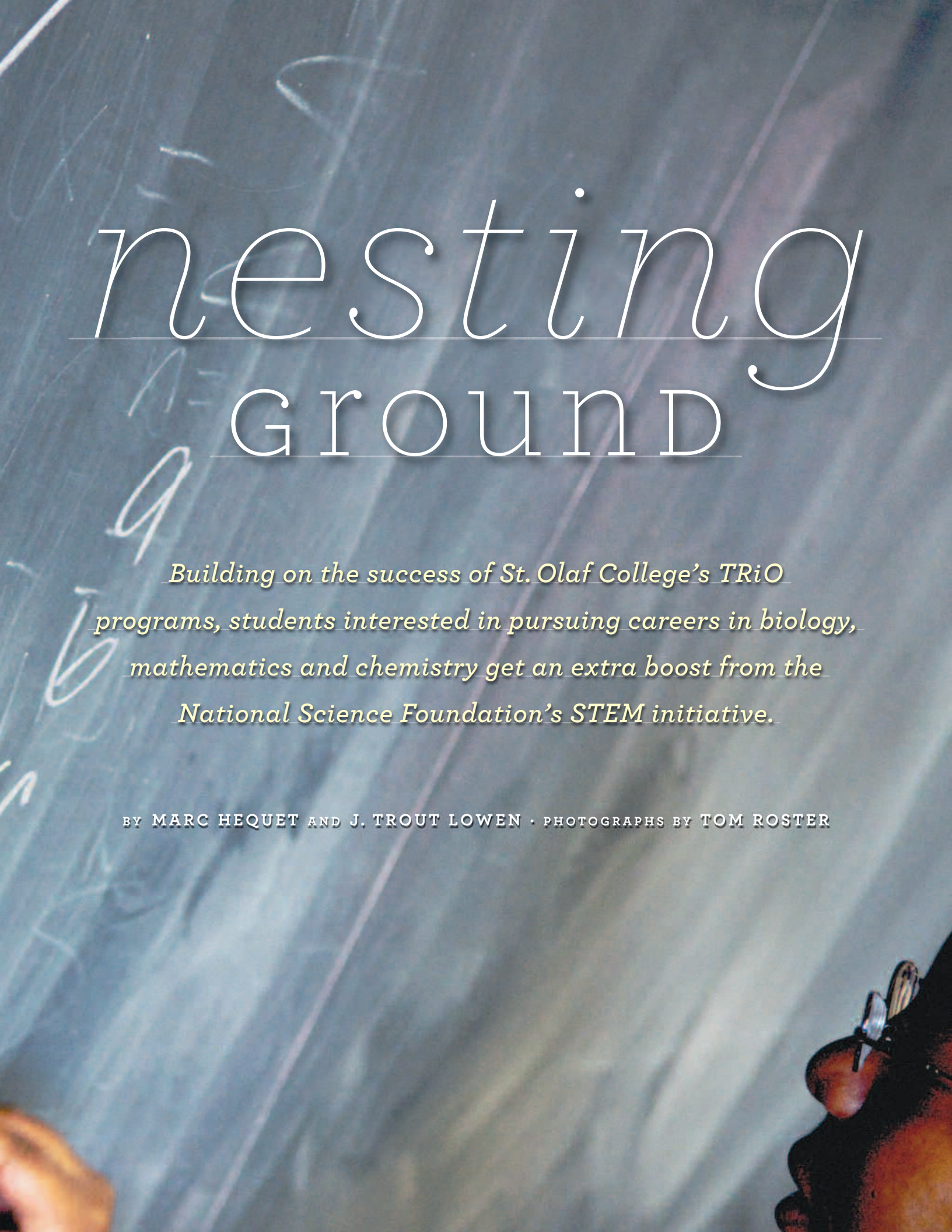
Scholarships in Science, Technology, Engineering and Mathematics (S-STEM) provide support for academically talented students who are pursuing degrees in science and mathematics, with an emphasis on students from populations traditionally under-represented in the sciences.

nesting ground

Building on the success of St. Olaf College's TRiO programs, students interested in pursuing careers in biology, mathematics and chemistry get an extra boost from the National Science Foundation's STEM initiative.

BY MARC HEQUET AND J. TROUT LOWEN · PHOTOGRAPHS BY TOM ROSTER



USUALLY BRIGHT, TALKATIVE AND FOCUSED, in the middle of his junior year Jose Ramirez '09 was suddenly struggling — participating less in classes, handing homework in late and fighting to stay awake during lectures.

It wasn't that he'd lost interest in school. He loved biology, his major. He was fascinated by the intricacy of the human body and its complex interconnected systems. The first in his family to go to college, he dreamed of becoming a cardiologist.

But after his mother lost her job, the 21-year-old from St. Paul, Minn., began waiting tables to help support his family. The problem was that it wasn't his only job; it was his third. Ramirez was already working as a teaching assistant in biology and moonlighting at the campus bookstore. Eventually, he dropped the restaurant job, but then he took another job as an office assistant on campus.

"My mom wasn't working anymore, so it was my responsibility to support my family," explains Ramirez, the youngest of six children. "That's expected of me. So I did what I could."

"I was exhausted," he confesses. "I would go to class for the sake of going to class, and then I would go to work."

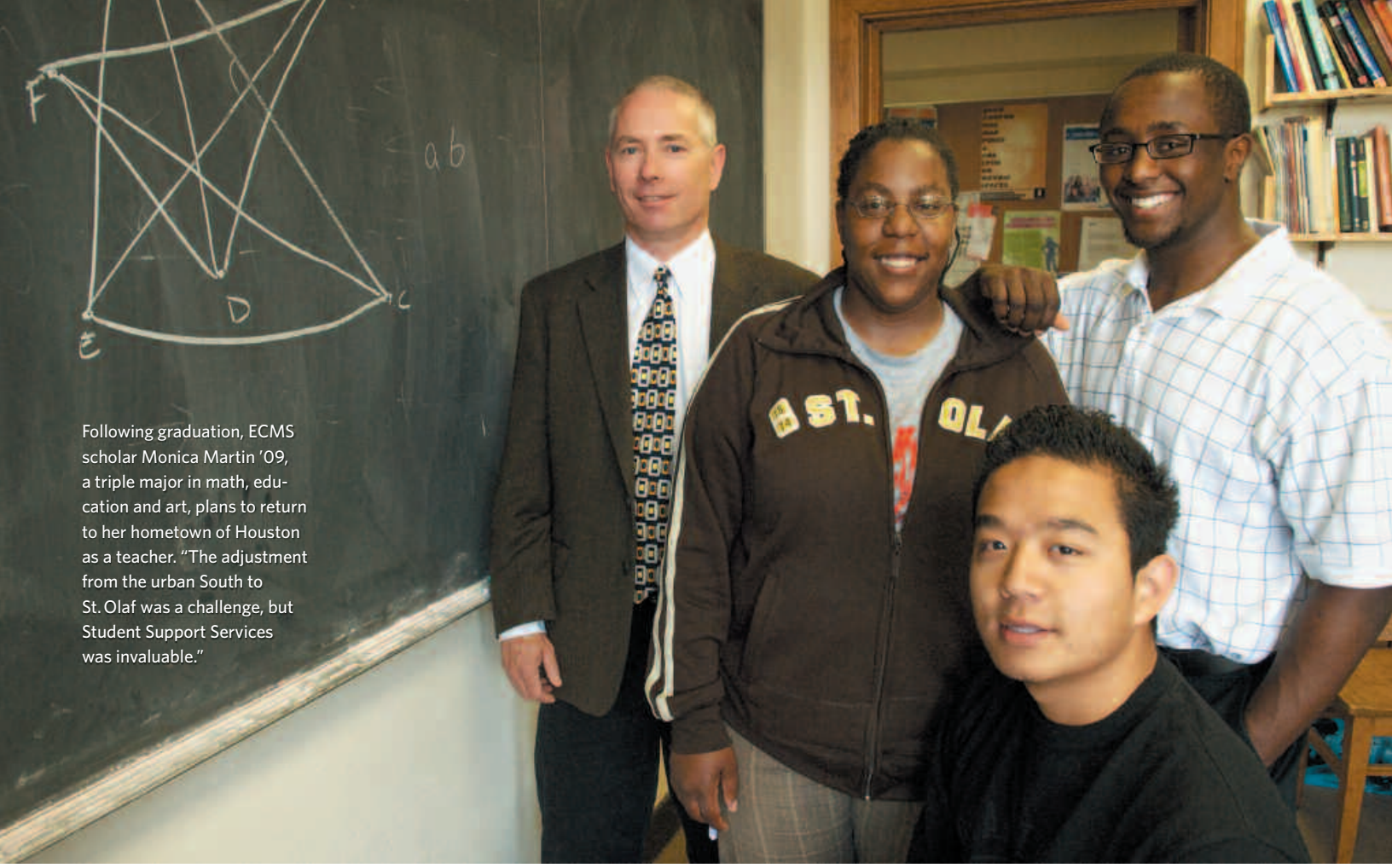
At some schools, a promising student such as Ramirez might have fallen through the cracks. Instead, he was supported by St. Olaf College's safety net, a web of interconnected programs stretching from high school through college designed not just to keep Ramirez and students like him from failing, but also to help propel them toward the successful completion of their degrees.

The most recent strand woven into that net, the Scholarships in Science, Technology, Engineering and Mathematics (S-STEM) program funded by a grant from the National Science Foundation (NSF), provides up to $10,000 in annual support for academically talented, financially needy students pursuing degrees in science and mathematics, with an emphasis on students from populations traditionally underrepresented in the sciences. The goal of the NSF program is to increase the number of students nationwide who receive degrees in the fields of science, technology, engineering and math.

Ramirez is one of more than 27 biology and mathematics majors benefiting from S-STEM grants at St. Olaf through Encouraging Careers in the Mathematical Sciences (ECMS), the inaugural S-STEM program created last year for math students, and Biologists For the Future (BFF), new this year. In late July, the St. Olaf Chemistry Department was awarded $583,000 to develop its own S-STEM program. The first chemistry S-STEM students likely will be named later this year.

St. Olaf's S-STEM funding, three grants totaling some $1.6 million over five years, is intended to relieve the financial strain on students so they can better focus on academics. Almost 90 percent of the funding goes directly to students. S-STEM also funds additional advising, field trips, guest speakers, tutoring and off-campus study opportunities for those students, as well as a new summer course emphasizing critical reading and writing skills in the sciences and social events designed to build peer support networks.

Jose Ramirez '09 and Tsetan Lobsang '10 (right) are among the science and math majors benefiting from St. Olaf's new programs, Encouraging Careers in the Mathematical Sciences and Biologists For the Future.



Following graduation, ECMS scholar Monica Martin '09, a triple major in math, education and art, plans to return to her hometown of Houston as a teacher. "The adjustment from the urban South to St. Olaf was a challenge, but Student Support Services was invaluable."

"If we can help students get rid of a loan, that's huge," says St. Olaf Professor of Biology Anne Walter, who is heading up the Biologists For the Future program. "The freedom to study deeply and broadly, permitted by these scholarships, will prepare our students as biologists and give them time to take steps to realize future careers in biology. Their impact on society will have the broadest resonance."

When Ramirez's academic work faltered, his professors quickly intervened. After counseling at the dean's office, he made some changes — improved time management and balancing studies with family visits. By summer, he was down to one job.

"I think Biologists For the Future is a great program and I'm excited to be part of it," he says. "Instead of making money, I'm studying and reading books. I'm bettering myself. This is for my future."

BUILDING BLOCKS

The S-STEM program builds on the success of other St. Olaf initiatives, including precollegiate programs such as TRiO/Upward Bound, TRiO/Educational Talent Search and GEARUP, the TRiO/Student Support Services program, which also provides a Summer Bridge Program for incoming first-year students, and the TRiO/McNair Scholars Program for current students (see "Early Awareness," page 18).

Development of the S-STEM programs has been a college-wide collaboration, says Kathy Glampe '92, director of Student Support Services, bringing together academic departments with Student Support Services and the Office of Admissions, which help to identify students eligible for S-STEM.

Encouraging Careers in the Mathematical Sciences (ECMS), the inaugural S-STEM program created for math students last year and co-directed by St. Olaf Professor of Mathematics Matt Richey (left), provided scholarship support for 13 students in the Department of Mathematics, Statistics and Computer Science, including (clockwise, from left) Monica Martin '09, Ian Gacheru '10 and Tenzin Choerap '10.

In its first year, EMCS provided support for 13 students in the Department of Mathematics, Statistics and Computer Science. The department expects to fund 12 to 15 students each year.

"The financial assistance, extra supplemental instruction sessions, the group camaraderie, and specialized advising through the ECMS program has made a math major a reality for many students who otherwise weren't even considering the major, even though they were talented in the subject," says Glampe, co-director of the ECMS program with mathematics professor Matt Richey. "Now, with the biology program getting started, I am seeing some of the same things happen."

This year, 11 sophomore, junior and senior biology majors have been accepted into the BFF program, co-directed by Walter, Glampe and biology professor Diane Angell. In its first year, the program also will seek to identify and include some incoming first-year students, bringing the funding up to 20 scholarships each year.

"Really, these programs are a win-win for everyone," Glampe adds. "The students in the program are benefiting individually. Just as importantly, St. Olaf College and the National Science Foundation are preparing more students in the critical fields of math and biology, which benefits our whole society."

Development of the S-STEM scholarship programs has been a college-wide collaboration. This year 11 biology majors have been accepted into the Biologists For the Future program, co-directed by biology professors Anne Walter (top, left) and Diane Angell, and Student Support Services Director Kathy Glampe '92 (top, right). Future biologists include (clockwise, from top) Jose Ramirez '09, Kosaizee Yang '11, Ma Xiong '11, Essa Mohamed '09 and Tsetan Lobsang '10.

A TRADITION OF SUCCESS

The National Science Foundation established S-STEM a decade ago under the American Competitiveness and Workforce Improvement Act of 1998 to train more scientists and engineers to insure America's global competitiveness in the 21st century. The National Academy of Sciences reports that more than half of all engineering degrees awarded by American universities now go to foreign-born students. At the same time, the United States imports more high-technology products than it exports. And U.S. high school students score below their international counterparts in math and science.

The need to increase the number of STEM graduates is even greater among typically underrepresented groups: women, minorities, first-generation college, disabled and low-income students. According to the Louis Stokes Institute for Opportunity in STEM Education, of every 10,000 low-income students starting ninth grade, just 30 will earn a bachelor's degree in a STEM field, and only one of those students will begin graduate school in a STEM field the year after graduation.

Nationally, over the past 10 years, African American and Hispanic students have accounted for fewer than 10 percent of all life sciences, mathematics and physical sciences majors and fewer than 5 percent of all Ph.D. graduates.

St. Olaf is already well-known for its commitment to the sciences. The new Regents Hall of Natural and Mathematical Sciences reinforces that commitment, providing a new state-of-the-art science facility designed to promote interdisciplinary collaboration. The college is also nationally recognized for the extraordinary number of Ph.D. candidates in math and science who received their undergraduate education at St. Olaf. In recent years, 36 percent of all St. Olaf graduates have earned a degree in a STEM discipline. Eight to 10 percent earned mathematics degrees compared to the national average for liberal arts colleges of about 2 to 3 percent. Approximately half of St. Olaf math majors are women, and 75 percent of all St. Olaf students take a mathematics course at the calculus level or above.

"We've done well helping a large number of students who probably wouldn't have pursued a math major at other schools," says ECMS co-director Matt Richey. "A math major is not immediately perceived as a good career option." Instead, most see the math requirement as "something to get out of the way."

But there remains room for improvement, especially among low-income and minority students in the sciences: of the 84 to 100 St. Olaf students who graduate each year with a biology major, just two or three come from underrepresented groups. The statistics are similar for math majors.

One reason for that disparity may be that many of those students are underprepared for STEM majors when they get to college; some come from small-town or inner-city schools that can't afford to offer Advanced Placement classes in math. For the first time this autumn, St. Olaf is offering a precalculus course to help such students get started.

"They're perfectly fine at math," says Richey. "They just aren't as prepared as their peers who come from more financially advantageous backgrounds. We want to bring out their talent regardless of the circumstances that brought them to us."

Another significant barrier for underrepresented students is a lack of critical reading and writing skills. Rather than channeling those students to a remedial writing class, the college created a new course for science and mathematics students, GE211 *Topics in Writing: Science in World and Word*, a blend of reading seminar and writing workshop.

The course was developed by English professor Diane LeBlanc, director of writing, with science and math students in mind, but it's open-ended enough to be used with a variety of academic disciplines.

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>
> — PROFESSOR OF BIOLOGY ANNE WALTER

Taught for the first time during this summer session by education instructor Dan Forstner with help from Anne Walter, students read biology-related books, general interest articles from periodicals, including *Natural History* and the *Smithsonian* and the *New York Times*, poetry and even fiction. Students also wrote daily and critiqued each other's work.

"We hoped that GE211 would also be an opportunity for students to learn about scientists as people and to explore and think about some big ideas outside of the pressure of a science course," says Walter. "And it seemed to work, as each student reported being excited by, or interested in, something new."

STEM scholar Nicole Marvin '09, from Maple Grove, Minn., was one of eight students who completed the summer session of *Science in World and Word*. "Hopefully, this will help me to integrate other scientists' works into my future research papers," she says.

More than just academic support, however, Marvin says becoming a STEM scholar has given her a much broader perspective — one that's grown, in part, from working with her BFF peers and learning about their diverse life experiences and their commitment to their communities.

Their perspectives bring a different point of view, she says, "on readings, on class material and also on life."

STEM standouts

St. Olaf College's S-STEM participants are recognized for their heart and their hard work. Like all Oles, these students want to make a difference in the world. They've risen above extraordinary personal circumstances to accept the still higher challenges of excelling at St. Olaf.

CARING for Others

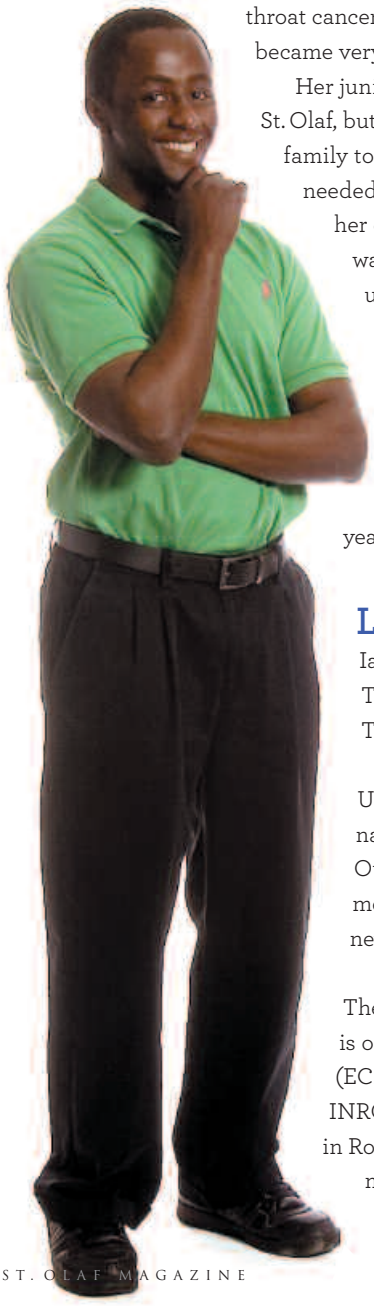
Mathematics was Tenzin Tsetan Lobsang's first love. It was familiar, explains the St. Olaf biology major. When Lobsang immigrated with her family to the United States in 1997 from a Tibetan settlement camp in South India, "math was the only thing I could understand and it was very similar to what I had learned in India," she recalls.

As her English improved, Lobsang developed an interest in science. That interest was cemented in high school on a return trip to India to visit her ailing grandparents, suffering from lung and throat cancer. "I noticed the lack of medical assistance they received and became very interested in how I could help them," she says.

Her junior year in high school, she set her sights on studying biology at St. Olaf, but as the first one in her family to attend college, she needed a little help to make her dream a reality. "It was very difficult to figure out the resources and the steps to come to college," she says. "I received a lot of help from the TRiO programs," she says, Upward Bound — in high school — and Student Support Services at St. Olaf. "Without these programs I don't know where I'd be."

"The BFF program will give me the tools I need to apply to graduate school."
— TENZIN TSETAN LOBSANG '10

Lobsang's interests have now expanded to include Western and Eastern medicine and helping tuberculosis patients in Tibetan settlement camps. A Biologists For the Future scholar this year, she's looking forward to the extra support and camaraderie the program has to offer.



Looking AHEAD

Ian Mwangi Gacheru moved with his mother and two other relatives from his native Kenya to the Twin Cities in 1994 in search of better educational opportunities. He found them in the St. Olaf TRiO family of programs.

"I would have definitely not been anywhere near where I am now if it wasn't for these programs. Upward Bound helped me to focus myself for getting into college; Student Support Services helps me navigate through college, even when it gets tough. MACO [Multicultural Affairs and Community Outreach] has helped me make connections with people. The McNair Scholars Program is preparing me for advancing my education and my career after college. These are all quality programs and you'll never find more helpful people."

Gacheru has made the most of his opportunities. The math and economics major and St. Olaf wrestler is one of 16 Encouraging Careers in Math and Science (ECMS) scholars. Over the summer, he served as an INROADS intern and also interned at the Mayo Clinic in Rochester, where he studied fundraising. "From the mentoring to the financial support, ECMS is one of the best programs to be involved with," he says.

"I would love to travel the world and solve complex issues related to the economy."
— IAN MWANGI GACHERU '10

A Search for UNDERSTANDING

Nicole "Nikki" Marvin has always had a passion for science, loving the mystery of it all and the idea that anything is possible. "As a child I would lose myself within the exploration, observation and analysis of the biological world," she says.

A head injury during a soccer game in 2002 and the long process of recovery set Marvin on her current path. Marvin is majoring in biology and psychology with a concentration in neuroscience. She says her passions are biology, enviromental education and neuropsychology. Her goal is work with people with learning disorders, developmental disabilities and recovering head-injury patients.

"I had the opportunity to experience many aspects of neuroscience and the brain-body connection firsthand," says Marvin. "Who wouldn't be hooked after that?"

> "I long to understand how changes in the brain influence physical and cognitive function."
>
> — NIKKI MARVIN '09

After spending her summer as a teaching assistant in the new reading seminar and writing workshop *Topics in Writing: Science in World and Word* — and taking the course at the same time — she joined Assistant Professor of Biology Sara Fruehling and four other students on a service-learning trip to Chennai, India, where they worked with the InterChurch Service Agency and the local drug agency CMSI (Comprehensive Medical Services India) to improve CMSI's medicinal garden. In addition to investigating some of India's forest restoration projects, she researched native and local medicinal plants that could then be included in CMSI's garden.

"India gave me a broader perspective on the issues that face people throughout the world — poverty, malnutrition, poor health care, [lack of] education, child labor and environmental awareness," says Marvin. "My experiences have only made me want to help others and address the global issues of the world further."

Achieving His POTENTIAL

"The human body is just so fascinating," marvels biology major Jose Ramirez. "The process of how the body gets sick and then has the ability to cure itself or the way our organs and tissues make up this complex network of intercommunication systems that act as one is what made me want to become a biology major."

Ramirez's fascination with the way things work began early. As a child he asked his mother for books on plants and animals. In 10th grade, his interest in biology blossomed, nurtured by an inspired teacher and participation in the TRiO Upward Bound and SSS Summer Bridge programs. By the time he arrived at St. Olaf, Ramirez, the first in his family to go to college, knew he wanted to become a doctor.

> "Scientists have made great achievements over the years, but there are still so many more to be made and I hope to contribute to that progress."
>
> — JOSE RAMIREZ '09

Over the summer, his research — conducted through the McNair Scholars Program with Assistant Professor of Biology Kevin Crisp — focused on the regenerative properties of the microglial cells in the central nervous system of the earthworm, research that can provide insight into neurodegenerative disorders in humans, such as Alzheimer's and Parkinson's diseases.

As a result of his research experience, Ramirez's career goals have evolved again. "I think research will definitely be part of my professional career as a doctor," he explains.

As one of the inaugural group of students accepted into the new Biologists For the Future program, Ramirez will get the financial and academic support and encouragement needed to pursue his goals. "I'm excited to be part of it," he says. "I look forward not only to the mentoring I'll receive from the biology faculty, but also being able to serve as a mentor to younger students."

Early Awareness

Many science and math students in St. Olaf College's S-STEM programs typically started their college trek as far back as middle school when they were participants in a bundle of initiatives known as TRiO.

The federal TRiO programs, which are funded under Title IV of the Higher Education Act of 1965, are educational opportunity outreach programs designed to help low-income, first-generation or underrepresented students prepare for college, have successful undergraduate careers and go on to graduate school.

TRiO helped Kenny Zimmerman '06 out of the tough Frogtown neighborhood of St. Paul, Minn., and into St. Olaf. "The ultimate goal is pretty simple," says Zimmerman, now a St. Olaf academic adviser for GEAR UP and TRiO/Educational Talent Search, "we're just trying to get kids into college."

Each year, nearly 200 St. Olaf students volunteer as TRiO mentors. The St. Olaf team works with students at schools in Minneapolis and St. Paul to get them thinking in terms of going to college — St. Olaf, perhaps, but not necessarily.

"The key to doing effective work is always putting the students first and really getting into their frame of reference," adds Daniel Jackson '00, another TRiO alumnus and an academic adviser for Educational Talent Search at St. Olaf.

Since 1989, the St. Olaf Education Department has sponsored the TRiO programs — Educational Talent Search, Upward Bound and Student Support Services — and added the GEAR UP program in 1999. The TRiO/McNair Scholars Program was funded in 2008.

- **Educational Talent Search (ETS)** is an early intervention program that works with students in grades six through 12 to help them prepare for college. ETS provides advising about college admissions requirements, information about scholarships and other financial aid, career preparation and activities focusing on personal growth.
- **Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP)** works in collaboration with teachers, community members, students and families to provide tutoring, mentoring, field trips and career exploration to increase the number of low-income, first-generation students who enroll in postsecondary education.
- **Upward Bound (UB)** helps high school students prepare for college by providing academic support, guidance and an intensive summer academic enrichment program.
- **Student Support Services (SSS)** is a college retention program that provides advising, academic support, Supplemental Instruction, career and graduate school preparation and an intensive Summer Bridge Program to TRiO students during their undergraduate career at St. Olaf College.
- **The McNair Scholars Program** assists low-income, first-generation and underrepresented college students in developing research skills and graduate school preparatory services to pursue post-baccalaureate education and ultimately college-teaching careers.

"St. Olaf's sponsorship of educational opportunity and STEM initiatives demonstrates a deep commitment to being an active partner in insuring that all students have the opportunity to fulfill their educational aspirations," says Janis Johnson, director of the St. Olaf McNair Scholars Program.

The one thing the programs can't do is provide the determination it takes to be successful. That's what the students in any major must provide themselves. And they do.

McNair Scholar **Tenzin Choerap '10** was a Tibetan refugee born in India who has lived in Minneapolis since childhood. Numbers fascinate Choerap, an ECMS scholar and a math major with a concentration in management studies. A January 2008 Interim trip to Budapest as part of a class called *The Higher Structure of Mathematics* firmly rooted Choerap's interest in the subject. His goal is to enter graduate school for an advanced business degree.

Biology major **Kosaizee Yang '11**, a Gates Scholar and a participant in Minnesota's Future Doctors program (a collaboration between the University of Minnesota and Mayo Clinic Medical School), believes that the Biologists For the Future program will help her achieve her goals of improving medical treatment for people who live in poverty. "I dream of making a healthier world," she says.

Originally from Somalia, McNair Scholar **Essa Mohamed '09** immigrated with his parents and three siblings first to San Diego, then to Rochester, Minnesota. A double major in biology and sociology/anthropology, he intends to continue his education at Mayo Medical School and aspires to become an anesthesiologist or an orthopedic surgeon. "I've always had a passion for science," he says.

BFF scholar **Ma Xiong '11** discovered an interest in biology while participating in the SSS/Summer Bridge program for admitted St. Olaf students the summer before starting college. Xiong receives extra tutoring through the Student Support Services program and looks forward to learning what a biology major can offer her professionally.

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