For 15 years, biology Associate Professor Anna Sher has grappled with tamarisk. The woody, flowering weed, also known as salt cedar, has been the focus of Sher’s research. She has traveled the West, studied the ecological impacts and potential solutions, and lobbied for change and involvement. She’s heard from the bird-watchers and beekeepers who extol the virtues of the invader, and she’s heard from ranchers and ecologists who clamor for its removal.

“The problem with tamarisk is that it’s able to establish itself and effect other changes to the ecosystem that are harmful to the original plants and animals,” says Sher, who also directs research, herbaria and records at the Denver Botanic Gardens. “It changes the structure of the forest.”

Imported from Asia in the 1800s as an ornamental, tamarisk spread from gardens to natural waterways, boosted along the way by planting programs to control erosion. It spread across the West, and concentrations are now found on an estimated 2 million acres throughout the region.

As board president of the Colorado-based nonprofit Tamarisk Coalition, Sher says scientists’ challenge is to understand the role of tamarisk while pushing for research into tamarisk and the effects flood control and other water policies have on natural landscapes.

And the work is more important than ever. “In arid ecosystems, rivers are the veins of life,” she says. “Whatever we do to them has an effect on the entire region.”

**MATH DAY FOR GIRLS: HIGH SCHOOL STUDENTS TAKE STOCK OF CAREER POSSIBILITIES**

At the second annual Math Day for Girls, 125 Denver-area high school students came together to learn some new mathematics and to explore the many career and professional options associated with mathematics.

Funded by DU and Community College of Aurora, Math Day for Girls was designed to encourage girls in grades 9-12 to continue their studies in math and perhaps pursue related careers. Because they lack role models and don’t know what careers mathematics supports, many young women pursue other subjects and career paths, even though they have the passion and aptitude to succeed in mathematics-based areas. By offering opportunities to network with professionals and to learn about career options, Math Day for Girls seeks to expand opportunities for the area’s young women.

The event was organized by Debra Carney of the DU mathematics department and Patricia Anderson of the CCA mathematics faculty, who collaborated with Women in Design, the event’s sponsor and a networking group for professionals working in architecture, landscape architecture, interior design and environmental design.

Activities included an address by NSM’s Sharon Bütz, also of the mathematics department. Her presentation, “Stretch Your Mind in New Dimensions,” introduced the young women to the concept of the fourth dimension. During the talk, participants were asked to build their own hypercubes (or four-dimensional cubes) using the construction toy Zometool—an exercise that tested their minds while reinforcing Bütz’s points.

Another program entry, “The Yolk’s on You,” offered a hands-on engineering egg-drop contest. Math Day concluded with a career panel featuring local architects Cheryl Bicknell, Juliann Harvey and Nicole Ellison. They shared their experiences and urged participants to pursue career paths that reflect their passions, interests and talents.

“It was exciting to see these girls get excited and have fun with what they were doing,” says Carney of the day’s events. “Seeing successful women is important to these girls. It’s important to show these girls that they really can be successful in this field and that they can be successful while having a career and a family.”

**BIOLOGY PROFESSOR TACKLES TAMARISK**

Sher’s research has shown that tamarisk is not a particularly formidable competitor as a seedling, but with human help, such as flood-control projects that disrupt flooding cycles, it has thrived. And in areas where it gets a foothold, it doesn’t play well with others. Thick tamarisk groves change the ecosystem and drive off native wildlife, including eagles and some fish, says Sher, who co-authored Colorado’s plan to eradicate tamarisk.

The plant creates salty soil conditions around it—conditions that are inhospitable to native plants. It can also increase fire intensity and frequency. Just as troubling, tamarisk gobbles up water, depriving farmers and cities downstream.

Eradication methods include spraying herbicide and unleashing imported insects. But even as scientists develop ways to eradicate tamarisk, there is new debate over whether they should, Sher says. If tamarisk goes, what replaces it? Will native species return to vacant plots now that the soil has been left high in salt? And what about birds that have adapted to tamarisk?

Anna Sher
LETTER FROM THE DEAN

It is good to be back again! Thanks to all of you who visited and sent cards or flowers when I was hospitalized.

This version of The Continuum focuses on another of the division’s strategic initiatives. We are looking at science, technology, engineering and math education, otherwise known as STEM education. We cannot do this alone and are partnering with DU’s Morgridge College of Education. Every third Friday, a group of faculty from NSM and MCE meets to discuss problems of STEM education and possible grant proposals—all under the watchful eye of Alvaro Arias, coordinator of the STEM initiative. In fact, Arias has a NSF award to study in Australia.

Still other STEM-related initiatives range from Women in Science day to the use of Second Life, a 3-D online world, in nuclear engineering in the Department of Physics and Astronomy. It’s all part of what keeps NSM alive, relevant and vibrant.

In this issue, you’ll meet student Nathan McNeil, who recently was selected as a Goldwater Scholar. In the next issue, you’ll get to know math graduate student Kyle Pula, who has just received two awards—a Fulbright and an NSF award to study in Australia.

I hope you find this newsletter informative and that you remember to check our Web site to learn about other exciting developments in science and math at DU.

Best wishes,

L. Alayne Parson
Dean

MATH DAY FOR GIRLS: HIGH SCHOOL STUDENTS TAKE STOCK OF CAREER POSSIBILITIES

At the second annual Math Day for Girls, 125 Denver-area high school students came together to learn some new mathematics and to explore the many career and professional options associated with mathematics.

Funded by DU and Community College of Aurora, Math Day for Girls was designed to encourage girls in grades 9-12 to continue their studies in math and perhaps pursue related careers. Because they lack role models and don’t know what careers mathematics supports, many young women pursue other subjects and career paths, even though they have the passion and aptitude to succeed in mathematics-based arenas. By offering opportunities to network with professionals and to learn about career options, Math Day for Girls seeks to expand opportunities for the area’s young women.

The event was organized by Debra Carney of the DU mathematics department and Patricia Anderson of the CCA mathematics faculty, who collaborated with Women in Design, the event’s sponsor and a networking group for professionals working in architecture, landscape architecture, interior design and environmental design.

Activities included an address by NSM’s Sharon Bütz, also of the mathematics department. Her presentation, “Stretch Your Mind in New Dimensions,” introduced the young women to the concept of the fourth dimension. During the talk, participants were asked to build their own hypercubes (or four-dimensional cubes) using the construction toy Zometool—an exercise that tested their minds while reinforcing Bütz’s points.

Another program entry, “The Yok’s on You,” offered a hands-on engineering egg-drop contest. Math Day concluded with a career panel featuring local architects Cheryl Bicknell, Juliann Harvey and Nicole Ellison. They shared their experiences and urged participants to pursue career paths that reflect their passions, interests and talents.

“It was exciting to see these girls get excited and have fun with what they were doing,” says Carney of the day’s events. “Seeing successful women is important to these girls. It’s important to show these girls that they really can be successful in this field and that they can be successful while having a career and a family.”

BIOLOGY PROFESSOR TACKLES TAMARISK

For 15 years, biology Associate Professor Anna Sher has grappled with tamarisk.

The woody, flowering weed, also known as salt cedar, has been the focus of Sher’s research. She has traveled the West, studied the ecological impacts and potential solutions, and lobbied for change and involvement.

She’s heard from the bird-watchers and beekeepers, who extol the virtues of the invader, and she’s heard from ranchers and ecologists who clamor for its removal.

“The problem with tamarisk is that it’s able to establish itself and effect other changes to the ecosystem that are harmful to the original plants and animals,” says Sher, who also directs research, herbaria and records at the Denver Botanic Gardens. “It changes the structure of the forest.”

Imported from Asia in the 1800s as an ornamental, tamarisk spread from gardens to natural waterways, boosted along the way by planting programs to control erosion. It spread across the West, and concentrations are now found on an estimated 2 million acres throughout the region.

Sher’s research has shown that tamarisk is not a particularly formidable competitor as a seedling, but with human help, such as flood-control projects that disrupt flooding cycles, it has thrived. And in areas where it gets a foothold, it doesn’t play well with others.

Thick tamarisk groves change the ecosystem and drive off native wildlife, including eagles and other fish, says Sher, who co-authored Colorado’s plan to eradicate tamarisk. The plant creates salty soil conditions around it—conditions that are inhospitable to native plants. It can also increase fire intensity and frequency. Just as troubling, tamarisk gobbles up water, depriving farmers and cities downstream.

Eradication methods include spraying herbicide and unleashing imported insects. But even as scientists develop ways to eradicate tamarisk, there is new debate over whether they should, Sher says. If tamarisk goes, what replaces it? Will native species return to vacant plots now that the soil has been left high in salt? And what about birds that have adapted to tamarisk?

As board president of the Colorado-based nonprofit Tamarisk Coalition, Sher says scientists’ challenge is to understand the role of tamarisk while pushing for research into tamarisk and the effects flood control and other water policies have on natural landscapes.

And the work is more important than ever. “In arid ecosystems, rivers are the veins of life,” she says. “Whatever we do to them has an effect on the entire region.”

Anna Sher
ELEANOR CAMPBELL AWARD HONORS WOMEN IN MATHEMATICS

The Department of Mathematics recently presented its Eleanor Campbell Memorial Award to Abby Johnson, a math and physics major, at the annual Pioneer Awards Ceremony in April. Johnson is only the second recipient of the award, given on behalf of the estate of Eleanor Campbell by her son and daughter. The award recognizes an outstanding female student graduating with a degree in mathematics.

The impact of education on her own life and her experience as an educator left her with a strong belief in the importance of knowledge. “My mother believed education was the key to everything,” says D’Ann Arias, chairman of the mathematics department. “It honors us, and it honors our students.”

Eleanor Campbell’s parents never attended college, but her father encouraged her to study math. Often, she was the only girl in her math classes. Campbell graduated from DU in 1939 with a bachelor of arts degree in education. She taught elementary school in the Denver area, specializing in math, for 15 years before retiring to start a family. Campbell died on Jan. 1, 2008, at the age of 90.

Although the Arvada, Colo., native won a half-tuition scholarship to DU as a seventh-grader at the state geography bee, he came to DU primarily to study mathematics. Once he settled on campus, he added the physics major to his plate. “It’s another science about how things work,” he says.

When McNew isn’t working on mathematical theories (he’s partial to Aliquot Sequences), he’s probably in the physics lab, determining how heat flows through certain types of materials. He also enjoys plenty of extracurricular activities, including the Honors Program, the Valtorta Society, the Lamont choir, broomball and the Society of Physics Students. In spring 2009, he was named a member of the Lamont School of Music, and he spent the summer working at the Fermi National Accelerator Laboratory. McNew plans on pursuing a PhD in mathematics.

McNew’s adviser, mathematics Professor Nic Ormes, thinks the talented student has a promising career before him. “I expect that in a few years Nathan will be a professor of mathematics,” he says. “I foresee him doing original research and proving new results.”

FOCUS ON: THE STEM INITIATIVE

The Division of Natural Sciences and Mathematics directs three strategic initiatives that respond to the complex challenges facing the planet and humankind.

Any conversation about a competitive workforce pivots on the need for improved education in the areas of science, technology, engineering and mathematics, known within the academic and policy-making communities as STEM.

In fact, both the National Research Council and the National Science Foundation consider these disciplines as the “core technological underpinning of an advanced society.” As recently as 2006, the United States National Academies expressed concern about the declining state of STEM education in the country, noting that the nation must make dramatic strides in this area if it is to remain economically vibrant.

With that in mind, the Division of Natural Sciences and Mathematics launched its STEM Initiative, which calls on faculty in the sciences and mathematics to do the following:

• join forces to provide materials and reach K-12 teachers in these disciplines
• collaborate with education professionals on ways to bring the excitement of science and mathematics into the classroom
• encourage students to consider studying science and mathematics in college

Still another priority, says Alvaro Arias, chairman of the Division of Natural Sciences and Mathematics and director of the initiative, is to prepare DU’s teaching-focused science and mathematics majors for the rigors of their profession and the realities of the classroom.

“The percentage of teachers who quit the first year is very high,” he says, noting that math and science majors often lose their subjects but don’t know how to share them with others.

To jumpstart the initiative, Arias decided to provide NSM faculty a forum for learning more about the challenges facing K-12 educators. There was no better way to do that, he determined, than introducing them to their colleagues at DU’s Morgridge College of Education. Eager to bring the excitement of science and mathematics majors for the rigors of their profession

The grant enlists a multidisciplinary team from across the University. The principal investigator is the math department’s Maria Lopez-Yoni Linder, a Morgridge College professor with a PhD in educational psychology. Along with education researchers from the School of Arts and Science, Linder is working on the soundtrack, and students from the School of Art and Art History have been asked to help with graphics, animation and illustration. The games will be tested at DU’s Fisher Early Learning Center, as well as in Head Start classrooms. Arias expects the games to be ready for deployment by next fall.

Although the STEM Initiative takes NSM faculty outside their traditional roles, Arias values the experience for its long-term consequences. “At NSM, we’re very research-oriented, but we don’t want to forget about these other aspects of the University,” he says. “This is meant to serve the public good.”

“AT NSM, WE’RE VERY RESEARCH-ORIENTED, BUT WE DON’T WANT TO FORGET ABOUT THESE OTHER ASPECTS OF THE UNIVERSITY. THIS IS MEANT TO SERVE THE PUBLIC GOOD.”

— ALVARO ARIAS

The exchanges helped NSM faculty understand the challenges intrinsic to the nation’s diverse schools. It also helped them formulate some ideas about how to improve STEM education on campus. The ideas—most of them still in the gestation stage—range from a living and learning community and first-year seminars to a STEM Club, all offering would-be teachers the opportunity to explore STEM issues.

The goal is to galvanize the NSM and education faculties to pursue funding opportunities related to STEM education. Recently, the mathematics department received a $1 million grant from the D.vl. To start developing three bilingual computer games for children ages 3 to 5. The games, which will develop early math skills through play, are designed to take preschoolers from the concrete to the abstract, introducing them to basic mathematical concepts along the way. Just as important, the games will record each student’s progress, providing Head Start teachers with valuable information they can use to shape instruction.

Math and physics major Nathan McNew was recently awarded a Goldwater Scholarship by Barry M. Goldwater Scholarship and Excellence in Education Foundation, established by Congress in 1986 to honor the late senator and to encourage outstanding students to pursue careers in the natural sciences and engineering. McNew applied for the award in December 2008 and was notified of his acceptance in February 2009.

Although the Arvada, Colo., native won a half-tuition scholarship to DU as a seventh-grader at the state geography bee, he came to DU primarily to study mathematics. Once he settled on campus, he added the physics major to his plate. “It’s another science about how things work,” he says.

Math and physics major Nathan McNew was recently awarded a Goldwater Scholarship by the Barry M. Goldwater Scholarship and Excellence in Education Foundation, established by Congress in 1986 to honor the late senator and to encourage outstanding students to pursue careers in the natural sciences and engineering.

The foundation awarded 278 scholarships for the 2009-2010 academic year to sophomores and juniors from across the United States. McNew is the first DU student to receive the award.

Goldwater Scholars were selected on the basis of academic merit from a field of 1,091 students nominated by the faculties of colleges and universities nationwide. The one- and two-year scholarships cover the cost of tuition, fees, books, and room and board up to a maximum of $7,500 per year.

Like virtually all of this year’s winners, McNew’s career goals involve advanced academic study. He plans to pursue a PhD and a university teaching career. As he told DU Today in fall 2008, his interest in mathematics lies in “being able to understand the underlying theory.”
The Division of Natural Sciences and Mathematics directs three strategic initiatives that respond to the complex challenges facing the planet and humanity. This is the second in a three-part series focusing on these key programs.

Any conversation about a competitive workforce pivots on the need for improved education in the areas of science, technology, engineering and mathematics, known within the academic and policy-making communities as STEM.

In fact, both the National Research Council and the National Science Foundation consider these disciplines as the “core technological underpinning of an advanced society.” As recently as 2006, the United States National Academies expressed concern about the declining state of STEM education in the country, noting that the nation must make dramatic strides in this area if it is to remain economically vibrant.

With that in mind, the Division of Natural Sciences and Mathematics launched its STEM Initiative, which calls on faculty in the sciences and mathematics to do the following:

• join forces to provide materials for K-12 teachers in these disciplines
• collaborate with education professionals on ways to bring the excitement of science and mathematics to the classroom
• encourage students to consider studying science and mathematics in college

Still another priority, says Alvaro Arias, chairman of the department of mathematics and director of the initiative, is to prepare DU’s teaching-focused science and mathematics majors for the rigors of their profession and the realities of the classroom.

“The percentage of teachers who quit the first year is very high,” he says, noting that math and science majors often love their subjects but don’t know how to share them with others.

To jumpstart the initiative, Arias decided to provide NSM faculty a forum for learning more about the challenges facing K-12 educators. There was no better way to do that, he determined, than introducing them to their colleagues at DU’s Morgridge College of Education. Sager to avoid the stiffness of a meeting in favor of an informal environment hospitable to an exchange of ideas, Arias invited interested members of the two faculties to participate in regularly scheduled wine-and-cheese events. This, in itself, represented an outside-the-box approach to an emerging initiative. After all, the two faculties seldom connect—“which is a pity,” Arias says, “because we know the content, but we don’t know the schools.”

Given the disciplinary distance between the two faculties, Arias wanted to create an opportunity for ideas and perspectives to percolate from the grass-roots level, from education faculty working in the trenches and from NSM faculty engaged in the research arena. “What we wanted to do was to stop talking and find out about what we have in common. The problem is that we don’t speak the same language,” Arias says. “We’re more concerned with content, and they’re more concerned with the conditions in the schools. When we get together, the language is foreign.”

The exchanges helped NSM faculty understand the challenges intrinsic to the nation’s diverse array of schools. It also helped them formulate some ideas about how to improve STEM education on campus. The ideas—most of them still in the gestation stage—from a living and learning community and first-year seminars to a STEM Club, all offering would-be teachers the opportunity to explore STEM issues.

The meetings also galvanized the NSM and education faculties to pursue funding opportunities related to STEM education. Recently, the mathematics department received a $1 million grant from the Mellon Foundation to develop three bilingual computer games for children ages 3 to 5. The games, which will develop early math skills through play, are designed to take preschoolers from the concrete to the abstract, introducing them to basic mathematical concepts along the way. Just as important, the games will record each student’s progress, providing Head Start teachers with valuable information they can use to shape instruction.

“Because the games utilize play—the best education tool for preschoolers—Arias believes they will prepare youngsters to succeed at math-related tasks in kindergarten. And success in kindergarten paves the way for achievement in later grades, he says, explaining that grade-level proficiency in math rivals proficiency in reading as a critical indicator of readiness for higher-level work.

The grant enlists a multidisciplinary team from across the University. The principal investigator is the math department’s Mario Lopez. Yong Linder, a Morgridge College professor schooled in early childhood education, is advising game developers about assessment and child development, while Jeff Farmer, a research professor and expert in math education, counsels on the best ways to introduce and develop mathematical concepts. Chris Malloy of the Lamont School of Music is working on the soundtrack, and students from the School of Art and Art History have been asked to help with graphics, animation and illustration. The games will be tested at DU’s Fisher Early Learning Center, as well as in Head Start classrooms. Arias expects the games to be ready for deployment by next fall.

Although the STEM initiative takes NSM faculty outside their traditional roles, Arias values the experience for its long-term consequences. “At NSM, we’re very research-oriented, but we don’t want to forget about these other aspects of the University. This is meant to serve the public good.”

— Alvaro Arias

The Department of Mathematics recently presented its Eleanor Campbell Memorial Award to Abby Johnson, a math and physics major, at the annual Pioneer Awards Ceremony in April. Johnson is only the second recipient of the award, given on behalf of the estate of Eleanor Campbell by her son and daughter. The award recognizes an outstanding female student graduating with a degree in mathematics.

Recipients of the award, chosen by mathematics faculty members, obtain a generous monetary gift and a recognition plaque.

“We are extremely grateful for the award,” says Alvaro Arias, chairman of the mathematics department. “It honors us, and it honors our students.”

Eleanor Campbell’s parents never attended college, but her father encouraged her to study math. Often, she was the only girl in her math classes. Campbell graduated from DU in 1939 with a bachelor of arts degree in education. She taught elementary school in the Denver area, specializing in math, for 15 years before retiring to start a family. Campbell died on Jan. 1, 2008, at the age of 90.

Although the Arvada, Colo., native soon a half-tuition scholarship to DU as a seventh-grader at the state geography bee, she came to DU primarily to study mathematics. Once he settled on campus, he added the physics major to his plate. “It’s another science about how things work,” he says.

When McNiew isn’t working on mathematical theories (he’s partial to Aliquot Sequences), he’s probably in the physics lab, determining how theories (he’s partial to Aliquot Sequences), he’s probably in the physics lab, determining how theories...