For as long as she can remember, Nigerian native Cybill Okitikpi dreamed of studying medicine in the United States. She is pursuing her dream as a McNair Scholar at Minnesota State Mankato, where her research on the antioxidant properties of the bitter leaf plant earned a Best Presentation Award at the University’s 2009 Undergraduate Research Conference.
Above: Researchers who use the Department of Electrical and Computer Engineering Technology’s Cleanroom are required to wear protective clothing, an integral step in keeping dust and dirt to a minimum in an environment used to test integrated circuit devices.

PREPARING TO REALIZE A DREAM
A native of Nigeria, Cybille Okitikpi remembers having only one dream as a young girl—to study medicine in the United States.

FACULTY AND STUDENTS
Faculty who have high-quality digital photographs of recent research or creative projects are encouraged to submit them to the College of Graduate Studies and Research for inclusion in upcoming issues of FRONTIERS or TOMORROW. Photographs should be at least 200 dpi and should be accompanied by a brief caption describing the project and the photo. E-mail photographs (in jpg or tif format) to anne.blackhurst@mnsu.edu.

GOT PHOTOS?

Department of Electrical and Computer Engineering Technology

EXAMINING GROUP BEHAVIOR ON THE FLY
While science may not be ready to make claims about a genetic link to mob mentality, Minnesota State Mankato biology professor Dave Tomia conducted research to identify whether certain behaviors in selected lines of Drosophila, fruit flies, are a collection of individual behaviors or a population-based behavior.

ADVOCATING FOR EQUALITY
An innocent comment made by a stranger on an airplane nearly 10 years ago served, in part, as motivation for Nancy Fitzsimon’s new book.

UNDERSTANDING INDIA: WHERE FAMILY MEANS BUSINESS
As part of their effort to present a global perspective, Minnesota State Mankato law professors Penny Herschaff and Vicki Luoma are researching business cooperatives in India’s carpet industry. During a recent visit, they witnessed first-hand the challenges and triumphs of life in India.

YIELDING EXTRAORDINARY RESULTS
As an environmental sciences graduate student, Nicole Alfafara learned about a toxin’s harmful effects on the people and pets of a local community. Determined to make an impact, she went to work to identify a more comprehensive risk assessment and mitigate the negative effects on the community.

DEPARTMENTS
4 URC
5 MAP
6 RASP
9 CESR
A THOUSAND WORDS

The mission of FRONTIERS is to celebrate the scholarly and creative accomplishments of Minnesota State Mankato faculty and students and inform the campus community of research-related opportunities. FRONTIERS is published three times per year by the College of Graduate Studies and Research and distributed to Minnesota State Mankato faculty, staff, and graduate students. The College of Graduate Studies and Research welcomes ideas for future issues and other content consistent with the mission of the newsletter. Please e-mail any ideas to cesr@mnsu.edu.

The College of Graduate Studies and Research welcomes ideas for feature stories and other content consistent with the mission of the newsletter. Please e-mail story ideas to cesr@mnsu.edu.
A native of Nigeria, Cybill Okitikpi remembers having only one dream as a young girl—to study medicine in the United States. With hopes of becoming a medical scientist, Okitikpi understands that research will be an important part of her career and research presentations will be vital to her success. She feels fortunate to gain experience with both at Minnesota State University, Mankato.

Although Okitikpi was prepared to move to the U.S. and be on her own immediately after high school, her mother was less so. In fact, Okitikpi studied physics for three years at a university in Africa while her mother became more comfortable with her relocating to Minnesota.

Once in the U.S., Okitikpi chose Minnesota State Mankato as the place to begin working toward a career as a medical scientist. A pre-med student studying human biology with minors in chemistry and women’s studies, Okitikpi is also a McNair Scholar. The McNair Achievement Program provides first-generation college students, low-income students, and students from groups underrepresented in graduate education the opportunity to effectively prepare for graduate studies. Research and presentations are requirements of the program.

Okitikpi’s academic advisor, Dr. Marie Pomije, suggested she contact chemistry professor Dr. Danae Quirk Dorr to discuss possible research projects. Quirk Dorr and Okitikpi reviewed many options, including Quirk Dorr’s ongoing research with Vernonia amygdalina, commonly called bitter leaf—a plant used regularly by people in West Africa as part of a daily diet and as a traditional remedy for conditions such as diabetes.

“My previous knowledge of bitter leaf and its use in Nigeria increased my excitement for the research here. Dr. Quirk Dorr and I wanted to see if the plant compounds contained antioxidants,” said Okitikpi.

Natural antioxidants are valuable substances that may reduce the negative impact of free radicals on the human body. Much of the human aging process is a function of oxidation. As we use oxygen, our bodies create free radicals as a natural byproduct. In addition, exposure to environmental factors, including tobacco smoke and radiation, can lead to the formation of free radicals. Free radicals are electronically charged and naturally collect electrons from other molecules. In the process, they can cause damage that may lead to various conditions including heart disease and cancer. Compounds known as antioxidants have been described as having the ability to “mop up” free radicals, therefore neutralizing the electronic charge and reducing the risk of disease.

Okitikpi completed the majority of her work in the chemistry lab, analyzing the antioxidant activity of bitter leaf and comparing its activity to that of a known antioxidant. In addition, she conducted experiments to determine both its phenolic and flavonoid content. Okitikpi’s results show that bitter leaf possesses significant antioxidant properties and contains both phenols and flavonoids.

Quirk Dorr appreciated Okitikpi’s research and work ethic. “Cybill is extremely bright, inquisitive, and motivated,” Quirk Dorr said. “She was able to work independently and completed a remarkable amount of work on her own.”

Okitikpi presented her research at both the McNair Colloquium and the Undergraduate Research Conference at Minnesota State Mankato, where she earned a Best Presentation Award. Although she found the presentations a bit nerve racking, both experiences helped her a great deal. “Preparing for them really helped me to organize my research and refine my presentation materials,” said Okitikpi.

In the long term, Okitikpi plans to make research a significant part of her career. “As an MD/PhD, I can work with patients and in the lab. I think I can get better results if I can test the things people use.” And, since Okitikpi still has a year remaining in the McNair Achievement Program, she will be conducting additional research in the short term. Watch for her at Minnesota State Mankato’s 2010 Undergraduate Research Conference.
EXAMINING GROUP BEHAVIOR ON THE FLY

Is mob mentality genetic? The answer may lie in the fruit fly. While science may not be ready to make claims about a genetic link to mob mentality, Minnesota State Mankato biology professor Dan Toma is conducting research to identify whether certain behaviors in selected lines of *Drosophila*, fruit flies, are a collection of individual behaviors or a population-based behavior. How are decisions made within the group? Are the decisions consistent or random? Do the flies exhibit the same behavior when they are in a group as when they are alone? A behavioral geneticist, Toma has more than a decade of research experience with *Drosophila*. His expertise, a 2009 grant from the Faculty Research Committee, and access to relatively famous genetic lines of fruit flies combined to make the study a reality.

Toma received the noteworthy *Drosophila* lines from Dr. Jerry Hirsch upon Hirsch’s retirement from the University of Illinois, Urbana-Champaign. “Hirsch is a pioneer, really the founder of behavioral genetics,” said Toma. Hirsch began developing the lines of *Drosophila* more than 50 years ago. In the late 1950s, he began a series of experiments questioning how the genes of an organism contribute to complex behavior in animals. By breeding a population of the fruit fly to walk up (against gravity) and another to walk down (toward gravity), Hirsch established distinct behavioral lines of flies and was the first to scientifically prove a genetic basis for behavior.

Toma was one of Hirsch’s last students at the University of Illinois, Urbana-Champaign. At the time Hirsch retired, Toma was conducting post-doctoral work in California. Toma was conducting post-doctoral work in California. Toma requested and received Hirsch’s tubes filled with the infamous, 50-plus-year-old line of *Drosophila* given to him by Dr. Jerry Hirsch upon Hirsch’s retirement from the University of Illinois, Urbana-Champaign. Each generation of fruit flies lives less than two months and is sustained on Toma’s homemade yeast, sugar, corn syrup and gelatin pastes.

Toma received a research grant from the Faculty Research Committee. Toma’s undergraduate students sent individual fruit flies through a plastic maze, one at a time. As the fly moves forward in the maze, it makes a series of decisions. The maze is located inside a black plywood box with a light at the exit side of the maze to draw the flies through. The exact route of the fly and the time it takes to complete the maze are recorded.

“Flies are a genetic workhorse. A lot of what we know about our own genetics is drawn from the fruit fly. We can find the gene in the fly and then we can look for it in the mouse and human,” said Toma. Hirsch and others have proven the genetic basis for behavior. Now scientists like Dr. Toma can extend existing research, conduct new research, and continue to contribute to our understanding of human behavior. Perhaps someday they will be able to identify a genetic explanation for the power of the adolescent peer group.

**Is mob mentality genetic?**

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“From my own experience giving talks on the research, there were frequent inquiries about how individual flies in these selected populations behaved,” said Toma. He wondered, given the contribution of research on these selected lines to the understanding of behavior, why had no study at the individual level been done?

“Hirsch’s research was population based. But we want to know what an individual fly does. Undergraduate students are working to determine: Is the population-based phenomena of walking up or down a group-based, social mentality? Is it an emerging property or is it simply a collection of individual behaviors?” said Toma. In other words, do the flies with the genetic predisposition to walk upward continue to do so when they are alone or do they only walk upward as a member of the group?

To understand how complex behavior is produced and controlled in organisms and populations of organisms, Toma explained, one must understand the difference in behavior of an individual as opposed to the behavior of the population. Toma and his students run individual flies through a T-choice, clear plastic maze, one at a time. As the fly moves forward in the maze, it comes to a “T” in the tunnel where it must choose to turn and walk up or walk down. As the fly continues through the maze, it makes a series of these decisions. The maze is located inside a black plywood box with a light at the exit side of the maze to draw the flies through. The exact route of the fly and the time it takes to complete the maze are recorded.

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Dr. Stephen Stoyno is a Fulbright advisor, Graduate Coordinator for the Department of English, and professor of English at Minnesota State Mankato. He does not seem to be easily impressed. However, graduate student Ahmet Dursun impressed Stoyno not only with his performance as a scholar, but his performance as a human being. “What people may not know about Ahmet is that he is deeply committed to helping others,” Stoyno said.

When Dursun’s roommates came down with appendicitis, Dursun acted as his interpreter at the hospital and nursed him back to health after he was discharged. In the midst of gathering data in Turkey for his thesis, Dursun stopped to act as a tour guide for Minnesota State Mankato friends visiting his homeland. It should come as no surprise, then, to those who know him that much of Dursun’s research centers on helping others learn.

As a graduate teaching assistant at Minnesota State Mankato, Ahmet Dursun found teaching English composition to non-native speakers to be quite a challenge, and he thought there must be a better way. His teaching experience, combined with a project from an earlier course on second language literacy development, prompted Dursun to formally explore and document the challenges facing first-year international students in college-level composition courses.

“Ahmet’s study illustrates how a capable graduate student can take a project completed for a course and use it as the basis for undertaking a serious scholarly investigation of an important issue and contribute to the professional discourse in the student’s chosen field,” said Stoyno.

Dursun believed that if he and other composition instructors learned more about incoming students’ English composition experiences, they would be in a better position to implement effective teaching strategies. “In order to help them, you need to first know their challenges. However, there is a paucity of research about the challenges first-year international students face in developing reading and writing in composition classes,” Dursun said. Thus, his professional struggle extended the focus of his research.

Dursun interviewed first-year, non-native students enrolled in Composition 101 about their experience with English language education, speaking, reading, and writing, as well as the problems they faced in the composition classroom. What he found suggested their performance was highly affected by their individual background knowledge, use of English, and familiarity with new writing genres.

Generally speaking, different cultures provide different approaches to reading and writing instruction. Until students learning English as a second language (ESL) become familiar and comfortable with the approach used in U.S. composition courses, they struggle. “Therefore, in order to be most effective, the instructors should take the characteristics of this group of learners into account and plan their instruction accordingly,” said Dursun.

In April, at Minnesota State Mankato’s first annual Graduate Research Conference, Dursun presented his findings, along with recommended teaching strategies to better meet the needs of ESL composition students. He earned an Outstanding Presentation award for his presentation.

However, that was only one of several noteworthy accomplishments for Dursun. He presented a second time at the GRC as part of a group research project, and his ESL project was chosen to be presented at the Minnesota State Colleges and Universities System Graduate Research Conference in the Twin Cities. In addition, he was a Fulbright Scholar, student senate representative, and Outstanding English Student of the Year. In May, he graduated with his master’s degree, a few days later, he returned to his home in Turkey.

Dursun was so involved, he said, because he came to the United States for one purpose only: to learn. “I gave up my teaching position in Turkey, my home, and time with my friends and family to study. I try to take advantage of every opportunity that is presented to me,” he said.

Fortunately for the community, the newly established Graduate Research Conference also provided a platform for Dursun to help others learn. Stoyno said, “I believe this is just the beginning for Ahmet. I expect him to contribute a great deal to the field not only in Turkey, but internationally as well.”


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Long before “Slumdog Millionaire” won an Academy Award for Best Picture, Minnesota State Mankato colleagues Penny Herickhoff and Vicki Luoma witnessed first-hand the challenges and triumphs of life in India. Both Herickhoff and Luoma teach business law. As part of their effort to present a global perspective, they are researching business cooperatives in India’s carpet industry. Carpets are the number one export of India and a great source of tourism. “And,” Luoma said, “to fully research the laws, we had to travel to India.”

In the relative comfort of Luoma’s campus office, the duo worked to describe the overwhelming poverty they witnessed—people without shelter huddling around open fires; a rug and chair on the side of the street serving as a dentist’s office; women in saris hauling rocks in baskets on their heads as members of a highway road crew. Judging by observation, they estimate that 20-30 percent of people in India live without any permanent shelter.

Herickhoff said, “The poverty is grinding. If you have seen “Slumdog Millionaire,” those slums are real. If you have a job, if your family has an income and you have food to eat, that is a victory.”

As crushing as the poverty is, by all accounts, life in India is much better now than it was a decade ago. In 1998, the government in India outlawed child labor—a sort of indentured servitude—in the carpet industry. Subsequent modifications to the law provide health care and education to entice families to send children to school rather than to work.

Indian culture places family at its center. More often than not, successful businesses have family roots, including Kingfisher Airlines and Tata Motors. The family co-op is a popular business model in many other cultures as well.

“Because on their face, and I believe in their intent, the policies of the Indian government are quite progressive,” said Herickhoff.

While in India, Herickhoff and Luoma visited courts and government offices to review the history of the laws designed to eliminate child labor and improve living conditions for the poorest of the poor. In addition, the Minnesota State Mankato research team toured various carpet factory cooperatives.

In the larger cooperatives, Herickhoff and Luoma observed adults ranging in age from their mid-20s to mid-40s working at the looms. The conditions were good, and people seemed content. Herickhoff and Luoma were also able to observe several smaller, and more common, family co-op carpet factories. The workers at the family co-ops seemed mostly to be girls younger than 18 years of age. Although it is legal for families to employ their own children, the government offers incentives—such as replacement workers, health care, and meals—for families to send these children to school.

“On average, a family of five can produce four rugs per year, earning an annual income of around $480. In contrast, one rug may sell for $5,000 in Delhi,” said Luoma.

With family business a primary delivery system for entrepreneurship in India, the government is working hard to support the model, giving people who used to be day laborers more ownership and control. The Indian government now provides raw materials as well as marketing and shipping assistance to family cooperatives. In addition, more local, government-supported markets allow families to sell their handicrafts directly.

After acting as observers of the carpet industry during their first visit, Herickhoff and Luoma plan to return and interview members of the family cooperatives. They are interested in learning whether the Indian model could be transferred to other parts of the world and hope to discover which government policies are working for the family co-ops and which are not.

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Some painters think in colors. Some poets think in rhythm and meter. Minnesota State Mankato MFA sound design student Ben Inniger says that sometimes he thinks in sound. Perhaps you have heard his thoughts.

Inniger works daily to create and record the sounds of life, real and imaginary—from the blast of a gun to the uttering of a fairy’s wings. His work has been featured in theatrical performances in Mankato at both the Ted Paul and Andreas Theatres on the Minnesota State Mankato campus and at the Ytrisaker Fine Arts Center on the Bethany campus.

Inniger’s work includes more than fantastical sound effects. He also composes background music for theatrical performances and original songs for musicals. In fact, Inniger began his undergraduate career as a music major. But, he says, “Although I am an OK musician, I am a terrible performer. Being in front of people is not the thing for me.”

Fortunately for audiences in the Mankato area, Inniger found work behind the scenes, composing music for plays and learning audio technology and the design process along the way.

“I love to compose music. It is kind of how I got into theater,” said Inniger. “Once there, I discovered I was a fairly adequate sound designer.”

George Grubb, Inniger’s advisor and sound designer for Minnesota State Mankato’s Department of Theatre and Dance, says Inniger is much more than adequate. “Ben is an incredibly talented sound designer,” said Grubb.

Inniger recently accepted his fifth regional sound design award from the Kennedy Center American College Theatre Festival.
American College Theatre Festival. Participants in the festival were awarded a trip in May 2009 to New York for a Broadway Master’s class in sound design. While he has composed music for symphonies, Inniger is more comfortable composing music for theater because the play provides a foundation for his creativity. “I appreciate the challenge of using my creativity to match the script and the director’s vision of it. It requires me to be eclectic and flexible. It is very fun,” said Inniger. At Minnesota State Mankato, the fun for Inniger began two weeks after classes started. “In Ben’s first semester here, I sort of threw him into the fire and had him design the first show of the season. It was amazing to watch his creativity,” said Grubb. The ambitious program of the Department of Theatre and Dance at Minnesota State Mankato has challenged Inniger. “We produce 18 shows a year and sometimes it feels like a burden,” he said. “But Dr. Paul Hustoles is a brilliant producer and fundraiser, so we have access to technology that is being used in professional theatre, which prepares us to be productive the day we graduate.”

Meeting the demands of the production schedule at Minnesota State Mankato is obviously a labor of love for Inniger. Listening to him, it is clear he enjoys his work. “We are crazy busy here, but I am so proud of the work we do,” said Inniger. And he appreciates the broad-based education he is receiving. “Theatre history, set design, directing, lighting, I am learning it all.”

While busy on the Minnesota State Mankato campus, Inniger continues to gather experience off campus. His work includes audio recording for Minnesota Valley Choral and teaching sound design at Bethany Lutheran College. Last spring, Inniger wrapped production of an original musical, on which he collaborated with Valley Choral and teaching sound design at Bethany Lutheran College. Last spring, Inniger wrapped production of an original musical, on which he collaborated with Peter Bloedel, entitled “I am Jar Sonnets.” Inniger spent the first part of summer 2009 working for Highland Theatre and the second part as the house engineer for the Eugene O’Neill Theatre Center in Waterford, Connecticut.

He expects to graduate with a Master of Fine Arts from Minnesota State Mankato in May 2010. His thesis, sound design production for “Into the Woods,” will be presented at the American College Theatre Festival. Participants in the festival were awarded a trip in May 2009 to New York for a Broadway Master’s class in sound design.

Graduate student Nicole Alfafara admits she was, in many ways, an ordinary undergraduate student. However, while studying environmental sciences as a graduate student at Minnesota State Mankato, Alfafara learned about a toxin—cyanotoxin microcystin—and its harmful effects on a local community. And what she did then was extraordinary.

Alfafara first heard about microcystin as an undergraduate in Michigan. One of her fellow students presented research on the toxin in drinking water. When Alfafara learned that the toxin was causing problems in a local lake, she knew she had found the basis for her thesis work. “Nicole showed enormous initiative. My role was in helping her shape her research into something that had not been done before,” said her advisor and biology professor, Dr. Steve Mercurio.

Nearby Crystal Lake has a recent history of poor water quality, including high levels of cyanotoxin microcystin. Exposure to the toxin is a serious public health issue and can result in skin irritation, liver and kidney damage, gastrointestinal distress, liver cancer, sore throat, nausea, vomiting, visual disturbance in humans, and illness and mortality in animals. The community is well aware there is a problem. Crystal Lake beaches have been closed, warning signs are posted, and in the summer of 2007, the death of two local dogs was linked to the cyanotoxin microcystin exposure.

Alfafara contacted the Minnesota Pollution Control Agency and the Department of Natural Resources for coordination and support of her research project. At the time, neither agency had plans for sampling Crystal Lake and neither had funds to support her research. Fortunately, funding for the test kits and other supplies were covered by a faculty research grant secured by Mercurio.

Over the course of seven weeks, Alfafara collected water samples from Crystal Lake. Each sample included varying amounts of Cyanobacteria—bacteria commonly referred to as blue-green algae—which lies at the heart of the microcystin problem.

As the bacteria are ruptured or die, they release the toxin. When government agencies monitor water quality for microcystin, they measure only the amount of toxin in the water at the time of sampling. This process ignores the toxin stored in the bacteria cells.

Alfafara and Mercurio wanted a more complete measurement—an environmental yield measuring the toxin in the cells as well as the toxin in the water. Alfafara explained, “The purpose of my research was to establish a new toxicalogical risk assessment for microcystin ingestion, by determining the intra- and extra-cellular microcystin concentrations.”

Because alfafara was interested in determining the total amount of toxins in the sample—those that had been released from the bacteria as well as those stored—she needed to extract the toxins from the bacteria. The optimal extraction method involved a chemical solution similar to stomach acid. That is why Cyanobacteria are so harmful when ingested. A person or animal’s stomach acid kills the bacteria and releases the stored toxin.

Alfafara’s newfound passion for environmental sciences shines no signs of fading in her long-term plans. “After I graduate from Minnesota State Mankato, I want to get my doctorate and continue to research the behavior of pollutants and their effects on aquatic environments and human health,” she said. “I really want my work to help the environment and make an impact on people’s lives.”

**RESULTS**

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**SOUND THINKING**

**CONTINUED FROM PAGE 12**

broad, sweeping policies with intermittent benefits that are difficult to monitor and enforce,” said Elliot.

Between collecting and analyzing data, Elliot presented her research at various conferences: at the Minnesota State Mankato Graduate Research Conference, at the South Dakota State Graduate Research Conference Geography Convention, and two consecutive years at the American Geographers Annual Meeting.

Elliot said, “I am extremely grateful for the support provided by the Department of Geography and the College of Graduate Studies and Research that has allowed me to present my research in Boston, Las Vegas, and Brookings, S.D. We do all this great research at Minnesota State Mankato, but until we share it with other departments, colleges, and universities, and build bridges and become part of the community, our work is not complete.”

**SENSING A RIVER’S DISTANT IMPACT**

**CONTINUED FROM PAGE 12**

nicole alfafara's research has focused on cyanotoxin microcystin, a toxin that is harmful to humans and animals when ingested. alfafara's work has shown that the freeze/thaw process on minnesota lakes releases more toxins.

**results**

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alfafara and mercurio wanted a more complete measurement—an environmental yield measuring the toxin in the cells as well as the toxin in the water. alfafara explained, “the purpose of my research was to establish a new toxicalogical risk assessment for microcystin ingestion, by determining the intra- and extra-cellular microcystin concentrations.”

because alfafara was interested in determining the total amount of toxins in the sample—those that had been released from the bacteria as well as those stored—she needed to extract the toxins from the bacteria. the optimal extraction method involved a chemical solution similar to stomach acid. that is why cyanobacteria are so harmful when ingested. a person or animal’s stomach acid kills the bacteria and releases the stored toxin.

alfafara’s newfound passion for environmental sciences shines no signs of fading in her long-term plans. “after i graduate from minnesota state mankato, i want to get my doctorate and continue to research the behavior of pollutants and their effects on aquatic environments and human health,” she said. “i really want my work to help the environment and make an impact on people’s lives.”

**sensing a river’s distant impact**

nicole alfafara’s research has focused on cyanotoxin microcystin, a toxin that is harmful to humans and animals when ingested. alfafara’s work has shown that the freeze/thaw process on minnesota lakes releases more toxins.
In rural India, women dressed in colorful saris worked as members of a highway road crew, hauling baskets full of rocks on their heads. In 2008, Nirma University in Gujarat, India became Minnesota State Mankato’s newest sister institution as the University continues to expand its international partnerships. (See related story on pages 10-11.)