Aaron Budge and Jim Wilde meet regularly to discuss research projects and contracts that are a part of the Center for Transportation Research and Implementation.
Directed and choreographed by Paul Finocchiaro, “Chicago”—the most requested musical on audience surveys for years—opened the Ted Paul Theatre 2010-2011 season. In preparation for the show, Finocchiaro’s research included travel to NYC, Chicago, and L.A.; tango lessons; and a visit to the Cook County Jail.
PAVING THE WAY
Contracts for research at Minnesota State Mankato have increased from $1.7 million in 2009 to $7 million in 2010. “Now several faculty members who have successful contracts are mentoring others,” said Annie LoPrieno, director of Research and Sponsored Programs. Civil engineering faculty members Jim Wilde and Aaron Budge are two such mentors.

CONNECTING TO ENHANCE EDUCATION
By staying connected to the front lines, the College of Education established itself as a leader in delivering innovative solutions to education professionals. Ginger Zierdt, director of the Center for School-University Partnerships, said that connections with those on the front lines have led to long-time professional development contracts.

GETTING A FOOT IN THE DOOR
A small project with Best Buy provided a great opportunity for automotive engineering technology students to get hands-on experience. It also added to the more than $1.8 million in grants and contract revenues for MnCAR during 2010—and may lead to even more.

FINDING THE RIGHT MIX
Steve Druschel and his undergraduate students are testing the effectiveness of more than 50 different de-icers for the Minnesota Department of Transportation (Mn/DOT). The project is one of two contracts Druschel holds with Mn/DOT.

FILLING OF LAKE PEPIN
Scientists at the Science Museum of Minnesota noticed that the erosion of stream banks, riverbanks, and bluffs of major Mississippi River tributaries had increased over time. And when the Science Museum needed a research partner to help them discover the reason for the increase, they contacted Rick Moore and the Water Resources Center at Minnesota State Mankato.

MODELING PROGRESS
Donald Friend and Anthony Filipovitch are introducing the concept of modeling and simulation to stakeholders in the Midwest. The concept is seen as key to helping America stay competitive in a rapidly changing, high-tech world. And, with fewer than a dozen centers in the country, Minnesota State Mankato is at the forefront of the movement.
U.S. Highway 14 was prepped for concrete application. After the concrete was poured, temperature sensors were inserted into the fresh concrete to help assess its strength during the curing process. Research showed that strength gain over time is strongly correlated with temperature history during curing. Information provided by the temperature sensors allows the new roadway to be open to traffic as soon as possible.

PAVING THE WAY

President Richard Davenport likes to remind people that Minnesota State Mankato is all about big ideas and real-world thinking. But sometimes big ideas require big money for implementation, and with shrinking budgets and increased competition for grants, giving legs to big ideas can be difficult.

Minnesota State Mankato faculty and staff seem to have found an option with contracts for research. Annie LoPrieno, director of Research and Sponsored Programs, said contracts for services offer great options. “Large federal grant awards are very difficult to obtain,” she said. “Contracts offer unique opportunities for faculty and staff to pursue research and also offer a way for smaller industry and government entities to investigate specific needs.”

In fact, contracts for research at Minnesota State Mankato have increased from $1.7 million in 2009 to $7 million
in 2010. “Now several faculty members who have successful contracts are mentoring others,” said LoPrieno.

Civil engineering faculty members Jim Wilde and Aaron Budge are two such mentors. Wilde serves as the director of the Center for Transportation Research and Implementation. Through the Center, both professors have secured multiple contracts with the Minnesota Department of Transportation (Mn/DOT) and the Minnesota Local Road Research Board (LRRB).

Less than a year old, the Center has established a reputation for producing deliverables on time and within budget. Wilde said, “We focus on offering research that provides the right thing at the right place at the right time. We like to say the Center is where the research meets the road.”

For three years, Wilde and Budge have invited faculty from across campus to learn about their methods of securing contracts. “Mn/DOT posts a list of needs every year,” said Wilde. “Many are out of our area of specialty, but we can help others negotiate the system of statements of intent, proposal writing, billing, and deliverables.”

“It is a mentoring process,” added Budge. “Jim mentored me, now we are mentoring other faculty members. And I think we have 13 or 14 proposals from across campus—electrical engineering, computer science, biology, construction management, mathematics, urban and regional studies—that will be submitted to Mn/DOT this year.”

Wilde and Budge have more than $1 million in active contracts between them. While they work jointly on some projects, they each have several other contracts with Mn/DOT.

One of Wilde’s current projects involves county roads located in the wind corridor—a popular location for wind towers. “When a company installs 100-150 towers, they may haul in 6,000 loads of concrete and 7,000 loads of aggregate in addition to the turbine components,” said Wilde. “County roads not designed for that traffic can be severely damaged or destroyed.” Counties and wind tower companies are sometimes at odds when they must negotiate repair bills.

Wilde is working to construct a formula that estimates damages to the roads up front. The project also includes collaboration with a consulting firm to develop policies and model road agreements to assist counties facing new wind farm construction. This completed package will minimize risk and save time and money for both parties.

Budge’s research specialty involves subgrade soil stabilization and other soil- and foundation-related interests. Different soils possess different properties; some are more stable than others. Therefore, county and state engineers use a variety of materials to strengthen soil before building roads on it. “Several research studies document the stabilizing effect of soil additives, but the information is scattered and in different formats,” said Budge. “That makes it time consuming and expensive to access.”

His project includes delivery of a reference tool that provides recommendations for the best stabilization materials and techniques depending on the particular soil properties and project needs. County and state engineers expect the tool to save money and provide better results in soil stabilization and road construction and, ultimately, smoother roads.

Both Wilde and Budge focus on delivering what the client needs. They understand that contract awards are tied directly to on-time delivery of a workable product. They are not alone.

“The ability of faculty and staff across campus to deliver the goods has helped Minnesota State Mankato increase contract awards by more than 300 percent in 2010,” said LoPrieno. “Contracts are increasing here because industry and government agencies know we get the job done.”
As the director of the Center for School-University Partnerships (CSUP), building connections ranks high on Ginger Zierdt’s job description. She doesn’t stay in one place very long. Campus meetings, telephone conferences, and school visits as far away as Australia are all part of the process. However, Zierdt is quick to point out that she is just one member of the College of Education’s team.

“Our faculty is phenomenal,” said Zierdt. “They have their fingers on the pulse of what communities and schools need.” By staying connected to the front lines, Zierdt said, the College of Education at Minnesota State Mankato has established itself as a leader in delivering innovative solutions to education professionals—from early childhood to special education to elementary and secondary to counselors and administrators.

One example is the annual special education law conference, which began in 2007. The majority of lawsuits filed against school districts are related to special education services, which is a major concern to districts. “We had been wanting to offer a law conference designed for special education professionals for years,” said Gail Zahn, special education professor.

So when the CSUP agreed to help with the details, Zahn and faculty member Bob Miller organized a schedule of workshops and recruited nationally recognized speakers for a two-day conference for special education practitioners. The law conference caught the attention of the Minnesota Department of Education (MDE).

MDE recognized that Minnesota State Mankato possessed the infrastructure, the capacity, the expertise, and the credibility to offer dynamic training for working
professionals. Three years ago, MDE contracted with the College of Education to enhance Mankato’s special education law conference.

The College of Education offers numerous professional development opportunities, from classes to conferences to online seminars, depending on the needs of the professionals. “These events have supported new courses in our department and have built our reputation well beyond the classroom,” said John Seymour, associate professor of counseling and student personnel.

Indeed, consistent delivery of innovation and customized solutions for education and other professionals solidified the College of Education’s reputation. Area school districts serving students preschool to 12th grade regularly partner with Minnesota State Mankato and have invested in training contracts with the University for more than 20 years.

The longest running contracts place graduate teaching fellows in P-12 classrooms. Graduate teaching fellows are specially selected, first-year licensed teachers working toward a graduate degree.

Fellows in the classroom receive a full year of one-to-one mentoring by a master teacher. Districts release the master teachers from daily classroom duties to take on special assignment tasks. Special assignments may include supervising student teachers, leading on-campus professional development, and/or advancing special initiatives. In addition, the master teachers receive professional development through the University.

Kristin Dauk, fourth grade teacher in Mankato, appreciates the value of the program both as a graduate student and a master teacher. “I am the only person I know of in the area who has experience on both sides of the program,” said Dauk. “As a graduate fellow, the master teacher was a great resource for the whole language curriculum I was teaching. And the experience as a master teacher on special assignment allowed me to explore additional training and revisit the theoretical side of education, which I am applying now in the classroom.”

The College of Education knows the contract piece of their training initiatives, whether serving individual districts or statewide conference attendees, is important to their continued growth. “Ultimately, what we do through our work represents what we do to prepare our teachers,” said Zierdt. “Contract work helps build the credibility of our program.”

Mentoring Preschool Professionals

The Center for Mentoring & Induction recently announced a three-year contract with the Minnesota Department of Education to develop a professional mentoring program for early childhood educators. “Our longstanding involvement with mentoring made Minnesota State Mankato the perfect fit for this statewide effort,” said Lori Bird, director of the Center. “The award will allow us to extend our work beyond K-12 schools to preschools, daycare centers, and early intervention agencies.”

The Center will provide professional development, using mentorship as its primary tool. Bird explained that mentorship, which uses collaboration and thought-provoking discussions, is very effective in helping teachers improve their skills.

In this three-year project, the Center will use essential early childhood learning standards; identify early childhood professionals and train them as mentors; identify and train mentees; facilitate the mentorship program; and complete assessment of the project and its outcomes.

“What we intend to do is show that the principles and practices of mentoring and coaching are highly effective professional development strategies,” said Bird. “Whether it involves new teachers adjusting to the profession or developing a collaborative culture within an agency, our goal is to prepare education professionals in a way that best serves children.”

Carol Burns (left) and Lori Bird visited Children’s House, a childcare center on the campus of Minnesota State Mankato. Bird and Burns received a grant to develop a preschool professional mentoring program with the Minnesota Department of Education.
Last spring Bruce Jones received a call from a Minnesota State Mankato alum now working at Best Buy. The company, the alum explained, was negotiating with another business to market an electric motorcycle. Best Buy wanted an independent lab to test the motorcycle and identify any potential problems before they finalized the agreement.

“Best Buy wanted to limit its exposure to risk,” Jones said. “They asked us to do a product evaluation and identify any safety concerns.”
On the day scheduled for testing, rain puddles filled the test course. Students asked Jones if they should reschedule. “In turn, I asked if any of them had ever been caught in the rain on their motorcycle,” said Jones, smiling. The test went on as scheduled.

During testing, Jones and his team of undergraduate and graduate students found that the motorcycle lacked adequate electrical shielding to protect the motor from moisture. When used in wet conditions, it had a tendency to shut off, a characteristic the manufacturer was unaware of.

Like the many contract projects that come in to the Minnesota Center for Automotive Research (MnCAR), the Best Buy request was one that the Center could easily handle with its existing equipment. Like most others, it provided a great opportunity for Minnesota State Mankato students to get hands-on experience working in the lab as well. And it added to the more than $1.8 million in grants and contract revenues for MnCAR in 2010—and may lead to even more.

“Best Buy was extremely pleased with our work,” reported Jones. “We don’t have any new contracts with them yet, but if they choose to expand into the electric scooter market, we’re in a great position to help them.”

That’s one of the reasons MnCAR perennially ranks amongst the top grant and contract recipients at the University. Organizations who work with the Center—from government entities and public institutions to private businesses—appreciate not only the results they receive but also how cost effective and professional the operation is. They often return to the Center with additional projects and tell others about their experience.

“It snowballs,” Jones said. “We get our foot in the door with a small project for a company like Best Buy, we prove ourselves, and then more work comes our way.”

Much of MnCAR’s work comes from grants received from large groups such as the Department of Energy, the Environmental Protection Agency, and the Minnesota Corn Growers Association. As the director of MnCAR, Jones devotes a portion of his time to seeking out requests for proposals and grant opportunities. Up to 80 percent of the contracts the Center receives, he said, are generated by those efforts.

But as MnCAR’s reputation grows and word of its new, state-of-the-art lab spreads, the number of private contracts will likely grow as well. A private company has already inquired if the new lab could be used to test the hydraulic systems for hybrid buses. “That’s going to open up more contracts for testing and service for us,” Jones explained. “That will generate more money and more experience for our students.”

The dollars are definitely important. Contracts and grants have allowed MnCAR to hire and sustain a full-time lab technician who is responsible for calibrating the equipment, ordering parts, and more. They have also made it possible for the Center to purchase new equipment and pursue new projects.

But it’s the impact on students that matters most to Jones. “Without a doubt, the most important part is that our students are able to get this kind of experience,” said Jones. “The more realistic the projects they are involved with, the better the education they will receive.”
Finding the Right Mix

Going in and out of a freezer several times a day during the warm summer months sounds like a plush assignment, but doing anything 3,500 times requires discipline. Discipline is one of many research skills taught by Steve Druschel, assistant professor of civil engineering at Minnesota State University, Mankato. Druschel and his students are testing the effectiveness of more than 50 different de-icers for the Minnesota Department of Transportation (Mn/DOT).

Minnesota has one of the leading research transportation departments in the country. But they are not interested in research for research sake. Ultimately, they want a tool that enables them to apply the research. In this case, Mn/DOT wants recommendations on the most efficient de-icing strategies for Minnesota roads and climate.

“Rock salt is so yesterday,” joked Druschel. While rock salt is still widely used, environmental concerns, advancements in technology, and new de-icing products prompted Mn/DOT’s request for research on the alternatives. “Mn/DOT wants a sense of how various de-icers work,”
said Druschel. “Are there combinations of products and/or application procedures that will be most effective for our climate?”

That question has kept Druschel and his undergraduate students busy in the labs throughout the summer and during the academic year. Under Druschel’s supervision, students prepared ice samples; applied de-icers; recorded melt; and repeated. They were meticulous in their procedures and record keeping.

Druschel found that research contracts are one way to breathe life into his labs. Walk past a civil engineering lab and most days you will hear music and see the areas used by undergraduate students. “To me, it is important that a lab be alive,” he said. “A lab that is quiet and waiting for the next experiment isn’t contributing.”

Although the students begin as inexperienced researchers, Druschel’s training schedule ensures a pool of quality research assistants. “The joke is that you can be a test tube washer one day, a week later you are working on the experiment, and a month later you are running the experiment,” he said. “And that is OK, because those are very defined roles. The training is there. Labor management is a big part of the contracts.”

Conducting research requires extra work from faculty members. But for Druschel, the benefits are worth the effort. “I want to be challenged. I recognize an important part of being good is failing occasionally,” he said. “I can do that inside research.”

Managing contracts adds additional challenges. “When I sign a contract, I am ultimately responsible,” said Druschel. “I can’t just say, ‘Well that didn’t work out.’ I need to work through that. And sometimes that means nights and weekends. If I get busy, too bad, the work needs to get done. I have to meet deadlines.”

Druschel values the opportunities research contracts provide to the program and his students. Students gain the opportunity to work in the lab, work in the field, and apply their classroom lessons to public work projects. “I learn new things in the lab every day,” said Breanna Brown, first year civil engineering student. “I got involved because it helps set me apart from other students.”

In addition to the de-icing research, Druschel, his students, and construction management faculty members Leah Roue and Brian Wasserman are analyzing the environmental effects of concrete-derived sediments. They are studying the impact of things like concrete dust produced from pavement cuts on trout streams.

And University officials are hoping there will be more contracts in the future. Druschel recently submitted three additional proposals. He said there are some test tube washers who are ready for additional responsibility.
As a new construction management faculty member in 2004, Brian Wasserman attended a lot of informational meetings. One meeting featuring the Minnesota Department of Transportation (Mn/DOT) research needs, such as infrastructure preservation, particularly intrigued him. “I knew immediately it was something I wanted to do,” said Wasserman.

Fast forward to a few years later when he was well on his way to completing a doctorate in industrial technology. Wasserman wanted to apply his experience in project management and gain additional experience in materials. “After hitting the books,” he said, “I was ready to get into the field.”

He contacted Jim Wilde, civil engineering professor. Wilde had experience with the Mn/DOT contract proposal process and mentored Wasserman through the initial application. “Jim helped me to understand what Mn/DOT was looking for in their proposals,” said Wasserman. Currently, Wasserman is involved with three Mn/DOT contracts.

Wasserman has benefitted from University-wide support. In addition to his colleagues in civil engineering, both Research and Sponsored Programs (RASP) and the Business Office were extremely helpful. “Annie LoPrieno, director of RASP was very supportive and enthusiastic. Kristel Lynch walked us through the internal process,” Wasserman said. “And Rosemary Kinne, the University’s budget and finance officer, is great. She keeps everything on track.”

While contracts typically do not offer multimillion dollar awards, totaled they are making a real difference for the University. “Small successes lead to bigger contracts,” said LoPrieno. “People like Brian Wasserman are quickly making a difference in the number of contracts awarded to Minnesota State Mankato.”

Gaining Traction VIA MN/DOT CONTRACTS
Scientists at the Science Museum of Minnesota noticed something unusual in the Mississippi River. The erosion of stream banks, riverbanks, and bluffs of major Mississippi River tributaries had accelerated over time. "That was a bit of a surprise," said Shawn Schottler, Science Museum senior scientist. "We know that these erode, but the rate of erosion is increasing at a seemingly unnatural pace."

When the Science Museum needed a research partner to help them discover the reason for the increase, they contracted with Rick Moore and the Water Resources Center at Minnesota State Mankato. "We knew the Water Resources Center had the expertise and experience related to our needs," said Schottler. "Once we met, it was obvious this was the right group to partner with on this project."

A primary indicator of increased river erosion is the sediment in Lake Pepin, the largest naturally occurring lake on the Mississippi River. Notable for more than its claim as the birthplace of waterskiing, Lake Pepin is a collection point for the Mississippi and

Rick Moore and Nicole Rietz spend hours in front of the computer collecting and mapping data, including the location of tile systems for 21 watersheds along the St. Croix, Minnesota, and Mississippi Rivers.

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FILLING OF LAKE PEPIN

Minnesota Rivers. As such, the lake serves as an archive of the sediment erosion history of the two rivers.

The sediment accumulation rate in Lake Pepin has increased more than nine times over the last 200 years, and the build up threatens the natural flora. At the current pace, it is estimated the lake will be full in 300 years.

Previous studies show that a whopping 80 percent of the sediment deposited in the lake comes from the Minnesota River Basin. Soil samples show that more than 60 percent of the lake sediment is from non-field sources such as stream banks, bluffs, and ravines.

“The project began with the assumption that the increased erosion was caused by a wetter Minnesota climate and/or a significant increase in agricultural tile drainage,” said Schottler. The data collected will either provide support or dismiss the assumption.

Rick Moore, GIS (geographic information system) research analyst at Minnesota State Mankato and primary collaborator of the project, provided additional background. “Between 1930 and 1950, significant sediment accumulation rate increases corresponded with the land use changeover from prairie to row crop,” he said. “Another significant increase was noticed between 1950 and 2008, which corresponds with increases in both precipitation rates and tile drainage.

“We designed the project to look at the geographic and historical extent of artificial drainage, as well as examine the human population and land use from the 1940s to the present,” said Moore. Contrary to previous assumptions that urbanization contributes to runoff and therefore causes more river erosion, the data in this study collected proves otherwise. Watersheds with increasing population have not had a change in hydrology.

Comparative studies of watersheds with and without tile drainage but with similar increases in precipitation are a key component to this project. However, locating tile systems is difficult. In addition to the fact tiles are underground, tiling permit records are private.

Moore and his team are in the process of collecting and mapping data from many sources: aerial photos, census records, land capability and use studies, cropping pattern analyses, observations of surface tile inlets, ditch drainage records, and landowner surveys. The variety of sources will help them estimate drainage density of the 21 watersheds contributing to Lake Pepin.

Moore’s team consists of himself and a part-time geography graduate assistant, Nicole Rietz. Even 18 months into the project, the responsibility for mapping tile drainage systems in 21 watershed areas can be overwhelming for the small team. “I still lose sleep about it sometimes,” said Moore. “Thankfully we just map the data. It is up to someone else analyze it and draw conclusions about correlations.”
During a visit to Old Dominion University in Virginia, President Davenport was impressed with the Virginia Modeling, Analysis, and Simulation Center (VMASC). Excited by the concept, he gathered a team, which included Provost Scott Olson, geography professor Donald Friend and urban studies professor Anthony Filipovitch, to research the possibility of establishing a modeling and simulation center at Minnesota State Mankato.

Modeling and simulation is seen as key to helping America stay competitive in a rapidly changing, high-tech world. So much so, a U.S. Congressional Caucus has been established on the topic. With fewer than a dozen centers in the country and none in the Midwest, Minnesota State Mankato is at the forefront of the movement. A center in Minnesota would be expected to contribute a great deal to the region’s economy.

VMASC was established in 1998 as a multi-disciplinary research facility. It lists more than 100 partners from industry to government to academia and reports grants and contracts in excess of $80 million. The center’s estimated economic impact on the region is $400 million.
annually and the modeling and simulation industry in Virginia produced a direct economic output of $1.6 billion in 2008.

So what does a modeling and simulation center do? According to the VMASC website, it uses modeling, simulation and visualization as enterprise decision-making tools to promote economic, business, and academic development. Filipovitch describes it as something akin to SimCity for business, industry, and research. It is a way to test behavior and decision-making without putting anyone or anything at risk.

Historically used in the defense industry, modeling and simulation can be used in a variety of public and private applications such as doctors performing simulated surgeries; emergency response procedures that consider details such as construction sites and wind direction; and business managers practicing decision-making skills required as business executives. “The applications are endless,” said Friend. “The modeling and simulation movement is changing the way engineering and business work to break down environmental and societal issues.”

The final design of the modeling and simulation center at Minnesota State Mankato, officially named Minnesota Modeling and Simulation Center is still being worked out. Friend and Filipovitch are busy introducing the concept to stakeholders in the Midwest, listening to ideas and concerns from the University and community, and laying the foundation of what the Center will look like. Friend said, “The tagline on the first information sheet was, ‘How can we build the Center so you will come?’ Our partners’ involvement is important to make this work.”

A major benefit of a center on a university campus, explained Filipovitch, is that no single person needs to master all the areas required for the research or modeling. It relies on a team approach. Each expert will contribute their specific area of expertise and graduate students gain skills and experience when they assist faculty.

The Center has unlimited potential as an individualized resource for industry and research. “Most consultants train you on their model. We will develop a model for you,” said Filipovitch. “And, aside from the very largest consulting firms, none possess all capabilities of a university—mathematical modeling, simulation gaming, ability to convert to visual output so it can be seen and interacted with in real time, accountants, engineers, social scientists, and more. It takes a huge array of competencies to offer modeling and simulation. Here we can assemble all the competencies needed for a project under one roof.”

A monthly brown bag series for the Center begins in January. Filipovitch kicks it off with a discussion on designing simulation games and Brian Martensen will share information about mathematical modeling for the amateur in February.

For more information about the series and other Center activities, contact Donald Friend, director at donald.friend@mnsu.edu or 507-389-2618 or Anthony Filipovitch, director of research at anthony.filipovitch@mnsu.edu or 507-389-5035.
Minnesota State Mankato senior and former paratrooper Patrick Nelson was the first recipient of the NFL Tillman Scholarship. Created in memory of former Arizona Cardinal Pat Tillman, the award recognizes those who have served their country while continuing their education. Nelson served in the military for seven years including 39 months in combat. A Minnesota native, Nelson plans to pursue a graduate degree in sport management after completing undergraduate degrees in history and sport management this spring. Nelson was invited on field to watch the coin toss between the Minnesota Vikings and the Arizona Cardinals. Photo courtesy of the Minnesota Vikings.