For teachers of grades K-8
Graduate certificate in science education combines the best of both fields

Washington University’s graduate certificate in science education is a 15-credit hour post-bachelor’s program designed for teachers of grades K-8. If you have completed one semester of Education 6000 Hands-On Science K-8 with a grade of B or better, you are eligible to apply for the certificate program. Candidates for the certificate can take Education 6000 courses and other eligible Washington University courses at a reduced cost. Credits earned as part of the certificate are applicable to a master of arts in education in instructional processes. (A separate application must be completed through the department of education for the master’s degree.)

Acceptance to the certificate program is competitive. The deadline for spring program entry is Nov. 15, or April 15 for fall entry. Contact Amy O’Brien for information, (314) 935-9342, aobrien@wustl.edu. Applications may be downloaded from the Science Outreach website, www.so.wustl.edu.

Congratulations and welcome to our new 2004 graduate certificate in science education candidates: Diane Key-Biggs, Saint Louis Zoo; Sally Koczan, Wydown Middle (Clayton); and Chalita Black-Rogers, Long Middle CEC (St. Louis Public).

This program is supported by the Howard Hughes Medical Institute.

A CLOSER LOOK: Sally Koczan, science teacher at Wydown Middle (Clayton); Carole Von Eschen, teacher at Flynn Park Elementary (University City), and Jack Diani, instructor, examine a horseshoe crab in Education 6004 Biological Form and Function.

For teachers of grades K-8
Education 6004 Hands-On Science K-8: Biological Form and Function

Content for this course has been realigned to match the Missouri Grade Level Expectations. Topics include:
• The diversity of life
• Plant and animal classification
• Adaptations that help living organisms thrive and reproduce

Dates: Tuesdays, Jan. 18-April 26, 2005, 4:30-7 p.m.

Instructors: Jack Diani and Mark Kalk

Location: Washington University
Hilltop Campus, 217 Rebstock Hall
Credit: Three graduate credits in education
Cost: $250 registration plus additional parking fee
Register: Contact Amy O’Brien, (314) 935-9342, aobrien@wustl.edu.
Education 6000 classes are supported by the Howard Hughes Medical Institute and the National Science Foundation.
For grade 2 classes
**Study St. Louis County’s Native American history**

Integrated history and science programs help second graders identify how and why Native Americans peoples camped or settled at Tyson — the economic and geographic reasons can be seen! Students can find sedimentary rocks and discover how Native Americans used and traded them. Activities include a simulation of a tribal governing system and resolving a problem. Teachers can customize a program to fit their needs.

For grade 4 classes
**Connect Missouri history—ecology—geology**

Visit an abandoned mining town, a springbox, and a human-made cave, and interact with Missouri history and geology. Learn what Missouri ecologists are studying in forests, and how the land at Tyson was used between 1775 and 1950. Teachers can create customized programs varying in length from two to four hours. This program will start in spring 2005.

For grade 6-8 classes
**Integrate middle school subjects through ecology**

For teachers who want to include ecology and environmental studies in cross-discipline units, Tyson educators can help design an outdoor experience to meet curricular goals. For example, students can compare food webs in different ponds, examine an ecological mystery in an oak hickory forest setting, or apply geological findings to an archaeological site. Marty Galganski, Tyson Field Science coordinator, will work with you to design a program that fits your needs.

For grade preK-12 classes
**Field trip programs offer topics for diverse groups**

Tyson Field Science offerings for classes are designed to help children understand how seasonal conditions affect wildlife and the environment.

For children ages 3-5 and families
**Fall Family Fun mornings**

Enjoy your child’s or grandchild’s company while discovering the wonders of nature at Tyson. “Batty about Bats,” the last session in the fall series, include a tour of Tyson’s cave, a quiet story about bats, and a chance to discover the difference between hibernating and roosting bats. Visit [www.biology.wustl.edu/tyson/educ-parent.html](http://www.biology.wustl.edu/tyson/educ-parent.html) for additional session information. Program dates are Oct. 1, Oct. 4, Oct. 11, Oct. 18, and Oct. 25. All sessions begin at 10 a.m. and end at noon. An adult must accompany all children. The cost is $6.50 per child; free for adults.

About Tyson programs

For all Tyson programs, contact Marty Galganski, (314) 935-8437, mgalganski@biology2.wustl.edu, to register or learn more. Costs are $5-6 per student for school programs. The Tyson Field Science Program is housed at Washington University’s Tyson Research Center, eight miles west of the I-270/I-44 interchange, at the Beaumont-Antire exit.

The Tyson Field Science Program is supported by the Gaylord Foundation, the Friends of Tyson, and individual donors.
Keeping Busy

Congratulations to these educators on receiving recognition for their contributions to science education.

The National Association of Biology Teachers has given Stan Braude, instructor in biology, its Four-Year College Biology Teaching Award. Braude is one of the authors of the Outreach Partnership curriculum on animal behavior.

The St. Louis section of the American Chemical Society has named Frank Cange of Trinity High School its High School Chemistry Teacher of the Year.

For high school biology classes
High school students taste university science and campus life with DNA Science Days

Bridge the gap between high school and college by bringing your students to Washington University for a DNA Science Day experience. This free program includes:
• Reimbursement for bus transportation to and from your school
• A college level lab investigation
• Lunch and a tour of campus

“I encourage students to ask about the science, but also to ask about college, careers, and anything else they can think of,” says Susan Flowers, program coordinator. “The day starts out very science-oriented, but when they return from the campus tour, they have more questions about what it’s like to attend a research university, to major in science, or to live on campus.”

To book a visit for fall 2004 or spring 2005, contact Flowers, (314) 935-8271, flowers@biology2.wustl.edu.

DNA Science Days are supported by the Howard Hughes Medical Institute.

For grade K-8 classes
Teaching Teams travel for hands-on science

Help your students catch the excitement of doing science from Washington University student volunteers. Teaching Teams members visit your class, bringing hands-on activities such as The Heart, The Water Cycle, Physics, Plant Propagation, Genetics, Chemistry, The Brain, and others.

To schedule a visit, call Kristin Sobotka, (314) 935-7170, or e-mail kristin@biology2.wustl.edu.

The Teaching Teams are supported by the Howard Hughes Medical Institute.
Imagine having all science lab materials for ten different hands-on genetics investigations, prepped and delivered to your classroom.

That’s what biology teachers at 28 St. Louis high schools look forward to every year. Since 1992, when University City became the first partner, over 28,500 students have learned genetics using the Modern Genetics hands-on curriculum and classroom materials.

Partner schools get more than ready to use lab supplies. They get connected with Washington University resources, including graduate classes for teachers, science lab materials, and teaching support. The Modern Genetics partner schools are: University City, Jennings, Washington, Webster Groves, Parkway Central, Pacific, Riverview Gardens, Crystal City, Hazelwood (all three high schools), Maplewood-Richmond Heights, Wellston, Affton, Elsberry, Mehlville (both high schools), St. Louis Public (all ten high schools), and East St. Louis.

Three schools joined the program this summer: East St. Louis, Hazelwood West, and Oakville (Mehlville). Teachers at the new schools will use partnership resources to help about 1,700 biology students learn about genetics each year. In 2004-05, nearly 5,400 students from all 28 partner schools will do hands-on genetic science as part of the Modern Genetics program.

Teachers from the new partner schools participated in Biology 4732 Modern Genetics, a two-credit graduate course, in August. Susan Flowers, genetics/bioinformatics director, instructed the course, with guest lecturers Martin Israel, professor of physics, and Sarah C.R. Elgin, professor of biology. Mary Wilmes-Riesenber, scientist at Monsanto, also gave a guest lecture. The teachers toured the Genome Sequencing Center to learn how DNA is sequenced on a large scale.

Jackie Neeley, biology teacher at Oakville Senior, says she’s excited to get back into her classroom. “The number one reason teachers don’t do labs is lack of prep time,” she explains. “But this program makes it easy for us. It’s a great resource.”

The teachers who participated in the summer course are: from Affton, Robert Pelc; from Riverview Gardens, Martha Burich; from Oakville (Mehlville), Jackie Neeley; from Hazelwood West, Mary Kebert; from East St. Louis, LaDonna Kennon-Singleton, Mildred Mayberry, Victoria McGee; and from Washington, Jennifer Hamilton, Al Matzes, and Rick Schwentker.

Flowers will hold a two day workshop for all partner school teachers new to the program, Oct. 18-19, from 9 a.m.-5 p.m. To attend, contact her at (314) 935-8271, flowers@biology2.wustl.edu. If you teach biology in a partner high school, contact Chris Mohr, lab manager, (314) 935-8271, mohr@biology2.wustl.edu, to order lab supplies. Even if you don’t teach at a partner school, you can still use the curriculum. Visit the Science Outreach website to download Modern Genetics for All Students, at www.so.wustl.edu.

Modern Genetics is supported by the Howard Hughes Medical Institute, the Washington University Genome Sequencing Center, the National Institutes of Health, and the Monsanto Fund.
For science teachers of grades 7-12
From class work to bench work

“W hat’s it like to work in a research lab?” This fall, eight St. Louis science teachers can answer that question from personal experience. They participated in the Summer Research Fellowships for Science Teachers program, working with faculty mentors at Washington University, completing their own research project, and joining in weekly discussion meetings. Five of the fellows who returned for a second summer are in the process of developing curriculum related to their research.

Juanita Chambers, Yeatman-Liddell Middle School (Saint Louis Public), worked with Carla Easter, outreach director. Chambers returned to the Washington University Genome Sequencing Center for a second summer fellowship. This year, she developed her experience into paper modeling activities for high school students.

Anne Deken, Hardin Middle School (St. Charles), worked with Jon Chase, assistant professor of biology, for a second summer. At Tyson Research Center, Deken studied two related species of Daphnia. She is working on a middle school curriculum on using the concentration of hemoglobin in the organism to determine pollutant levels in pond water.

Mike Grupe, Lutheran High School North, worked with Wayne M. Barnes, associate professor of biochemistry and molecular biophysics. Grupe tracked the PCR mutation rate of genes under different pH levels. He is working on developing a lab investigation using bright red coral genes to visibly show the effects of DNA transformation of bacteria.

Elmer Kellmann, Parkway Central High School, worked with Sarah C.R. Elgin, professor of biology. He returned for a second year, and worked with a team investigating the differences in the genetic sequences of two species of fruit flies.

Rona Robinson-Hill, McKinley Classical Junior Academy (St. Louis Public), worked with Susan Dutcher, professor of genetics, on a study of the single-cell flagellate Chlamydomonas. She investigated genes and proteins involved in the intraflagellar transport system.

Cheryl Stephens, Washington High School, worked with Barbara Kunkel, associate professor of biology, and Karen Preiter, graduate research assistant. Stephens investigated the conditions required for a plant pathogen to become virulent. She also developed a PCR investigation of hemoglobin genes in Daphnia species for high school students.

William Thoele, CBC High School, worked with Mark Running, assistant member and principal investigator, Donald Danforth Plant Sciences Center. Thoele investigated the genetics of the plant Arabidopsis, using techniques like polymerase chain reaction, gel electrophoresis, and electron microscopy. He plans to return next summer to develop a high school curriculum in plant genetics.

Thomas Willis, Sumner High School (St. Louis Public), worked with Stephen L. Johnson, associate professor of genetics. He studied the development of transgenic zebra fish that express a green fluorescent protein.

THE SUMMER RESEARCH FELLOWS smile after sharing their projects with the group. From left, Thomas Willis; April Bednarski, coordinator; Juanita Chambers; Susan Flowers, coordinator; Mike Grupe; Anne Deken; Elmer Kellmann; Cheryl Stephens; Bill Thoele; and Rona Robinson-Hill.

For more information, contact Susan Flowers, (314) 935-8271 or flowers@biology2.wustl.edu. The Summer Research Fellowships for Science Teachers are supported by the Howard Hughes Medical Institute.

Free scientific equipment

As research labs replace their equipment, many items can be used in the K-12 classroom. If you are interested in any of this equipment, please contact Susan Flowers, (314) 935-8271 or flowers@biology2.wustl.edu.

• Waring professional blender with attachments
• Microcentrifuge
• Large two-channel electrophoresis power supply
• Gas chromatograph
School is back in session, and teachers are making sure that students are all on the same page. In five St. Louis County school districts, teachers’ efforts continue a process started this summer. Working with Washington University science and math education faculty, teachers aligned curriculum to district and state standards and identified ways to improve instruction.

The St. Louis Math and Science Partnership (MSP) provides professional development and teaching materials designed to help schools provide challenging curriculum and close achievement gaps. Partner districts are Ferguson-Florissant, Maplewood-Richmond Heights, Riverview Gardens, University City, and Webster Groves. This summer, 53 partner district teachers attended graduate courses at Washington University, and another 92 teachers participated in curriculum planning sessions and enrichment activities.

Knowing Math
Elementary students who have trouble in math usually have failed to learn a key concept. Teachers in four St. Louis MSP districts participated in an introduction to Knowing Math, a program designed to help kids catch up.

Amanda Blair, fourth grade teacher at Glasgow Elementary in Riverview Gardens used the curriculum with a few students. She said, “Multiplication just clicked for them, and they were far beyond the regular class in naming numbers and place value. The program is excellent as far as catching up students who need it.”

Rational Number Academy
Teachers of grades K-8 from four St. Louis MSP districts took their math study to a new level in August, when they participated in Edu 6010 Rational Number Academy. Because the course is listed as an academy, the teachers will continue meeting throughout the year with their district colleagues.

Jere Confrey, professor of math education, focused the course on rational number operations, and methods teachers can use to help children understand them.

“Rational number is probably the most critical concept for children to learn if they’re going to succeed in advanced math,” explained Confrey. “We’re trying to provide a foundation for kids, and we’re going beyond what’s required by testing. To get kids to understand math, you have to get into deeper cognitive issues.”

Leadership Academy
St. Louis MSP teachers also began a year-long science study in this summer. Kathy DiRanna, K-12 alliance director for WestEd, leads the professional development objective of the Center for the Assessment and Evaluation of Student Learning (CAESL). She and her colleagues helped teach Edu 6008 Science Leadership Academy in June.

“Assessment is a vital part of the teaching and learning cycle, and it’s an important tool teachers can use to monitor student progress,” said DiRanna.

“Like good teaching practices, good assessment is grounded in standards and in the research about how students learn.”

Terri Thomas, eighth grade science teacher at Brittany Woods Middle School in University City, took the science assessment course with two of her colleagues. As a partner in the St. Louis MSP, Brittany Woods will receive kits and materials that Thomas and her colleagues can use to help students develop an understanding of science concepts. They will continue to meet as a group with MSP personnel throughout the year. “I’m excited about being able to chart kids’ progress,” said Thomas.

The course also helped teachers understand how assessment is more than giving tests. “We even looked at a class activity as an assessment,” said Thomas. “Good assessment involves a lot of observing, keeping an accurate record of who’s done what, rather than just putting a grade in a grade book. It can tell you where to go.”

Thomas and her colleagues at University City met again in August to select curriculum and identify materials that Thomas and her colleagues at University City met again in August to select curriculum and identify materials that the St. Louis MSP will provide for the school year. Teachers at Maplewood-Richmond Heights, Riverview Gardens, and Ferguson-Florissant also met in district groups to address the school year ahead. As the year progresses, MSP personnel will stay in contact with teachers,
and digging

conducting follow up sessions, visiting classrooms, and delivering materials.

Teachertrek
A group of 18 science teachers in Riverview Gardens traveled to Montana in June as part of Teachertrek, a dinosaur dig offered by the St. Louis Science Center. Working with paleontologists at Emporia State University, the teachers joined in every part of the digging process. Chuck Jones, biology teacher at Riverview Gardens High School, was lucky enough to find a triceratops skeleton partially uncovered. Ann McMahon, science coordinator for Riverview Gardens, said, “The Science Center and Emporia State staff were great. They gave us all the background we needed on the geologic record, and answered all our questions.” This year, the Teachertrek group will work on using their experience to enrich their teaching of the Foss earth history unit and a related GEMS unit.

Ascend
This summer, the St. Louis Science Center piloted a program for high school students in the partner districts. The Ascend program was an intensive seven week experience that blended science experiments, math projects, art, reading, and outdoor activities. The group of 51 students also learned about various careers, job skills, and habits of successful people. Carolyn Ikpeama, student programs director and MSP project director for the St. Louis Science Center; Jenell Madison and Caroline Steinhauser, community coordinators for the Science Center, and 13 teachers from the partner districts worked together to lead and coordinate the program.

For more information about the St. Louis MSP, contact Victoria May, director of science outreach, (314) 935-6846, or visit the Science Outreach website, www.so.wustl.edu. The St. Louis MSP is supported by the National Science Foundation.

Science Outreach thanks program partners
Science Outreach programs would not be possible without the partners we work with throughout the year. Thank you to these individuals for their materials donations and contributions to K-12 teacher programs.

Edu 6002
Jim Jordan, Saint Louis Zoo
Stan Braude, biology
Mike Dyer, biology
Garland Allen, biology
Sarah C.R. Elgin, biology
Mark Johnston, genetics
Rachel Slough, genetic counselor
Eric Richards, biology
Jonathan Losos, biology

Edu 6012
Pat Gibbons, physics
Ann McMahon, Riverview Gardens School District

Equipment donations
Jo Holt, biochemistry, molecular biophysics
Josie Clark-Curtiss, biology
Walter and Memory Lewis, biology
Bill Zvanut, Fischer Scientific
Steve Bequette, ISC BioExpress

Modern Genetics
Sarah C.R. Elgin, biology
Mary Wilmes-Riesenberg, Monsanto
Martin Israel, physics

St. Louis MSP
Jere Confrey, math education
Sibel Kazak, education

Lewis Ford, education
Shirley Eisenhauer, biomedical engineering
Amanda Carr, biomedical engineering

Summer Scholars in Biology and Biomedical Research
Shelley Sakiyama-Elbert, biomedical engineering
Thomas Steinberg, infectious diseases
Larry Taber, biomedical engineering
Tamara Doering, molecular microbiology
Monica Bessler, molecular biology, pharmacology
Kurt Thoroughman, biomedical engineering
Mitchell Grayson, immunology
Jianxin Bao, speech and hearing, CID
Daniel Kelly, cardiology
Paul Schaeffer, cardiology
Colin Nichols, cell biology
Dwayne Simmons, anatomy and neurobiology, CID
Tim Schedl, genetics
Kathy Ponder, biochemistry, molecular biophysics
Alison Goate, genetics
Daniel Link, pathology, immunology
Kevin Black, radiology

Michael Lovett, human genetics
Robert Arch, pathology, immunology
Kathryn Miller, biology
Eric Richards, biology
David Kirk, biology
Barbara Schaal, biology
Ralph Quatran, biology
Michael Neff, biology
Paul Stein, biology
Mark Johnston, genetics
Sharon Stahl, Arts and Sciences
Erik Herzog, biology
Doug Chalker, biology
Danny Kohl, biology
Sarah C.R. Elgin, biology
Micaiah Wilcox, chemistry
Julie Emerson, Mary Institute Country Day

Summer Research Fellows
Sarah C.R. Elgin, biology
Barbara Kunkel, biology
Mark Running, Danforth Center
Steven Johnson, genetics
Susan Dutcher, genetics
Wayne Barnes, biochemistry, molecular biophysics
Jon Chase, biology
Carla Easter, Genome Sequencing Center

For students ages 9-14
FIRST LEGO® League: A sport for the mind
Combine hands-on robotics with a sports-like competition through participation in the FIRST LEGO® League. Students work in groups of 10, and focus on team-building, problem solving, creativity, and analytical thinking. Each team’s mission is to strategize, design, build, program and test a fully autonomous robot using the LEGO MINDSTORMS™ technology. The 2004 challenge is to help people with different levels of physical ability do things like read signs, walk, or climb stairs.

The Missouri FLL competition will be on Dec. 4, 2004, from 8 a.m.-5 p.m. at the St. Louis Community College Florissant Valley campus. For more information on starting a team, contact Kathie Reuter, (314) 965-8432 or reuts@aol.com.
Teachers, students summer at Tyson

Teachers and high school students joined Tyson Field Science Program staff for outdoor teaching and learning at Tyson this summer. A group of high school student interns helped lead a camp for younger children, and several teachers participated in research projects.

Tyson Field Science conducted its first camp with the Wild Canid Survival and Research Center, aka the Wolf Sanctuary, which is housed on the Tyson grounds. Two sessions were held for ages 6-9 and ages 10-14. High school students Leo Adams and Stephon Redus, Bayless High School; Whitney Meredith, Metro High School (St. Louis Public); and Leslie Ramey, Crossroads School; presented Native American stories and crafts each morning. Along with Tyson staff and volunteer Jenn Agnew, the campers explored the pond and cave, participated in a wolf howl, walked the creek, learned and participated in Native American games and orienteering, made wolf snacks, built their own bugs, and made discoveries at an ancient chert quarry.

The high school students participated as part of a program with the St. Louis Science Center. They joined in outings with scientists, turned their classroom bunker into a Meramec sandbar with a mural, and created a presentation on their experience. “They made wonderful contributions to the camp program, and we look forward to welcoming them back next year,” says Galganski.

Teachers delved into personal projects at Tyson this summer, that included differentiation and science and social studies simulations. Each intern chose a personal observation and journaling site for seven weeks. Interns Mandy Kotraba, Lafayette High (Rockwood); Tracy McCord, Lyon Academy (St. Louis Public); Barry Williams, Brittany Woods Middle (University City); and Joan Franke, Riverview Gardens Middle (Riverview Gardens), enjoyed on-site field trips with Washington University faculty Jon Chase, Wayne Drda, and Owen Sexton. An additional highlight was the Meramec canoe trip, which included explanations about river systems and geology from Bob Criss.

Teacher and student interns at Tyson are supported by the Center for Inquiry in Science Teaching and Learning (CISTL), through funding from the National Science Foundation.