



# The Forum on Botanical Education and Outreach



The FORUM begins on Friday evening with early registration and a reception. The main FORUM sessions will occur on Saturday, August 3. Although some informational sessions will be included, the program will primarily include interactive panel and roundtable discussions as well as breakout groups focusing on a range of topics. Individual sessions will be grouped within topical themes, or 'threads,' that span the entire FORUM. The day of sessions will also include a Keynote lecture by Dr. Neil Campbell. The FORUM will be linked to the scientific meetings via workshops and field trips on Sunday, August 4.

The FORUM is sponsored in part by the National Science Foundation, Council on Undergraduate Research, Project Kaleidoscope, and the Deep Gene Research Coordination Network.

## FORUM KEYNOTE SPEAKER DR. NEIL A. CAMPBELL

### "BOTANY EDUCATION IN OUR SCHOOLS AND COLLEGES: AN OPTIMISTIC FORECAST"



Neil Campbell began his college studies at Long Beach State College as a history major, but went on to a B.S. in Zoology after he discovered science through general education requirements. Following an M.A. in Zoology from U.C.L.A., Neil earned a Ph.D in Plant Biology from the University of California, Riverside. He has published numerous research articles on the structure and function of salt glands in halophytes and on the cellular basis of leaf movements in Mimosa and other legumes. His over 30 years of teaching in diverse environments include general biology courses at Cornell University, Pomona College, and San Bernardino Valley College, where, in 1986, he was the first recipient of the college's Outstanding Professor Award.

Neil is best known as the author of *Biology*, a textbook for biology majors that is now co-authored with Jane Reece. Neil is also the lead author of two non-majors textbooks, *Biology: Concepts and Connections* and *Essential Biology*.

Each year, over 500,000 students worldwide use Campbell/Reece biology textbooks. In 1995, Neil co-founded Peregrine Publishers, creators of The Biology Place and The Chemistry Place web sites.

He is now working on a high school biology textbook and web site that will be published in 2003. Neil is currently a visiting scholar in the Department of Botany and Plant Sciences at U.C. Riverside, which recognized him as the university's Distinguished Alumnus for 2001.

#### PRELIMINARY SCHEDULE

##### Friday, August 2

6:00-9:00pm Early Registration--Pyle Center Lobby  
Light Refreshments--Pyle Center

##### Saturday, August 3

8:00am- Registration, Pyle Center Lobby  
8:30am-5:00pm Keynote Lecture--Dr. Neil Campbell &  
Concurrent Sessions  
5:00-6:30pm Reception

##### Sunday, August 4

8:00am-5:00pm Workshops and Field Trips  
Register for these Separately

#### SIX TOPICAL THEMES, OR "THREADS," OF THE FORUM:

- ✿ Emphasizing Botany across the Curriculum
- ✿ Designing Investigative Laboratories
- ✿ Engaging Undergraduates in Research
- ✿ Developing Effective Teaching and Mentoring Skills
- ✿ Supporting Effective Teaching and Learning
- ✿ Reaching Out beyond the Ivory Towers

Please visit the conference website for details about the FORUM, including a listing of session titles, presenters, etc. ([www.botany2002.org](http://www.botany2002.org)).



## Dr. Martin Apple

President, Council of Scientific Society Presidents

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### Scientists' Obligations in the 21st Century

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Sunday, August 4, 7:30 pm  
Memorial Union Theater

Dr. Martin Apple is President of the Council of Scientific Society Presidents, an organization dedicated to establishing science policy, developing scientific leadership and promoting increased interaction among scientific societies. He successfully interfaces between the 60 member organizations, leading researchers, science educators, Congresspeople, and the media, organizing interesting and provocative twice-yearly meetings for the Council members and orchestrating the production of concise and timely position papers. He also is a frequent speaker, advocating for improved science education, federal funding of research, greater interaction and cooperation among scientific societies, and greater involvement of scientists in their community, their societies, and at the national level. He is Chairman of the Board of Visitors of the University of Maryland Biotechnology Institute (five nationally renowned research centers) and Chairman of the Board of Trustees of the University of Illinois Center for Advanced Research in Behavioral Neurobiology in Chicago.



He established the world's first transgenic plant research center (President, International Plant Research Institute, San Carlos, Calif., 1977-82) and has been the CEO of other similar enterprises in California, including the first U.S. computer assisted molecular design R&D center and a high tech business development group. He has worked closely with Congressional representatives in regard to policy and advised about education (Expert advisor, Dept. of Education, 1996-2001; Mem. USDA Blue Ribbon Panel, 2000-01).

He received an MSc from the University of Minnesota in Genetics and Microbiology, and a PhD in Biochemistry from the University of California.

Dr. Apple has received numerous awards, including: Leadership Citation East-West Center. Bd. of Govs., 1988. Leadership Citation, Council of Scientific Society Presidents, 1995. Fellow: Amer. Coll. Clinical. Pharmacology and Amer. Inst. Chemists. Fellow - Phi Beta Kappa (Distinguished Service Award 1984, 1985), Sigma Xi (life member, University of Calif Berkeley Chapter) Board of Directors, Chairman, long-range strategic planning committee, 1988-92.



**Dr. Peter Raven**  
Director, Missouri Botanical Garden

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## Plants and People in the 21st Century

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Tuesday, August 6, 2:00 pm  
Historical Society Auditorium

Peter H. Raven, is Director of the Missouri Botanical Garden and Engelmann Professor of Botany at Washington University in St. Louis, positions he has held for some 31 years. Currently, he is Chair of the Board of the American Association for the Advancement of Science, of the National Geographic Committee's Committee for Research and Exploration, and of the National Research Council's Division of Earth and Life Sciences.

Described by Time magazine as a "Hero for the Planet," Dr. Raven champions research around the world to preserve endangered plants and is a leading advocate for conservation and a sustainable environment. In recognition of his work in science and conservation, Dr. Raven has been the recipient of the National Medal of Science and of numerous other prizes and awards. He served as president of the Botanical Society of America in 1975 and received the Society's Award of Merit in 1977. He has held Guggenheim and John D. and Catherine T. MacArthur Foundation Fellowships, and is a member of the academies of science in Argentina, Brazil, Chile, China, Denmark, India, Italy, Mexico, Russia, Sweden, the United Kingdom, and several other countries, as well as the Pontifical Academy of Sciences.

Dr. Raven is co-chairman of the editorial board of the Flora of China, a joint Chinese-American international project that is leading to a contemporary account on all the plants of China. He has written numerous books and publications, both popular and scientific, including *Biology of Plants* (co-authored with Ray Evert and Susan Eichhorn), the internationally best-selling textbook in botany, now in its sixth edition, and *Environment*, co-authored with Linda Berg, now in its third edition.

Dr. Raven received his Ph.D. from the University of California, Los Angeles, in 1960 after completing his undergraduate work at the University of California, Berkeley. He has received honorary degrees from a number of universities in this country and throughout the world.



# Workshops--All Sunday, August 4



Please read the Refund and Cancellation Policy. Workshops are ticketed events; tickets may be purchased while registering and will be included in the registration packet. If you participate in a Workshop(s) before acquiring your registration packet, bring your registration confirmation notice so that you have a record of your purchased ticket.

## FULL DAY

### W-1 Modern Methods..... FREE

8:00 am - 5:00 pm

Target-audience: Graduate Students/Research Scientists  
Enrollment Limit: 20

Sponsored by the National Science Foundation.

Organizer: Michael R. Gretz, Michigan Technological University  
Tele: 906-487-3175, E-mail: [mrgretz@mtu.edu](mailto:mrgretz@mtu.edu)

This workshop will provide participants direct (albeit brief) experience with current methodologies in such diverse areas as aquatic robotics, remote sensing, molecular biology and advanced microscopy. The format is four 2-3 hour sessions spread over the day. The workshop is designed to provide the opportunity for scientists to learn about techniques outside of their field of interest at a level of complexity sufficient to encourage technology transfer between disciplines. The opportunity to discover an aspect of another research area applicable to your specialization is equally valuable to those just beginning their scientific careers as those firmly entrenched in a certain area of endeavor.

Summaries of the four sessions are listed on the Botany 2002 website ([www.botany2002.org](http://www.botany2002.org)), and include the following: 1) Automated in situ discrimination of phytoplankton taxa based on light absorption, Gary Kirkpatrick, Mote Marine Laboratory; 2) The Chlamydomonas Genome Project, Arthur Grossman, The Carnegie Institution of Washington; 3) Non-Equilibrium Ecosystem Dynamics: Large-Scale Observational Technologies for Operational Limnology and Oceanography, Judith Budd, Michigan Technological University, and; 4) Multiphoton and Lifetime Imaging, John White, University of Wisconsin.

Graduate students should register as early as possible, as we will be providing up to 10 travel awards to graduate students attending the workshop. These will be awarded on a first come/first served basis to qualified students who provide a short letter from their advisor attesting to their student status. Contact Michael Gretz for more information on qualifying for these awards. First-come, first-served!

We especially encourage members of under-represented groups to sign-up.



## HALF-DAY, MORNING

### W-2 Fast Plants in your Classroom..... \$28.00

8:00 am - 12:00 pm

Target-audience: Faculty/Graduate students  
Enrollment Limit: 24

Organizer: Wisconsin Fast Plants Program  
Tele: 608-263-2634,  
E-mail: [wfp@fastplants.org](mailto:wfp@fastplants.org)  
Internet: [www.fastplants.org](http://www.fastplants.org)



Wisconsin Fast Plants, rapid-cycling Brassica rapa, are an ideal organism for illustrating many of the important principles in biology through students' investigative activities. Newly developed materials with Fast Plants will demonstrate the inter-relationships among variation, phenotype, genotype, environment, adaptation to environment, selection and evolution. The workshop will also include ideas in photobiology and tropism.

### W-3 A Problem-solving Approach to Using Bioinformatics in Biology Education: Investigating One Cell with Three Genomes..... \$15.00

8:00 am - 12:00 pm

Target-audiences: Faculty/Graduate students;  
also Junior High School/High School Teachers  
Enrollment Limit: 24

Organizers: BioQUEST Curriculum Consortium  
Internet: <http://www.bioquest.org>  
John R. Jungck, E-mail: [jungck@beloit.edu](mailto:jungck@beloit.edu)  
Sam Donovan, E-mail: [donovans@beloit.edu](mailto:donovans@beloit.edu)  
John M. Greenler, E-mail: [greenlrj@beloit.edu](mailto:greenlrj@beloit.edu)  
Beloit College

Recent technological changes have streamlined access to the data and tools used in the analysis of molecular sequences and structures. These emerging resources challenge us, as educators, to take advantage of new opportunities to engage students with realistic biological problems. Our approach to developing bioinformatics education materials involves three foci: the central role of evolutionary theory as a powerful heuristic for identifying and interpreting homology; the integration of bioinformatics across the introductory biology curriculum; and, providing students with opportunities to engage in realistic problem solving with rich data resources.



# Workshops (Con't.)



In this workshop we will feature a set of activities and investigations around a dataset of proteins produced by the three genomes found within the nucleus, mitochondria, and chloroplasts of a cell. Participants will be asked to engage in evolutionary, genetic, and developmental levels of analysis as they explore the relationships between gene transfer and protein transport across these three linked genetic/physiological systems.



**TWO-HOUR, MORNING**

## W-4 Producing, Using and Distributing Curriculum Materials in a Multimedia World . . . \$10.00

8:00 am - 10:00 am

Target-audiences: Faculty/Graduate students & Junior High School/High School Teachers  
Enrollment Limit: 20

Organizer: Mike Clayton, University of Wisconsin  
Tele: 608-262 2333, E-mail: clayton@facstaff.wisc.edu

New technologies open up opportunities for the creation of curriculum materials that encompass different learning styles. Using these new tools the Dept. of Botany at the University of Wisconsin- Madison has developed teaching resources that include collections of digital images, computer-mediated interactions, digital movies, and word processing documents. While these target specific instructional needs in our department, we also make them widely available to other educators via the Internet (<http://botit.botany.wisc.edu>) and CD-ROM. We will demonstrate how some of these resources are integrated into an exercise on the plant cell. Digital images are used in lab to provide a passive reference to students; they are used in the lab manual, and are incorporated into web-based review lessons. We also consider the larger issues of generating and sharing multimedia resources between institutions. The activity is suitable for those involved in education from the junior high through college levels.

## W-5 The Case of the Pilfered Plants: Biotechnology (and more) using an interactive CD-ROM. . . . . \$15.00

8:00 am - 10:00 am

Target-audiences: Junior High School/High School Teachers & Faculty/Graduate students  
Enrollment Limit: 50

Organizers: Deborah M. Langsam, E-mail: [dmlangsa@email.uncc.edu](mailto:dmlangsa@email.uncc.edu)  
Steven Clark, E-mail: [sdclark@email.uncc.edu](mailto:sdclark@email.uncc.edu)  
Linda M. Simpson, E-mail: [lmsimpso@email.uncc.edu](mailto:lmsimpso@email.uncc.edu)  
University of North Carolina at Charlotte

The workshop showcases an instructional module in biotechnology developed by the presenters for college-level introductory biology students. The module can stand alone or be accompanied by hands-on lab sessions and includes an interactive CD-ROM forensics case study; students are asked to solve "crimes" involving the theft of plants from university greenhouses and the loss of genetically engineered bacteria from a vandalized lab. Among the unique features of the module: an on-line laboratory manual; sophisticated animations illustrating PCR; and crimes that don't involve murder or rape, but are instead linked to a series of botanical, medical, and environmental issues. The module helps students understand the science behind DNA fingerprinting, fiber analysis, and blood typing and serves as a springboard for discussions of rainforest destruction, genetic engineering, and the ethical issues related to biotechnology research. In this hands-on session, participants will have the opportunity to preview the module. In addition, presenters will offer a variety of teaching tips and ways that the module can be expanded beyond introductory biology for use in upper division courses or with junior high and high school students.

## W-6 Techniques in Producing Content in a Multimedia World. . . \$10.00

10:00 am - 12:00 pm

Target-audiences: Faculty/Graduate students & Junior High School/High School Teachers  
Enrollment Limit: 12

Organizer: Mike Clayton, University of Wisconsin  
Tele: 608-262 2333, E-mail: [clayton@facstaff.wisc.edu](mailto:clayton@facstaff.wisc.edu)

This will follow our first workshop "Producing, using and distributing curriculum materials in a multimedia world". It will best serve those who are just beginning to use the computer as an instructional tool or those considering setting up a UNIX server. To address the specific interests of the participants we will break into three groups. Kandis Elliott and Claudia Lipke will lead one group. Kandis is our staff artist and Claudia is our photographer. Their emphasis will be on photo-manipulation of images with the computer. A second group will be led by Mike Clayton and the emphasis will be on the use of software such as Macromedia, Authorware and Adobe Acrobat to develop computer based interactions. A third group led by Seth Price will consider the process and opportunities of setting up a UNIX server. Seth is in computer science and has set up our instructional server using Macintosh OS X server (see <http://botit.botany.wisc.edu>). Macintosh OS X Server is a UNIX operating system (similar to Linux, BSD, or Solaris) that uses the Apache web server and PHP scripting to serve web pages.



# Workshops (Con't.)



**W-7 Teaching with C-Fern:  
From Spores to Sporophytes  
in Three Weeks. . . . . \$34.00**

10:00 am - 12:00 pm

Target-audiences: Faculty/Graduate students & High School/  
Middle School Teachers  
Enrollment limit: 20

Organizers: C-Fern Group, Internet: <http://cfern.bio.utk.edu/index.html>  
Stephenie Baxter Duncan, E-mail: [shammons@utk.edu](mailto:shammons@utk.edu)  
Les Hickok, E-mail: [lhickok@utk.edu](mailto:lhickok@utk.edu)  
University of Tennessee, Knoxville

C-Fern, a derived strain of the tropical homosporous fern, *Ceratopteris richardii*, offers a dynamic approach to teaching many basic aspects of plant biology using hands-on and inquiry approaches. It can be adapted for a variety of educational arenas including middle school, high school, undergraduate or independent student projects. C-Fern exhibits a variety of unique features not typically found in other organisms traditionally used in the classroom. These features include: simple and inexpensive culture methods, independent haploid and diploid generations, distinct sexual types within the gametophyte generation, rapid development from spores to sporophytes in three weeks, easily visualized development (including differentiation of basic cell types, swimming sperm, fertilization events and early embryo development), and a variety of distinct visual mutants that can be used in genetic exercises. The ability to routinely culture and score large numbers of individuals in both the haploid and diploid generations allows for actual hypothesis formulation and testing by students and provides an effective means of increasing their understanding of basic genetic principles. This workshop, in addition to providing the opportunity for hands-on manipulation and visualization of various developmental stages of C-Fern (including chemotaxis with sperm), will illustrate how it can be used to address basic principles of biology and genetics. Participants will learn how to construct a Growth Pod (C-Fern portable culture incubator), learn general culture techniques, and analyze cultures that demonstrate segregation patterns for a variety of mutant types.

Each participant will receive a C-Fern Manual (\$32.00 value)



**W-8 Of Cabbages and Kimchee:  
Investigative Case-based Learning  
Activities from Recipes Gone Wrong to  
Real-time Data Acquisition  
and Simulation. . . . . \$10.00**

10:00 am - 12:00 pm

Target-audiences: Junior High School/High School Teachers  
& Faculty/Graduate students

Enrollment limit: 20

Organizers: BioQUEST Curriculum Consortium  
Internet: <http://www.bioquest.org>  
Ethel Stanley, E-mail: [stanleye@beloit.edu](mailto:stanleye@beloit.edu)  
Margaret Waterman, E-mail: [waterman@biology.semo.edu](mailto:waterman@biology.semo.edu)  
Christina Strickland, E-mail: [chris@clackamas.cc.or.us](mailto:chris@clackamas.cc.or.us)

Kimchee is a traditional, fermented Korean food that offers rich opportunities for inquiry in the classroom and lab. Using an investigative case-based learning approach, we present cultural, nutritional, biochemical, and microbiological aspects of kimchee in a series of activities that include: 1) exploration of a LifeLines OnLine case "The Kimchee Recipes," 2) construction of take-home kimchee fermentation chambers, 3) demonstration of real time data acquisition to monitor changes in pH, turbidity, CO<sub>2</sub> production, O<sub>2</sub> consumption, and microbial populations, and 4) demonstration of a new BioQUEST computer simulation, Sim Chee, to build kimchee models and simulate fermentation under different experimental conditions



## HALF-DAY, AFTERNOON

**W-9 Botanical Gardening-  
Gardens of Lilliput. . . . . \$28.00**

1:00 pm - 5:00 pm

Target-audience: Faculty/Graduate students  
Enrollment limit: 24

Organizer: Wisconsin Fast Plants Program  
E-mail: [wfp@fastplants.org](mailto:wfp@fastplants.org)  
Internet: [www.fastplants.org](http://www.fastplants.org)



Botanical gardening, "Gardens of Lilliput," is an approach which deepens students understanding and appreciation for the world of plants through investigative and recreational gardening. Students can grow a wide phylogenetic range of plants from mosses to angiosperms in low-cost mini systems (i.e., soda bottle caps and deli containers) encouraging investigative learning based on "knowing by growing."

**W-10 Getting to the Roots of Plant  
Evolution: Genomics and the  
Reconstruction of  
the Tree of Life. . . . . FREE**

1:00 pm - 5:00 pm

Target-audiences: High School Teachers (preference) & Faculty/  
Graduate students  
Enrollment Limit: 25



# Workshops (Con't.)



Organizers: Deep Gene Research Coordination Network  
 Internet: <http://ucjeps.herb.berkeley.edu/bryolab/deepgene>  
 Staci Markos, E-mail: [smarkos@socrates.berkeley.edu](mailto:smarkos@socrates.berkeley.edu)  
 Brent Mishler, E-mail: [bmishler@socrates.berkeley.edu](mailto:bmishler@socrates.berkeley.edu)  
 Jepson Herbarium-University of California, Berkeley

Workshop is FREE and first-come, first-served. Preference will be given to high-school teachers (grades 9-12) and limited to 25. In addition, teachers will receive up to \$75.00 reimbursement of fees for attending other workshops and field trips or for registering for the conference.

Phylogenetic analyses using molecular and morphological data have yielded stunning results about the tree of life and how all organisms on earth are related to each other. The use of phylogenetic methods to understand evolutionary history has become a common theme throughout science. Understanding the concepts and basic methodology of these relatively new techniques is an important component of science education at the high school and undergraduate college levels.

This workshop will provide an introduction to phylogenetic methods using examples from the green plants. Using material that is easily accessible nationwide, we will conduct a hands on demonstration of a classroom exercise appropriate for grades 9 - 12 and introductory biology classes at the university level. Using a simple phylogenetic analysis with morphological and genomic data, we will explore the evolutionary relationships of land plants. Results will be used to discuss adaptation to life on land, radiation of the angiosperms, molecular evolution, and the new classification of green plants.

This workshop will provide a foundation for students to (1) conduct a scientific investigation by collecting, categorizing, and analyzing data, (2) read and analyze data summarized in a cladogram, and (3) understand basic evolutionary concepts such as adaptation, diversification, symbiosis, and convergent evolution.

Sponsored by the National Science Foundation (Grant DEB-0090227), The Deep Gene Research Coordination Group exists to integrate green plant phylogenetics and genomics. The group is exploring ways in which comparative phylogenetic studies can inform functional genomic studies, and knowledge of plant genomes can inform the understanding of phylogenetic relationships. For more information, please visit our web site (<http://ucjeps.herb.berkeley.edu/bryolab/deepgene/>).



## AFTERNOON, TWO-HOUR

W-11 Producing, Using and Distributing Curriculum Materials in a Multimedia World. . . . . \$10.00

1:00 pm - 3:00 pm, Repeat of W-4, Enrollment Limit: 20

W-12 The Case of the Pilfered Plants: Biotechnology (and more) using an interactive CD-ROM. . . . . \$15.00

1:00 pm - 3:00 pm, Repeat of W-5, Enrollment Limit: 50

W-13 Of Cabbages and Kimchee: Investigative Case-based Learning Activities from Recipes Gone Wrong to Real-time Data Acquisition and Simulation. . . . . \$10.00

1:00 pm - 3:00 pm, Repeat of W-8, Enrollment Limit: 20

W-14 Techniques in Producing Content in a Multimedia World. . . \$10.00

3:00 pm - 5:00 pm, Repeat of W-6, Enrollment Limit: 12

W-15 Teaching with C-Fern: From Spores to Sporophytes in Three Weeks. . . . . \$34.00

3:00 pm - 5:00 pm, Repeat of W-7, Enrollment Limit: 20

W-16 Teaching Botany/Biology Using Inquiry. . . . . \$10.00

3:00 pm - 5:00 pm

Target-audiences: High School Teachers & Graduate Students/  
 Undergraduate Faculty  
 Enrollment Limit: 50

Organizer: Gordon Uno, E-mail: [guno@ou.edu](mailto:guno@ou.edu)  
 University of Oklahoma

Inquiry, which has been recognized as the method to drive science education reform, helps students discover and construct an understanding of scientific concepts on their own under the guidance of the instructor. This workshop will introduce participants to different kinds of inquiry and the general techniques of inquiry instruction using a variety of short, hands-on activities and information about the Introductory Botany course at the University of Oklahoma, which is taught using this method. In addition, participants will learn how to develop "discovery" activities on their own and how to make traditional laboratories more inquiry-oriented. We will also address the most common problems in teaching biology today, with suggestions and examples of how to deal with or overcome these problems. This workshop will introduce participants to a new biology education initiative from the American Institute of Biological Sciences (AIBS); ideas for the initiative will be solicited.