Dear Reader,

Welcome to the second volume of UT Discovers. The first volume of UT Discovers showcased the breadth of faculty environmental research and scholarship. This issue focuses on examples of faculty research, scholarship and creative activity that support University outreach and engagement. The volume shows that The University of Toledo is a vibrant and important community asset.

In this issue we highlight University of Toledo scholars who are taking their research, scholarship and creative activity into the community to make a difference in the lives of those who live in the region. In reading this volume, you will appreciate how a faculty member’s expertise and understanding of the frontiers of their academic disciplines provide value to our community. You will see that faculty members from across our diverse institution are making extensive contributions. University scholarship ideally does not stay within the boundaries of the institution but rather is translated into the larger community to benefit residents in many ways. These short stories are only a sampling of how the university both engages the community and is engaged by it.

We hope you enjoy meeting a few of our scholars and their work. If you have any questions about the work this publication describes, I am pleased to answer questions and obtain additional information for you.

Sincerely,

Frank J. Calzonetti
Vice President for Research and Economic Development
This publication was produced by The University of Toledo Office of Research and Innovation in conjunction with The University of Toledo Office of University Marketing.

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How can a story be dark and depressing while simultaneously alive, beautiful and full of love? Jane Bradley writes stories that are both dark and beautiful. The shining thread throughout is the redeeming power of love, of being able to see beauty through the dark surface.

Bradley says she became a voracious reader at a very young age. It was an escape and refuge from her own dark existence of poverty, tattered clothes, violent parents with alcohol and drug addiction problems, and cops always at the door. She was fortunate in having a third-grade teacher who recognized that she was a bright girl with talent. Bradley began writing.

Her first story was about a bear who terrorized the forest, breaking things and knocking down trees. Then one day “Old Grouch” fell in love with a bunny who had moved into the forest and who rebuffed him until he changed his ways. The teacher passed the story around, and Bradley says she got a bit of fame. She realizes now that the story was a metaphor for her father.

Because it draws on logic, emotion and reason, metaphor has tremendous power, Bradley explains. She says that immersing herself in Emerson and Thoreau, who both used metaphor expertly, helped her make her world a beautiful place. Bradley also uses metaphor heavily. “It taps simultaneously into rational thinking and emotion to make meaning,” she says. Her stories are filled with metaphors but also are frequently themselves metaphors and help her understand herself and those around her. She admonishes, “Write what you know, but also write what you want to know.” Metaphor helps do this.

Following her own advice, Bradley has written Living Doll, which is autobiographical. She is interested in how the mind works and how people recover from trauma. This novella is now used in graduate courses, rehabilitation, and therapy. It has had a reach far beyond the academy to impact lives in positive ways. Power Lines is a collection of short stories that look at power and equity among people from differing backgrounds. It deals with how love and power get entangled. “I’m really proud of that book,” she says. “Its Southern stories focus on nature and show how to make a beautiful life. We can’t judge those who are down and out, what we call ‘white trash’ down home. We need to look at them with compassion. I was happy, for many reasons, when the New York Times Book Review, listed that collection as a ‘Notable Book’ and gave it high praise.”

Are We Lucky Yet? is a collection of powerful short stories, some graphic, some with humor, others more despairing. Many of these are based on events in Toledo or even incidents that happened to Bradley herself or her friends. One particularly notable story is loosely based on the Mother’s Day brawl at a local Golden Corral—from the perspective of the mother with the unruly children. It is a sympathetic, compassionate and insightful look at the actions and thoughts of downtrodden members of society. I won’t spoil the story for you; you will have to read it for yourself.

Following her dictum to write what want to know, Bradley’s latest book, You Believers, is based on the car-jacking and murder of Peggy Carr, a
A Goodbye Letter to My Drug
By Teri Fields

I never did think I’d have to say goodbye to you
But I always wanted to.
I never knew the real sober side of me,
But I always wanted to meet her without you.
I never longed for the relief of death I thought you would finally bring
But I always missed living daily.
I never regretted having met you because you showed me my true strength
And I always doubted you would be able to destroy me.

popular and well-liked young Toledo woman.
Bradley was fascinated by how someone can be so casually evil in plotting and planning to kill a stranger;
Bradley also had a need to understand how a mother can survive the loss of her daughter, particularly in such a brutal fashion. The book provides insights into these concerns.

With her talent in writing and seeing beyond the surface, her compassion for those less fortunate, her understanding of the power of love, and her curiosity about the effects of and recovery from trauma have combined to lead Bradley to work with several shelters in Toledo.

She has aptly combined her love of and talent for writing with her teaching to develop writing workshops that have made a difference for many women living in shelters and rehab houses. To accomplish her goal, Bradley developed a course on writing in the community. She first spends four or five weeks teaching students in the creative writing program to conduct writing workshops. The class learns how to use prompts to draw concrete details from reluctant and shy participants, when to push and when to pull back. The students also write their own prompts. “Some of them bomb and some are useful for everyone,” Bradley says.

At the end of the training sessions, Bradley takes the students into the shelters they have chosen from the list of possibilities. Now it is the students’ turn to run the workshops and get the residents to write about their hopes, their experiences, their youth, their future. At the end of the eight-week workshops, the students and Bradley work together to type and compile chapbooks, correcting typos and grammatical errors in the process.

“Many of these women are basically illiterate,” Bradley says, “and when that is the case, I just say ‘Talk to me.’” The chapbooks get printed and Bradley plans an evening of public readings in a downtown coffee house. The women read their own poems and stories using a microphone in front of a crowd. They get applause and recognition.

This entire process has an effect on the students and the workshop participants, Bradley remarks. They learn to be much less judgmental and to see the good in people. One young woman who worked at Aurora House did not want to stop the workshops and continued through the summer without pay or course credit. One young man has graduated and will be working in Harlem with an inner-city project.

Other students are instituting a poetry-reading series at the Sub Shop downtown with donations going to support Aurora and N.A.O.M.I. houses.

The women in the community workshops never want Bradley and the students to leave when the course is over—which is why Bradley will continue to teach this course and return to the communities that want to write. Many in the workshops keep in touch, and some come to UT as students. “A lot don’t make it,” comments Bradley, “but the program has helped many who do succeed. One has become a lawyer, another a Web designer,” Bradley adds, “She is so talented that I’ve hired her to design the Website for my novel You Believers.”

Bradley says she hopes to create a ripple effect and have more students take the project on. She has plans to enlarge her community efforts to include organizations that treat cancer patients and assisted living residences. Bradley’s energy and enthusiasm for her writing, her teaching and her reach into the community are palpable. It is easy to see why she has had such a positive impact on those whose lives she has touched.
Public history is the application of historical knowledge and methodology to the community beyond the walls of academe. Public history also deals with current issues in society. Because the emphasis is on places, events, issues and people outside the higher education community, it can be thought of as an applied discipline. This makes it distinct because most history scholars are concerned with research questions that yield scholarship that speaks to other scholars. The public historian has an expanded view of its audience, part of which involves paying attention to the expertise of people outside of academe and to people in other disciplines who have knowledge of the past. Public history is a way of connecting the past to the present.

As a professor of public history, Diane Britton considers herself an engaged historian. “I do collaborative work,” she insists. “It is team research in its ultimate form. We don’t do research for the public; we do history with the public,” she emphasizes. Public historians bring their expertise and methodology to the table, but the community members bring a sense of what is important to the community.

This concept of “shared authority” also applies to oral history, which is a large part of public history. Britton notes that interviewers can direct results of their research just by the way they ask questions. “But a well-trained interviewer allows people to determine what is important,” she says. There needs to be a relationship with the community. “It’s what it’s about: collaboration, relevance, application of knowledge and method,” Britton admonishes.

Over the past several years, Britton has been involved in numerous community-oriented projects which have had two major goals: first to help the community group or organization achieve its objectives and second to help students become both proficient and knowledgeable about public history methods and aims.

One early project was a collaboration with the director of Woodlawn Cemetery. The director at the time contacted Britton because he simply wanted to know more about the history of the cemetery and the people buried there. Britton engaged her students, who found nineteenth century ledgers in a dust and guano-coated storage barn—those old ledgers are now in the Canaday Center. A local monument maker allowed the students to examine company records. The students developed 100 short biographies of some of the Toledo notables interred in Woodlawn and published an article in the Northwest Ohio Quarterly, a well-respected public history journal that at one time was supported by The University of Toledo and is a collaborative project involving the Maumee Valley Historical Society and the Lucas County Public Library. One student wrote the successful National Register nomination. “It is rare for a cemetery to be on the National Register of Historic Places,” Britton comments, “but Woodlawn is.”

Local community histories include a history of Ottawa Hills, which incorporated oral histories from long-time residents. But this bit of local
lore also documents the suburbanization of Toledo. Students in another class created a history of Birmingham in the words of the residents. In addition, students created a photographic history of the neighborhood for the local library. Work with the Metroparks of the Toledo Area resulted in a history of the Ludwig Mill that the metropark system uses as a basis for historical presentations and re-enactments at the mill.

The Columbian House in Waterville opened as an inn and tavern in the early 1800s. It changed hands several times of the past 200 years and is now a restaurant. Visitors can walk around the second floor rooms furnished as they would have been in the 1800s. The third floor was added as a community ballroom in the mid 1830s. Some say the building is haunted by a number of ghostly presences, including the inhabitant of a former jail cell that now serves as a closet. Britton and her students created plans of the building, which today are preserved in the Historical American Building Survey records.

Yet another project came about as a result of a gift from the Ability Center to the university to include a disability studies program. Britton collaborated with Barbara Floyd and Patricia Murphy in hosting a conference that involved scholars of both history and disability history. The collaborators got the cemetery recognized and historical markers installed on the Health Science Campus and at the Arlington Avenue site, an important milestone in the history of Toledo.

The results of these projects serve as prime examples of how a historian and students can engage the community and enhance the experience for all involved. These efforts and others like them will preserve the flavor and history of these areas for future generations to enjoy and learn from.
Earth circles its sun, which is a star in the Milky Way Galaxy. Our star is now alone, but it was not always that way, says Rupali Chandar. When it was formed, it was part of a cluster, but now, it has no companions. Working with data from the Hubble Telescope, Chandar is revising the way astronomers think about stars—their birth, life and death.

Star clusters are gravitationally bound groups of thousands to millions of stars; they form in all kinds of galaxies: spiral galaxies such as the Milky Way, smaller dwarf galaxies that do not have a rotating disk and regular structure, and interacting galaxies—two galaxies in the act of merging. Chandar says that the Hubble can take pictures of galaxies at different wavelengths and, if observations are done the right way, they can yield information on the age and mass of the cluster—even information on size. Scientists can then compare the age and mass of star clusters in different galaxies. “All galaxies that are actively forming stars are forming star clusters,” Chandar says, “and the reason is because stars form in clusters.”

Chandar explains that she counts the number of clusters at different ages in the galaxies she examines. Scientists know the rate of star formation for certain galaxies. She finds that the number of clusters drops off with time. “There are far more young clusters than old ones,” she notes, with clusters younger than 10 million years being 100 times more plentiful than those 100 million to one billion years old. “And that difference doesn’t change with the mass of the clusters.”

“What?” she asks. “What is the physics that drives this finding?” Astronomers have been surprised by these results because theoretical predictions have suggested that larger and denser clusters should last billions of years and that clusters should disintegrate in old age, not during their youth. Chandar has some ideas that seem to make sense and is in the process of fully exploring them.

One idea hinges on star formation itself. Chandar says that scientists have not fully realized how important the actual formation is. “Stars form from gas and dust,” she explains. “Not all the gas and dust get incorporated into the new star.” As the combination condenses and the star turns on and begins to generate energy, some of this gas blows away. The expulsion of this extra gas is almost certainly important in the early break-up of clusters.

Another idea that might contribute to understanding the early demise of clusters is the fact that everything is moving when clusters form. “Each cluster and each star within it has its own individual motion,” Chandar says. “This independence may disrupt the gravitational bonds that hold the cluster together initially. After a few million years, each star may just go its own way.”

Chandar is also pursuing several community outreach activities closely associated with her research. One program she has just begun is a teacher-training workshop, titled “Beyond the Solar System,” that brings astronomy research to interested middle and high school
The Birth of a Star

teachers. “This program actively engages these teachers in the mathematics and physics of the science with the goal of increasing and enhancing astronomy in the secondary schools in a fun way,” Chandar comments. The program is tied to Ohio benchmarks and standards, and, although she has only had one workshop, so far the feedback has been positive.

“The teachers knew a lot coming in and are very motivated,” Chandar says. She has built on that enthusiasm and provided CDs with simulations and videos that explain astronomical and physics concepts. She has also showed her “students” how to access real data from the Hubble Telescope going back 20 years. She notes that she continues to receive e-mails from the teachers. One of the most important results of the program is that she is building ties and a foundation for collaborating with UT faculty.

Another program that is in the planning stages focuses on middle school girls. “This is the point where we start to lose girls who are interested in math and science,” Chandar remarks. She hopes that by getting them involved in different activities will provide them with a positive atmosphere and revive their interest in science. The program will introduce these girls to active research scientists and introduce them to the research being carried out at The University of Toledo.

The research being done by Chandar and her connection with local schools is a winning situation for both the university and the school system. Young scholars get introduced to the excitement of discovery; teachers get to improve their repertoire of classroom activities, and the university gets to showcase some of its research endeavors.

Rupali Chandar is currently funded under grants from the Space Telescope Science Institute and the National Science Foundation.

COURTESY OF NASA: NASEA.GOV/MULTIMEDIA/IMAGERYALLERY/IMAGE_FEATURE_1867.HTML

The Hubble Space Telescope image of the SPIRAL GALAXY NGC 2841.

A bright cusp of starlight marks the galaxy’s center. Spiraling outward are dust lanes that are silhouetted against the population of whitish middle-aged stars. Much younger blue stars trace the spiral arms. Notably missing are pinkish emission nebulae indicative of new star birth. It is likely that the radiation and supersonic winds from fiery, super-hot, young blue stars cleared out the remaining gas (which glows pink), and hence shut down further star formation in the regions in which they were born.

WHIRLPOOL GALAXY M51

The Whirlpool’s most striking feature is its two curving arms, a hallmark of so-called grand-design spiral galaxies. Many spiral galaxies possess numerous, loosely shaped arms that make their spiral structure less pronounced. These arms serve an important purpose in spiral galaxies. They are star-formation factories, compressing hydrogen gas and creating clusters of new stars.

In the Whirlpool, the assembly line begins with the dark clouds of gas on the inner edge, then moves to bright pink star-forming regions, and ends with the brilliant blue star clusters along the outer edge.

COURTESY OF NASA: NASA.GOV/MULTIMEDIA/IMAGERYALLERY/IMAGE_FEATURE_1867.HTML

ANTENNAE GALAXIES

The two spiral galaxies started to interact a few hundred million years ago, making the Antennae galaxies one of the nearest and youngest examples of a pair of colliding galaxies. Nearly half of the faint objects in the Antennae image are young clusters containing tens of thousands of stars. The orange blobs to the left and right of image center are the two cores of the original galaxies and consist mainly of old stars criss-crossed by filaments of dust, which appears brown in the image. The two galaxies are dotted with brilliant blue star-forming regions surrounded by glowing hydrogen gas, appearing in the image in pink. By age dating the clusters in the image, astronomers find that only about 10 percent of the newly formed super star clusters in the Antennae will survive beyond the first 10 million years.

COURTESY OF NASA: HUBBLESITE.ORG/NEWS/ARCHIVE/RELEASES/2006/46/IMAGE/A/

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COURTESY OF NASA: HUBBLESITE.ORG/NEWS/ARCHIVE/RELEASES/2006/46/IMAGE/A/
How do we learn to speak our mother tongue? In fact, how do we learn to speak any language? And learning a second language has its own peculiarities depending on the mother tongue and language to be learned. But regardless of a person’s language background, earlier research on second language acquisition indicates that everyone goes through a similar process in acquiring the new language’s grammatical forms.

An Chung Cheng grew up in Taiwan speaking Mandarin Chinese, picked up Taiwanese and Hakka, learned English in grade school and Spanish as a fifth language at college. When she started to learn Spanish, she began to ask how learners acquire language skills and process linguistic knowledge. Her curiosity about language acquisition grew stronger when she started to teach Spanish. Knowing how we learn a language can inform teaching approaches and be more effective in helping students learn.

When she looked at how Chinese students learn to use the Spanish ‘ser’ and ‘estar’ and then at how English students learn these two simple verbs (both verbs mean ‘to be’), Cheng found that both groups learn how to use ‘ser’ first. Initially, students tend to use either ‘ser’ or nothing, as a baby would (‘cookie good’ instead of ‘the cookie is good’). The next stage in language acquisition is learning to use ‘estar’ with location. In Spanish, Cheng explains that students need to distinguish between an inherent characteristic (such as the color of something), which would require ‘ser’, or condition (such as a physical or mental state), requiring ‘estar’. “The use of ‘estar’ with an adjective is more difficult and is a grammatical structure acquired later,” she adds, “but since we can’t look inside someone’s head, we have to look at what the student knows and produces.”

In her studies, Cheng has found that Chinese-speaking students tend to take longer than English speakers to reach a higher accuracy in learning the uses of Spanish ‘ser’ and ‘estar’. Cheng is working to uncover features that will help students make the selection between the two verbs—what are the contextual cues that determine which to use? However, before she can determine the selection factors, she says we need to consider language interference. “For example, in Chinese there is no connector between subject and adjective, so Chinese students must recognize that the connecting verb is necessary and then choose which one,” Cheng explains.

These psycholinguistic and classroom-based studies are leading to a better understanding of how students learn and also defining how a person’s native language affects the acquisition of a new language. Cheng says this understanding can help make teaching more effective.

Because of Cheng’s background and her involvement with pedagogy, and because she has a child in the Toledo Chinese heritage school, she began serving on the Board of Directors of the Chinese Center of Toledo. Chinese heritage schools have existed for more than 100 years in the United States, Cheng notes. Immigrants founded them in an effort to maintain their Chinese culture, language and heritage.
Although the original Chinese heritage school students were all Chinese children, today there is an influx of people not of Chinese descent as well as Chinese children adopted by American parents who then want their children to know and maintain their heritage. These schools, some as small as 20 students and some with hundreds, exist outside of the formal educational system; run and staffed largely by volunteers, there are more than 1,000 in the U.S. (Ohio has 18 and Toledo one). They operate on weekends and after regular school hours out of rented school sites and churches.

Toledo’s Chinese heritage school uses part-time and volunteer teachers, but they are not certified to teach in public schools in the U.S. Cheng is using her expertise to help shape the school and its curriculum. Her knowledge of language education is instrumental in training the instructors and reaching them the principles of language acquisition.

Cheng is also able to bring UT graduate students in foreign language education to volunteer at the school. “This is advantageous,” she says, “because they are trained in pedagogical methods and techniques and gain teaching experience with heritage and foreign language learners.”

However, just having good teachers is not enough, Cheng remarks. Parental involvement is essential to learners’ success. Heritage speakers have an advantage because they speak the language at home, but there is little linguistic support outside of the home for these minority students. With proper support, heritage schools can help speakers become proficient in speaking and writing.

“And,” she adds, “studies find that students who have two languages also have brains that are more active—and they tend to do better in math and science.” Cheng also comments that the earlier children start to learn a second language, the better it is for them and the more proficient they become.

In addition to training volunteer teachers and teaching a class, Cheng is helping to restructure the curriculum to meet students’ needs. Ultimately, she hopes to create a model curriculum that can be used in other Chinese heritage schools around the country.
Folklore, a first cousin of anthropology, focuses on how individuals interact to pass along the informal knowledge that undergirds our lives. Folklore is commonly defined as vernacular or “people’s knowledge”; it occurs in face-to-face communication—or informal communication such as Facebook. Its informal nature is essential: folklore is not controlled by institutional policies or roles but takes place at the margins—at the coffee pot, before the meeting, on the playground, in the church basement. The “twin laws” of folklore are tradition and innovation, meaning that any human action or creation is both an outgrowth of past experiences and a unique, one-time creation by an individual.

So what does folklore have to do with education? Schools are one arena in which performance is everything, and the ability to perform in an accomplished or expert manner determines success. Consider the best teachers: they usually tell the best stories as examples—stories that communicate both the substance (the tradition) and the reason students should care (the innovation). Students seek to become full-fledged, expert performers; yet often they are not encouraged or even allowed to perform.

As for the traditions that students and their parents practice in their everyday lives, these often go unnoticed—even by the students themselves and their parents. As a discipline, folklore considers traditional cultural expressions such as jump rope rhymes, game rules, riddles and gardening as fascinating texts that reveal clues to identity as well as to history, socioeconomics, geography and religion. Folklorists contend that what happens outside schools is as important as what happens in school.

Lynne Hamer uses the theoretical underpinnings of folklore in her research on education and its methods and looks at individuals as creators within the folkloric tradition. “Who has the right and the authority to create?” she asks. “Why are some texts exalted as canonical while others regarded as trivial?” She argues that absorbing facts and being able to spit them back creates workers, while the ability to synthesize and create something new develops leaders. And these two extremes create a dichotomy in schools. “We must let others in as authorities in a multicultural education,” she remarks. “Education requires a variety of voices and needs to move towards social reconstruction.”

Schools should be places where change and opportunity are available. If the problem is the dropout rate, or violence or truancy, how do you work from parent and community knowledge to remedy that to create better schools? One way is to bring family and friends into the school to tell their own stories in such ways that their stories become authoritative within the institution. Each individual has resources others can learn from. “If we want to make a change, we need to bring in people who historically have not had access, who have been marginalized,” she says.

Using her folklore background, Hamer has developed projects that combine research, education, engagement and service learning.

In 2007, Hamer began to work with Sister Virginia Welsh at the Padua Center, a community center in one of the economically poorest and most racially segregated neighborhoods in Toledo. “Through this
partnership, the Padua Alliance for Education and Empowerment, we discovered how to create a democratic education by holding university classes in community locations with only forays into the university,” Hamer explains. “The move made pedagogical sense; my students, mostly pre-service and in-service teachers and school administrators, had all spent between 14 and 30 years in classrooms. Because of the continuing and increasing de facto segregation in our nation’s schools, they had interacted almost exclusively with peers who had very similar backgrounds to their own. What could they learn by having another class in a university setting, interacting yet again with people very much like themselves? Focusing on folklore—particularly oral history, neighborhood architecture, yard decorations and foodways—helps the UT students and community experts find common interests. Once they have found those, they work together enthusiastically.”

Hamer has also developed an undergraduate counterpart to this graduate course. At Pickett Academy, a Toledo Public School with 98 percent free-and-reduced-lunch-rate students (the common indicator of poverty within a school), she is holding University of Toledo classes through UT’s Workplace Credit program. Through combined efforts with Martha Jude, principal of Pickett, and the Parent Partners at Pickett, 16 Pickett parents and community members have begun to work on undergraduate degrees. The program is in keeping with current educational research that points to supporting parents’ educational and employment opportunities as critical in school reform.

The Pickett pilot program has an added dividend—students see their parents in school and develop a greater appreciation for what school offers. They are less likely to become truants or to drop out. Hamer also notes that putting UT classes in the local public school helps allay the fear factor. “We transform UT and the school at the same time,” she remarks.

The ongoing Padua Alliance project thus involves creating democratic spaces for education and exchange between those who are usually in academe and the dominant culture and those who work through community “folk” institutions such as local markets, theater groups and parent groups. Combining pedagogy and research has taken UT into the community but also brought the community into UT through a forum series Hamer has organized. Guests have included teachers, principals, lawyers, community organizers, small business owners, youth theater directors, probation officers and recovering addicts—all of whom bring a similar dedication to collaborations with schools, communities and local agencies. Opening up such opportunities for community members encourages some, who in the past have felt marginalized, to enter or return to the university as students and future researchers, while encouraging UT students to see all community people as potential collaborators.
Domestic violence is the most prevalent crime that police come in contact with and is the number one source of violent crime against women and children,” says Richard Johnson, assistant professor of Criminal Justice. In one year 1.3 million women in the U.S. are physically assaulted by a spouse or intimate partner; of the 3,800 women murdered annually, 33 percent are the result of domestic violence. Further, domestic violence contributes to other crimes—the vast majority of inmates in U.S. prisons grew up in abusive environments.

In an attempt to understand what happens in domestic violence calls, Johnson has pursued three general lines of inquiry: the likelihood of assault on a police officer, analysis of firearms incidences and the possibility of predicting a physical assault on an officer.

Domestic violence is the crime that police officers encounter most often, Johnson notes. In the late 60s, the U.S. Department of Justice said that it was the most dangerous call a police officer could make. But there were no data. Studies conducted in the 80s found that statement not to be true (because the databases of the time did not separate the types of calls); academicians thus began to play down the dangers of domestic violence. The problem was, even if domestic violence was third or fourth on the list (after ambush, robberies and traffic stops), it was still dangerous and still the cause of police deaths. When he examined the data, he found that, from 1980 through 2006, 514,711 officer assaults occurred nationally. By extrapolating from other research, Johnson was able to calculate that domestic violence is the cause of 113,236 officer assaults. That statistic, if correct, means that 4,194 assaults occur each year on officers handling domestic violence cases. “Clearly,” he says, “domestic violence calls are not danger free.”

Further, Johnson notes, whereas officer murders have decreased for a number of reasons (better protective gear, better training, better weaponry), he found that officer survival statistics in domestic violence cases have remained stable. When he analyzed FBI data and searched newspaper accounts for the years 1999 through 2003, he found 143 firearm assaults on 225 officers responding to domestic violence calls. Of those, at least one officer was wounded in 67 of the incidents and one officer killed in 27.

To determine survival characteristics in domestic violence cases, Johnson analyzed the 143 firearm assaults as to the day of week, time of day, place, type of weapon, presence of witnesses, offender background, and officer behavior. He found that survival was mostly under officer control—in particular, was the officer wearing body armor? Johnson also found that officers are twice as likely to survive an attack with every yard distant from the shooter; officers are also twice as likely to survive if they are able to return fire.

Johnson subsequently wanted to determine if he could use existing data to predict officer assaults. What are the characteristics of domestic violence calls that lead to assaults on officers? When he examined assailant characteristics, he found a one-in-four chance of assault if five
distinct variables were present: (1) unemployment, (2) residence with the victim, (3) alcohol use (drugs seem not to be an issue), (4) property damage, and (5) hostile demeanor. If none of those characteristics was present, no assault occurred in any of the cases in the study.

These results led Johnson to develop a training presentation to help law enforcement officers screen calls for the level of danger. Dispatchers can be trained to collect details from the caller. The presentation has been mailed to all police departments in the Midwest that employ 500 or more officers. Several states have incorporated the presentation into in-service training on a statewide basis and several municipalities have also independently adopted the program.

“It’s important to remember,” Johnson says, “that even though domestic violence does not result in as many assaults and murders as some other police duties, it still presents dangers. We need to do anything we can to predict a dangerous situation and save lives.”
Drug Abuse on Campus

John Laux

John Laux is an associate professor in the Department of Counselor Education and School Psychology. His areas of clinical and research interest include dual-diagnosis, personality disorders, and personality assessment. He has clinical experience in a variety of treatment settings including a VA medical center, a community mental health center, a campus counseling center, and an inpatient chemical dependence treatment center.

The school systems across the country have a number of programs that help occupy students’ time after classes are done for the day. There are even some weekend programs. What these programs all have in common is structure and supervision. Those features disappear, however, once students reach college.

When he arrived at The University of Toledo, John Laux was interested in the measurement and assessment of drug and alcohol abuse among college students. He did some evaluation of the Michigan Alcoholism Screening Test (MAST), which led him to examine another survey instrument, called the SASSI-3. The MAST is a 21-question instrument that counselors and psychologists have used to determine if a client has an alcohol problem, Laux explains. The SASSI-3 is a subtle substance abuse screening inventory that has scales that may be useful in predicting illegal behaviors, including domestic violence. Laux wanted to see if it was a valid questionnaire for that purpose.

“It turns out that SASSI-3 is not very good at predicting college students’ illegal behaviors,” Laux remarks. In creating the questionnaire, the SASSI-3’s authors selected questions that statistically discriminated people who had a criminal history from those who did not. Laux says it did not perform well with college students. The SASSI-3 instrument was not originally intended to measure criminal behavior, Laux says, and it should not be used in that way. They also found that it is not a good measure of predicting if people will complete domestic violence counseling and re-offend. “But it is really good at measuring substance abuse,” notes Laux. “It can also tell if someone is faking.”

The researchers reached these conclusions by comparing answers with other “gold standard” tests such as the Michigan Alcohol Screening Test and CAGE. People can easily lie about cutting down. The SASSI is supposed to circumvent faking and defeat attempts to lie. “There is a growing body of literature that says it is successful,” Laux remarks, “but then according to some, it fails.”

In considering Laux’s expertise in evaluating the various tests for substance abuse, evaluators for the Family Drug Court in Toledo contracted with Drs. Piazza, Salyers and Laux to help with a study designed to reintegrate children with their parents. The court had designed a treatment program and received federal funding support but needed an external evaluator. They contacted UT Counseling faculty, including Laux, to fill this role. “It took three years to put the program evaluation together,” he says.

Laux and others served as evaluators on another externally funded research grant investigating the needs of incarcerated women. The cooperative venture involved faculty in Criminal Justice, Social Work and Counselor Education Departments. This research project included the development of a questionnaire that was administered to more than 1,000 mothers in the criminal justice system. The second focus of this project included a series of 12 monthly, qualitative interviews with 300 mothers.
who had a history of incarceration or were currently incarcerated.

The research produced a number of peer-reviewed journal articles, including papers that focused on the barriers for incarcerated women getting treated for mental health and substance abuse issues. “It is almost ubiquitous that women had difficulty finding childcare arrangements and had problems with transportation,” he says. “They are also largely undereducated, stuck in low-paying jobs, and have a history of physical and mental abuse and trauma. Many have been sexually abused and worked in prostitution, and many have a deep-seated distrust of authority figures, which makes it difficult for them to accept proffered help.”

Removing barriers can be accomplished in a number of ways, Laux suggests. Not all services are on, or even near, bus lines; so agencies can help by providing transportation. Some agencies are starting to offer childcare services on site. Another mechanism is to provide sex-specific treatment sessions so that women are not sitting in the same room as their abusers.

But Laux isn’t stopping there. He and a former doctoral advisee, Dr. Megan Mahon, are interested in measuring the effectiveness of the UT counseling center and improving its services. “Historically, counselors use satisfaction surveys to measure program successes. But only those who are happy with the services stick around to get the survey.” Laux and Mahon are trying a new approach: asking students to rate the change in the severity of their symptoms at the end of just three sessions, which is the average number of sessions received by students in college counseling center settings. It is Laux’s hope that this approach will help determine the center’s effectiveness.

Also at issue is a student’s resiliency to adversity and pressure. In middle school and high school, there are many programs that provide structure and help students improve their academic performance. When they get to college, that structure disappears. Laux wants to know why some students with the same kinds of backgrounds do well while some don’t. If he can tease out the characteristics that promote resiliency, then he and his colleagues will be in a better position to help all students.

Research that helps students improve their academic lives and thus their future and research that helps citizens improve their chances of having stable families and economic prosperity can only benefit the community we all live in.
Where do different commodities and freight come from, where do they end up, and how do they get there? And what difference does it make? The solution to the first question might seem like a no brainer—use a Geographical Information System (GIS), but it is definitely more complicated than appears on the surface. The answer to the second question is even more convoluted.

Peter Lindquist was initially interested in passenger transportation issues and began to investigate how GIS could help analyze and forecast mass transit issues. More recently he has moved into looking at freight and freight movement. Lindquist, working with Mark Vonderembse from UT’s College of Business and Innovation and Jiwan Gupta from Civil Engineering, was involved in the Upper Midwest Freight Corridor study that was a cooperative venture by seven Midwest state transportation offices and three universities (Wisconsin, Illinois-Chicago and Toledo).

“Coming out of that project, we found we needed to collect a lot of data on infrastructure and traffic flow,” Lindquist comments.

So Lindquist set out to do two things: first build a Web-based GIS program that could take massive amounts of data and present it in usable form; second, create an automated electronic data collection system.

The data come from many different sources, Lindquist explains. Some is from federal databases such as the U.S. Department of Transportation, the U.S. Army Corps of Engineers, and the U.S. Census Bureau, while other data come from various state databases and even private industry such as railroads. The challenge is to combine this disparate data, which can be in just about any format, into a seamless, comprehensible and manageable structure. “We need to be extremely careful,” he notes, “because we have to maintain the integrity of the data while packaging it in a way that makes sense and is useful.”

With the able assistance of graduate students, Lindquist built the first web-based GIS program to visually present data on highways, rail lines, waterways, airports, ports and intermodal terminals. To the initial data, he and his group have added commodity information, tonnage, employment, manufacturing sites, retail businesses, warehousing and other transportation-related economic details. “We want to be able to connect the dots—to be able to analyze the sources, end points and traffic patterns,” he says, “to say nothing of the economic impact of freight traffic.” Being able to identify these relationships allows researchers to forecast and plan infrastructure needs such as warehouses, highway improvements, freight handling and employment needs. The datasets currently have detailed information for ten states in the Midwest plus southwestern Pennsylvania and the upper half of New York. Additional data are managed for the remainder of North America in less detail.

The home of the Upper Midwest Freight Coalition is at the University of Wisconsin-Madison, but the home of the data and its Web presentation programs is The University of Toledo. With such a massive amount of data—several million data points—coming from so many sources, Lindquist’s...
goal now is to automate the acquisition of data and make sure it is accurate and current. The incoming data can be in just about any format, he says, so the primary challenge is to integrate it into a manageable structure from which the many collaborating research partners—universities, government and commercial firms—can extract the information they want and need. The existing online system is user-friendly and even hosts an FTP site, Lindquist says. The data, which reside on a server in the Geographic Information Sciences and Applied Geographics (GISAG) Lab, are filtered and customized for individual partners.

A recent thrust of Lindquist’s work is to streamline the data collection process for several federal agencies that have each been collecting their own data dealing with maritime transportation. The problem, Lindquist says, is that these different datasets don’t talk to each other, so there is a lot of duplication of effort and disparities in what data are collected and reported. The Coast Guard wants to know where vessels are at any given time; U.S. Customs and Border Patrol wants to know what is entering the country; the IRS wants to collect taxes, and the U.S. Army Corps of Engineers wants to know what sea lanes and ports are busiest. Lindquist has assisted in the process by developing GIS-based methods to report vessel calls to docks within ports, which is then transferred to a central repository. This system can accept all the data required by all parties. This prototype system is under development for the New York harbor. “If it can handle New York, it can handle anything,” he remarks. The real-time testing will take place in the Great Lakes.

The end result of these combined data collection and management processes will be a unified system that can be used to track commodity movements, examine traffic volume, and analyze intermodal transportation needs. “We will be able to show how much cargo is going through any port, calculate the economic impact and demonstrate how connected areas are to each other and to international trade,” Lindquist says.

The system can also be used to forecast and predict freight flows and infrastructure improvements over the entire Midwest region. “States tend to look inward, but freight goes everywhere,” Lindquist explains. “If we look at the regional picture, we can identify bottlenecks at key points and find ways to relieve congestion or divert traffic to keep it moving.”

The efforts of Lindquist, his students, colleagues and partners have a unique and positive impact on the ability to conduct research in several fields from economics to geography, engineering and business. But the benefits also reach into the local and regional economy and state and federal government needs. This is yet another example of research walking in tandem with community engagement.
More than 23 million Americans have Type 2, adult-onset diabetes, largely because of dietary factors and a sedentary lifestyle. The incidence of diabetes is increasing. In Type 2 diabetes, the body develops insulin resistance, i.e., it does not respond properly to insulin, the hormone responsible for controlling glucose (sugar) transport from the bloodstream into the cells for storage. Also in Type 2 diabetes, fat deposition in tissues increases, leading to a host of problems created by inflammatory reactions—from fatty liver disease, to muscle and nerve damage, to loss of eyesight, to vascular abnormalities.

Sonia M. Najjar has investigated the role of insulin clearance in liver in the pathogenesis of insulin resistance. She has found that if insulin clearance is impaired, fat develops in the liver and undergoes redistribution to adipose tissue to be stored. Hence, visceral obesity develops. Marcia McInerney is interested in delineating the cellular events involved in the inflammatory complication of visceral obesity. As the collaborators dug deeper into the behavior of cells, they initiated a partnership with Sharrel Pinto to develop, implement, and evaluate a medication therapy management program (MTMP). The purpose of this partnership was to extend bench research to practice with the primary goal of evaluating the impact of a pharmacist-provided MTMP on the outcomes of patients with metabolic syndrome, a condition that includes diabetes, high cholesterol, high blood pressure, obesity or a combination of these. And, what began as an outreach program has now turned the corner to become another research program.

The researchers have found that diet is a major culprit in the progression of obesity, inflammation and ultimately insulin resistance. Americans eat a high fat, high carbohydrate diet, McInerney explains. On top of that, the average American has an essentially sedentary lifestyle and gets far too little exercise. As caloric intake continues to exceed caloric expenditure, fat deposition in the liver and adipose tissue increases. Clinically, this becomes evident as fat around the waistline.

As the fat cell’s metabolism starts to malfunction, it releases chemical signals that call in macrophages, cells that are important in protecting the body against bacterial invaders.
However, these macrophages can also become aggressive and start consuming body cells. McInerney is examining the physical appearance of tissue as it becomes filled with fatty cells and finds that macrophages are attacking the fatty cells, thus increasing inflammation.

Najjar has identified a protein—CEACAM1—that promotes insulin clearance in the liver. Through mice “engineered” to have inactive CEACAM1 in liver, she has demonstrated that altered function of this protein causes fatty liver disease, visceral obesity and insulin resistance. Moreover, consuming a high-fat diet decreases CEACAM1 in the liver of normal mice, which results in obesity.

“Obesity starts in the liver,” Najjar states confidently. She believes that individuals with lower levels of CEACAM1 in the liver are at higher risk for developing insulin resistance and obesity than those with normal levels of this protein in liver. Thus, inducing this protein in the liver could possibly be the basis of a preventive measure for the full-blown illness.

In addition to their basic research on the origins, mechanisms, and effects of diabetes, Najjar and McInerney are collaborating with Sharrel Pinto to develop and evaluate a medication therapy management program. They are working with local pharmacists in independent pharmacies to look at medications customers are receiving. The pharmacists offer counseling sessions on lifestyle choices and managing their disease. Pinto says that it started as an outreach program but has now become a funded research project. Patients with metabolic syndrome are being seen by local pharmacists on a biannual basis. Pharmacists counsel them on their disease, make recommendations to physicians on the most appropriate medications to get patients to their clinical goals, and discuss appropriate lifestyle changes with patients. Pinto’s results indicate that patients who receive counseling from their pharmacists through this program are reaching their clinical goals within the first couple of visits and are able to maintain it for the duration of the program. Patients are making appropriate lifestyle choices, which include reducing caffeine and alcohol intake and seeing specialty physicians such as a podiatrist, ophthalmologist and dentist. These steps help patients improve their quality of life and be more productive at work, which ultimately results in improved health, fewer sick days and cost savings for individuals and the system as a whole.

Such collaboration between basic science researchers and practice-oriented researchers is one example of translational research that ultimately results in improved quality of care and reduced costs.
What do a producer, director, dramaturg, costume designer and scene designer have in common? They are all involved in the production of a stage play; they are the force behind the sets, voices and action that you see when you watch a play, whether on stage or film. Without these individuals, there is no play, no movie, no film.

The process typically begins with the director who, in consultation with the producer, decides on a play. For Cornel Gabara, the selection of a play is triggered by some current event—the war in Iraq for Macbeth or the absurdity of the current political situation for Ionesco’s The Bald Soprano and The Lesson. “Art is a personal interpretation and response to social and political events in the artist’s immediate community as well as the global one,” he says.

Gabara is also interested in plays that deal with human nature rather than specific events or cultural references. Character is more important than context, he explains. “If a play is about a fact, it is closer to journalism; if it is about character, it is an art. I like to think of myself more as an artist than a journalist.” Gabara thus uses his art to explore the matter of personal responsibility. “I think this is what the great literature of the past did—Oedipus, Richard III, King Lear, in which the characters answer the consequences of their own actions.”

Holly Monsos

Holly Diane Monsos, chair of the Department of Theatre and Film, is primarily a costume designer with area and regional theatre credits. She also serves as a theatre producer for both UT and the Glacity Theatre Collective.

James Hill

James Hill, professor of Theatre and Film, is a scenic designer who also is a painter and maker of elegant, detailed models. Besides designing for UT, Professor Hill works as a technical director and designer with the Glacity Theatre Collective and other producing companies in the region.

Edmund Lingan

Edmund Lingan, assistant professor of Theatre and Film, is a theater historian with special interests in Medieval theater and the intersections between religion and theater. He is also a faculty director of main stage productions for the department and serves as dramaturg for the GlacityTheatre Collective.

Cornel Gabara

Cornel Gabara, assistant professor of Theatre and Film, has a degree in engineering from Rumania as well as a MFA in Acting. He has performed on international stages and serves as director and artistic director for UT and the Glacity Theatre Collective.
Working with classical text requires starting from the point when those plays were written, Gabara notes. He explains that those plays were very contemporary in spirit. Shakespeare wrote for his time, even if the subject was historical or mythical. So the challenge for Gabara is how to make the text accessible and meaningful for a modern audience. There is an art to directing, he says, to knowing how to analyze text and to interpret action and relationships. He wants his students, and by extension the public, to know how beautiful it is to be an artist.

The dramaturg is often the first one after the director to start working on a play. In his academic persona, Edmund Lingan, dramaturg for the Glacity Theatre, is a theater historian. He is particularly interested in the intersection between religion and theater, lately taking a closer look at avant garde theater and alternative religions that have arisen in the United States and Europe in the past 50 years. “What’s especially interesting is that leaders of many new religions of the late 19th and early 20th centuries drew on theater to construct their cosmologies,” he comments.

But what is a dramaturg and what does he do? The dramaturg focuses on three primary tasks: Research leads to deeper understanding of the history of the play itself as well as the time and social milieu of the play and the playwright. The dramaturg writes notes for the program and arranges for talks and discussions that help the audience understand and better appreciate the performance. Finally, the dramaturg is a critic before the show opens—in a sense is a “theatrical editor” who comments if some action or inflection does not ring true or integrate with and support the story. The dramaturg examines and deepens understanding of the play for actors, designers, costumers, directors. “Theater itself is a metaphor as it represents something that in fact it is not,” adds Lingan. And interestingly enough, not all companies use the services of a dramaturg, and not all productions require the dramaturg’s special knowledge and talents.

Lingan says his favorite Glacity production from the perspective of the dramaturg was Sarah Ruhl’s *Eurydice*, an adaptation of the Greek myth of Orpheus and Eurydice from Eurydice’s point of view. “It involved understanding different versions of the myth,” he explains, “and immersing myself in water as a symbol and how it is used in the play.” He says that he even went through the play word by word to find every instance of water or images of water. “The result was that water became a physical presence on stage in the form of an actual waterfall, creating a striking image that intersected with the text.” Lingan says he has the best of all possible worlds because he can take his research and publish it in professional journals or turn it into a production for public enjoyment.

Once the director and dramaturg have gone through the play, the director will call in designers to discuss concepts. The director has by now determined the general approach to take—traditional, avant garde, realistic, surrealistic? Each member of the production team has a vision of the play that he or she wants to translate into reality on stage. But the process of doing so is very much a collaborative project that requires the director to know how to deal with different people, different personalities, different ideas and artistic sensibilities.

Both Holly Monsos, costume designer and producer, and James Hill, scene designer, described their participation in the UT Theatre and Film production of *12 Angry Jurors* to demonstrate how the group works as both creative individual artists and as a creative collaborative. Monsos notes that Gabara conceived of the play in a very surrealistic way, seeing the jurors as isolated and trapped in a desert until they could get out but also as reflective of the melting pot that the U.S. has become.
Hill is a member of the prestigious United Scenic Artists guild and has designed numerous sets for regional theaters, including four operas. He asked himself, “What is in this play and how can I interpret the script in a new way that gives it meaning?” The major concern is that the scenery must serve the action of the play, even suggesting mood in a believable style. He saw the play as a commentary about the legal system and the nation, how mistakes can be made. Hill notes that once a design concept is created and accepted by the rest of the team, the scenic designer becomes an architect who must communicate the design to the technical director and the rest of the shop staff, all while keeping an eagle eye on budget. “Sets can be very expensive. It is not unusual for a single set for a regional production to cost $35,000,” he remarks, “while Broadway plays can run to the millions.”

Monsos says what struck her was the absence of any character names—they are identified only by number. And when they speak to each other, they say, “That guy,” or some similar, featureless phrase. The combined visions resulted in setting the jurors in a prison exercise yard surrounded by coils of barbed wire and bleak walls. Each juror wore a costume that in some way hinted at his or her character. She notes that, whereas the original jurors were all men, the UT production used six men and six women.

“Numbers have certain symbolic meaning, and I wondered if the writer had chosen a specific number to correspond with the personality of the juror,” Monsos says. She decided to play that idea up and suggested to Gabara that each juror’s number be used on the costume in a way that might suggest the character’s personality. So Juror #5, who keeps changing his mind, had 5s all over his shirt in different sizes, fonts and directions; Juror #1, the foreman, had 1s marching around the hem, pocket flaps and collar of her outfit, all the same size and spacing; Juror #12 had a large, shiny 12 on the back of his jacket as befit his job in advertising; and flighty Juror #2 had 2s in different sizes and fonts in a winding trail on the bottom of her skirt. “It became a game for the audience to try to figure out why the numbers were done in a particular way,” she says, adding that she likes to think it helped with understanding the distinct personality of each juror.

Monsos, Gabara, Lingan and Hill provide their special functions and expertise for the Glacity Theatre Collective, which began as the brainchild of seven professionals, five of whom were members of UT’s Theatre Department. “We began the company because of frustration with the lack of professional opportunities in the area coupled with the difficulty of getting away to do any other work. Our vision is a high-quality theater right here, at home, that can do strong, unusual work and with productions that can be scheduled to avoid conflict with the department’s production season,” says
The community reaction to Glacity has been small but passionate, Monsos says. One attendee wrote of *Waiting for Godot* that it was the best performance of *Godot* that he had ever seen and perhaps the best theater production he had ever seen. But the second performance of *The Santaland Diaries* had two people in the audience. With little or no advertising budget, the greatest challenge is simply getting the word out. So, everyone, come see what a gem you have in your own backyard here in northwest Ohio.

The collective performs in Studio A of the Valentine Theater, which was recently awarded funds from the Toledo Foundation to convert the studio into more useful space and to upgrade the lighting system.

Glacity Theater does its own productions and occasionally brings in artists from outside. The faculty make every effort to have visiting artists give workshops and talks to UT students. Some shows go on the road—the group has performed in Europe and Canada and recently made their Carnegie Hall debut with the Toledo Symphony. Glacity operates under the Special Appearances level, at the bottom rung of professional theater categories, Monsos explains. It can—and does—use Actors Equity Association (the actor’s union) professionals whom it pays at union rates, but it also employs non-Equity actors. The production staff all receive a fee, even if not at Equity rates. UT faculty who form most of the production staff return their fees back to the company. Additionally, Monsos remarks that the selection of plays takes into account the small budgets as well as the nontraditional space the group prefers.

The complete jury:

- JoEllen Jacob (Juror 8)
- Lynnette Bates (Juror 1—The Foreman)
- Andrea Harris (Juror 2)
- Jason Santel (Juror 4)
- Marlie Billops (Juror 6)
- Starr Chelsea Cutino (Juror 10)
- D.J. “Z” Adams (Juror 12)
- Ahmad Atallah (Juror 11)
- William Toth (Juror 9)
- Brian Purdue (Juror 7)
- D.J. Helmkamp (Juror 5)
- Tyria Allen (Juror 3)

(not pictured in this scene is Nicholas Torrance (The Guard))
According to Congressional reports, there are 603,245 bridges in the National Bridge Inventory, 149,647 of which are in need of repair or replacement. The interstate highway system, with its many bridges, was built 50 years ago with a projected design life of 50 years. Moreover, truck traffic has increased, and trucks are getting heavier, adding to the problem.

Douglas Nims has been working to understand what happens and why as bridges age. He is working on various aspects of monitoring the health of these structures and is involved in a variety of studies: the Maumee River Crossing Veterans’ Glass City Skyway Bridge (VGCS), using magnetic sensors to “look” though concrete to see the hidden corrosion in reinforcing steel, evaluating a plastic bridge that resists corrosion, studying premature cracking in a new concrete bridge, and “listening” for indications of corrosion in the main cables of a suspension bridge.

The VGCS is a new cable-stayed bridge in Toledo. Because understanding how a bridge ages and deforms over time can improve maintenance and reduce costs, Nims is part of a research team that collaborated with the Ohio Department of Transportation (ODOT) to install sensors to measure deformation in concrete. The sensors were installed in the segments of the bridge as they were cast. Thus, the research team has been able to collect data on the deformation of the concrete under heavy loads and over time. “Mathematical models used for design and construction predict how the bridge will behave,” Nims comments. “The sensor data have allowed us to make a more detailed model that is consistent with the earlier models, is verified by the sensor data and confirms the bridge is deforming as expected.”

Ohio has a significant number of prestressed box girder bridges, Nims says. The steel tendons that reinforce these bridges can corrode with little visual indication of the corrosion occurring inside the concrete. Nims and Vijay Devabhaktuni, of the Department of Electrical Engineering and Computer Science, are developing a magnetic sensor to detect this hidden corrosion. The researchers conducted field trials on a condemned bridge last summer. Two magnetic systems were used to inspect the strand and, when the bridge was demolished, the actual condition of the tendons was found to correspond well with the results of the magnetic inspection.

A potential long-term solution to corrosion may be to use a material that ages differently than steel and concrete. In Huron County, Ohio, Nims and his students are monitoring the performance of a small bridge entirely made of plastic. The first test they conducted was a destructive test on a full-scale prototype of the bridge section to confirm the structural properties of the plastic section. Since the bridge went into service, they have conducted two truckload tests—the first to establish how the bridge performed immediately after construction and the second to determine if there were any changes in behavior after a year in service. The plastic bridge is performing well, Nims notes.
The Anthony Wayne suspension bridge in Toledo is over 90 years old and scheduled for a major rehabilitation. As the main cables change over time, they generate an acoustic signature, explains Nims. He will be part of the team that assists ODOT in evaluating the bridge by conducting acoustic monitoring.

The Veterans' Bridge has a problem, however—namely ice formation on the stay cables. Although the problem had been anticipated during the design phase, it was considered unlikely to be important. Despite those predictions, lane closings have occurred four times since the bridge opened to avoid hazards from falling ice. Nims notes that curved ice sheets falling from the cylindrical stays are like a large airfoil and could pose a significant hazard to motorists. Under the aegis of Richard Martinko of the University Transportation Center, he is leader of a team that includes researchers from the University of Cincinnati, the U.S. Army Cold Regions Research and Engineering Laboratory, and other University of Toledo faculty who are addressing the problem of falling ice. This problem has two significant aspects: for the short term, the researchers are helping ODOT operations respond to potential icing incidents; for the long term, they are collecting information to recommend options for a permanent solution.

Toledo is a natural transportation center whose economic vitality depends on its aging transportation infrastructure network. Bridges are an expensive and vulnerable link in that network. With the support of the Ohio Department of Transportation and The University of Toledo’s University Transportation Center, Nims and his colleagues are striving to develop smart bridges and inspection techniques that will both reduce the life cycle cost of bridges and keep them safe.

Douglas Nims is currently funded under grants from the Ohio Department of Transportation and the U.S. Department of Transportation.
Children acquire language skills by first hearing and then by learning to speak. They need to hear words pronounced to build a language. But if they have a hearing impairment, they don’t hear well, don’t speak well and eventually don’t learn to read well. Research has shown that children learn to read up to about grade four, after which time they read to learn. Some children with hearing loss achieve high academic standing, but in general they do not read past the fourth-grade level.

Lori Pakulski wanted to know what the differences were among children with and without hearing loss. In collaboration with colleague Joan Kaderavek, the researchers explored early language and literacy skills of hearing-impaired children immersed in either sign language or spoken language at home. They concluded that children who had intensive immersion in either signing or verbal skills from infancy developed literacy skills and did better academically than those who did not have that experience. In fact, many of the children performed at a higher level than even their hearing peers. Additionally, Pakulski and Kaderavek found that children who use some sign language and some verbal communication do not do as well.

This early research also examined the factors involved in developing reading skills. Kaderavek and Pakulski found that children who were engaged and enjoyed reading would improve. Pakulski says that even among hearing pre-schoolers, a small percentage do not enjoy being read to. This number is higher among children with hearing loss, with the result that they do not develop efficient literacy skills. Their research studies have shown that children with hearing loss are interested and engaged when playing with toys. Their engagement lags when simply read to. But if the book the parent is reading is manipulative (e.g., has dials, moving figures, buttons, knobs—something to touch and move), the child remains attentive. “This may be an important means of increasing literacy engagement for children who are at risk for language or literacy difficulties,” Pakulski and Kaderavek have indicated. The researchers note that it is particularly important to focus on the “fun” aspect of reading stories to very young children with hearing loss. Pakulski says research also indicates the importance of parent language training.

In the meantime, a friend who was working with parents of hearing-impaired children had discovered that some of Pakulski’s research was bearing positive results. She approached Pakulski, who suggested organizing a playgroup so that the children and parents could learn from each other. What she wanted to do was translate her research into a natural, child-oriented environment. The families would also learn how to engage the children in literacy experiences at home.

“Hearing impairment is a low-incidence handicap,” Pakulski remarks. Prior to the inception of the playgroup, people had to drive to Ann Arbor or Akron to find support and help when they desired spoken language outcomes for their children. But the playgroup, which is specifically for children whose parents want them to learn to speak,
is controversial. “Signing parents may have their own culture,” she says. “These parents don’t always want their children to have implants or hearing aids and may not want them to marry and start a family outside of the deaf community.”

The playgroup, begun on an intermittent basis, was originally just play. Pakulski has since developed a more formal curriculum and format: reading activities relate the story to some activity or craft; songs are paired with rhythm. Parents receive a pre-teaching note about the objectives and rationale of the session. Pakulski and her students take pictures of the children and then help them write about what they did, compiling photos and description into an “experience book.” There are also take-home activities and thematic material and activities for before, during and after the sessions.

Most children in the playgroup are 3 to 4 years old, but some are as young as 1. Pakulski says that some children wanted to remain in the group and have stayed until they were 7 or 8. This gave her the idea of a “book buddy” program in which the older children read to the younger ones. “This gives them a sense of pride and accomplishment,” she comments, “and greater self assurance as readers.”

Not only has Pakulski’s research informed her work with playgroups for the hearing impaired, but also the playgroups have provided a research environment and allowed her to ask additional questions. The next step? With the help of Jenn Glassman, a speech-language pathologist who serves as the coordinator of the UT Speech-Language-Hearing Clinic, the playgroup will begin meeting weekly in 2011. Pakulski is also looking forward to incorporating animal assisted therapy.
When people have a stroke or heart attack, or when they have brain or spinal injuries, they require a great deal of care during the rehabilitation period. Linda Pierce had worked as a rehabilitation nurse for spinal and brain injury patients and persons with stroke and their caregivers. But when her mother had a stroke, she became personally involved. She found that caregivers need education and support. That realization spurred her to see what light research could shed on the topic of caregiving.

The literature is full of studies showing that caregivers undergo strain, stress, anxiety, depression, and feelings of being overwhelmed. “However,” Pierce notes, “the picture is not all that bleak. One of my early research studies pointed to the need for understanding the meaning of caring for another and the potentially positive outcomes for these carers,” she says. Pierce thus set about determining caregivers’ perceptions and needs over time.

Because her research indicated that many caregivers were new to the caring role and lacked knowledge and support, Pierce looked into ways to provide those services. She and Victoria Steiner of the College of Medicine, plus university-based software engineers, developed a Web-based service called Caring–Web©. “Sometimes medical professionals tell caregivers too much too soon and they become overwhelmed; and sometimes the caregivers need more information early in the course of treatment,” Pierce says. This Website includes a discussion group that connects caregivers with nurses, gives tips on basic caring issues, links to national associations and educational sites, and also incorporates an “ask the nurse” section where caregivers can get information on more personal problems that they might not want to air publicly—such as spirituality and sexuality. The site even includes news, weather, sports and games. Jokes got on the site when one carer said she occasionally needed a good laugh. Music from the 50s was added when another caregiver said her spouse had trouble speaking but could sing—and liked to do so when she was bathing him (in a tub set in the middle of the kitchen).

Pierce and her colleagues didn’t just establish the Caring–Web© as a service to caregivers, however. The site was used in a research project to determine its usefulness and efficacy. In an initial small study, users of the site reported it was helpful. More recently, the research team reported statistical results from a federally funded study that used Caring–Web© and followed Web and non-Web users for a year. There were no significant differences in gender, age, ethnicity, measures of depression and life satisfaction for the caregivers or visits to healthcare providers for the persons with stroke. However, there were significant differences in hospital re-admissions and emergency department visits for the stroke survivor. Additionally, Pierce notes that an interesting trend, even though not significant, was that more caregivers in the non-Web user group placed persons with stroke in nursing homes—and sooner in the study than the Web users. The differences in healthcare service use
between these two groups resulted in higher care costs for caregivers who were non-Web users.

As part of that study, when Pierce and her colleagues tracked caregivers of stroke patients for a year, they found that caregivers’ problems sorted themselves into three major themes; successes in caring also fell into three similar main themes. Initially, caregivers’ successes revolved around the ones being cared for, in trying to get them to become more independent. Problems in the initial stages also centered on physical tasks and developing a daily routine with new living arrangements. Doing things together and seeing accomplishments was a second measure of success whose problem counterpart was feeling inadequate and turning to others for help. The “looking for normal”—wanting life to be the way it was—problem becomes the success of “finding a new normal.” Interestingly, Pierce says the caregivers who were able to develop a new sense of normal and find balance in their lives also reported more successes than problems during the year of that study.

The Caring-Web© site is now a continuing program of The University of Toledo and maintained by the rehabilitation staff. The site is open 24 hours a day every day of the week to anyone who wants to use it. Recent modifications were made to the site but educational links and tips for caregivers as well as support through “ask the nurse” were maintained. It continues to provide timely and accurate news and educational material for research and treatment information on stroke, as well as support for caregivers. Pierce’s work is a vivid example of how one person has turned her professional passion into a research project that morphed into a community service that then became another research project.

That service—Caring-Web© at caringweb.utoledo.edu—continues to change and develop in response to Pierce’s research and users’ comments and suggestions.
A few years ago, the Regional Growth Partnership and the Toledo-Lucas County Port Authority wanted to analyze the industrial drivers of the local economy. Neil Reid, Director of the Urban Affairs Center, and Mike Carroll, Director of the Center for Regional Development at Bowling Green State University, conducted a study that identified eight industries that either were or had the potential to be future economic drivers. The question then became how to strategically develop them.

This was the beginning of a dual research-economic development adventure that has both helped the floriculture industry in northwest Ohio and produced research insights into cluster-based economic development. After a lot of reading and a four-day visit to the University of Wolverhampton in the West Midlands of England, they determined that a cluster-based effort could work in northwest Ohio. “But such an effort takes money,” Reid says. Fortunately they obtained some funding to help the floriculture industry, under pressure from international competition and rising costs, become more competitive.

The first need was to get buy-in from the growers, who are mostly independent family farmers. Reid and Carroll surveyed the growers about what they thought their major challenges were and then used that information to convince a few of the more open growers to come together to address these challenges. “Major challenges are too big and too complicated for individual businesses to address alone,” Reid comments. “They require concerted action and agreement along with cooperation from academe and from industry leaders.”

An earlier survey had found that 15 percent of the growers planned to either close or downsize over the next five years. Reid and Carroll presented the cluster idea as a strategy that would save their businesses if they could agree to work together to identify and address challenges. “The first project had to have several key characteristics,” Reid says, “one that would have a high chance of success, that would engage as many growers as possible, that would show real benefits of working together and be nonthreatening to individual growers.”

Survey results showed that the growers felt the market was stagnant; but they were not good at marketing. They needed to raise awareness. The answer was to create a brand identity—enter the Maumee Valley Growers. Now individual growers could do cooperative advertising. The brand was recognized and growers reported more people going through their doors, but was it successful? A residential survey indicated that 41 percent of households recognize the name, and growers say it helped. “But it’s difficult to measure success because we can’t get sales information,” says Reid. “It is also difficult to tie success directly to branding.”

So the next project was one that Reid hoped could be directly measured. Energy is the industry’s largest expense after labor, and natural gas is the major energy source. Rather than purchasing gas as individuals, the growers would pool purchases. “When you buy in quantity,” Reid notes, “the unit cost does down.” It took Joe Perlaky,
the cluster manager, an entire year to convince enough growers to agree to participate and make the effort worthwhile. Reid explains, “This kind of group purchase means the growers are giving up independent decision making on timing, price and quantity. It’s difficult to get to that point, even if they knew they would save money.”

The cluster engaged an energy consultant, Palmer Energy, who would meet periodically with growers and agree with them on the timeframe, price and quantity of gas to purchase. Initially about 24 growers participated, saving between 8 and 15 percent on natural gas purchases. “Then something interesting happened,” Reid says. “Growers in other parts of the state heard about the program and asked to participate. We had never expected this.” The program has now expanded statewide and even expanded into southeast Michigan with almost 100 growers participating. The cluster purchasing has freed growers from agonizing over gas purchases. Palmer has brought expert knowledge to the process so that decisions are more strategic and more likely to have the desired effect. “This never would have happened without the university,” says Reid. “The growers would never have done this on their own.”

What’s in the future! Reid says they are coming back to markets, directing attention to local food systems and increasing the amount of food production taking place in greenhouses. Northwest Ohio greenhouses are 90 percent floriculture, he comments. Greenhouse vegetables are grown in Mexico and Canada. Can we capture that market to benefit the local food system and the industry?

Reid’s work with the greenhouse industry has led to greater understanding of what the key barriers to cluster formation are and how clusters can be defined and delineated. These research findings and insights benefit ongoing work with clusters in northwest Ohio as well as around the globe.
Grass, trees, corn and cornstalks. They are all biomass and are all made up of lignin, cellulose, and hemicellulose, commonly called lignocellulose, of which the major components are sugars. Many algae also are high in sugar and can be used as a biomass source. If those sugars can be released, they can be converted into various other components, including fuel and chemicals. But those sugars are locked up tight, say Connie Schall, Sasidhar Varanasi and Sridhar Viamajala. “The cellulose is actually crystalline,” Schall explains, “and acts like reinforcing rods in concrete. The hemicellulose is amorphous, like concrete itself; lignin wraps itself around the other two components. It’s like breaking down reinforced concrete wrapped in tar.”

The goal for the researchers is to break down this solid structure to make a product, or at least platform chemicals that can be further processed into products or fuels. The starting material, be it grass, wood or algae, is extremely complex, so part of the problem is to determine cost-effective ways of pretreating the material—breaking it into its components for further processing.

Because of the complexity of the starting material, the researchers have turned to a pretreatment process using specialized ionic liquids (IL). Pretreatment breaks the structure apart by dissolving the cellulose, effectively turning steel rods into what Schall describes as a bowl of spaghetti. The advantage of using IL, she notes, is that it is functional at low temperatures, which is important since high temperatures can convert the feedstocks into undesirable by-products. But for this process to be economical, there must be a mechanism to recover the IL from the resulting mash so that it can be recycled and reused. Varanasi notes that UT has developed methods both for cost-effective pretreatment of biomass using ILs and for the recovery of ILs.

Once the biomass structure is broken apart, the next step is to extract the sugars. “The structure is so complex, varying from feedstock to feedstock, and so little is known about it, Schall comments. She
is particularly interested in separations and proteins, crystallization and enzymes, and thus has gravitated to investigating the structure of various starter materials or feedstocks. Working with crystallographers, she is looking at x-ray data and both the chemical and physical structure of lignocellulosic material in grass, wood and algae as it undergoes pretreatment. Because enzymes are so specific, breaking the lignocellulose down in stages and analyzing the products at each step can help determine which enzymes in which combinations would be most efficient in breaking the material down into its component sugars.

But extracting the sugars is one thing; converting them to fuel or products is another challenge, says Viamajala. All sugars are not the same—the common glucose is a 6-carbon sugar whereas much of the biomass feedstock breaks down into xylose, a 5-carbon sugar (C-5). Varanasi explains that the yeasts that convert sugar do not like xylose. “However, for the process to be commercially viable, we have to use all the sugars,” adds Viamajala. A coordinated effort with Patry Relue led them to devise a way of tricking the yeast into accepting C-5 sugars and convert both sugars into ethanol. “We don’t alter the yeast,” he says. “We alter the conditions to accommodate the needs of the yeast.” The advantage is that there is now no need for a genetically modified organism.

Because it is not possible to use neat ethanol by itself in a standard engine, the researchers are also looking at ways to convert lignin into bio-oil, a precursor of transportation fuel, that can become a gasoline-like product. Additionally, they are working on converting nuisance algae from Lake Erie into a useful product, primarily using pyrolysis (a high-temperature combustion process in the absence of oxygen).

Viamajala notes that other kinds of algae are high in oil and can become essential products such as tires and lubricants as well as platform chemicals to produce bio-derived plastics that would replace those derived from petroleum. Refineries can accept bio-oils now, he notes. Certain kinds of algae are also capable of grabbing nutrients from municipal or animal waste, Viamajala remarks. “Nutrients are nonrenewable,” he says, adding that the world supply of phosphorus, which is mined, will be depleted in 100-150 years. “Algae is good at picking up phosphorus and can be a mechanism for treating wastewater and then, after drying, serve as a natural, slow-release mulch and fertilizer for crops. This is an alternative to chemical treatments and is a sustainable way of handling wastewater.

Although much of the research is still at the bench stage, some demonstration projects are underway. “Ultimately, industry and academe must complement each other,” says Schall. These efforts can lead to a greener, more efficient, and more robust and vibrant Toledo. But intellectual curiosity and the excitement of discovery is the heart of the enterprise. “The beauty of basic science--the interrelationships among biology, chemistry, and engineering--are so cool!” Schall exclaims. “It’s just a lot of fun.”
Lung cancer causes 165,000 deaths a year and costs $20 billion a year in medical management. The National Institutes of Health recently completed a study that showed that CT scans of the chest would reduce mortality from this disease by at least 20 percent—but it could cost as much $40 billion a year. On the other hand, an accurate screening test capable of identifying the approximately 10 percent of heavy smokers who develop lung cancer could reduce to about $4 billion the cost of managing lung cancer when it is early and surgically curable. Thus, if the cost of screening to ensure early diagnosis could be reduced substantially, it would save lives as well as money.

Since lung cancer results from DNA damage to the (epithelial) cells lining airway passages, Jim Willey thought that measurement of gene activity in these cells might serve as an accurate test for lung cancer risk. “Inhaled oxidants are a major source of damage to epithelial cell DNA,” Willey explains, “and we know that certain genes, including antioxidant and DNA repair genes, act in the airways to prevent this damage.” Moreover, it is known that people are born with different levels of protection conferred by antioxidant and DNA repair genes. He hypothesizes that those born with low levels of protection from these genes are at higher risk for lung cancer.

Only very small samples of airway epithelial cells can be safely removed from individuals. Thus, in order to measure gene activity, Willey says, the technology must be able to take a very small tissue sample and amplify the signal related to gene activity. The technology used for this is called polymerase chain reaction (PCR) and was discovered in the 1980s. The key thing to measure is the level of messenger RNA (mRNA), which is the molecule that a gene synthesizes when it is activated. However, PCR only works with DNA, so the first step is to convert the RNA to DNA. After this, the DNA is amplified with PCR. A problem arises with PCR, however: during amplification there is a chance that the relative proportion of one gene to another will change. “What we are really interested in is the original proportion or pattern,” Willey notes.

But to understand the original pattern, Willey says they needed to include some controls, called internal standards. “The idea is that the internal standards behave like the DNA we are trying to measure via the PCR technique,” he explains. “We know how many copies of internal standard we put in at the beginning, then at the end we measure the proportion of signal from DNA compared to the signal from its respective internal standard. We calculate the ratio at the end of the process, which allows us to determine how active the gene is.”

Willey and his students and colleagues have ramped up the PCR process to measure multiple genes simultaneously. “To do this reliably,” he says, “we need to have an internal standard for each gene in the PCR process.” These internal standards are synthesized bits of DNA that are at least a little bit different from the naturally occurring DNA. A known quantity of the internal standard for each gene is combined
gene activity for the suite of protective antioxidant and DNA repair genes. In previous case control studies, the PCR process yielded about 85 percent accuracy, Willey comments. He notes that not all false positives were necessarily false—some people may have been correctly measured as being at risk and have simply not yet developed lung cancer. Based on the encouraging results so far, Willey and his colleagues applied for and have received FDA approval to conduct prospective studies on subjects who are at risk for lung cancer based on age and history of cigarette smoking but are thus far healthy. This kind of study involves a very large number of people, he explains, and takes a long time because everyone in the study must be followed for several years to determine who develops lung cancer. Then, when a person develops lung cancer and becomes a “case,” the researchers select eight individuals from the cohort who are physically and demographically matched to that case so that gene activity in people with and without the cancer can be analyzed.

Willey notes that nine hospitals in the Midwest are participating in this prospective study including the University of Michigan, Ohio State University, Henry Ford Hospital System, Vanderbilt University, Tennessee Veterans Administration Hospital, the Mayo Clinic, Cleveland Clinic and the University of Toledo Medical Center. Investigators at Toledo Hospital (ProMedica) now are collaborating on this study with another seven hospitals expected to join this year.

If the test is validated, the goal is to use it to identify the 10-20 percent of individuals at greatest genetic risk so that they can be selected for CT screening programs. This will reduce the cost and increase the effectiveness of those programs in reducing mortality from lung cancer.
How does a nice, young woman get interested in research on sex trafficking? For Celia Williamson, it was her social work roots. She says she was working with children and families when she noticed women standing around the street near the building. “I didn’t much like them,” she says, “but I began to focus on the intent of my profession, which has a primary mission to work with the vulnerable, poor and oppressed. So I set aside my daily routine and started interviewing them.”

It was an eye-opening experience. She learned about drug use, drug houses and the sex trade. She realized she wanted to do research on girls and women who get trafficked into the sex trade; she ended up doing a dissertation on street prostitution. She had a career trajectory mapped out, but came to The University of Toledo because she knew she could do the research she wanted to in Toledo. She had grown up in the part of the city she is now studying and had doors open to her that would not be for others.

“All my research has to have some direct relevance to the community,” Williamson says. Her initial research looked at identifying the types of women involved in street prostitution—the renegade, the pimp-controlled and the outlaw (an independent loner). Her goal was an effort to help social workers engage in better assessments, leading to more productive interventions. She used this information to assist staff at a local community-based program that she developed to work with those victimized through the sex trade. “Knowing who we are dealing with helps understand how to help them. Street prostitution is not one size fits all,” she says. Her research has followed a logical progression since those first studies.

The Trafficking Victims Protection Act acknowledged the existence of human trafficking victims within the borders of the U.S., a tragedy identified as “modern day slavery.” Because many of her subjects had been forced or manipulated into the sex trade, Williamson began to focus her studies on the experiences of American victims under the age of 18. She wanted to develop an understanding of victims’ experiences and how they were recruited, which can help both in prevention and intervention.

Williamson is now collaborating with Geographic Information Systems (GIS) mapping experts in the Geography and Planning Department. These efforts will produce a map based on data that defines the characteristics of at-risk youth to visualize high-risk areas: Have they been incarcerated? Do they come from broken homes? Do they live in low-income areas? Have parents or siblings been arrested? These GIS maps will provide Ohio with information to know where to focus its efforts. Knowing the early indicators will allow the state to better identify and divert those youth who may be at risk.

The research Williamson has undertaken has had far-reaching benefits for the region, the first of which was the Lucas County Human Trafficking Coalition whose mission is to increase awareness of human trafficking. The coalition seeks to unite social service providers, law enforcement and the general community while developing collaborative

Sex Trafficking
protocols and procedures to respond to victims, target demand, and prevent further victimization and exploitation. Furthermore, Williamson’s research has been instrumental in advocating for and securing an FBI Innocence Lost Task Force in Toledo that focuses on investigations and rescues of minors from the sex trade. Toledo’s task force is number four in the country in the number of investigations launched, arrests made and rescues of victims.

In 2010, Williamson led the Research and Analysis Committee under the Ohio Attorney General’s Trafficking in Persons Commission to better understand the number of foreign-born and domestic human trafficking victims recruited from or in Ohio*. The results of this study were used by State Senator Teresa Fedor and the Ohio attorney general to advocate for laws to protect vulnerable persons in Ohio and to prosecute traffickers. A new anti-trafficking law has passed the Ohio legislature.

Ohio is the only state that has accumulated these kinds of statistics on trafficking and prostitution. It has become a model for other states, and Williamson and her colleagues have taken the effort to the national scene and formed the National Research Consortium on Commercial Sexual Exploitation, of which Williamson serves as president. The consortium consists of scholars from across the U.S. whose research expertise focuses on sexual exploitation. Together they will seek to answer those research questions that are critical in halting human trafficking and that will help to fill the gaps and save lives.

*The U.S. Department of State estimates that there are between 14,500 and 17,500 foreign victims being brought into the United States each year. The National Center for Missing and Exploited Children estimates that 100,000 U.S. minors between the ages of 12 and 17 are victims of child sex trafficking. Ohio estimates that 783 foreign-born youth and adults are trapped into the labor and/or sex trade in Ohio. Approximately 1,078 minors are manipulate or forced into the sex trade in Ohio. Eighty-five percent of those are taken out of their cities and often the state.