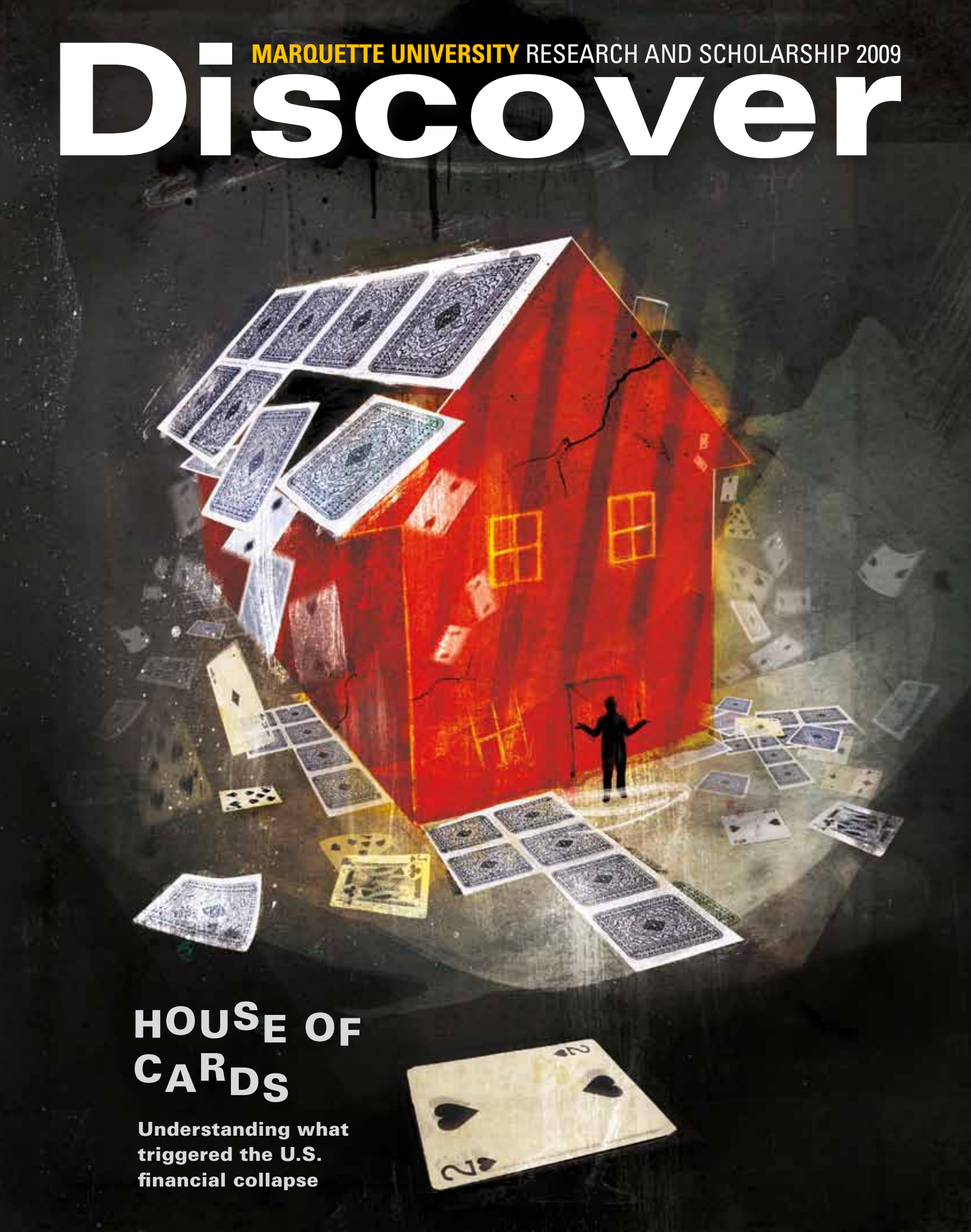
Discover

MARQUETTE UNIVERSITY RESEARCH AND SCHOLARSHIP 2009



HOUSE OF CARDS

Understanding what triggered the U.S. financial collapse

These are difficult times, with a tough economy forcing hard choices everywhere from the White House to university campuses to the average kitchen table. It will take innovation and creative thinking to rebuild America's economic system and industrial strength, and much of that innovation will naturally come out of our university system. Fortunately, Marquette University and many others are up to the challenge. Our unwavering commitment to advancing new knowledge, from science to the humanities, has never been more needed.

At Marquette, our Catholic, Jesuit heritage and commitment to mission influence everything we do. We're proud to be a hub of intellectual activity where the region's best thinkers gather to solve the most pressing issues of our day, where creative thinking is nurtured, where mysteries can reveal answers and where breakthroughs can contribute to the quality of life far beyond our campus boundaries.

Although it's more difficult than ever to secure federal research funding, our faculty have had some outstanding successes this year. Our faculty continue to win grants from the National Institutes of Health, National Science Foundation, National Endowment for the Humanities and other agencies, and our foundation research dollars have nearly doubled since 2006-07.

In the pages that follow, you'll read about some of these top scholars, including nationally and internationally known experts on the mortgage crisis, alternative energy, mental imagery, preschool literacy and ancient languages. To learn more, we hope you'll go to www.marquette.edu/research or visit us in person.

Wm. Wiener

William Wiener, Ph.D.
Vice Provost for Research and Dean of the Graduate School

MARQUETTE
UNIVERSITY

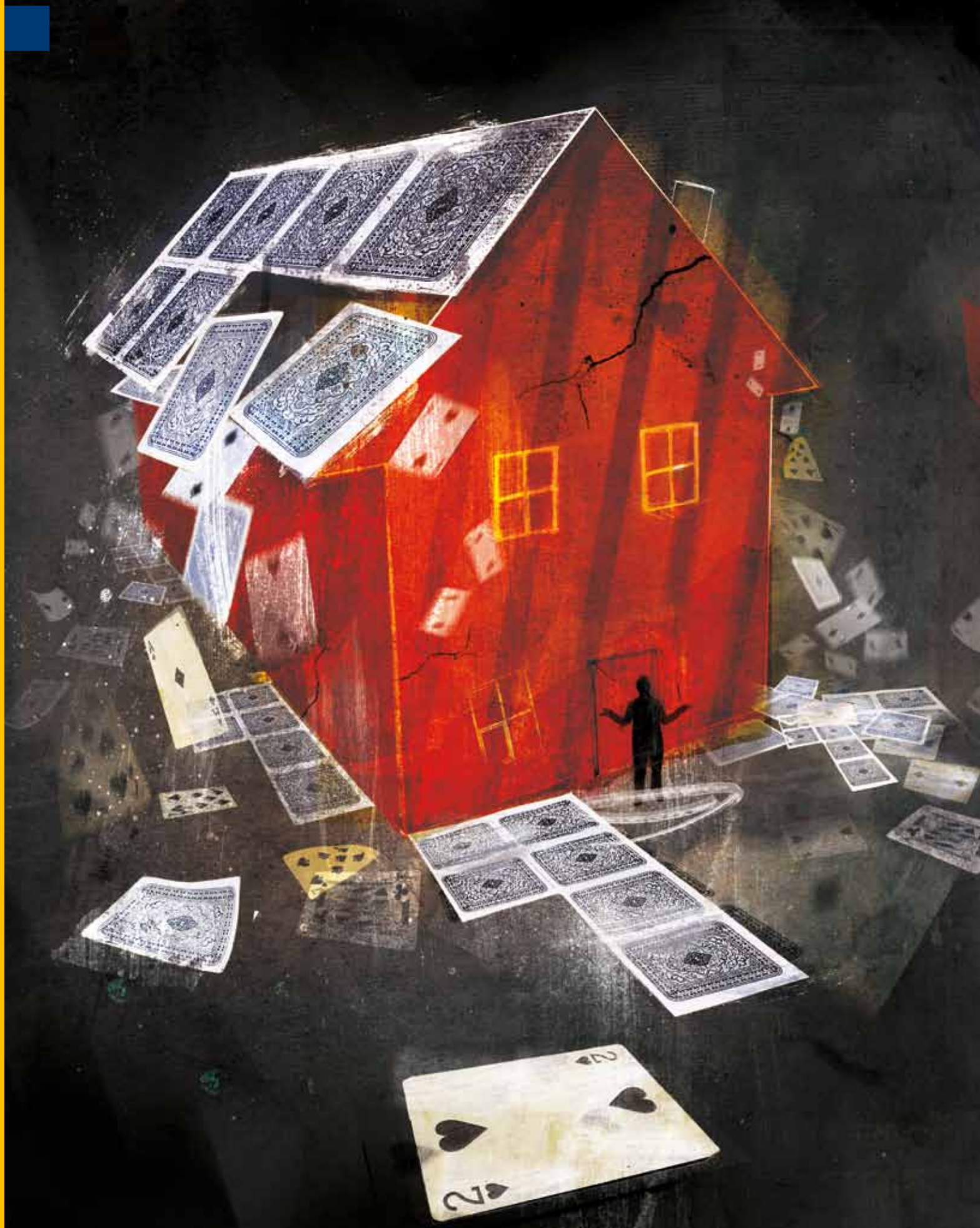
Be The Difference.

Discover

MARQUETTE UNIVERSITY RESEARCH AND SCHOLARSHIP

MARQUETTE RESEARCH IN BRIEF

DISCOVER: Marquette University Research and Scholarship is published annually by the Office of Marketing and Communication.
Editor: Nicole Sweeney Etter, nicole.etter@marquette.edu
Designer: Joan Holcomb, joan.holcomb@marquette.edu
Contributing writers: Andrew Brodzeller, Tim Cigelske, Brigid Miller, Joni Moths Mueller, Tim Olsen and Christopher Stolarski
Cover: Illustration by Danny Allison



HOUSE OF CARDS

Dr. Anthony Pennington-Cross has devoted his career to studying the loans that led to the financial collapse of 2008

In 2005, Dr. Anthony Pennington-Cross, then a senior economist at the Federal Reserve Bank of St. Louis, spoke at a foreclosure-prevention conference in Memphis. Following his address, an executive with a large lending institution approached Pennington-Cross and asked, "What are we going to do when all these 228s reset?"

"What's a 228?" he responded.

Illustration by Danny Allison

Four years later, and with billions of dollars lost, the Marquette associate professor of finance is intimately familiar with the 228 or "hybrid" loan. So are millions of other people. The question now is, what happened to the mortgage industry? Pennington-Cross' research reveals a house of cards destined to collapse. Today he is regarded as one of the foremost experts on subprime loans. Oft-cited in journal articles and frequently quoted by the media, his work has never been more relevant.

Subprime mortgages grew significantly during the late-1990s, and it was at that time that Pennington-Cross first noticed this new, risk-based lending model.

A graduate of Oberlin College in Ohio, Pennington-Cross earned his doctorate in urban and regional economics from George Washington University. Following post-doctoral work at the Wharton School of Business and a brief stint at the Research Institute for Housing America, he took a position in 2000 as a senior economist at the Office of Federal Housing Enterprise Oversight.

Subprime mortgages should make up no more than 8 to 9 percent of the total mortgage market, Pennington-Cross says, but at the brink of the collapse, they reached nearly 25 percent.

While at OFHEO, he researched the performance and market segmentation of subprime mortgages. Prior to the advent of subprime mortgages, loans were made using a fixed protocol based on employment, income and a down payment. If borrowers didn't meet basic standards, they didn't receive loans. Subprime mortgages changed that. "This was a new market for OFHEO," Pennington-Cross says. "This was a revolution in mortgage lending — credit scores were suddenly important in the process."

Pennington-Cross began developing and analyzing the types of models that the mortgage industry would later use as its standards for making subprime loans.

Pennington-Cross' early research and modeling suggested that subprime mortgages should make up approximately 8 to 9 percent of the total mortgage market. Any more than that and the entire industry would become exponentially vulnerable.

"Subprime mortgages provide a great opportunity for individuals to get a home, which is one of the primary ways that households can build wealth," he says. "But these loans are quite risky, which begs the question: Even if we can price these loans correctly, does it mean we should make the loan?"

Subprime mortgages fast became attractive loan options. Lenders loved them because fees were taken upfront; investors loved them because — when securitized, or "bundled" — they yielded high returns. The problem, says Pennington-Cross, is that the entire system relied on home prices rising.

Just as subprime mortgages were growing in popularity, the temptation to take equity out on homes grew. Homeowners looked at mortgage tax incentives and lower interest rates as sure-fire ways to pay down existing debt, such as credit card balances, says Pennington-Cross.

"This made the housing market even more vulnerable," he notes.

Soon after Pennington-Cross joined the Federal Reserve Bank of St. Louis in 2004, he started researching 228s, the subprime mortgage he

Dr. Anthony Pennington-Cross is researching predatory lending laws, and his early findings are curious. "In some states, where new laws fail to delineate any consequences for lenders who make suspect loans, it has become even easier for subprime lending to occur," he says.

first heard about at that conference in Memphis. The nonconventional 228s are 30-year mortgages with a two-year fixed rate. After two years, it becomes an adjustable-rate mortgage, or ARM. "Lenders take lots of fees upfront and offer 'teaser' rates, at least 2 percent lower than the index rate," he says. "These were designed as short-term loans."

According to Pennington-Cross, after two years borrowers were left with three options: get a new 228 loan, refinance into a prime loan or default. Interestingly, he notes that most of the mortgages immediately preceding the Great Depression were also short-term loans.

Despite the acknowledged risk, subprime loans soon comprised nearly 25 percent of all mortgages. By 2008 the housing market and mortgage industry were collapsing. Banks were leveraged to the hilt, losing billions by the day. Trusted financial institutions such as Bear Stearns and Lehman Brothers folded.

"Popular wisdom suggests that this downfall was not in the early data on subprime mortgages," Pennington-Cross says. "I don't believe that."

Even in his early research, Pennington-Cross says he was able to simulate a 20- to 25-percent default rate among subprime mortgages in a benign economy.

Greed and subsequent lapses in ethical behavior are at the heart of the collapse, he says. "There were constant temptations, financial incentives to put people in bad loans."

MEA CULPA

Who erred, who got greedy and who swindled? Most post-mortem examinations of what initiated the 2008 U.S. economic crisis identify the housing market and mortgage industry as the primary culprits. According to Dr. Anthony Pennington-Cross, the onus falls on five groups. "If even one of these groups had behaved the way they were supposed to, none of this would have happened," he says.

The Borrowers

Bottom line: Many individuals applied for and accepted loans they didn't understand or couldn't afford. But Pennington-Cross also acknowledges that many of these homebuyers were taken advantage of by brokers.

The Brokers

There is nothing illegal about trying to make money, says Pennington-Cross. But mortgage brokers clearly had their eyes on the prize and not on the financial health of the borrowers when making risky, exotic loans.

The Aggregators

These "middlemen" who bundled loans for the investment banks were more pawns than anything, according to Pennington-Cross. "When the markets started to collapse, they were the first to get hit," he says.

The Securitizers

Investment banks like Bear Stearns and Lehman Brothers were under pressure from investors for high-yield returns. Despite the risks, says Pennington-Cross, "They sold these securitized loans as vanilla. These are extremely sophisticated investors — they knew what they were doing."

The Rating Agencies

"They totally blew it," says Pennington-Cross, identifying rating agencies as the lynchpins. "They overrated these securities, often giving AAA ratings to junk."

Illustration by Keith Skeen

Imagination:

THE POWER TO HEAL

Can you see a beautiful sunset in your mind's eye, hear your grandmother's voice in your mind's ear or taste the tartness of a lemon with your mind's taste buds? Most people can. And Dr. Anees Sheikh knows that such tricks of the imagination can be powerful tools in emotional and physical healing. "Of all the recent developments in the healing arts, perhaps the most noteworthy one is our increased understanding of the healing potential of mental imagery," he says.

Sheikh, a professor of psychology who has taught at Marquette for more than 40 years, was a pioneer in the field of mental imagery and is credited with helping establish the field.

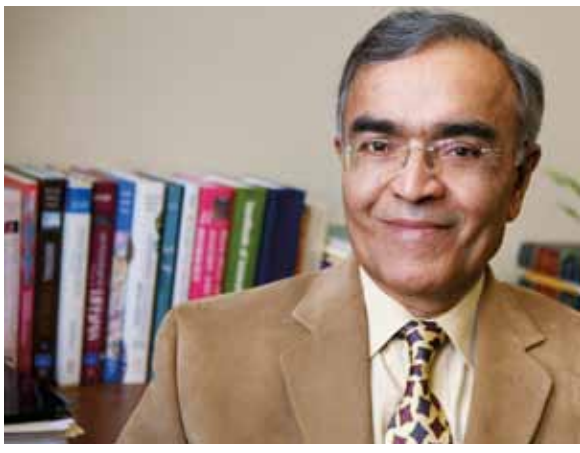
The founder of the *Journal of Mental Imagery*, Sheikh has published 16 books on the topic and trained thousands of health professionals around the world through his workshops and lectures. The Dalai Lama was so impressed by Sheikh's work that he wrote a foreword to Sheikh's 2002 book, *Healing Images: The Role of Imagination and Health*. Sheikh's latest book, co-written with David Pincus, his former graduate student, is titled *Imagery for Pain Relief: A Scientifically Grounded Guidebook for Clinicians*. It is due out in 2009.

Mental imagery has a very close connection to the body, according to Sheikh. "Imagine that you are squeezing lemon juice into your mouth," he explains. "Your mouth will pucker up and you will salivate, just as you would if you actually squeezed lemon juice into your mouth. This is just an example of the many identical responses to actual stimuli and to imagery. While they may not have the same intensity, they are of the same nature." Simply imagining walking up stairs produces electrical activity in your leg muscles, imagining a scary situation will affect your blood pressure, and imagining a happy event will elevate your mood. In many important aspects, an experience in imagination can be the psychological equivalent of the actual experience, he says.

In addition to its close connection to physiology, mental imagery can be a valuable vehicle for therapeutic work for other reasons, Sheikh says. "Images have intimate ties to our emotions," he says. "They are an excellent source of details about early experiences, particularly the traumatic ones in need of resolution, and they are less likely to be filtered through the conscious, critical apparatus." Sheikh has found that clients open up more when they are describing mental images, because they do not feel as responsible and self-conscious as when they are describing their experiences in words.

Recently Sheikh has been exploring the healing potential of death imagery, which stems from his belief in "the profound inner wisdom of our mind-body system." He points to the fact that our body temperature remains roughly constant regardless of the ambient temperature; that our heart beats 100,000 times every 24 hours, pumping 6,300 gallons of blood through 96,000 miles of blood vessels; and that 3 million new red blood cells are created every second. The immune system is full of constant, awe-inspiring miracles, he says.

It's one reason that Sheikh feels that imagery is key to physical and emotional health. "We don't heal our patients. We help them heal themselves by helping them connect to their inner wisdom. With a little nudge from the therapist, the patient reconnects with some unfinished emotional issues from the past, mentally revises them and brings closure," Sheikh says. "It is never too late to have a happy past, and the first step to a happy future is to imagine it."



Ready, set, read

Marquette's speech-language pathologists boost literacy for hundreds of Wisconsin preschoolers

The odds were against 3-year-old Miguel. He was growing up poor, with few books at home and a limited grasp of English. Instead of participating in his preschool class, he stared at the ceiling or fell asleep. But then Miguel was enrolled in an intensive literacy program offered through Marquette. He received bilingual instruction that snuck vocabulary and phonics into every part of his school day, from snack time to the playground. A year later he was speaking both Spanish and English — and he was excited about reading.

Learning to read can be especially challenging for children from poverty or non-English-speaking homes. Fortunately, the Wisconsin Reading Acquisition Program, developed by speech-language pathologists in Marquette's College of Health Sciences, offers a solution. A new $4 million grant from the U.S. Department of Education is helping the program reach more students like Miguel than ever before.

WRAP is led by Drs. Maura Moyle and Brenda Gorman, assistant professors of speech pathology and audiology, and Sue Berman, clinical instructor of speech pathology and audiology. Of the 31 Early Reading First grants awarded in 2008 by the U.S. Department of Education, theirs is the only project headed by speech-language pathologists. "We've always known about the connection between language and literacy," says Moyle. "It just makes sense that speech-language pathologists, with their training, would be uniquely qualified to improve literacy."

The newly expanded program serves 300 at-risk, low-income 3- and 4-year-old children from diverse cultural and linguistic backgrounds each year. The goal: to improve children's oral language, written language awareness, alphabet knowledge, verbal reasoning abilities, analytical thinking and English language skills.

The Marquette team reviewed other approaches and found that many existing programs boosted alphabet knowledge but failed to improve vocabulary and phonological awareness. Their approach, which includes a research-based curriculum and focus on teacher training and parental outreach, has seen results in all three areas.

Children receive more than two hours of formal literacy-related instruction every day and two hours of informal instruction infused into day-to-day activities. For example, a class might reenact a book from storytime using props related to new vocabulary. For snack time, teachers might choose a snack that starts with the letter of the week, and tell the children that those whose names start with a particular sound can get up and play. Even on the playground, teachers reinforce vocabulary by making comments such as "You're jumping on the line" or "That's a long swing."

After working with Marquette on a smaller scale for three years, Day Care Services for Children, a Head Start agency in Milwaukee, had seen early results. Participating preschoolers scored in the highest category for all literacy benchmarks on Head Start's assessments. "It was so successful with those kids we thought, why don't we expand it to all Head Start kids?" says Mike Poma, the agency's executive director.

Nearly all of WRAP's students come from poverty, and research shows a strong correlation between socioeconomic status and literacy. The need often becomes apparent to Gorman after the first house call. "Families I work with wouldn't have a single book in the house," she says. And yet research also shows that children who succeed in kindergarten

From left to right: Dr. Maura Moyle, Sue Berman and Dr. Brenda Gorman. The trio won a $4 million Early Reading First grant from the U.S. Department of Education, the largest three-year grant in Marquette history, for the Wisconsin Reading Acquisition Program.

have 1,000 hours of book experience. One well-documented study showed that children of professional families are exposed to 45 million words by age 3, compared to 15 million words for a child raised in poverty.

"Parents starting out at a lower economic level have more challenges," Poma says. "What this program does is it assures when the child is in childcare, they're getting the developmental stimuli that they need. It's helping parents get their children prepared for school while they work on getting the family financially secure."

The need is acutely felt in Wisconsin, where African-American children have the worst reading test scores in the nation and where there is the largest achievement gap between black and white children. WRAP targets a diverse group: 90 percent of participants are minorities, roughly half speak English as a second language and nearly 10 percent have special needs.

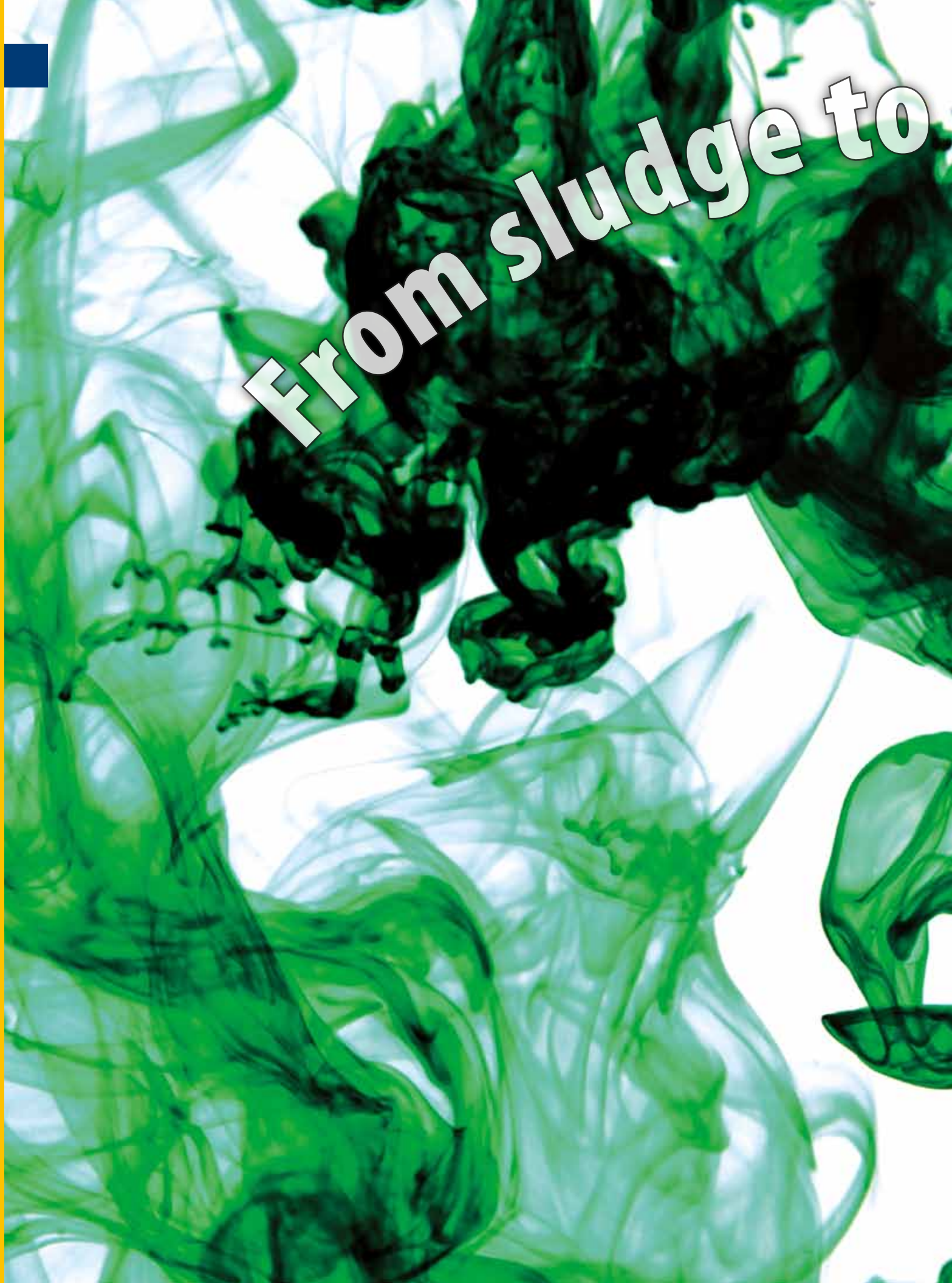
"We have a very challenging group of kids, with multiple, multiple needs," Berman says. "But they come with multiple strengths, too, which we try to acknowledge."

Participating Head Start teachers receive 100-plus hours of training every year. "Teachers often don't know how to interact with English-language learners, so sometimes those kids don't get as much attention, even when they sometimes need it the most," Gorman says.

Strong first-language skills help enhance a child's success in a second language, so WRAP offers some materials in both English and Spanish. The program also uses tiered instruction, which means that before struggling kids fail, they're identified and given extra support in small groups or one-on-one.

Parental outreach is also key. Teachers make quarterly home visits and work on a Family Development Plan to help parents and kids continue the learning at home. The program also offers monthly parent training sessions and incentives for parents who participate. Five Head Start sites include Family Literacy Centers, which feature a mini-library with books, computers and training videos. The grant also funds family-support workers who try to get parents more involved and who offer resources for parents to improve their own literacy.

"We wanted more parents to get involved," Gorman says. "If parents are using these practices in the home as well, that will be huge."


From sludge to

sustainable energy

Dr. Dan Zitomer harnesses the power of anaerobic microorganisms

Deep in northern Wisconsin, four tanks hold a combined 230 million pounds of bacteria essential to the operations of Packaging Corporation of America. This soupy mixture constantly breaks down the waste produced by creating 500,000 tons of corrugated cardboard a year.

With the help of Dr. Dan Zitomer, director of Marquette's Water Quality Center and associate professor of civil and environmental engineering, Packaging Corporation of America is transforming this potent bacterial stew into a remarkable source of renewable energy.

Zitomer specializes in converting industrial waste, whether it comes from airplane de-icing fluid or restaurant leftovers. When anaerobic microorganisms break down waste, they give off methane gas, which can then be harnessed to power factory and industrial operations. This saves companies money, and it helps save the environment by conserving natural resources and reducing carbon dioxide emissions. It also helps keep waste out of sewers and landfills.

"It's a niche area in which our college excels," Zitomer says. "Sustainable energy, going green — it's a good place for us to be. It's a place to make a difference."

Zitomer is a recognized expert and innovator in anaerobic digestion, and he offers a short course on the subject that brings academics and industrial scientists from around the world to Marquette each year. Clients as diverse as the Milwaukee Metropolitan Sewerage District, the Great Lakes Naval Training Center and Coca-Cola Enterprises of Atlanta look to Zitomer for help in applying this technology.

Currently Zitomer is researching a process called anaerobic co-digestion to perfect the process even further. Essentially he's trying to find the most potent mixture of microbes to produce the most methane, a process known as bioaugmentation. The more gas, the more waste companies can recycle into fuel. His work is funded by grants from the state of Wisconsin and We Energies, which provides natural gas, electricity, steam and water services to portions of Wisconsin and Michigan. Zitomer is also researching how to keep his blend of microorganisms stable and active so companies could purchase it as an off-the-shelf product.

Anaerobic digestion is attractive to companies because it's a relatively inexpensive way to dispose of unwanted by-products. "Anaerobic microorganisms operate without oxygen — they're the little guys operating at the bottom of the swamp generating that sour smell," Zitomer says. "They have great potential in that you can just add them to a waste stream and pretty soon thereafter start collecting the gas." When it works, this can be significantly less costly than breaking down waste with methods that use oxygen, which require additional investments and energy for stirring or bubbling in air.

Most of the time, these anaerobic microorganisms handle their job without incident, but changes in temperature can cause the process to stagnate. When that happens, Packaging Corporation of America calls on Zitomer's expertise again. "It's a 200-million-pound organism," says John Piotrowski, the company's senior environmental engineer. "When it gets sick, it's going to kick us — and kick us hard. When it doesn't function well it's a nightmare."

Piotrowski met others who made claims to be experts in this process, but they often turned out, in his words, to be little more than snake oil salesmen. So he was skeptical of Zitomer's process at first. Until he met him.

"I was just floored," Piotrowski said. "Dan had a clear and competent understanding of how industrial processes worked — or didn't work. He's like a guru. Now we've stabilized our system so that we don't significantly worry about it."

For the Packaging Corp. plant in Tomahawk, Wis., the impact has been dramatic. The company has replaced natural gas, a fossil fuel, with renewable energy at a savings of more than $1 million a year. The amount of energy it captures and reuses to power its boilers would be equivalent to providing energy to 2,700 homes in northern Wisconsin for a year.

DIGGING THE

What is the archeological evidence for Old Testament history? Theology professor Dr. Deirdre Dempsey uses her expertise in ancient languages — and old-fashioned sweat labor — to find out.

BIBLE

During the summers, Dr. Deirdre Dempsey's day can start at 6 a.m. and include hours spent digging inch by inch through hot, dusty Syrian soil in search of a fragment of history.

It's not the typical life of a theology professor, but Dempsey's expertise in ancient languages makes her a valued asset on archeological digs. She's part of the team that since the early 1980s has excavated off and on at Tell Qarqur in Syria, a project sponsored by the American Schools of Oriental Research and the University of Arkansas.

The 56-acre site, located in the Orontes River valley in northwest Syria, is significant because the annals of the Assyrian king Shalmaneser III mention a battle that Shalmaneser fought at a place called Qarqar, near the Orontes River, in mid-ninth century B.C. "In a list of the enemies he fought at this battle, he included King Ahab of Israel," Dempsey says. "So we hope that we have the site of this ancient battle."

Dempsey specializes in Northwest Semitic languages, including Hebrew and Aramaic, and teaches a course at Marquette called Digging the Bible. When she is not away on archeology digs, she publishes on other topics related to the Old Testament in journals such as *Vetus Testamentum*, *Biblische Notizen*, *The Bulletin of the American Schools of Oriental Research*, *Orientalia* and *The Bible Today*.

Originally from a Navy family, she spent some of her childhood living in Cairo, Egypt, where she marveled at the pyramids and other ancient wonders. "That whetted my appetite in historical artifacts and whet my appetite in other languages as well," she says.

She fell in love with archeology as an undergraduate. "I got into archeology through the back door," she says. "I was very interested in historical background for the Old Testament — any archeological evidence for Old Testament narrative."

Dempsey first traveled to Syria to dig at the Tell Qarqur site more than 20 years ago. Thus far, the team has not turned up any artifacts that contain writing. But Dempsey's translation skills were put to the test on earlier digs at Tell Nimrin, Jordan, where archeologists found nine pottery fragments (called ostraca) and one seal impression with inscriptions in an Aramaic cursive script dating to 400 B.C.

Inscriptions are usually found on pottery fragments. "You always find a ton of broken-up pottery, which is good because you can date the period you're digging through," Dempsey explains. If there is an inscription, it's often mundane.

"You're not going to find the Epic of Gilgamesh," Dempsey says. "It's more like 'Don't forget to bring the milk home.'"

Still, those details can reveal information about the people who once called that place home. At Tell Nimrin, Dempsey's team found a piece of pottery with three lines of writing that included names. "That tells you something about the population of an area," she says.

She usually spends eight weeks on a dig, working as both the team epigrapher and a site supervisor. She plans to return to Syria in summer 2009.

Although modern tools, such as ground-penetrating radar, make the job easier, archeology is still deliberate, slow work. The team has covered only a few acres of the massive site at Tell Qarqur. "It's hard physical work. It's actually exhausting," she says. Digging starts at 6 a.m. and usually ends around lunchtime, when it gets too hot to work. Still, windy weather with temperatures in the 90s and 100s is "not too bad," in her opinion — while digging in Jordan, she endured 120-degree days on the edge of the Dead Sea.

There are other occupational hazards, including scorpions and pit vipers, also known as two-step snakes. "Because you have two

Pages 14-15 and above: Dr. Deirdre Dempsey out in the field at Tell Qarqur, Syria. Images courtesy of Dr. Jesse Casana and the Tell Qarqur Expedition.

steps and that's it — you're dead," Dempsey explains with a wry smile.

Tell Qarqur is believed to have a 10,000-year history of occupation, and the earliest excavations turned up artifacts from 2,000 B.C. The team has found artifacts, including incense burners called cultic stands, which indicate there was once a temple there. The team also found an idol figure of the sort mentioned in Genesis.

"We know we have the site of significant cities, cities that had been around for millennia," she says.

But what Dempsey really wants to find is something with inscription that could be deciphered. After all, that's why she's there.

"The language I'm hoping we're going to find is Aramaic," she says. "It's exactly the sort of thing that I'd love to find because it might give some evidence to prove or disprove if we are actually digging the ancient Qarqar. I still think it's there."

LOST IN TRANSLATION

Dempsey doesn't need to go halfway around the world to ply her expertise. "Anything to do with Northwest Semitic languages — that's what I'm most interested in researching," she says. She spent seven years assisting in the revision of the Old Testament as an editorial board member for the New American Bible.

She's written several articles on translations of Syriac (a dialect of Aramaic) and Christian Arabic texts. Most recently she wrote an article to suggest a reinterpretation for Ecclesiastes 12:4.

"We have this problematic verse in Ecclesiastes that everyone will say is problematic," Dempsey explains. "I'm not changing the theology. It's a way of trying to make sense of something that hasn't made sense."

In another recent paper, Dempsey analyzes early Arabic, Syriac and Hebrew texts to see what early scholars believed about the language of the generation of the Tower of Babel and the origin of writing. Was the original language Hebrew? Or was it Syriac?

"I'm interested in the early scholars who debated that question," she says. "I hope that these texts can help shed some light on the scholarly exchanges, direct or indirect, among the three Abrahamic traditions."

FIGHTING A HARMFUL RESULT OF CHEMOTHERAPY

What role can a dentist play in helping a child continue chemotherapy treatments for cancer? Maybe a key one if research now underway confirms a theory posed by Dr. Brian Hodgson, assistant professor of pediatric dentistry in the Marquette School of Dentistry, and co-investigators at the Medical College of Wisconsin and the University of Alabama-Birmingham.

Chemotherapy drugs can cause painful sores to form in a patient's mouth that provide an open window for infection to enter the body at a time when a child's immune system is already weakened. "To prevent the spread of infection," Hodgson says, "a doctor will stop chemotherapy or radiation therapy to allow the oral tissue time to heal." But that interruption in treatment can be harmful.

Hodgson believes light therapy applied directly to the oral cavity may offer a way to inhibit the development and reduce the severity of mouth sores so that treatment can continue.

Hodgson's friend, Dr. Harry Whelan of the Medical College of Wisconsin, was using photodynamic therapy in the treatment of brain cancers. He told Hodgson that the light therapy seemed to help wounds heal faster.

"The same day I had seen a 4-year-old patient who was scheduled for a bone marrow transplant for leukemia," Hodgson says. "We had extracted three teeth that were so decayed. I knew the heightened risk of infection. I wondered whether light therapy would work on a tooth-extraction site. There was no research published on this subject, but several papers were found on the treatment of mucositis with light therapy. Our first two pilot studies appeared to reduce the mucositis."

Hodgson and his co-investigators used a hand-held device developed by Quantum Devices of Barneveld, Wis., that is about the size of the wand used by airport personnel to scan passengers as they pass through the security checkpoint. When held to a child's cheek, the light-emitting diodes inside transmit a light that penetrates the oral tissues. It doesn't hurt, doesn't get hot and causes no thermal effect. A treatment takes 84 seconds.

"We believe the light is being absorbed by the mitochondria in the cells. The light allows the mitochondria to create more ATP or energy in a cell. Our objective is to help a cell heal itself rather than die," Hodgson explains.

NASA used this type of light in plant growth experiments in space and is interested in potential medical applications. NASA is funding the current placebo-controlled double-blind study spearheaded by Hodgson of 80 adult and child patients using these lights, including patients at Children's Hospital of Wisconsin, the University of Alabama-Birmingham and Children's Hospital of Alabama. Hodgson plans to publish the results in 2009.

A NEW APPROACH TO SENSORS

Sometimes great things come in tiny packages. That's the case of the microcantilever, a simple sensor device (whose dimensions range from microns down to nanometers) that could have applications from the field of medicine to the detection of biochemical warfare agents. With support from the National Science Foundation, Dr. Fabien Josse is studying this new approach in sensing technology.

Josse is a professor of electrical and computer engineering and director of Marquette's Microsensors Research Laboratory. An associate editor for *IEEE Sensors Journal*, he has served as a visiting professor in Germany, Switzerland and France.

Josse compares a microcantilever to a miniaturized diving board that naturally vibrates at a specific frequency. By stretching out like a finger from a microchip, these extremely mass-sensitive or stress-measuring devices outperform conventional sensors by detecting changes in cantilever bending or vibrational frequency. In health care, microcantilevers could be used to monitor blood glucose and screen for diseases at the earliest possible stage. They could also be used by military personnel to detect chemical and biological warfare agents in the field.

But until now, these devices haven't worked well at detecting substances in liquids. Josse is trying to change that. Working with colleagues at Marquette and Georgia Tech, Josse hopes to create a more efficient and sensitive sensor by utilizing optimal cantilever geometries and more general and intelligent control of the excitation characteristics, which could drastically enhance performance. "The long-term goal is the development of portable, low-cost, microcantilever-based sensing devices that are capable of simultaneously detecting a broad spectrum of substances," he says.

COLD WAR PROPAGANDA LIVES ON

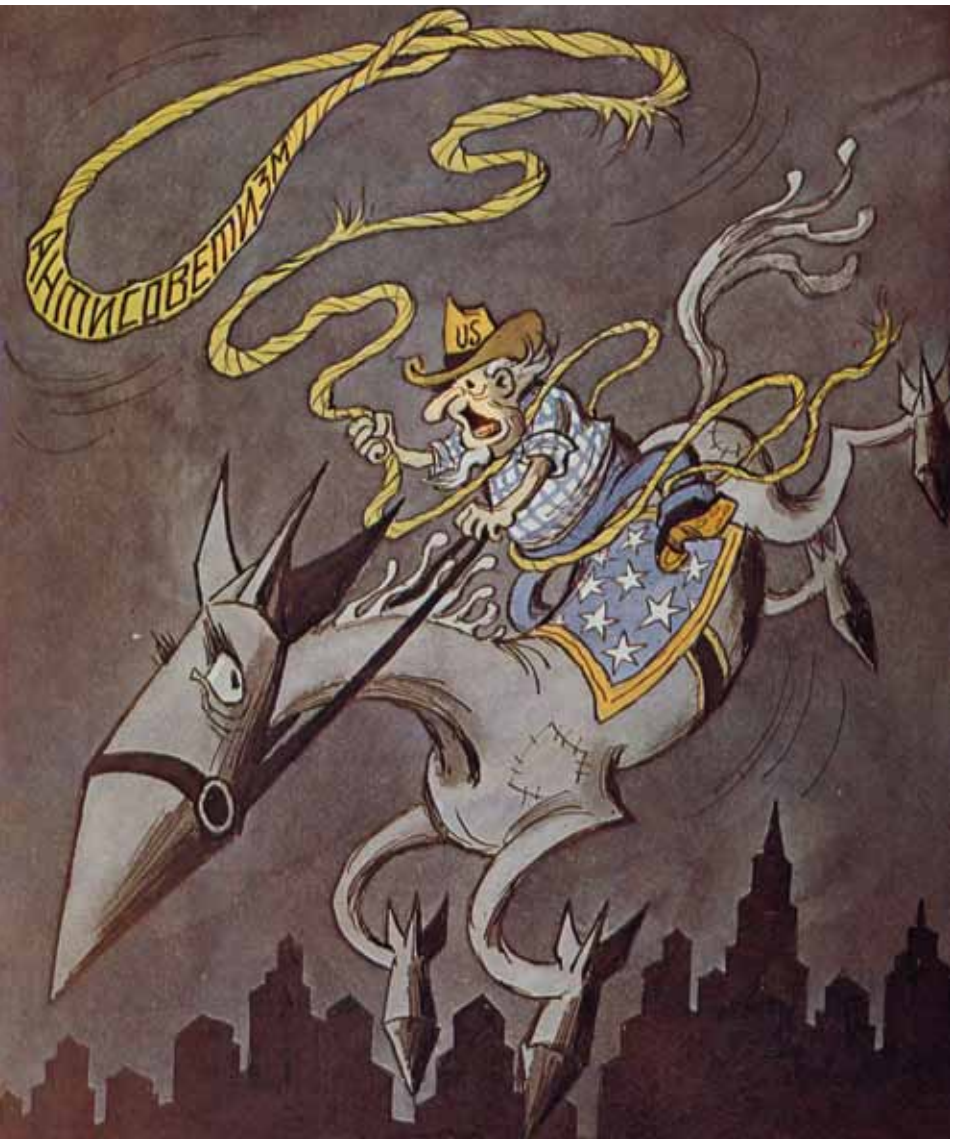
What does American culture look like through the prism of Soviet mass media? And how do those impressions shape the modern relationship between the United States and Russia? That's the research focus of history professor Dr. Alan Ball.

Ball is working on a follow-up to his 2003 book, *Imagining America: Influence and Images in 20th-Century Russia*. During the Cold War, "a big part of the propaganda battle was each side saying our way of life is better than your way of life," he explains. Because America's free market society and consumer culture appealed to many around the world, Soviet authorities directed intense criticism at "the American way of life." It appears that most of all, Ball adds, "they were concerned that their own people might be enticed."

Ball's new book will translate and analyze articles from Soviet mass-market periodicals, ranging from sports and women's magazines to a Communist-sponsored satirical magazine. Ball, who teaches courses in Russian and Soviet history and the Cold War, started the project after realizing that the primary sources he wanted for his students didn't exist in English.

"It's unlike any book I've done before because it's mostly translation," says Ball, who has a contract with Oxford University Press. "Virtually nothing like this is translated and available for the Western reader."

Ball's book will focus on several themes in Soviet coverage of the United States: American politics, capitalism, racism, crime, culture, sports and religion. He found that ideology colored even a topic as innocuous as sports: Soviet publications tended to portray American sports as violent and exploitative, representative of American culture at large.



While Soviet propaganda appeared to die along with the Cold War, Ball noticed some of the same messages reemerging recently in the Russian media, as tensions increased between Russia and America.

"My hypothesis is that you couldn't expose people, including Vladimir Putin, to four decades of propaganda and have it disappear in 1991 without a trace," Ball explains. "As Russians have become disillusioned with America again, they did not have to invent critical images of the United States as, say, an imperialist bully. The images had been there all along during the Soviet period, and there was neither the need to create them from scratch nor to explain them to most citizens."

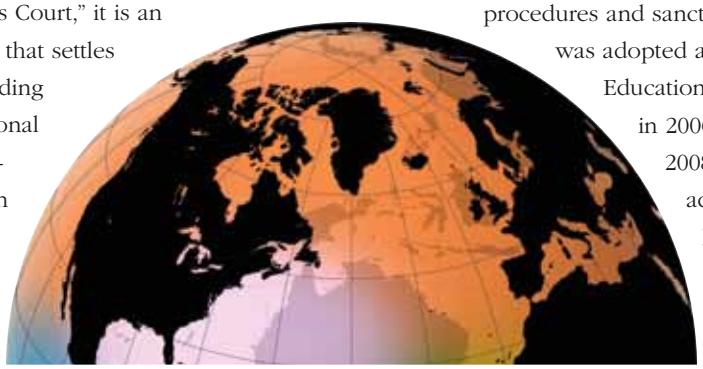
Upper left: This Cold War-era cartoon from a Soviet satirical magazine depicts the United States casting a grim imperialistic shadow. Lower left: Another Cold-era cartoon paints America as an imperialistic cowboy. Images courtesy of Dr. Alan Ball.

SPORTS LAW ON THE GLOBAL STAGE

Foreign players in the NBA. An NFL game in London. Major League Baseball offices in China. As the world of sports becomes globalized, one professor is at the heart of understanding how the law applies to an increasingly complex industry.

Matt Mitten, director of the National Sports Law Institute at Marquette University Law School, is an internationally recognized expert in sports law who is now turning his attention to the intricacies of governance in sports on a world playing field. Mitten lectures at international conferences and law schools on the cutting-edge issues — including doping and athlete eligibility disputes — facing sports in all corners of the globe.

Mitten is a member of the Court of Arbitration for Sport. Known as the "World's Sports Court," it is an international arbitral tribunal that settles sports-related disputes, including those arising out of international and Olympic sports competition and events. He is also an author of a leading sports law textbook; faculty adviser to the *Marquette Sports Law Review*, the oldest sports law review in the nation; and a frequent contributor to both national and international academic publications, including most recently Korea's *The Journal of Comparative Law*.



Outside its obvious application to industry participants such as athletes and team owners, why does sports law matter? Mitten notes that legal rules developed to resolve sports-related issues have tentacles into general case law. "Important antitrust, intellectual property and labor law principles arose out of sports cases," he explains.

Another good example of the growth of sports law is the 2003 adoption of the World Anti-doping Code by international sports governing bodies to harmonize doping rules, testing procedures and sanctions for Olympic sports. The code was adopted as a treaty by the United Nations Education, Social and Cultural Organization in 2006 and ratified by the United States in 2008. "The successful development and adoption of this treaty may teach us lessons we can apply to agreements on broader global issues ranging from the environment to trade policy," Mitten says.

ENHANCING ATHLETIC PERFORMANCE — THE NATURAL WAY

Dr. William Ebben became fascinated with the science of sports when he worked as a strength and conditioning coach for the Green Bay Packers, U.S. Olympic Education Center, Marquette University and others. Now an assistant professor of exercise science, he's driven to helping athletes become stronger, faster and safer.

"If we can find ways to enhance performance without chemicals, steroids and even dubious supplements, then the research is useful," he says.

Ebben is a national leader in the field of strength and conditioning and a highly productive researcher — he published 12 articles last year and has another 10 in review or in press. His research recently earned him national awards from the American Society of Exercise Physiologists and the National Strength and Conditioning Association.

His lab focuses on several areas, including evaluating plyometrics (explosive exercises such as jumping), lower-body muscle activation during resistance training, speed development, and strength- and power-training methods. In almost all of his studies, he explores gender differences.

"I think that's important because historically women have been underrepresented in exercise science research," he says. "It's important to find similarities or differences, and in some cases, I'm hopeful there are similarities so that we can decrease the gender gap or the perception that there are differences."

Understanding gender differences can protect athletes. For example, because women are six times more likely to suffer ACL injuries, Ebben studied how men and women activate the hamstrings and quadriceps. He found that women don't activate their hamstrings as well as men — key because the hamstring acts as a helper for the ACL — while they activate their quadriceps more, which pulls on the ACL. The problem might be reduced by adjusting training methods, he says.

He also studies the brain connection between upper-body muscle activation and lower-body reflexes. He found that by clenching a jaw or fist, athletes could enhance the power of a lower-body movement. Since Ebben introduced the concept to sports literature, he has heard anecdotal stories of professional athletes using the technique.

He is also intrigued by speed development, which he views as underresearched. "As a strength coach, you can take an athlete and in some cases make them twice as strong. But you can't make someone run twice as fast," he says. "You're shooting for gains of 2 to 5 percent. And yet speed is probably the most important physical factor in many sports such as soccer, baseball and football."

UNDERSTANDING SMOOTH MUSCLES

Heart disease, irritable bowel syndrome, asthma, infertility — it's possible that malfunctioning smooth muscles could cause these and a host of other illnesses. But while smooth muscle cells — which surround all hollow organs — are clearly critical, we are just beginning to understand how they function. Dr. Thomas Eddinger is working to enhance that understanding.

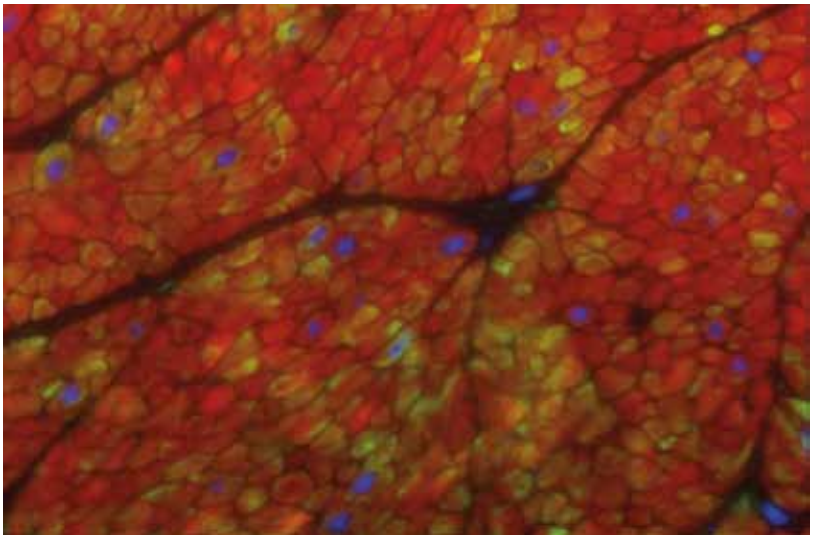
Eddinger, a professor of biological sciences, is well known as a pioneer in the field of smooth muscle research. For more than 20 years he has studied these workhorse cells, which are responsible for maintaining blood pressure, propelling food through the digestive system and excreting urine from our body. He is best known for helping identify four different myosin protein isoforms found in the cells of smooth muscles. Since that pivotal discovery, Eddinger has continued his work to better understand how the subunit proteins combine to form different molecules that regulate the muscle cell's ability to function and recover from injury.

After helping to identify the myosin isoforms, Eddinger's lab adapted techniques routinely used at the tissue level to study single cells, which showed that single cell function can be related to the expression of the myosin isoforms. But Eddinger wants to look beyond single cells.

Much of the research in this field relies on individual cells grown in cultures. However, Eddinger's lab has shown that cultured cell behavior is different from cell behavior in actual tissue, so it studies cells in freshly isolated or intact smooth muscle tissues. In order to really understand how smooth muscles function it is vital, Eddinger argues, to study the cells in their natural state.

"If I want to understand how a person functions in the real world, I'm not going to throw them into a freezing lake," he says. "How that person reacts would say nothing of how they typically function. I'm using that same concept in my lab. If we want to understand how smooth muscles function at the cellular level in our bodies, we need to study the tissue, not just a single isolated cell."

While many questions still need to be answered, Eddinger is confident that his lab's work will help explain how smooth muscles work and carry out vital functions in our bodies. And once that happens, he says, "Treatments and therapies will follow that allow people to lead longer and healthier lives."



Smooth muscle cells in stomach showing distribution of non-muscle myosin (green), actin (red) and nuclei (blue). Reprinted with permission from the *American Journal of Physiology – Cell Physiology*.

CREATING STRONG NURSE LEADERS

As one of 20 nurses nationally accepted for a three-year Robert Wood Johnson Executive Nurse Fellowship, Dr. Janet Krejci hopes to improve Wisconsin health care by developing strong nurse leaders.

"The health care system is broken," says Krejci, associate professor of nursing. "We need strong nurse leaders to create a better future for vulnerable humans. Providers are trained to be fabulous clinicians, but they don't always get the leadership development needed to negotiate today's complex health care environment of advancing technologies, multiple providers and rapid movement of patients through the health care system."

The RWJ fellowship came on the heels of a fellowship with the American Council of Education, which Krejci used to research interdisciplinary teaching and scholarship and innovations in education delivery for health professionals.

"Sentinel events in health care often happen because of communication issues," says Krejci. "Presently we educate health professionals in silos — physicians in one, nurses in another, social workers in another, and then put them in health care settings and say 'OK, now talk to each other.' If these groups don't understand each other, patients suffer."

Krejci plans to incorporate her findings from the ACE fellowship into the RWJ project. She hopes to transform Marquette's health care systems leadership graduate program into a hybrid format (combining online with face-to-face education); collaborate with the Wisconsin Center for Nursing to build a statewide leadership academy; and increase access to leadership development and mentoring for nurses from rural areas and underrepresented groups.

SURVIVING KATRINA — AND THE MEDIA

What caused some Hurricane Katrina survivors to rebound and lead successful lives while others were left feeling powerless, voiceless and angry?

The answer could lie in how local media portrayed the survivors in their new environments, according to Dr. Sumana Chattopadhyay, assistant professor of broadcast and electronic communication.

Chattopadhyay started studying survivors of the 2005 disaster after reading about disparities between displaced hurricane survivors in Atlanta and Houston. The Atlanta group adapted quickly to its new surroundings while the new Houston residents suffered from joblessness and a sense of despair. In 2008, about 100,000 evacuees were still living in Houston, while another 80,000 lived in Atlanta.

Chattopadhyay, who researches how media shapes identity, combed through articles in the local media to determine how many portrayed the survivors as victims versus intruders. "Are the displaced people perceived as victims deserving of empathy and help?" Chattopadhyay asks. "Or are they perceived more as refugees now part of the community but who are not always welcomed with open arms?"

In the Houston media, Katrina survivors were depicted as victims just as often as they were portrayed as intruders. In Atlanta, survivors were portrayed as victims three times more often than as intruders. Chattopadhyay found that in Atlanta most of the intruder mentions came from government officials, while in Houston reporters used the intruder terminology most often. In addition, she found that while coverage of evacuees in Atlanta gradually decreased over time, coverage in Houston stayed consistently high from 2005 through 2007. One journalist Chattopadhyay interviewed confided that the media might have been "a little harsh."

The hurricane's impact continues — long after the Gulf waters have receded and the news cycle has moved its attention elsewhere — so Chattopadhyay continues her research on the long-term adjustments in Katrina survivor communities. Next, she hopes to study whether survivors believe they can influence the political process, which helps determine how engaged they are in their community and the political domain.

HOW LATINO YOUTH SUCCEED

Dr. Lisa Edwards is well aware of studies that paint grim portraits for inner-city adolescents.

She's driven to change that picture.

Edwards, an assistant professor of counseling and educational psychology, researches how Latino youth have overcome discrimination, poverty and pervasive low expectations. She found that the common attributes of the most successful youth included strong family bonds, valuing religion and possessing a bold, almost defiantly positive attitude.

"All we hear about is the negative," she says. "There are real concerns, but I'm also interested in finding out the factors and strengths that help people be successful."

She started spreading word of her interest, contacting a local middle school and offering to help families. Edwards helped to coordinate an event where mothers and sons discussed how they could rely on each other as the students faced the stress of entering high school.

"One need our families face is the transition from middle to high school," says Melodie Hessling, principal of Nativity Jesuit Middle School in Milwaukee. "When Lisa came to Nativity, I was impressed by how she linked her experience with the needs of our families."

This wasn't the only time Edwards has taken her research to where it really counts. Along with her graduate students, she presented at an event with two local groups of young women, Hermanas and Sistas, about how ethnic identity and other cultural strengths can help deal with discrimination and racism.

The daughter of a Colombian mother and European-American father, Edwards feels both professional and personal satisfaction in sharing her knowledge with others who can benefit. She believes that she's helping fulfill Marquette's social justice mission.

"I really try to focus on the positive cultural strengths and factors that help youth succeed," Edwards says. "I want to make sure the research gets out there and improves people's lives."

THIN BODIES, THIN WALLETS?

What's the connection between fat and finances? The question intrigued Dr. Olga Yakusheva, an assistant professor of economics who specializes in health and labor economics. After analyzing a national dataset of more than 10,000 American adults, she discovered a relationship between income and obesity that is the opposite for men and women. Her paper "Thin bodies, thin wallets?" is under review by the *Journal of Health Economics*.

"What we found was actually very interesting because it very much depends on the gender," Yakusheva explains. High-income men are more likely to be overweight or obese than low-income men, whereas low-income women are more likely to be overweight or obese than high-income women. "The trend is a lot more noticeable among women. That's where poor women are really, really overweight and rich women are really, really skinny," she says. That pattern held true for Caucasian and African-American women. The correlation between weight and income was least strong among Hispanic women.

Because low-income adults are generally at risk for negative health outcomes, Yakusheva was surprised by the difference between genders.

"For men, we're thinking it may be occupation," she says. "Men who have lower incomes tend to be in more physically demanding occupations, and higher-income men are more likely to be in white-collar jobs. They sit all day and then maybe have dinner with friends and pour a couple of drinks, and there's just not a lot of physical work that goes into their daily life."

For Caucasian women, body weight often stayed consistent from age 25 to 45 or older. One possible explanation could be the "stickiness" of poverty, Yakusheva says.

"It could be that women who are relatively better off also grew up in families that were better off, and that's why they may have come through childhood and adolescence healthier than women who grew up in poorer households," she says.

A second hypothesis involves a woman's choice of spouse. Thinner women might be more likely to marry financially successful men who then carry them into comfortable middle-age and retirement, Yakusheva says.

Her latest study examines the role of the environment in weight gain among college freshmen.

"When you come to campus as a freshman, for the most part you are placed with a random roommate in a random dormitory," she explains. "So I'm going to look at whether living with a more overweight person makes you more overweight or whether there are dramatic differences in how much weight kids gain between dormitories, and what is it that makes some dormitory environments more conducive to being fit or some more conducive to putting on weight."

MARQUETTE BOOKSHELF

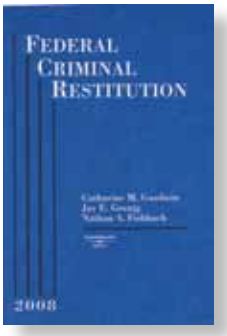
Looking for new reading material? Check out some of the latest works written and edited by Marquette University faculty.

Spain is (Still) Different: Tourism and Discourse in Spanish Identity

By Eugenia Afinoguénova, assistant professor of Spanish, and Jaume Marti-Olivella (Lexington Books, 2008)

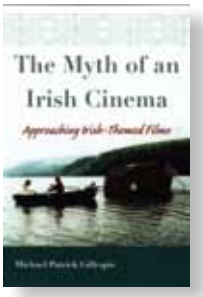
International Handbook of Urban Education

Edited by William Pink, professor of education, and George Noblit (Springer, 2008)



Federal Criminal Restitution

By Jay Grenig, professor of law, Nathan Fishbach and Catharine Goodwin (Thompson West, 2008)

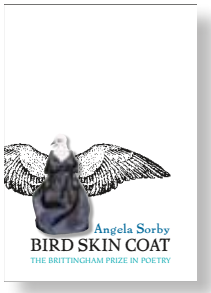


The Myth of an Irish Cinema

By Michael Patrick Gillespie, professor of English (Syracuse University Press, 2008)

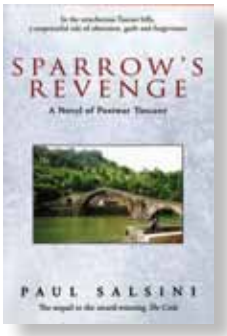
Human Fertility: Where Faith and Science Meet

Edited by Richard Fehring, professor of nursing, and Theresa Notare (Marquette University Press, 2008)



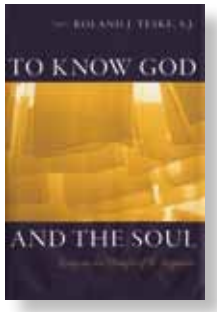
Bird Skin Coat (Winner of the Brittingham Prize in Poetry)

By Angela Sorby, associate professor of English (University of Wisconsin Press, 2009)



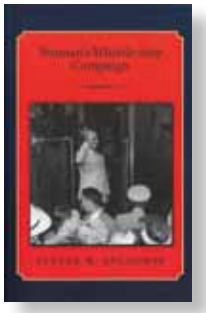
Sparrow's Revenge: A Novel of Postwar Tuscany

By Paul Salsini, adjunct professor of journalism (iUniverse, 2008)



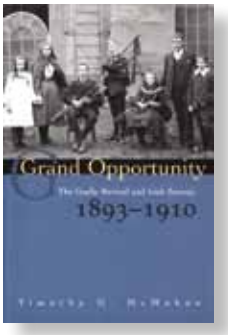
To Know God and the Soul: Essays on the Thought of St. Augustine

By Rev. Roland J. Teske, S.J. professor emeritus of philosophy (Catholic University of America Press, 2008)



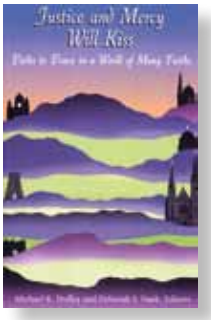
Truman's Whistle-stop Campaign

By Steven Goldzwig, professor of communication studies (Texas A&M University Press, 2008)



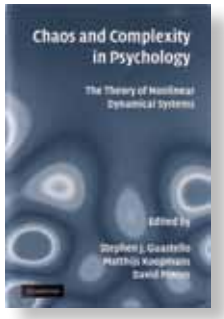
Grand Opportunity: The Gaelic Revival and Irish Society, 1893-1910

By Timothy McMahon, assistant professor of history (Syracuse University Press, 2008)



Justice and Mercy Will Kiss: The Vocation of Peacemaking in a World of Many Faiths

By Michael Duffey, associate professor of theology (Marquette University Press, 2008)



Chaos and Complexity in Psychology: The Theory of Nonlinear Dynamical Systems

Edited by Stephen J. Guastello, professor of psychology, Matthijs Koopmans and David Pincus (Cambridge University Press, 2008)

RESEARCH AND SCHOLARSHIP AT MARQUETTE

- More Marquette faculty applied for federal grants during fiscal year 2008, and externally funded research requests exceeded $28 million for the first time.
- Foundation research dollars nearly doubled from fiscal year 2007, and corporate research dollars also increased, with the largest award supporting work on renewable energy.
- Marquette faculty have formed strong partnerships with the Clinical and Translational Science Institute, Medical College of Wisconsin, University of Wisconsin system and others.
- Promentis Pharmaceuticals, a company launched by Marquette professors, recently licensed technology developed by Marquette and the University of Wisconsin-Milwaukee that could lead to a novel treatment for schizophrenia and other central nervous system conditions. It is the third example of commercial applications springing from Marquette research.
- The university supports research through several programs: three-year Way Klingler fellowships, fourth-year sabbaticals for junior faculty and the Lawrence G. Haggerty Faculty Award for Research Excellence.
- Marquette faculty edit a number of scholarly journals, from the *Journal of Orthopaedic and Sports Physical Therapy* to the *International Journal of Systematic Theology*.
- The Department of Special Collections and University Archives houses more than 17,000 cubic feet of archival material and 11,000 volumes, including approximately 7,000 titles within the rare book collection. The J.R.R. Tolkien Collection features many of the author's original manuscripts, including *The Hobbit* and *The Lord of the Rings*.
- Marquette has more than 20 academic centers and institutes that foster research in the areas of end-of-life care, ethics, neuroscience, rehabilitation engineering, transnational justice, water quality, sports law and other areas.

For more, go to *marquette.edu/research*.

Office of the Provost
O'Hara Hall
P.O. Box 1881
Milwaukee, WI 53201-1881

Pre-sorted
Non-profit Org.
U.S. Postage
PAID
Milwaukee, WI
Permit No. 628

MARQUETTE UNIVERSITY

Be The Difference.

POSTMASTER: Send address changes to Marquette University,
Office of Marketing and Communication, P.O. Box 1881,
Milwaukee, WI 53201-1881, USA.

MARQUETTE UNIVERSITY RESEARCH AND SCHOLARSHIP 2009

Discover