How would you like to earn credit searching for salamanders in the wild? This spring, students in the course “Teaching the Science of Nature I” learned all about ecology by interacting directly with the natural world.

The class met Saturday mornings at Tyson Research Center for 12 weeks of ecology. The course included guest speakers and field trips. The trips included Riverlands Environmental Demonstration Area to watch eagles, pelicans, river ducks and raptors; Horseshoe Lake to observe beaver construction and discuss the lakes agricultural effects; and the Meramec River for a canoe float to observe the principles of hydrology.

School is almost out for the summer—it’s your turn to learn in the outdoors. Come join Dick Coles and Judy Tisdale as they teach our ecology course “Teaching the Science of Nature II”.

The class meets Monday through Friday, June 19-23 from 8 a.m. to 4 p.m. at Washington University’s Tyson Research Center. Lectures are followed by hands-on activities. Study birds, trees, weather, food chains, insects, plants and much more. And as if being out at Tyson wasn’t adventurous enough, there are field trips to Forest Park, Washington State Park and Shaw’s Arboretum. You’ll be intrigued and enlightened by this course.

If you are presently taking “Teaching the Science of Nature I” with Dick Coles, you will find this course to be a wonderful addition.

However, teachers who took this course last summer are not eligible to take it again.

Participants in the course may earn two hours of WU credit in either Biology or Education (Bio 4002 or Educ 4002)

Course fees are waived because of funding from the Missouri Coordination Board of Higher Education. Participants pay only the $50 registration fee.

Last year’s class filled up quickly, so please complete the registration form on page 7 and send it in to the Science Outreach office. The $50 registration fee will be collected on the first day of class. For more information call Vicki May, Science Outreach Director at 314-935-6846 or e-mail may@biology.wustl.edu.
BY DANA BENEDICTUS
Thinking of getting your master’s degree, a few classes or a certificate in science education? Consider Education 6000 courses. They pay off immediately in activities you can use tomorrow with lab supplies and loaner equipment provided, continual professional development and connections with colleagues. They’re convenient, with after school and evening meeting times through University College (Washington University’s night school).

The Education 6000 sequence includes four three-credit classes: Electricity and Magnetism (6001), Heredity and Life Cycles (6002), Force and Motion (6003), and Biological Structure and Function (6004). A science education certificate requires only 15 credit hours. For fall 2000, Force and Motion (EDU 6003) starts Sept. 5 and meets Tuesdays from 4:30-7 p.m. Some activities include building equipment such as a skimmer, model racing car, hovercraft, air pump, inclined plane, force scale, can crushers and other simple machines.

Each course costs only $200—a $550 savings over the cost of a regular University College course. To register, complete the form on page 8 or call the Science Outreach Office at (314) 935-7170 or e-mail elaine@biology.wustl.edu.

These teachers took EDU 6002 Heredity and Life Cycles in spring 2000. Some were new to the courses, others were back for more. Here’s what they said about the program:

“Education 6000 is all science, all hands-on. I wasn’t a science major—I never took half of this when I was in school. I’m sorry I didn’t do this earlier. My kids love it. I replicate the class for my kids the next day. They ask me ‘what are we doing tomorrow?’ and I tell them they’ll have to wait until I get back from class! … It’s a fabulous program—a good secret!”

Jocelyn Pugh, fourth grade teacher, Moline Elementary School, Riverview Gardens School District

“I was expecting a lecture program, but from the first class I took it was all hands-on. … I couldn’t wait to do the lessons with my kids. It’s almost easier for me, as a first year science teacher—I feel the successes and excitement my students feel. It’s made it a lot more meaningful. … I’ve always felt I could go to the professors in this program. They’re all very approachable. … I recommend anyone in science to check the program out!”

Debbie Lambing, K-5 teacher, Clay Accelerated Community Education Center, St. Louis Public Schools

“I started these courses because I’m interested in learning more about Missouri history, conservation, and hands-on activities. This is my first ED 6000 course, and I’ve already received many activities to use in the classroom. They gave us cool stuff—everything you need is supplied—which makes it easy to apply.

Jocelyn Pugh, fourth grade teacher, Moline Elementary School, Riverview Gardens School District

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Kathie Reuter, K-5 gifted teacher, Kratz Elementary School, Ritenour School District

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Kathie Reuter, K-5 gifted teacher, Kratz Elementary School, Ritenour School District

“Physical science is more fun to do hands-on. … I can use the Legos and K’nex pieces almost all semester. Kids use them to design vehicles—they’re working in teams, doing technical drawings. K’nex pieces make the physical science concepts of speed, energy and acceleration into a hands-on activity, and the kids learn. Everyone gets sick of balls and rulers in physical science, and no one’s sick of these materials yet!”

Maura Brueggeman, eighth grade physical science teacher, Whiteside School, Belleville, Ill.
On Friday, March 17, Twelve students from each of two area high schools, Soldan International and Parkway North, were invited to spend the morning on the Washington University campus. The purpose of the day was to let the students become acquainted with the molecular biology aspect of Washington University's science program by giving them the opportunity to do some experiments of their own. Teachers from the two schools selected students from their school's honors biology classes. The students were instructed in the basics of molecular biology by Vicki May and Gary Corbin of the University's Science Outreach Office. Instruction was held in Rebstock Hall, Laboratory 125.

Groups, consisting of teams of students from each of the high schools, cooperated to complete a bacterial transformation. They genetically engineered *E. coli* to glow in the dark by inserting a gene for luminescence from the bacterium *Vibrio fischeri*. This laboratory experiment was followed by a simulation of screening for a genetic disease, Duchene muscular dystrophy, using gel electrophoresis.

After the completion of the laboratory experience the students were taken to lunch at the Mallinkrodt Center and then were given a tour of the campus by an undergraduate tour leader.
Elgin grows science outreach with seeds from many sources

BY DANA BENEDICKTUS

“I got into science education by having two kids,” says Sarah “Sally” Elgin, Ph.D., professor of biology and founder of the current science outreach program at Washington University. “Parents do hands-on science with their kids all the time,” she continues.

However, few parents do hands-on science to the extent Elgin does. A researcher in molecular biology, Elgin is known in the scientific community for her findings on gene regulation. And since 1990, she’s become known as a leader in bringing experiential science to area students in grades K-12.

**Early experiments**

Science Outreach at Washington University began with a partnership program Elgin developed with University City High School in 1990. “It was a volunteer effort,” recalls Elgin. “I solicited other faculty members and paired them with high school and junior high school teachers.”

The experiment was successful—but only short-term. “There was no mechanism for keeping the relationships going,” explains Elgin. She found this was true for other outreach projects in the early 1990s. “There was enthusiasm for pairing, but not enough structure,” she says.

Those early experiments in outreach taught Elgin what was essential for a successful outreach program. She knew she had to keep the partnership between scientists and K-12 teachers. “You need both the [K-12] classroom expertise and the scientific expertise,” she says.

**Second generation**

Outreach programs like Modern Genetics, Environmental Chemistry, Education 6000 and the WU student volunteer teaching teams are descendants of the early outreach projects.

“Incorporating outreach into University College ED 6000 courses created a well-defined framework,” says Elgin.

Elgin also learned to make sure outreach staff have prior teaching experience, and that teaching assistants are always full time teachers. The physical setting for outreach projects is also important. “It’s why we always teach ED 6000 in a classroom, not a lab,” says Elgin. “They [teachers] work in a classroom with flat tables, few electric outlets and water down the hall.”

“Since we’ve been doing this awhile, we’ve learned to think of things an average scientist wouldn’t,” explains Elgin. Outreach programs address safety and distribution of materials, as well as science concepts.

**Growth inhibitors**

Elgin’s successes have also helped her define what she sees as the two biggest obstacles to teaching hands-on science: sustainability and a misunderstanding of science in the present school culture. Funding is key to overcoming both obstacles.

Outreach programs are funded from a variety of sources, including Howard Hughes Medical Institute, the National Institutes of Health (SEPA), the State of Missouri (Eisenhower, CBHE), and others. However, many of the grants provided by these sources are for fixed periods. “Agencies and foundations are interested in developing new materials, but they often don’t invest in dissemination and sustainability,” says Elgin.

In spite of this challenge, Washington University’s Science Outreach Program, Modern Genetics is now part of the biology curriculum in nine school districts, including St. Louis Public, with its 11 high schools. Today 54 biology teachers and more than 5000 students are learning the basics of DNA science through Modern Genetics.

Changing attitudes about the importance of hands-on science may prove more difficult. “We have to build into the K-12 culture that science is hands-on,” says Elgin. She conducted a survey 10 years ago to discover what schools spent on science. “Most K-5 schools spent much more on art as on science,” she says, “because principals understood that if you want to teach about art, books won’t work. You must give out crayons, clay, materials. They didn’t understand that about science. … and if you don’t have [disposable] materials, you can’t do quality projects.” She notes that physical materials are not as much a problem—they can be used year after year. “Biological materials either grow or rot,” she says. “If every district would budget $10 per student per year for disposable science materials, we’d be set!”

**Fruits of labor**

Even with the challenges in the way her dream of hands-on science for all students, Elgin’s successes have generated recognition. Most recently, the St. Louis Academy of Science presented Elgin with a Fellows Award for her contribution to science education.

“The award is mildly embarrassing,” says Elgin. “I’m the visible one. But there are only a few cases where individual talent is obvious, like a concert violinist. In science, it’s rare—it’s almost always a group effort. … The same is true of outreach. Almost all the work has been done by others. That’s the nature of the human endeavor.”
Interested in sharing your teaching ideas at the National Science Teachers Association Conference? Well, here’s your chance. The NSTA National Convention is going to take place in St. Louis, Missouri from March 22-25, 2001 and they are now accepting program proposals.

Who can present?
Some sessions consist of a panel of experienced experts. Another session might be held by a single teacher who just has a good idea to share, even if it is not a new one.

What kinds of presentations are accepted?
NSTA provides convention attendees with a wide variety of sessions. The sessions are in the form of workshops, demonstrations, panels, and lecture/discussions. They try to cover eight different categories of science, from biology/life science to environmental science to physics. The audience ranges from pre-kindergarten teachers to college professors.

What are the Criteria for Rating Proposals?
- Does the proposal clearly describe the session?
- Is the information provided in the proposal complete?
- Is the proposal session of interest to NSTA members (e.g. teachers, supervisors)?
- Is the proposal session based upon recommended practices of or research in science education?
- Is the proposed session topic timely/appropriate?
- Does the proposal deal with NSTA concerns for the future or is it in line with NSTA policy and positions?

The reviewer will focus on the 150-200 word Summary of Proposal.

What is the Process for submitting a Session Proposal?
- Get a copy of the Session Proposal form. To get a copy of the form, see the website at http://www.nsta.org/conv/call.asp or call Vicki May for a copy at (314)935-6846.
- Fill out the form completely. Don’t forget to fill out the safety guidelines.
- Include three copies of the form when you mail it in.
- Mail it in to the Program Committee before May 15, 2000.

St. Louis Proposal
Becky Litherland, Program Coordinator
c/o NSTA Convention Office
1840 Wilson Blvd,
Arlington, VA 22201-3000

To receive a registration form or for more information about the workshops listed below call (314) 768-5446 or e-mail Jim Jordan, Associate Curator of Education at jordan@stlzoo.org

Animal Adaptations and Behavior
For teachers of grades K-8.
Mon., July 10 8:30am-12:30pm
6:30-8:30pm
Tues.,July 11 8am-5pm
Wed., July 12 8:30am-12:30pm

This workshop is an introduction to the myriad ways animals survive and thrive in our complex world. It is a cooperative class with the Missouri Department of Conservation.

Fee: $25 or for one hour graduate credit through Lindenwood University, $60 tuition.

Spineless Wonders: Monarchs, Mantids & More
For teachers of grades 4-8.

ZOO

During July and August 2000, the Rivers Project of Southern Illinois University at Edwardsville (SIUE) will conduct its annual summer training. Educators and environmental professionals are encouraged to attend and focus on one of the six curricula, Biology, Chemistry, Earth Science, Geography, Language Arts and Mathematics. The units were developed under a grant from the National Science Foundation. Trainers for the week-long sessions are practicing Rivers Project teachers.

July 31-Aug. 4
Southern Illinois University, Edwardsville, IL

This 10th Anniversary training was partially funded by the IL Board of Higher Education, Dwight D. Eisenhower, Title II funds for Illinois teachers. Applied technology and computer applications are the focus.

Tuition (two hours graduate credit, summer 2000) and curricular materials will be available for $200. Lodging and food will be provided at a low cost. Interdisciplinary teaching teams from the same school are encouraged to attend.
Interested persons should check the Rivers Project Web Page for information and details on the training, as well as information on the curriculum units. If you are interested in training in your area, call, e-mail, or write Dr. Bob Williams at the Rivers Project. http://www.siue.edu/OSME/river
Call (618)650-3788
Fax (618)650-3359
E-mail: rivers@siue.edu
Box 2222
Southern Illinois University, Edwardsville, IL 62026

MISSOURI BOTANICAL GARDENS

To receive a registration form or for more information about the workshops listed below call (314) 577-5144.

GEMS Leaders Workshop
For teachers grades K-8
Discover activity-based math and science curriculum units and involve your students in hands-on experimentation.
Date: August 2-4, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $125 (includes 4 guides and 1 handbook)

IEEIA: Investigating and Evaluating Environmental Issues and Actions
For teachers grades 5-12
Learn how to guide your students through the steps to investigate an issue, to access, process and evaluate information, and to use their critical thinking and problem-solving skills to determine solutions.
Date: June 19-23, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $30 (includes Teacher’s Curriculum Guide)

Oceans: From Shore to Sea
For teachers grades K-8
Investigate the ecology of oceans and study the composition of sands and adaptations of plants and animals in salt water.
Date: August 9-11, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $10 (non-refundable)

Discover Plants
For teachers grades K-9
Learn hands-on activities to focus on plant parts and their functions, plant reproduction, and tips for growing and experimenting with plants in the classroom.
Date: June 29-30, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $10 (non-refundable)

Keys to Survival
For teachers grades 5-7
Learn hands-on, engaging activities designed to encourage your students to explore new ideas, perform experiments, and think critically to solve a problem.
Date: July 31- August 1, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $10 (non-refundable)

Exploring Plant Mysteries: Botany for Teachers
For teachers grades 5-12
Investigate basic structures of plants, the mysterious processes that promote growth, development, and reproduction in plants through activities and discussions.
Date: August 2-4 and 7-8, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Missouri Botanical Garden
Fee: $30 (includes class text)

Mapping the Environment
For teachers grades 4-8
Study the environment by investigating weather trends, the emergence and blooming of tulips, and the migration of the monarch butterfly using geographic computer software.
Date: July 10-14, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Litzsinger Road Ecology Ct.
Fee: not applicable

GLOBE: Global Learning and Observations to Benefit the Environment
For teachers grades 5-12
The GLOBE Program is a hands-on science and education program that unites students, teachers and scientists from around the world to study and research the Earth’s environment.
Date: July 17-21, 2000
Time: 9:00 a.m.- 4:00 p.m.
Location: Litzsinger Road Ecology Ct.
Fee: $10 (non-refundable)

1. The popular NASA educational product, “The Solar System Lithograph Set,” is now available as a web document on NASA Spacelink. The set of 15 lithographs includes pictures of asteroids, comets, moons, the nine planets, and the Sun, along with background information for each title. The Solar System Lithograph Set is located at spacelink.nasa.gov/products/SolarSystem.Lithograph.Set/

2. What did we learn about the Moon from the Apollo, Clementine, and Lunar Prospector programs? The NASA educational poster “Once and Future Moon” offers Moon facts, classroom activities, and the top 10 scientific discoveries made during Apollo Exploration of the Moon. The poster can be found at spacelink.nasa.gov/Once.and.Future.Moon/
**TEACHER RESOURCES**

3. Visit [www.earth.nasa.gov/education](http://www.earth.nasa.gov/education) for resources for teaching earth science.

4. For a list of education contacts in your state, visit [aesp.nasa.okstate.edu/map.html](http://aesp.nasa.okstate.edu/map.html) and select your state.

**REGISTRATION FORM FOR SUMMER ‘00 ECOLOGY COURSE**

**“TEACHING THE SCIENCE OF NATURE I”**

The registration fee of $50 will be collected the first day of class.

Name ________________________________________ Address ______________________________________________

City ____________________ State ______ Zip __________  E-mail ________________________________________

Home Phone ______________________________ Work Phone ______________________________________________

School ________________________ District ________________________________ Grade ____________________

SEND TO: Vicki May, Washington University, Campus Box 1137, St. Louis, MO 63130

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**SPACE DAY 2000**

30 days and counting until liftoff!! Will you be there? Space Day 2000, May 4, 8-3:30 PM. Cooperating School Districts (CSD) and Challenger Center are proud to bring you this professional development opportunity.

Hear a stellar keynote presentation from retired NASA astronaut Charles D. Walker! A payload specialist on three Space Shuttle missions, Walker accumulated 20 days and 8.2 million miles of space flight experience. He now works as a senior specialist for Advanced Space Programs Development at the Boeing Company.

In addition to Walker’s presentation, participants will attend two learning sessions with NASA’s Johnson Space Center, browse student-made, space-related exhibits and get valuable ideas and materials at the Curriculum Resource Center.

The cost for this amazing day is only $60 and includes lunch and parking. Don’t miss your chance to register—contact Neal Gilb at neal@info.csd.org or (314) 692-1253 by April 28th.

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**TEACHER RESOURCES**

The PBS series Frontline will examine the phenomenon of global warming in a broadcast scheduled for April 18th. NOVA, which airs on Tuesdays at 9 p.m., will feature global warming and the International Space Station, respectively, in two April broadcasts.

Tune in to the “Secrets of the Dead” during May 15-17 (8-10 pm) to see how scientists from a variety of disciplines are using advanced technology to discover the truth about some of history’s great mysteries.

On May 24 (9-11pm), “Sahara” will take viewers to this desert, which covers more than 3,000 miles. Filmed in high-definition, the program will feature “foxes that mew, cats that bark, lizards that swim through the sand, and gazelles that never take a drink,” along with other wildlife.

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Washington University’s Science Outreach is interested in communicating to K-12 science teachers all the wonderful opportunities that are available on campus and in the St. Louis area. As always, questions, comments, ideas and contributions are welcome!

**Science Outreach Director**

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may@biology.wustl.edu
935-6846

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**Communications and Graphics**

Mike Wirtz
wirtz@biology.wustl.edu
Congratulations

to MS. KATHLEEN REUTER on being chosen as a Fellow in the Institute for Science and Math Education.

to MS. CATHY GREEN and MS. MONICA PENNY for having completed their fourth semester of Ed 6000.