education coordinator for the Massachusetts Horticulutral Society, Klemmer coordinated the popular Plantmobile school outreach program and children's programming for the New England Flower Show. She also has been a consultant for the award-winning "Texas Prairie Adventure" at the Dallas Arboretum and an outdoor children's exhibit, "Secrets of the Garden," at Longwood Gardens, Kennett Square, PA.

She currently serves as co-chair of the education committee of the American Association of Botanical Gardens and Arboreta. Klemmer is a contributing author for the Junior Master Gardener Golden Ray Series, Youth Handbook and Leader Guides and has written several articles for the Boston Globe Newspaper in Education supplements. She resides in Lake Forest, Ill.

OREGON STATE BOTANIST NAMED DIRECTOR OF NASA'S FUNDAMENTAL SPACE BIOLOGY PROGRAM

Terri Lomax, a professor of botany at Oregon State University, has been appointed director of the Fundamental Space Biology Division at NASA. The division, which she will direct for the next 2-4 years, is a $150 million annual research program that studies the effects of space on the physiology, development and function of living organisms. Lomax most recently served as director of OSU's Program
for the Analysis of Biotechnology Issues and has conducts research on the role of gravity in plant growth.

"I'm overwhelmed to be selected for a position such as this," Lomax said. "It's especially exciting right now, because with the upcoming completion of the space station, NASA is committed to a renewed emphasis on space science, and this division is responsible for much of the agency's biological research. It will be a great opportunity to help plan good research projects, develop new technologies and be involved in federal policy development."

The fundamental space biology program Lomax will head examines gravity's role in the evolution and development of terrestrial organisms and ecological systems, as well as how plants and animals, especially humans, react and adjust to the effects of different gravity levels. It may address questions about cellular processes in space, the physical effects of space flights on organisms, or the role of gravity in life on Earth.

The Wintergreen Nature Foundation

Programs for summer, 2003. All programs are held at Trillium House at Wintergreen Resort in central Virginia's beautiful Blue Ridge.

Contact The Wintergreen Nature Foundation for more information or to register by phone.

Phone: 434-325-7453
Fax: 434-325-6701
Email: info@twnf.org
www.twnf.org <http://www.twnf.org/>

Native Landscape Gardening in the Blue Ridge
June 14th 9:00am to 5:00pm
$50 members, $60 non-members

Participants will become familiar with both woody and herbaceous plants for zones 5 and 6 as well as a variety of habitats. Discussions will include plant combinations, soil composition, and natural pest and disease control. The goal is to explore the use of native plants in producing a low maintenance garden that will provide year round beauty. Included will be tours of established gardens and the opportunity for the group to design a garden on an undeveloped site.

Joan Albiston is a registered landscape architect in Charlottesville, VA. Her firm, Albiston Associates, creates landscape designs for private and multifamily residential, commercial, municipal and non-profit projects throughout central Virginia.

Ian Robertson, Ltd. is a well established landscape design and horticultural consulting firm in Charlottesville. Ian designed the Flagler Perennial, Minor, Streb and the West Island Garden at Lewis Ginter Botanical Garden in Richmond. He is also an instructor in horticulture at Piedmont Virginia Community College.

Discover the World of Lichens and Bryophytes
June 28th 9:00am - 4:00pm and
June 29th 9:00am - 2:00pm
$90 members, $100 non-members

Virginia's flora consists of at least 3,500 species or varieties of vascular plants. Not included in this count are the nonvascular plant and plant-like organisms like mosses, algae, mushrooms and lichens. These groups, if included in the flora would up the number of flora by several thousand species. Learn about two of these groups that are visible year round; the lichens and the bryophytes. Saturday will focus on the lichens of Virginia and Sunday will be an introduction to the world of mosses, liverworts and hornworts. Participants will learn the basics of lichen life histories and identification techniques, then see species in the field. Bryophytes will be introduced Sunday with a discussion of structures, habitats and identification. The book Lichens of West Virginia is recommended for the lichen class, and can be purchased at the shop at Trillium House.

Dean Walton is a field biologist for the Virginia Natural Heritage program of the Department of Conservation and Recreation. He also serves on the Flora of Virginia Project advisory board.

The Story of Ferns and Fern Allies

August 16 9:00am - 4:00pm and
August 17 9:00am – 1:00pm
$90 members, $100 non-members

Join us for a comprehensive discussion and exploration of Virginia's ferns and fern allies. Teaching materials will include plants in the field as well as local and regional herbarium specimens. In addition todemonstrating gross and microscopic diagnostic criteria for each of the fern families, participants will take a detailed look at fern reproduction and the genesis of hybrids.

Graham Stevens is a former TWNF botanist with particular expertise in the Spleenwort family.
Chip Morgan is a botanist and member of the Flora of Virginia Project Board with responsibility in compiling information on ferns and fern allies within Virginia.

Chicago Botanic Garden/ Royal Botanic Gardens Partner in Global Seed Bank Program Millennium Seed Bank Project, Kew, London

The United States' flora is the fourth most threatened in the world. Twenty-three globally endangered or threatened plant species occur in the Upper Midwest. Many more species are rare, with fewer than 20 populations throughout the region. Plants are fundamental to the existence of humankind, yet thousands face extinction.

Armed with technologically efficient laboratories and botanists having nearly 75 years of combined training in plant conservation science, the Chicago Botanic Garden has signed on as the latest partner in the Millennium Seed Bank Project with Royal Botanic Gardens, Kew, London. Other members of the international collaborative represent Western Australia, Burkina Faso, Chile, Egypt, Jordan, Lebanon, Saudi Arabia, Kenya, Madagascar, Mexico, Namibia and South Africa. U.S. participants include the Ladybird Johnson Wildflower Research Center in Texas and the U.S. Bureau of Land Management, Washington, D.C.

The Chicago Botanic Garden's charge: collect and safeguard the seeds of all tallgrass prairie plants indigenous to the Midwest - an estimated 1,500 species, including Echinacea purpurea (Purple coneflower) and the prairie grass, Andropogon gerardii (Big bluestem). At the heart of the Millennium Seed Bank Project is a human drive to safeguard the world's plants for generations to come. The brainchild of Kew's Seed Conservation Department, the project already has successfully secured the future of virtually all the United Kingdom's native flowering plants and aims to collect and conserve 10 percent — more than 24,000 species — of the world's seed-bearing flora, principally from drylands, by 2010.

Seed is collected on expedition "in the field" according to strict scientific protocols after botanists first locate the plants. The Garden's botanists are experts with knowledge of temperate plants of the region, and are familiar with the area's locations of specific species. The seeds are then sent to England, where they are stored at minus 20 degrees Celsius, deep in huge underground vaults in the Wellcome Trust Millennium Building at Wakehurst Place in West Sussex. This preserves each seed's unique characteristics and ensures its prolonged viability. In addition to collecting seed, the Garden is conducting research in collaboration with Kew, including testing the viability of seed and determining if an environmental factor where a seed was collected affects its ability to survive in storage. The Garden also conserves seeds in its own laboratories, thereby building its collection, and supplies Midwestern seeds for banking to the National Center for Genetic Resources Preservation in Fort Collins, Colo.

"Although diverse and healthy plant communities are necessary to support human life, plant diversity throughout the world is in jeopardy," says Kayri Haves, Ph.D., director of the Garden's Department of Conservation Science and Institute for Plant Conservation Biology. "The Conservation Science program at the Chicago Botanic Garden is part of a fascinating international effort to address this problem through research and education." For more detail on plant conservation science initiatives at the Chicago Botanic Garden, visit the Garden on the Web at www.chicagobotanic.org/research/conservation <http://www.chicagobotanic.org/research/conservation>. For background on the Millennium Seed Bank Project, log onto the Royal Botanic Gardens Web site, www.rbgkew.org.uk/msbp/index <http://www.rbgkew.org.uk/msbp/index>. For a complete list of U.S. imperiled plants conserved at botanic gardens, visit the Center for Plant Conservation's Web site, www.centerforplantconservation.org <http://www.centerforplantconservation.org>.

GLOBAL SUMMIT ON MEDICINAL PLANTS (GSMP) ; Mauritius - 2003

Nearly all centuries from ancient times have used plants as a source of medicine. Many people in the modern world are turning to Herbal medicine. The use of Traditional medicine and other Alternative Therapies for the maintenance of good Health has been widely observed in most countries. Traditional medicine is rich in domestic recipes and communal practices. The recent upsurge in the use of Herbal Medicines has led to enormous commercial possibilities, but many issues remain unresolved. Today, many medicinal plant species face extinction or severe genetic loss, but detailed information is lacking. For most of the endangered species, no conservation action has taken place. In the present context, an International Summit on Medicinal Plants will be a forum for scientists, researchers and policy makers to meet and discuss the key areas of conservation of medicinal plants, health care and Ethnomedicine etc.

Century Foundation and Bangalore University have great pleasure to host the Global Summit on Medicinal Plants in Mauritius Island with the support of Mauritius Research Council, WHO, Ministry of Tourism, Air Mauritius etc. from September 25th - 30th , 2003. at MARITIM HOTEL, Mauritius.

The main Theme of the Conference is 'Recent Trends in Phytomedicine and Other Alternative Therapies for Human Welfare'.

The Island of Mauritius which is the venue of the conference is unique in its Flora and Fauna. The flora is composed of 700 species of indigenous plants, of which about 300 are endemic to the region. Several endemic and indigenous species are used in the Traditional medicines. Traditional Knowledge in Mauritius is an Important source of income , food and health care locally. However many endemic plants in Mauritius are on the verge of extinction. Hence there is a need to promote the Revitalization and use of local health Traditions of ethnomedicine in the region and share the benefits derived from traditional knowledge with the Global community.

Mauritius with its multicultural population, suitable tropical climate, beautiful sandy beaches and green vegetation is a paradise island and its efficient communication infrastructure and regular airline connections with Asia, Europe, Africa and Australasia is an ideal location for this Global Summit.

This conference will draw attention to the vital importance of medicinal Plants and Other Therapies in Health care. There will be exciting programmes of plenary lectures, oral and Poster presentations and round table discussions. In addition to the scientific events, there will be opportunities for social interactions at the welcome reception and cultural events and programme of local visits.

We, on behalf of the Organizing Committee, welcome you to participate in this eventful Global summit on Medicinal Plants from September 25th - 30th , 2003 in Mauritius. Also, you are requested to nominate people from your institution /department so as to enable them to disseminate latest information on the sustainable utilization and cultivation of Medicinal plants.

For Registration and preliminary information on the summit please visit our website: www.cenfound.org/global/global.html

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The Seventh International Organization of Paleobotany Conference

The Seventh International Organization of Paleobotany Conference will convene in Bariloche, Argentina, March 21st through March 26th, 2004, at the Llao Llao Hotel and Resort on the Andean Range. The VII IOPC will be opened to all people interested in fossil plants as well as those scientists linked to plant biology and geology disciplines. For additional information, please check the meeting web page at www.iopc2004.org or well contact the organizer at info@iopc2004.org

Symposium Focuses on Sustainable Landscape Design Chicago Botanic Garden, July 31

Landscape professionals will learn practical realities and innovative solutions for sustaining landscapes dominated by native plants and natural plant communities at a School of the Chicago Botanic Garden symposium on July 31, 2003.

The "Sustainable Landscape Design" symposium is appropriate for professionals who design, install and maintain landscapes, as well as for site planners and engineers, large property owners and land managers seeking a better understanding of the benefits of designing landscapes with the entire ecosystem in mind. The program will focus on technical issues and case studies through roundtable discussions and lectures by experts including Debra Shore, editor, Chicago Wilderness magazine; Joyce Powers, restoration ecologist, Prairie Ridge Nursery, Mt. Horeb, Wis.; and Nancy Strole, clerk of Springfield Township, Ill. Topics will include the regulatory aspects, construction and maintenance, and design and stewardship of sustainable landscapes. Audience members also will be invited to share their stories and experiences.

The Garden is one of the premier sources in the United States for the continuing development of conservation, design or horticultural skills for professionals. Most programs are approved for continuing education units (CEUs) from professional organizations. The "Sustainable Landscape Design" symposium qualifies for CEUs from the following organizations: Association of Professional Landscape Designers, 2.5 CEUs; and Illinois Landscape Contractors Association, 5 CEUs.

Early registration runs through June 24. The symposium, from 9 a.m. to 3:30 p.m., costs $109 for Chicago Botanic Garden members; $137 for nonmembers.
Registration after June 24 is $129 for Chicago Botanic Garden members; $162 for nonmembers. For more information or to register, call (847) 835-8261, or visit the Garden's Web site at www.chicagobotanic.org/symposia. Registration deadline is July 24.

XVII IBC 2005
XVII International Botanical Congress
Vienna, Austria, Europe

Austria Center Vienna
18 - 23 July 2005
Nomenclature Section
13 - 16 July 2005
UNI-CAMPUS Hörsaalzentrum
http://www.ibc2005.ac.at
e-mail: office@ibc2005.ac.at

General Information
The XVII International Botanical Congress (XVII IBC) takes place 2005 in Vienna, Austria. It is being organized by the IBC Organizing Committee, the Society for the Advancement of Plant Sciences and the Vienna Medical Academy, with support from many societies related to Plant Sciences, as well as universities, research institutions, and private sponsors. The XVII IBC is held under the auspices of the International Association of Botanical and Mycological Societies (IABMS) of the International Union of Biological Sciences (IUBS).

Purpose
The XVII IBC, like all its precursors, will be a major convention of scientists from around the world. The XVII IBC will be a centennial meeting, 100 years after the 2nd modern IBC Vienna in 1905.

Registration
Registration is open to any person interested in any field related to plant biology. Payment of the registration fee allows entrance to all sessions, exhibitions and receptions; it will also include receipt of all congress documents and abstract publications. Reduced fees will apply to students and to scientists from developing countries.

Congress Site
The Austria Center Vienna is a large and attractive building with all modern facilities to support large international meetings.

Duration of the XVII IBC:
Scientific Sessions and Ceremonies July 18 - 23 (Monday - Saturday) 2005. The **Nomenclature Section** will be held during July 13-16 (Wednesday - Saturday) 2005 at the UNI-Campus "Neues Hörsaalzentrum".

Congress Highlights
The congress will convene at the Opening Session on Monday, 18 July 2005, with welcoming ceremonies and plenary lectures. The Scientific Program, and commercial and other exhibitions

will take place from Monday through Saturday. Scientific events will end daily at 18:30 leaving evenings free for Society or social meetings, or for the many cultural events and attractions that Vienna has to offer.

The Scientific Program
In the tradition of previous IBC Meetings, the Scientific Program of the XVII IBC will consist of Plenary Lectures, Symposia (consisting of oral and poster sessions), Society or Association Meetings, New Media Presentations, and Discussions and Workshops. All participants (plenary speakers excepted) will be limited to one oral or poster presentation.

Scientific Disciplinary Areas:
1. Cell Biology and Molecular Genetics
2. Genomics, Proteomics, Metabolomics
3. Structure and Development including Functional Aspects
4. Botanical Diversity, Systematics
5. Population Biology
6. Plant-/Eco- Physiology, Biogeogenic Cycles
7. Phytochemistry (basic and applied)
8. Ecology, Environment; Conservation Biology
9. Human Society and Plant Sciences
10. Natural Resources, Biotechnology, Economic Botany
11. Knowledge sharing Databases, Bioinformatics,Electronic Communications, Education

Language:
The official language is English. No simultaneous translation will be provided.

Excursions
Various pre-, mid- and post-Congress excursions will be offered.

Collections
The botanical collections in Austria are exceptionally rich. W and WU (Vienna), GJO and GZU (Graz, 150 km from Vienna) and LI (Linz, 180 km from Vienna) contain together 6,000,000 herbarium specimens including more than 500,000 types. Make use of the opportunity to visit these collections!

Deadline for symposium proposals: 30 September 2003
All prospective participants are invited to submit a proposal for a Symposium fitting within one of the Disciplinary Areas. Proposed symposia that bridge two or more disciplinary areas are also welcome and encouraged.

All authors (oral contributions and posters) will have to supply abstracts, the deadline for which will be announced in the Second Circular.

Proposals or questions regarding the Congress should be sent to:
Dr. Josef Greimler
Secretary General
XVII IBC 2005
Institute of Botany, University of Vienna
Rennweg 14
A-1030 Vienna, Austria
e-mail: office@ibc2005.ac.at
Phone: +43-1-4277-54123
Fax: +43-1-4277-9541
To receive the Second Circular, please fill out the following registration form and return it (preferably electronically) to the Secretary General

GRANTS FOR BOTANICAL GARDENS AND ARBORETA

The Stanley Smith Horticultural Trust invites applications for grants up to $20,000 for education and research in ornamental horticulture. Not-for-profit botanical gardens, arboreta, and similar institutions are eligible. The deadline for applications is August 15, 2003. For guidelines, contact Thomas F. Daniel, Grants Director, SSHT, Dept. of Botany, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118, USA (email: tdaniel@calacademy.org; tel. (415) 750-7191).

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Book Reviews

In this issue:

Anatomy of the Monocotyledons IX. Acoraceae and Araceae. Keating, R. C. 2002. ISBN 0-19-854535-5. (Hardcover 125.00 £.) 855 photomicrographs in 115 plates, 327 pp. Oxford University Press, - This long awaited work by Rich Keating, Professor Emeritus at Southern Illinois University at Edwardsville and Research Associate at the Missouri Botanical Garden**,** is a wealth of information on the family Araceae. It is the 9th in a series of works on anatomy of the monocotyledons with earlier volumes treating the Gramineae, Palmae, Commelinaceae-Zingiberales, Juncales, Cyperaceae, Dioscoreales, Helobeae (Alismatideae) and Iridaceae.

The work provides a glossary of tissue types along with abbreviations used for different morphological features and an extensive introduction dealing with numerous aspects of vegetative growth and morphology, germination and growth, reproductive morphology (inflorescences, pollen and pollination, fruits, seeds and embryos), paleobotany, chromosomes, biogeography, chemistry including thermogenesis and finally ethnobotany. A review of anatomical literature covers general sources, tissues (xylem, phloem, laticifers, secretory tissue and glands), cellular inclusions (starch, crystals, silica and various protrusions), leaves (venation, cuticle and blade surface, epidermis, mesophyll and special ecological features), stems and roots. The comprehensive literature cited at the end of the book is probably the most complete list of literature ever published on anatomy and related subjects for Araceae and Acoraceae, making it an important feature of the book.

The introduction also discusses the anatomical character state transformations and their potential use in phylogenetic analysis , discussing in turn collenchyma and sclerenchyma tissues and a summary of the trends of specializations in morphological features. This summary is one of the most interesting parts of the book because here Keating presents evolutionary trends of specialization in 24 different anatomical features. Later he makes use of these trends in specialization to assist him in making decisions regarding his own new suprageneric system of classification.

In one part of the introduction Keating summarizes different systems of suprageneric classification including that of Grayum (1990), Bogner & Nicolson (1991), Mayo, Bogner & Boyce (1997) and Keating from the present volume. Keating's own classification table also summarizes some of the distinguishing leaf and petiole characters.

The final portion of the introduction deals with molecular phylogenetic studies and a comparison is made between the strict consensus tree of French et al. 1995 with the classification of Keating (2001) based on anatomical, morphological and molecular data. The system is based entirely on monophyletic groups.

In a section entitled 'Histological and Character State Definitions for Vegetative Shoot and Root Anatomy of Araceae' Keating defines, illustrates, and compares all the characters recorded in the remainder of the work. The characters used included leaf structure (venation, midrib shape, trichomes, cuticle, epidermis, stomata, hypodermis, mesophyll, air cavities, collenchyma, vascular bundles and sclerenchyma), secretory ducts (laticifers, tannin cells, starch granules, crystal-bearing cells), raphide-bearing cells (druses, prismatic crystals and crystal sand), stems and roots.

The remainder of the book systematically reports the anatomical investigation of the Acoraceae and Araceae, by tribe and by genus, with each summarizing the anatomical features and listing the relevant literature for each. A total of 855 detailed photomicrographs in 115 plates exemplify the various anatomical features. The photomicrographs are of great quality and clarity.

An excellent summary at the end of the book lists all the genera in which certain diagnostic features occur. This enables one to make comparisons between genera.

This quarter century effort by Rich Keating has produced a work that has been long awaited but well worth waiting for. It will rank as one of the greatest achievements in aroid literature and owing to its breadth and detail will be valuable to a broad audience. - Thomas B. Croat, Missouri Botanical Garden, St. Louis, MO USA

References

Bogner, J. & D. H. Nicolson. 1991. A revised classification of Araceae with dichotomous keys. Willdenowia 21: 35-50.

French, J. C, M. Chung, & Y. Hur. 1995. Chloroplast DNA phylogeny of Ariflorae. Pp. 255-275. In: P. J. Rudall, P. J. Cribb, D. F. Cutler & C. J. Humphries (eds.), Monocotyledons: Systematics and Evolution. Royal Botanic Gardens, Kew.

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Keating, R. C. (in Press). Revised outline of the Genera of Araceae. Missouri Botanical Garden Monographs.

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The Earth's Biosphere: Evolution, Dynamics, and Change. Smil, Vaclav. 2002. ISBN 0-262-19472-4 (Cloth US$32.95) 346 pp. The MIT Press. 5 Cambridge Center, Cambridge, MA 02142-1493. - The term 'biosphere' was first coined by Eduard Suess (1831-1914), an Austrian geologist, in 1875. This was at a time when the earth "system" was being described as a set of concentric specialized spheres, from the earth's core to the top of the atmosphere. Suess originally defined the 'biosphere' as the zone at the surface of the lithosphere (the earth's crust) where plants' roots are in the soil to feed and at the same time a part [of the plant] is in the air to breath. However, by today's nomenclature, this is entirely too narrow a definition. The scientist to expand on this concept of biosphere, and, thus, the progenitor of the contemporary model, is Vladimir Vernadsky (1863-1945). This book describes the current extent of the earth's biosphere, as roughly extending from the upper level of the troposphere, about 900 km (birds have been known to fly that high), to about 2+ km deep in the ocean (whales have routinely dive that deep) to possibly 7 km subsurface (bacteria have been detected in boreholes). This book is at first a testament to Vernadsky and his research and ideas and, secondly, the interconnectivity of "life" within the earth's biosphere.

Thus, the earth's biosphere is that zone where life exists, from the microbial to the human, and this book admirably presents this complex tableau. In language tailored to the knowledgeable reader, Smil begins with the formation of life, as it is proposed for earth. Then, he offers us the broad scope of evolution; how environment affected "life", how "life" affected the environment and how "life" affected "life". His presentation is populated with numerous illustrations, graphics, and photographic material supporting his analyses. He validates his discussion with copious references as nearly 40 pages of citations attest. However, he cuts a broad swath across many disciplines and theories, such as biophysics, chemistry, plant science, ecology, environmental science, and just about every "fill-in-the-prefix"-ology there is. Unfortunately, there is a noticeable lack of mathematics. Which may, or may not, have been deliberate in order to attract the non-specialist. No equations are on hand to corroborate statements or relationships. There are plenty plots and graphs, but offers no explanation on what generated them, except to cite a reference. Smil has collected together a great deal of information and has strung it together as if it were the established model. Although, the parts seem to be well cited from the literature and, assumingly, reliable, his linkages and logic should be considered carefully. Finally, in his Epilogue, the reader is severely scolded and we are lectured on the consequences of overpopulation and other human stresses on our environment, the only biosphere we have.

Included is an assortment of appendices, providing tabular data ranging from biochemistry cycles to estimates of the biosphere's phytomass. The book is a good read, although it lacks some scientific rigor. *The Earth's Biosphere* is appropriate for most general academic and public collections and would be suitable for undergraduates and other informed readers. - Peggy Dominy, Sciences Librarian, Hagerty Library, 33rd & Market Sts., Drexel University, Philadelphia, PA, 19104

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Fenugreek: The genus *Trigonella*. Petropoulos, Georgios A., ed. 2002. ISBN 0-415-29657-9 (Cloth US$95.00) 200 pp. Taylor and Francis, Inc., 29 West 35th Street, New York, NY 10001. – *Trigonella foenum-graecum*, referred to as fenugreek in English-speaking countries, is possibly one of the oldest medicinal plants known to humankind. Fenugreek seed have been found in the tomb of Tutankhamun (entombed around 1325 B.C.) and the plant was mentioned by Hippocrates (470 – 410 B.C.). *T. foenum-graecum*, like other members of this genus, contains a wide array of biologically and/or pharmacologically active steroids, polyphenolics, and volatiles in its leaves and seeds. It has been used successfully as a forage crop thanks to the nutritional value of its leaves, and several industrial uses have been realized for the galactomannans (polysaccharide mucilage) in its seeds. These and other aspects of the phytochemistry, agronomy, and industrial applications of fenugreek are covered in **Fenugreek: The genus *Trigonella***, a recent volume in the series: **Medicinal and Aromatic Plants – Industrial Profiles** (Roland Hardman, Series Ed.).

Following the introductory chapter, which gives an overview of the cultivated regions, plant uses, and research activities relevant to *Trigonella*, the book provides detailed chapters on: Botany,

Physiology, Cultivation, Breeding, Nutrition and use of fertilizers, Pests and diseases, Weeds, Chemical constituents, Pharmacological properties, and Marketing. Several authors have contributed to this volume, with the book editor authoring or co-authoring four of the 11 chapters. As with many books that have multiple contributors, there is some degree of overlap amongst chapters, especially with respect to the overriding theme of medicinal properties, but each chapter does stand alone and provides unique material on its topic. A good inclusion of black and white photographs, figures, and tables complements the text; one page with four color plates also is included, but it is unfortunate that these plates are all duplicated images of photos already presented in black and white. Each chapter has its own reference list. A relatively comprehensive index is included at the end of the book.

Coverage on some topics is rather weak, such as the chapters on Weeds and on Pests and diseases, but most of the other chapters are quite thorough. Although the book is primarily focused on fenugreek, the cultivated species, the Botany chapter branches out and provides a nice overview of the taxonomy and distribution of the *Trigonella* genus. Topics relevant to seed and reproductive biology, such as pollination, seed development, germination, or yield, are covered in several chapters. Medicinal uses also are referred to throughout the book, but the chapter on Pharmacological properties provides the most comprehensive and scientifically supported presentation on this topic. It also is a good source of literature citations pertaining to the potential health benefits of fenugreek. Many references in this chapter are from medical and pharmacological journals, while other chapters more frequently cite non-refereed herbal books. The Phytochemistry chapter offers an excellent, easy-to-read presentation of the diverse chemical compounds found in fenugreek, and includes numerous chemical-structure figures that were greatly appreciated.

There are some minor problems and inconsistencies in the book. SI (Système International) units are not used throughout all the chapters, and in some cases (e.g. Nutrition and fertilizers) the contributing author repeatedly jumped from SI to non-SI units within the same paragraph, or even within the same sentence. There are a few numerical errors (e.g. pod diameter on pg. 12), occasional misplaced decimal points, and some Tables contained abbreviations that were not defined in the Table legend or text. Overall, however, most of the chapters appear to have been well edited for consistency.

This book is recommended to plant scientists in several disciplines, including general botany, agronomy, physiology, biochemistry, and systematics, to health science researchers interested in phytoactive compounds, and to industry scientists concerned with food ingredients and natural products applications. College and university libraries, particularly those serving students and faculty with interests in alternative crops or medicinal botany, should obtain a copy. Although the book contains no genomic information on *Trigonella*, researchers working in legume genetics and genomics nonetheless would find this volume of relevance, especially those working with the closely aligned model legume, *Medicago truncatula*. – Michael A. Grusak, USDA, Agricultural Research Service, Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX.

Plants, Genes, and Crop Biotechnology (2nd ed.). Chrispeels, Maarten J. and David E. Sadava. 2003. ISBN 0-7637-1586-7 (Cloth US$87.50) 576 pp. Jones and Bartlett Publishers, 40 Tall Pine Drive, Sudbury, MA 01776-2270. This is a good revision of Plants, Genes, and Agriculture, and the new title clearly signals the editors' emphasis on biotechnology. This edition offers updated information, new contributing authors, new chapters, new illustrations, a new organization, and a supply of discussion questions at the end of each chapter for use in the classroom. The book has received the approval of the American Society of Plant Biologists. On the whole it is an improvement over the popular first edition and will be a good textbook for introductory classes in plant biology and crop science.

Coming seven years after the first edition, this new edition has a lot of catching up to do, and the updates are apparent from the beginning. "Human Population Growth: Lessons from Demography" reports the slowdown in population growth. There are expanded treatments of the influence of the socioeconomic status of women on birth rates and the reasons why hunger persists in a world that produces enough food for all. Unfortunately, evidence of hasty revision begins on the first page

with the statement "Two thousand years ago the population reached 300 million, and now it stands at 6 billion, a 20-fold increase. Since then the human population has increased 20-fold."

"Agricultural R&D, Productivity, and Global Food Prospects," new for the second edition, covers many factors contributing to production gains, including changes in agricultural practices and changes in food consumption. Attractive graphs and maps convey a large amount of information about resources and productivity. "Development, Productivity, and Sustainability of Crop Production" contains excellent graphics to explain productivity. One map shows world distribution of arable land and fresh water, including the hectares of land and millions of liters of water available per person in each region. It is especially informative when considered in light of another map comparing agricultural labor and land productivity.

"Food Security: Why do hunger and malnutrition persist in a world of plenty?" is an expansion of a topic from the first edition. Since most countries produce more than enough food to meet the minimum requirements of all their citizens, writers are continually trying to explain why hunger and malnutrition are always with us. Several causes are noted: poverty, lack of influence within a culture, and discrimination based on gender, age, race, or religion. Recent declines in agricultural aid and education aid are partly to blame. So, too, is U.S. agricultural policy, which requires that food aid be surplus U.S. agricultural products. U.S. aid efforts are thus driven, not by the need abroad, but by the surplus at home. Suggested solutions are to improve food policies in developing countries, to encourage the development of a free market, and to encourage countries to reallocate spending from the military to agriculture. Reducing poverty is perhaps too general and daunting a solution for the author to propose, but it appears subtly throughout the text. The author mentions that Europe's aid strategy is to provide money to buy up locally available food for distribution to the hungry, since the root problem is nearly always poverty rather than insufficient food.

"Developing Food Production Systems in Sub-Saharan Africa" is a new topic for this edition. Sub-Saharan Africa has been a difficult area in which to apply modern agricultural methods. This chapter covers climate, traditional land use patterns, traditional crop production methods, and agricultural policies that make this region what it is.

"The Molecular Basis of Genetic Modification and Improvement of Crops" has been reorganized and enlarged from the first edition and now is placed earlier in the sequence. It provides a comprehensive view of molecular biology and genetics, including the composition of DNA and proteins, mitosis and meiosis, components of the gene, restriction enzymes, tissue culture, and transformation via *Agrobacterium* and particle bombardment. The illustrations are superb. A few statements may raise eyebrows. The definition of biotechnology as "the use and manipulation of living organisms, or substances obtained from these organisms, to make products of value to humanity" is so broad as to include primitive hunting and gathering, and it ignores the possibility of making products that harm humanity. The definition of genetic engineering as the transfer of genes between different organisms seems plain enough until one considers the cases in which additional copies of a native gene have been inserted to intensify a trait, or anti-sense sequences have been inserted to nullify a trait. The claim that "molecular manipulations later eliminate the molecular marker gene" is ahead of its time. This is a goal, but all commercially available crops still contain marker genes.

"Plants in Human Nutrition and Animal Feed" provides a good overview of nutrition basics, including carbohydrates, fats, proteins, vitamins, vitamin deficiencies, phytoestrogens and vegetarianism. "Golden rice," an excellent example of how genetic engineering could enhance crops, is given a balanced treatment. It can provide a portion of the daily vitamin A requirement, substituting for the fruits and vegetables that are not always within the budget of poor city dwellers. However, the authors fail to mention that "golden rice" is not yet available commercially. The section on food safety and regulation is very short.

"The Genetic Basis of Growth and Development" covers cells, tissues, organs, vegetative propagation, plant hormones, flowers, fertilization, the ABC model of floral organ determination, photoperiod, seeds, and fruits, and gives some examples of genetically engineered changes in these traits. "Seeds: Biology, Technology, and Role in Agriculture" is a new chapter for this edition. The topics include seed development and germination, production and storage, certification programs, seed banks, "Terminator" technology, and the shift in profits from companies that sell externally applied chemicals to companies that put traits into seeds.

"Converting Solar Energy into Crop Production" provides good coverage of photosynthesis, including photosystems I and II, C_3 and C_4 pathways, sources and sinks, photoprotection, water loss, and the implications for crop biomass production. "Plant Nutrition and Crop Improvement in Adverse Soil Conditions" covers soil particle size, pH, salinity,

mineral nutrients and deficiencies, water deficits, and breeding for crops tolerant of problem soils, while "Life Together in the Underground" covers the complex processes that occur out of sight. Mycorrhizae, root parasitism, the nitrogen cycle, nematodes, and agronomic practices for "healthy" soil are included.

"Ten Thousand Years of Crop Evolution" covers the beginnings of agriculture, plant domestication, centers of origin, crop evolution, the crop gene pool concept, genetic diversity, and intellectual property rights. "From Classical Plant Breeding to Modern Crop Improvement" introduces the reader to the extensive intercontinental exchange of crops that occurred over the last half century and to the plant breeding efforts that were required to make that exchange successful. The chapter includes all the standard points: variation, selection, genotype versus phenotype, broad sense heritability, environment influences, hybrids, backcrossing, quantitative trait loci, the Green Revolution, and the traits that may be introduced via genetic engineering in the future. The pedigree of IR-72 rice has been dropped from this edition.

The next three chapters, Crop Diseases and Strategies for Their Control, Strategies for Controlling Insect, Mite, and Nematode Pests, and Weeds and Weed Control Strategies, are expanded treatments of the pest and disease chapters from the first edition. The disease triangle, biological control, and herbicides are well covered. The discussion of chemical defenses of plants has been considerably shortened in this edition.

"Toward a Greener Agriculture" covers improved agricultural practices and sustainable agriculture. The potential contribution of genetic engineering to sustainable agriculture is considered. "Plants as Chemical and Pharmaceutical Factories" examines "biopharming," its potential for producing specialty chemicals with less damage to the environment, and the possible impacts on economies around the world.

"Urban Myths and Scientific Facts about the Biosafety of Genetically Modified Crops" is the only disappointing chapter. The first half discusses ten objections to genetically modified crops, including harm to the monarch butterfly, superweeds, fish genes in tomatoes, "unnatural" science, and the spread of antibiotic resistance. These objections are widely subscribed to, although some are not based on fact and others take a narrow view of a complex problem. Some of the issues are given a balanced treatment, but others are not so well treated. In particular, the segments on the monarch butterfly, superweeds and horizontal transfer of antibiotic resistance suffer from failure to reveal relevant but inconvenient facts. Teachers probably will want to use additional resources when they cover this aspect of crop biotechnology. The second part of the chapter is more satisfactory. It covers some of the testing and oversight of genetically engineered crops, especially for potential allergens.

Despite the deficiencies of the final chapter, the text as a whole is excellent in its breadth of view and its discussion of the complex issues associated with farming and biotechnology. This book can make a large contribution toward improving factual knowledge and understanding of crop science at many levels of the agricultural and governmental sectors of our society. - Judy Harrington, Research Associate, Soil and Crop Sciences, Colorado State University

Purshia: The Wild and Bitter Roses. James A. Young and Charlie D. Clements. 2002. ISBN 0-87417-491-0 (Cloth US$39.95) 280 pp. University of Nevada Press, Mail Stop 166, Reno, NV 89557-0076 — This is a timely, passionate book centering on antelope bitterbrush (*Purshia tridentata*) and its congeners desert bitterbrush (*P. glandulosa* = *P. tridentata* var. *glandulosa*) and Stansbury cliffrose (*P. stansburiana* = *P. mexicana* var. *stansburiana, Cowania stansburiana*), shrubs endemic to Western North America. The authors, particularly the senior author, have a long and productive history working on the lands on which *Purshia* occurs and an intimate familiarity with management of those lands and the people (both researchers and managers) who have studied and managed *Purshia*. They and their colleagues contributed substantially to the primary literature from which book draws. The book is rich with detail, documentation, and personal anecdotes. I found it an entertaining and instructive read.

Bitterbrush and its near relatives are important browse plants that are locally common. Young and Clements instruct the readers on their natural history, value to wild (especially mule deer) and domestic

animals, and management issues (especially as they pertain to fire, invasive weeds, browsing, and plant succession) in twelve chapters. These sometimes interlocking chapters group into four focus areas: (1) the plants' place in the biological (Chapter One, The Wild and Bitter Roses; Chapter Three, Bitterbrush Plant Communities) and human (Chapter Two, Hunters, Herdsmen, and Brush) worlds; (2) growth, reproduction, and physiology (Chapter Four, Ecophysiology of *Purshia*; Chapter Five, *Purshia* Seed Physiology; Chapter Eight, Ruminent Nutrition; Chapter Eleven, The Role of Nitrogen); (3) small animal ecological relationships and diseases, Chapter Seven, Granivore Relations; Chapter Nine, Insects and Plant Diseases; and (4) management issues, Chapter Six, Seeding *Purshia* Species; Chapter Ten, Wildfire Relations; Chapter Twelve, *Purshia* Management.

I think the book is especially useful in collating information and making a synthesis of the natural history and management of antelope bitterbrush (not so much is known about the other species) during the century and a half that Euro Americans have heavily imprinted Western North America. The authors make a plausible case for the expansion of antelope bitterbrush before and around the turn of the 20th century. This case is based on a depletion of perennial grass in the absence of invasive alien weeds with the subsequent increase of mule deer, a winter browse dependent animal, followed by exploitation of bitterbrush and other browse species by both domestic and wild ungulates and invasion by alien weeds, especially cheatgrass (*Bromus tectorum*), and western juniper (*Juniperus occidentalis*) and an increase in the frequency and intensity of wildfire (see also Leopold 1949, Whisenant 1990, Miller and Wigand 1994). They detail the efforts of land managers and federal and state research scientists including their personal efforts to find solutions to these degraded lands; especially to increase the population size and density of bitterbrush. They acknowledge with irony that those populations may have been artificially high and therefore be difficult or impossible to re-establish under current ecological conditions.

¡Other interesting paradoxes with themes in the book are the relationships of bitterbrush to sagebrush (subgenus *Tridentatae* of *Artemisia*) both in plant communities and in the minds of people and the nitrogen fixing capacity of bitterbrush and its near relatives. The authors point out the continuing efforts of land managers to control sagebrush while trying to enhance bitterbrush for animal habitat. While they acknowledge importance of sagebrush in the plant communities that they dominate the authors point out that this is a recent phenomenon. Both older literature and occasionally the authors have concerns about the utility of sagebrush on the landscape. The discovery of nitrogen fixation by *Purshia* is carefully detailed as is the importance of nitrogen to the productivity of semi-desert plant communities. However, it remains an elusive enigma of how *Purshia* nitrogen fixation benefits both the species and its attendant plant community.

There are a few issues that I feel a need to address. There are too many long, involved tables copied from the cited literature. The tabular material is for the most part summarized in the text. Most of the illustrations are excellent but a few are of poor quality, e.g., 3.5, 4.1, 6.1, 10.2a, 12.1, and 12.5. The authors needlessly spend time in the introductory chapter on Apache plume (*Fallugia paradoxa*), a species once thought to be a close relative of cliffrose (by me and my colleagues even!—see Blauer et al. 1975) and quote literature about hybridization with cliffrose. That relationship has been shown to be distant and the hybridization doubtful by base chromosome number differences, lack of viable progeny from the putative hybrids, a functionally dioecious breeding system in *Fallugia*, and no root nodules nor nitrogen fixation in *Fallugia* (McArthur et al. 1983, Baker et al. 1984). Even though information presented in the book is very well documented there are places, e.g., *Artemisia* variation (p. 147) and *Purshia* obligate outcrossing (p. 152), where the appropriate documenting literature could be cited. Despite the authors' prodigious research output on bitterbrush ecology and management they cite several anecdotal efforts of their work that bear no citation. There are a few typographical mistakes, e.g., McArthur is rendered MacArthur (p, 7—I would notice that), Gambel is rendered Gamble (p. 142), and Bruce Welch is Brian Welch (p. 151).

I don't want to mislead anyone. Despite my finding a few areas that could be improved in this book, I liked it a lot. I recommend it for anyone interested in *Purshia* biology and management and who would like to enjoy the ride, find the original source documents, and gain personal insight in biological discovery. It is unfortunate that the book doesn't detail how bitterbrush communities can assuredly be restored but it is certainly state of the art on what has been tried and thoughtfully details much of what needs to be learned and why bitterbrush is important in several ecosystems.—E. Durant McArthur, USDA Forest Service, Rocky Mountain Research Station, Shrub Sciences Laboratory, Provo, UT 84606-1856.

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Stevia: The Genus *Stevia*. Kinghorn, A. Douglas. 2002. ISBN 0-415-26830-3 (Cloth US$90.00) 211 pp. Taylor & Francis Books 29 West 35th St., New York, NY 10001. Stevia tells the story of that genus from the Asteraceae which includes Sugarleaf, Stevia rebuadiana, a popular source in some countries of non-nutritive sweeteners. This arrives as one more volume in series titled "Medicinal and aromatic plants/Industrial profiles," from Taylor and Francis. As a part of that series, it includes both reviews of the fundamental botany of this important genus, with the emphasis on S. rebaudiana, as well as detailed technical reviews of the production and organic chemistry of the principal non-nutritive sweeteners, stevioside and rebaudioside A, produced by these plants.

This work opens with a general Overview by the editor, followed by consideration of the botany and ethnobotany of the genus as a whole. The editor commendably keeps S. rebaudiana from being the sole focus throughout, though for obvious economic reasons, S. rebaudiana does receive the greatest amount of attention in most chapters. It is the major source of non-nutritive sweeteners in this genus, though a few other species out of the several hundred in Stevia also produce these compounds. The chapter on ethnobotany stretches back to the first European contact with natives in the region of Paraguay from which S. rebaudiana originally comes.

The various chapters' authors then turn to more specific consideration of the phytochemistry of the non-nutritive sweeteners and of the other chemical components of the Stevia's leaves, including extensive discussion of the artificial synthesis of these compounds. Their economic importance, especially in Japan where these compounds are a very important commercial source of non-nutritive sweeteners, comes next along with consideration of possible toxic side effects of these compounds, fear of which has kept them relegated in the American market to natural foods stores and the like. Also considered are the requirements for cultivation of Stevia spp. Finally, the use of sweeteners from S. rebaudiana in Korea, where their use is rising significantly, comes under consideration in the last chapter. Throughout, extensive bibliographies are provided.

The chapters are universally well written and very well illustrated, with biogeographic maps or sets of chemical structures as appropriate, and many readers will find the text accessible. This volume would be of interest to a number of audiences. Phytochemists and food scientists will find it fascinating, given the potential of the non-nutritive sweeteners from S. rebaudiana as well as other taste-modifying compounds from a variety of plants. These include the sweet-taste inducing protein miraculin from Miracle Berry (Richardella dulcifica, syn. Synsepalum dulcificum) which is also used extensively in Japan after production from transgenic bacteria, and the terpene glycoside gymnemic acid from Gymnema sylvestre (Asclepiadaceae). Introductory students might be introduced to some of the fascinating compounds offered by plants using some of the introductory chapters, including the ethnobotanical material, and even neuropsychologists and vertebrate physiologists, who use these taste-altering compounds in both research and student laboratories, also ought to buy a copy. All college and university libraries should purchase a copy, and many amateur botanists would enjoy the introductory material as well as the chapters on the practical use of these compounds in Japan and Korea. – Douglas Darnowski, Department of Biology, Washington College.

The Natural History of Pompeii. Jashemski, Wilhelmina F. and Frederick G. Meyer [Editors]. 2002. ISBN 0-521-80054-4 (Cloth US$175.00) 502 pp. Cambridge University Press, 40 West 20th St., New York, NY 10011-4211. Campania, a fertile area in the shadow of Mt. Vesuvius, was considered the most beautiful region in the whole world according to the Roman historian Florus. Pompeii and Herculaneum were prosperous Campanian cities on the shores of Bay of Naples. Preserved ruins indicate that before 79 AD these Roman cities were well planned with their forums, market places, shops and temples. They flourished in the proximity of Mt. Vesuvius as evidenced by their lavish villas, fruit gardens and wide roads. The people of Pompeii grew vineyards and olive trees, and traded wine and olive oil. Their gardens had pools, fountains, furnished triclinia, and inner garden walls painted with trees to lend an air of spaciousness. The people were tall and healthy and women were strong and beautiful. Frequent explosions of Vesuvius had spread ash that made the land fertile for agriculture. Vesuvius had been silent for 700 years before 79 AD except for a severe earthquake in 62 AD after which the city was rebuilt to its former grandeur.

The people of the area must have been accustomed to minor temblors as few fled when volcanic ash started falling at about noon on August 24, 79 AD. Some wealthy people must have left as several large and magnificent houses have been uncovered without any inhabitants. Then, in the middle of the night, the remaining residents of Pompeii and Herculaneum were caught in the wrath of Vesuvius. Hot ash and pumice spewed out burying the city in pyroclastic flows and surges one after another that continued until the early morning. Pyroclastic flows encircled an area that included the cities of Pompeii and Herculaneum. There was no terrestrial escape route except towards the sea. Recent excavations indicate that people did flee to the beach to find an escape but within a short time, pyroclastic flows even extended the beach several kilometers into the sea.

Gaius Plinius Secundus (Pliny the Elder) was a Roman senator and commander of the imperial fleet at Misenum where he lived with his sister and her 17 year old son, Pliny the Younger. During the early afternoon of August 24, Pliny's sister drew his attention to a large, umbrella-pine-like cloud arising from Vesuvius, 32 km across the Bay of Naples. The naturalist Pliny wanted a closer look at the phenomenon so ordered a ship for the excursion. However, the journey became an attempted rescue mission for, just as Pliny was setting off, he received a message from his friend Rectina, informing him that ash fall was blocking all escape routes from her house near the foot of the mountain. Unable to land at Pompeii which was already buried under pyroclastic debris, Pliny diverted his ships to Stabiae where he succumbed to poisonous gases. Although the pyroclastic flows did not affect Stabiae, the city was covered by about 200 cm of ash-fall. It is said that the volcanic ash from the eruption reached Rome, Africa, Syria, and Egypt.

The only surviving eye-witness accounts of the eruption of Vesuvius are two of Pliny the Younger's letters to the Roman historian Caius Cornelius Tacitus written 24 years after the fact. Recent excavations of Pompeii and Herculaneum have uncovered graphic evidence of the eruption that has been preserved for 1900 years. The sting of death is revealed in the skeleton of a man caught by a pyroclastic flow while trying to escape [Figure 50]. Even his cry appears frozen in time. A mother's anguish is perceptible as she protects her child from the pyroclastic surge that entombed them both [Figure 51]. A mule or horse skeleton, still standing, fills the barn with its screaming neigh [Figure 349]. A homeowner beat such a hasty retreat from the city that the guard-dog was left chained in the house. The dog tried to free himself but became entangled around the peg and then squirmed to become a victim of death [Figure 341]. A wealthy matron was caught in a Herculaneum chamber with a satchel of gold jewelry on her waist, ear-rings, and two rings on her left hand [Figure 372]. Some help came to the survivors and the devastated area after the catastrophe. Titus, the Roman emperor, rushed to review the area on hearing about he calamity, provided help to survivors, and gave special privileges to neighboring towns which had given shelter to refugees from the disaster area.

Pliny the Elder wrote about almost everything he noticed during his lifetime. In addition to his Natural History, he is said to have written 102 volumes on various scientific and antiquarian subjects. Among his writings only the 37 volumes of The Natural History are extant. His books cover subjects such as cosmology, geography, zoology, plants and their medicinal uses, and minerals and stones. Pliny was the first to use references for his sources of information. In describing plants, he gave Greek and Italian names, somewhat like modern synonymies. The editors of The Natural History of Pompeii have compiled the chapters using Pliny's Natural History as the prototype.

The eruption of Vesuvius is unique in human history for nature preserved the effects of the catastrophe vividly and completely. Although many excavations have been undertaken in the area, this book is the first to document all aspects of the natural history under one cover. It is an ambitious project and the introduction states modestly that this book is only

the beginning. Recent excavations have uncovered several complete skeletons of fleeing people huddled together in beach-side chambers at Herculaneum. Stratigraphic descriptions of profiles unfold the history of the eruption and the characteristics of various surges from the afternoon of August 24 to the next morning.

All plants cataloged in this book are identified from actual carbonized remains or from wall paintings [see wall-painting of quince and plums in a glass bowl; Figure 88], mosaics, sculpture [Figure 95], graffiti, inscriptions, or accounts by ancient authors like Pliny the Elder. All 184 plants documented here are identified by their scientific names at generic or mostly specific levels and by their English and Italian common names. Each plant description gives the source (such as wall painting), references to ancient authors, and remarks. Carbonized remains of *Allium sativum* (garlic) were found in Herculaneum indicating its use in Italy since Roman times. *Pinus pinea* or umbrella-pine (referred to in Pliny the Younger's letter to Tacitus) is shown in a painting [Figure 127]. Its carbonized cone was found in Herculaneum [Figure 126]. There was no dearth of material to use in describing *Vitis vinifera* subsp. vinifera (grape), which was painted or sculpted frequently [Figures 160-163]. A SEM photomicrograph of a beautiful cross section of a grapevine stem is illustrated in Figure 159. Several lists of spores and pollen grains are given but none are photographed except for a pollen grain of *Malva sylvestris* (wild mallow) in Figure 108. Micropaleontological chapters (including palynology) examine various profiles to interpret environmental changes in the Vesuvian area.

Fish, marine invertebrates, insects, amphibians and reptiles, birds, and mammals are described following the style of the plant descriptions. All these taxa are cataloged from paintings or sculptures found in the ruins of Pompeii and Herculaneum. Snakes had a special place in culture, shrines, and fashion during Hellenistic and Roman periods. A rat-snake climbing on a small fig tree is described from a beautiful painting [Figure 283] and snakes are described from exquisite gold bracelets [Figure 287]. A full section is devoted to snakes on Pompeian household shrines [Figures 291-293].

The final chapter details deductions about the health, nutrition and social status of Herculaneum's people based on an examination of a small population of human skeletons. Although the inferences of this small study cannot be applied to the whole population of Campania, preliminary deductions can be made about the people of the area. Fertility at Herculaneum was low probably due to the common use of contraception and abortion. Most of the inhabitants were healthy and well nourished. Women married young and there were mother-child deaths during child-birth. Prostitution and slavery were practiced in Herculaneum. Medical cures were available for certain diseases. In general, it was an affluent society with a creed of its own.

The editors should be complimented on their selection of reputed chapter authors from various scientific fields. This book instills a half a century's research on Pompeii. It is well-written and beautifully produced on glossy paper that renders excellent reproductions of wall-paintings, sculptures, and illustrations. However, reflection from the paper makes reading cumbersome. Good books are difficult to find and excellent ones are rarely affordable. The cost of this book is 35 cents per page which is a steal for such a book. Those who can, should get it and others should find a library to read it. All libraries should keep a copy on their reference shelf. This book will always be a centerpiece for lively conversation. — Satish K. Srivastava, Geology Consultant, 3054 Blandford Drive, Rowland Heights, California 91748; e-mail: sksrivastava@earthlink.net

Alpine Plants of North America. Nicholls, G. 2002. ISBN 0-88192-548-9; 344 pp. Timber Press Inc., Portland, OR. – Alpine plants experience demanding environmental conditions. These plants must withstand tremendous variation in temperature, moisture, and wind exposure to survive in what might be consider one of the most extreme plant environments. What is astounding to anyone who has hiked through these alpine regions, however, is the floral diversity that these regions harbor.

In **Alpine Plants of North America**, Nicholls provides a fairly comprehensive overview of the flowering plants in North American alpine environments. The book is primarily targeted towards growers and alpine-plant enthusiasts. Information conveyed in the book is readily accessible to non-scientists. In general, Nicholls avoids the use of technical plant terms and propagation and cultivation terms, and he provides a glossary at the end of the book for any marginally confusing terms that he does use (i.e., blade, calyx, rhizome). The book will be useful for scientists interested in propagating alpine plants for research purposes; however, this text will not be particularly informative for ecologists interested in the natural history of alpine plants. Very little natural history is provided, accept for anecdotal information spread throughout the volume.

The book has three sections. In the Introduction, Nicholls describes the principal characteristics of alpine habitats in North America (including Alaska, the Pacific Mountain System, the Great Basin, and the Rocky Mountains). This introduction highlights the variable environments that alpine plants experience and sets the stage for one of the take-home messages in this book, the difficulty of growing alpine plants outside of their native ranges.

In the second section of the book, Nicholls provides descriptions of alpine plants occurring in 54 genera. Each genus is introduced by a short section describing specific characteristics of the vegetation and flowers. Also included in some of the descriptions are some interesting anecdotal facts about the genera, such as the origin of some of the genera names and their reproductive biology. For each genus, he then describes either all of the alpine North American species or a subset that either he has had success cultivating or that he finds particularly attractive. The individual species accounts include their native range, elevation, phenology, and an accompanying photograph. Following these species accounts are detailed propagation and cultivation protocols for each genus. Also included is information on common garden pests and appropriate measures for pest control.

In the final section of the book, the author provides general cultivation information primarily for non-scientists, including the types of containers to use, how to construct rock gardens, sand beds, raised beds, and the benefits of alpine houses. He also discusses the merits of different soil mixtures and how to prepare the mixtures. The book ends with a glossary, appendices of alpine plant distributions by state and mail-order sources for seeds, and an index of plant names and the page number(s) on which the plants were described.

I only found the book to contain a few minor shortcomings. Primarily, I would have liked to have seen the author include more information about the natural history (and in particular the reproductive biology) of the plants, besides whether or not they were annual or perennial. In a few cases, the author mentioned that species were heterostylous or who the important pollinators were. In general, however, this information was sparsely represented in the text. In addition, in cases where genera were described as “toxic” to humans or livestock (i.e., *Delphinium* or *Ranunculus*), I would have liked to have seen some information about the types of secondary compounds involved (i.e., alkaloids).

Despite these minor weaknesses, the strengths of this book are many. Foremost, the book provides useful and practical advice for propagating and cultivating alpine plants. For individuals attempting to grow alpine plants out of their native range for either research or heuristic purposes, this book is an invaluable resource! I also particularly liked the photographs of each species. Almost 500 color photographs are provided in the book. The photographs provide up-close information about the flowers and about the plant vegetation. The majority of the photographs depicted in the book were taken in the native range of the plants, providing a nice visual image of the types of substrates that the plants grow on naturally.

The diversity of floral features offered by alpine plants and the challenge presented in growing them will continue to attract plant enthusiasts. This text presents a valuable resource for the propagation and cultivation of these flowering plants. -Rebecca Irwin, Institute of Ecology, Ecology Building, University of Georgia, Athens, GA 30602

The Genus *Arisaema*, A Monograph for Botanists and Nature Lovers. Gusman G, Gusman L. 2002. ISBN 3-904144-91-X (Cloth, US $ 69.95.) 507 color plates, 15 tables, 28 figures, 450 pp Timber Press, Portland, OR 97204-3527. This stunning and beautiful book is the result of many years of field work in many parts of the world by the authors who had firsthand experience with most of the species and made photographs of plants, mostly in natural habitats, showing different morphological aspects which best typify their systematics. A total of 507 color photographs allow most species to be well illustrated.

After a discussion of methods and timing of expeditions the introduction has a detailed and interesting section on morphology of the genus *Arisaema*, defining different aspects of the morphology and discussing each unit separately. Each feature is illustrated with a combination of line drawings and color photographs. Tuber morphology growth patterns, shoot and leaf morphology, variations in leaf patterns, inflorescences and sexual expression, differences in floral morphology, fruit morphology and germination patterns are all discussed in detail and correlated where possible with sectional classification. A glossary of leaflet shapes and many other features is presented, making even the beginner immediately familiar with *Arisaema.*

Another part of the introduction deals with chemical and medicinal properties of *Arisaema* and still another section deals extensively with cultivation, dealing separately with species from different regions of the world giving temperature and climatic regimes. The authors have a primary interest in learning how to cultivate all species and have been successful with a large percentage of the species. Having arisaemas in cultivation has enabled the Gusmans to better understand the species and to learn how best to grow them. This information, passed on the readers, is one of the important features of the book. Hardiness and winter protection, proper nutrition, and a discussion of pests and diseases is an important aspect of cultivation. A discussion of flowering time is presented and a table of flowering times in Belgium is presented.

A section on propagation deals with vegetative multiplication, the timing of fruit production, seed development and proper methods of sowing seed. The section on systematics provides a history of genus, principal workers and a history of their efforts and recent methods of investigations including a tabular presentation of chromosome counts and the respective citations for reports.

Following a detailed description of the genus is a detailed multi-entry key to the 14 sections of *Arisaema* accepted by the authors. A table is also presented which shows the geographical distribution of the different sections. Another table defines the characters used to key out species. These characters are later presented in a tabular form for sections and subsections. Also for each section inflorescence and leaf types are summarized and presented with diagrammatical paintings.

Finally the bulk of the book deals with a detailed treatment of all the sections and the species in each section, complete with extensive discussion of each taxon including detailed descriptions as well as patterns of distribution and flowering periods. The end of the book provides a detailed alphabetical glossary of terms particularly useful for the non botanist and an extensive bibliography with over 500 references involving *Arisaema*

This is indeed a very welcome work, a wonderfully colorful and immensely practical book for anyone even remotely interested in *Arisaema.* It is a book that aroiders have been awaiting for a long time and the wait has been worth it. It will be a prized possession of horticulturists and botanists alike. - Thomas B. Croat. Missouri Botanical Garden, St. Louis, MO USA

Portraits of Himalayan Flowers. Yoshida, Toshio. 2002. ISBN 088192-551-9 (Cloth US$39.95) 124 pp. Timber Press, 133 S.W. Second Avenue, Suite 450, Portland, Oregon 97204-3527. Portraits of Himalayan Flowers presents a largely pictorial account of many attractive plants from the Himalayas. The author is an associate researcher at the University Museum of the University of Tokyo, and he spent a decade traveling to the world's tallest mountains photographing various plants, most from the alpine regions though a few come from forests at lower altitudes.

Though this is an English edition of an originally Japanese book, the text is in excellent English, flowing melodically in many places. To the reader, the text resembles a sparer cousin of other famous works on the botanical exploration of the Himalayas, like Farrer's The Rainbow Bridge. Yoshida sets the scene very well in his brief introduction, as when he describes a morning early in his travels "Exiting the hut in which I had spent the night, I passed through a narrow doorway into a barren field shrouded in bright morning mist. A voice chanting a strange melody drew me out. In the field, a herd of male yaks and some scattered stones stood among the reddish stubble of just-harvested buckwheat," following later with comments like "All these flowers looked like large jewels scattered over the bleak highlands by the hand of God and left there because no one had dared to touch them" (pp.13, 15). The voice was that of an old Tibetan reciting the Tibetan Buddhist rosary, with 108 repetitions of a mantra. This experience had such an effect on the author that he chose to illustrate 108 plants in this work.

Before the Introduction, Professor Hideaki Ohba of the University of Tokyo provides in two pages "A History of the Study of Himalayan Plants." Throughout the main part of Portraits of Himalayan Flowers, at the base of each picture Yoshida provides a concise text including scientific and common names for each plant, as well as pertinent details on growth habits and other preferences, and the altitude at which the plant was photographed.

This work comes from Timber Press, so no great surprise that many outstanding photographs of horticulturally important species illustrate this work. The author patiently waited for rare clear skies to photograph almost every plant, in spite of his working during the wettest part of the year in the Himalayas. He also includes the names of many prominent peaks shown in the photographs.

If there is a flaw in this work, it is the too-dark printing of some of the excellent photographs,

at least in the copy used by the reviewer. Contrast is fine throughout. Otherwise, the book is a delight throughout, and most of the pictures are of excellent brightness.

Every college and university should obtain a copy of Portraits of Himalayan Flowers by Toshio Yoshida for its library. The stunning photographs will appeal to everyone interested in the Himalayas or in botany, and they might be an excellent tool for sparking interest in new students, with pictures of the famous Himalayan rhubarbs and woolly members of the Asteraceae. Buy a copy today. – Douglas Darnowski, Department of Biology, Washington College.

The Botanical Language: An Interactive Guide to Vascular Plants. Crowl, Virginia A. 2002. CD . 157 Forest Ave., Hudson, MA 01749-1830. The Botanical Language presents a wide range of basic botanical terms along with ample illustrations in a readily accessible format. The CD is formatted to be used with either a Macintosh (OS 7.0 or higher) or PC (Windows 3.1, 95, NT, or later). The reviewer was able to use this CD with Windows 2002 and Mac OS 10.2 without difficulties related to system software.

The Introduction presents a warning of the need to study the terms carefully and systematically—the author seeks with this CD to present details of vascular plants, saying that they have been chosen for the subject of this work because they are the most commonly noticed plants. Also, the author created this CD for use by students of botany or interested laymen. The opening to the CD includes a stern warning that not reading the Introduction will lead to confusion in new users, but this in part indicates that there are some flaws in the design of this CD—after all, the design should be optimized for the convenience of the user. In addition, the details and terms discussed are limited to those which are observable using the naked eye or a 10x hand lens.

The Table of Contents groups the photographs and their accompanying descriptions into seven sets, as they are related to Flowers, Inflorescences, Leaves, Descriptive Terms, Fruits and Seeds, Grasses and Sedges, and Nonflowering Plants. In all, 293 photographs illustrate various species at a resolution that is perfectly adequate for the purpose chosen. The 293 photos illustrate not quite as many species—a few species receive more than one entry.

Clicking on one of these seven categories leads the user to a list of the various entries under that heading. Entries consist of a single photograph with a few paragraphs of description. Botanical terms are highlighted in the description by underlining, and clicking on the term links to the glossary. Each term in the glossary has a short paragraph listing a definition and links to other entries throughout the CD that use that term. This is a sensible and useful feature, though one problem in the design of this CD is that links to other entries occur only as numerical references, not botanical or common names. Therefore, it is not immediately obvious, without actually going to those other entries, what other plants share a given feature.

By clicking on the small version of the photo which sits next to the text in an entry leads to a large version of the same photograph with the parts in question clearly labeled. The illustrations are of very good
contrast and brightness though generally not of high resolution.

Another section on Relationship of Terms briefly discusses Contrasting, Confusing, and Merging Terms, though the length of the discussion and the lack of included illustrative examples in this section may make it less than useful for new botanists—if nothing else, pairs of links to entries illustrating these three should have been included. Similarly, there is a Taxonomic Table which describes Latin names, their origins and use, as well as giving many examples, though not covering all families of vascular plants.

The Botanical Language will be of real use in introductory courses or anywhere a quick review of basic botanical terminology is needed. The lack of a search feature is a drawback, but it will nevertheless be of general utility. – Douglas Darnowski, Department of Biology, Washington College.

Plants. Irene Ridge, Editor. 2002 ISBN 0-19-925548-2 (Paperback + CD-ROM) 345pages Oxford University Press.- This book is an introductory text on plant physiology. The text is targeted towards "first or second year undergraduates". There are some places where it is clear prior coursework is assumed and for the typical first year undergraduate in the US (this text is geared towards the UK audience) this text would be rather difficult. Students who have had at least a year of biology (including a significant botany component) and chemistry would be able to understand the material in this text. There are 6 chapters of roughly 50-55 pages each. I feel these are a bit long for the typical first year student but the organization of these chapters and their length makes sense.

Plants covers the major areas one would expect to find in a plant physiology text although the depth of detail is less than that found in Taiz and Zeiger's, Salisbury and Ross', and Hopkins and Hüner's Plant Physiology texts. There are several points in Plants where the authors of a given chapter point out that memorizing and focusing on the tiniest details is not what is important. They make evident that understanding the importance of some concept, for example, the features of life cycles that have lead to success in terrestrial environments, is paramount to memorizing many details of those cycles. One thing included in this text that I have not seen in many plant physiology texts is a chapter on interactions between seed plants and microbes. Generalizations on such interactions and several case studies are presented. This is a nice basic chapter.

This text sticks very well to the main theme which is answering the question "how do plants function and grow in a wide range of environments." Every topic introduced in Plants somehow leads back to the main theme. This book also delivers when it comes to emphasizing "doing science". A number of the topics are approached in a fashion that leads the reader to understand how we know what we know. How did plant physiologists explore a particular phenomenon? What was observed in specific experiments and how did the scientists arrive at their interpretations?

One feature I find attractive with this text is the inclusion of questions as the reader reads the text, not as a list at the end of the chapter. These questions ask the reader to obtain information from tables and figures, including graphical data. This information in some cases must be interpreted in light of already presented information. The one thing I did not like about this arrangement is that the answers to the questions appear immediately after the question. I would prefer including all the answers in an appendix at the end of the text or certainly separated somehow from the question.

This text also comes with a CD-ROM for PC only. Two "exercises" are included: Digital Microscopy and Plant Gene Manipulation. Both of these are supplemental to the material in the book although they certainly can help student understanding of topics in the text. The exercises are interactive. They are probably too elementary for more advanced students but the programs would provide a good review for them and certainly the exercises are appropriate for the intended audience.

This is a good introductory book on plant physiology. It is not as detailed as other texts out on the market but it does things quite attractive for teaching an introductory student some basic ideas of plant physiology.- Henri Roger Maurice, Department of Biology, University of Southern Indiana, Evansville, IN 47712

The Triple Helix: Gene, Organism and Environment, Richard Lewontin. 2000. ISBN 0-674-00677-1 (paperback, $15). Harvard University Press. 136 pp. – This little book (only 13cm x 19cm x 136pp!) has an expansive scope. In the first three chapters, which were originally presented as a series of lectures in the Lezioni Italiani in Milan, Lewontin critiques the reductionist agenda in modern biology. The fourth and final chapter, which was written expressly for this book, outlines an alternative framework for our consideration, suggesting a middle path between "unremitting reductionism" and "obscurantist holism."

The three chapters of critique are well-written and persuasive. Lewontin's writing is easily accessible to undergraduate students, and yet manages to question many of the underlying assumptions implicit in the thought and work of most biologists today. The case he builds is strengthened considerably by the evidence presented from the scientific literature, and by the clarity of his logic and expression. Were his critique somehow taken to heart by biologists, it would significantly redirect the course of scientific inquiry in the 21st century. As Lewontin says:

"There is nothing in the first three chapters of this book that is not well known to all biologists. Everybody 'knows' at some level of consciousness that DNA is not self-reproducing, that the information in DNA sequences is insufficient to specify even a folded protein, not to speak of an entire organism, that the environment of an organism is constructed and constantly altered by the life activities of the organism. But this in-principle knowledge cannot become folded into the structure of biological explanation unless it can be incorporated into the actual work of biologists." P.129.

The real question is how to accomplish the task set forth in that last sentence. As a start, these three chapters should be required for reading and discussion by all undergraduate and graduate students of biology and their professors. If we were to do that, I believe we would soon come to wrestle with the same challenge which Lewontin faces in Chapter 4. In his words:

"The earlier chapters in this book have a distinctly negative flavor. They are devoted to explanations of the way in which a reductionist approach to the study of living organisms can lead us to formulate incomplete answers to questions about biology or to miss the essential features of biological processes or to ask the wrong questions in the first place. It is easy to be a critic. All one needs to do is to think very hard about any complex aspect of the world, and it quickly becomes apparent why this or that approach to its study is defective in some way. It is much more difficult to suggest how we can, in practice, do better. It is useless to call in general terms for some more synthetic approach or to say that somehow we need a new insight." p. 109.

Lewontin's response to this challenge is to make the following case, which I'll present in a highly condensed form:
The middle path between reductionism and holism requires us to recognize that "The world is divided into nearly independent subsystems within which there are effective interactions but between which there are no palpable relations… The delineation of effective subsystem boundaries is a major practical task for the biologist…" p. 110. Recent theories of systems (i.e. catastrophe theory, chaos theory, and complexity theory) are inadequate explanations of biological phenomena, and so we should consider that "organisms are internally heterogeneous open systems." p. 114.

Recognition of the internal heterogeneity of biological systems should lead to a renewed emphasis on "form" and its relationship to function at all levels of organization. From the elucidation of the structure of DNA in 1953 to the "X-ray structure of a voltage dependent K^+ channel" (*Nature* 423:33-41, 1 May 2003), the essential role of structural knowledge in our understanding of function is abundantly clear. "For this purpose we do not need a revolutionary insight into the laws of biology, but only a lot of hard work." p. 118.

Consideration of the openness of biological systems leads to the recognition that "organism and environment are both causes and effects in a co-evolutionary process… This coevolutionary process … is almost always topologically continuous. That is, small changes in the environment lead to small changes in the organisms which, in turn, lead to small changes in the environment." p. 126. "In order to take proper account of the ordinary topologically continuous changes in the relation of organism and environment, we do not need a revolution in the way experimental observations are made… only a reorientation of attention." p. 127.

Finally, "New experimental techniques are in part induced by the problems that are under investigation by a community of scientists with common interests, but once those technologies exist they have great power in determining the questions that are asked…As there is a dialectic between organisms and their environments… so there is a dialectic of method and problematic in science… Progress in biology depends not on revolutionary new conceptualizations, but on the creation of new methodologies that make questions answerable in practice in a world of finite resources." pp. 128-129.

While it may be unfair to extract the skeleton of an argument for inspection, including few of the ligaments and almost none of the flesh, I have endeavored to do justice to the case Lewontin makes in Chapter 4. I admit to some disappointment that there was no "new insight," no successor to the attempts of catastrophe theory, chaos theory, and complexity theory to provide an overarching framework to bridge reductionism and holism, except to emphasize the definition of organisms as internally heterogeneous open systems. On the other hand, the book succeeded beautifully in stimulating me to think about these deeper philosophical issues in biology, and to discuss them with my students and colleagues. I recommend **The Triple Helix** highly to both students and senior scientists for its provocative analysis of the intellectual direction of the biological sciences.
Jonathan Frye, Department of Natural Science, McPherson College, McPherson, KS 67460.

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Don Les' "Really Bad Plant Puns!"

Questions:

1. What do you get from eating too much milo?
2. Why was the Triticum plant sick?
3. Which plant hangs out at Las Vegas?
4. Who laughs at Calamus jokes?
5. Which plant couple wore green on St. Patrick's Day?

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Answers:

1. sore gums
2. it ate some wheat germ
3. the bird of pair-of-dice
4. somebody with a rattan sense of humor
5. Phil and Rhoda O'Dendron

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Bellingrath Gardens and Home is the 65-acre (26 ha) public garden and historic home of Walter and Bessie Bellingrath, located on the Fowl River near Mobile, Alabama. Walter Bellingrath was one of the first Coca-Cola bottlers in the Southeast, and with his wealth built the estate garden and home. He and his wife, Bessie, lived in the home which has since been converted into a museum. The gardens opened to the public in 1932. The site was listed on the Alabama Register of Landmarks and Heritage on Walter and Bessie Bellingrath. History. Bellingrath Blog.Â Bellingrath Gardens and Home features blooms and beauty every day of the year. Bellingrath Gardens and Home. It is our passion at Bellingrath Gardens and Home to preserve and enhance the 65-acre garden and grand estate home of Walter and Bessie Bellingrath. Walter Bellingrath Edgar, American Historian. Decorated Bronze Star, Legion of Merit; National History Publs. Commission fellow, 1971-1972.Â Edgar, Walter Bellingrath was born on December 10, 1943 in Mobile, Alabama, United States. Son of Charles Ernest, Junior and Amelia Lyon (Moore) Edgar. Education. Bachelor of Arts, Davidson College, (North Carolina), 1965; Master of Arts, University South Carolina., 1967; Doctor of Philosophy, University South Carolina., 1969. Career. From assistant professor to professor of history, University of Southern California, Columbia, since 1974; director Institute Southern Studies, University of Southern California, Columbia, since 1980; Neuffer professor southern studies, University of Southern Cal