

2008

**Bulldog**

University of Minnesota-Duluth

**Bytes**

Department of Computer Science



## A Message From the Department Head

### Rich Maclin

Entering my fourth year as Department Head, I cannot believe how quickly the time has passed. We are currently experiencing a very busy and tumultuous time for our department and the university.

We are in the process of assembling our documentation for an accreditation visit next year by ABET, the organization that accredits engineering programs and more recently, computer science programs. We have been accredited since 1989 and hope for a fairly straightforward accreditation process this year. During accreditation, computer professionals and other academics who have been trained by ABET visit campus and review the contents of our program and its impacts on students, alumni and faculty

and then make recommendations about it. This process is very useful to us, as it gives us a chance to continue to grow with the needs of our constituents and with changes to the field. The visit will happen sometime next fall and we will hopefully tell you more about how things went in next year's newsletter.

Another issue for the university is the budget crisis being experienced by the state of Minnesota, a problem many of you are also likely confronting. At UMD, we are not facing drops in enrollment, as public universities seem to be attracting some students who might have gone to more expensive private universities, but we nevertheless are likely to have to significantly tighten our budgets because of cuts in the state budget. Right now, the university is trying to keep tuition increases reasonable, and in order to do this we will likely see some cuts in staff and/or teaching resources and our department may be hit by these cuts as well (we will know more as more details of the Minnesota budget are worked out). We will keep you informed of what is happening as best we can.

In other news, student enrollment in Computer Science and Computer Information Systems seems to be slowly rebounding as

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## Faculty Spotlight

### Carolyn Crouch

The last two decades have seen enormous changes in computing, information processing, and the delivery of computer science education. Being a computer science professor and researcher requires the ability to adapt to such changes, and since arriving at UMD in the fall of 1988 Computer Science professor and Director of Graduate Studies Carolyn Crouch has filled the bill.

Professor Crouch began her life in higher education with a Ph.D. from Southern Methodist University. Her research focused on information retrieval (IR) in computer science. From there, her affiliations have included the University of Florida, Cornell University, Tulane University, and for the last twenty years, UMD. While at Cornell, Carolyn considers herself lucky to have worked with Gerard Salton, the world's leading figure in IR.

Carolyn's own work in IR has involved automatic query expansion and thesaurus construction, using cluster hierarchies in hypertext retrieval, and improving the effectiveness of web queries. She has also been heavily involved in the Initiative for the Evaluation of XML Retrieval, a yearly competition providing the opportunity for researchers in academia and industry to evaluate their methods for various web-based retrieval tasks.

As IR has moved to the web over the last two decades, the focus has shifted from the retrieval of relevant documents to the retrieval of relevant elements (paragraphs, figures, or sections of a document). Carolyn and her graduate students have adapted to these changes through the approach of dynamic element retrieval, which allows them to build documents at execution time based on an initial retrieval of "relevant" elements. They have recently described their system in several first-rate journals and proceedings. Future plans include expanding their approach into passage retrieval (one of the holy grails of IR) and other aspects of web retrieval.

Carolyn and her graduate students can often be seen huddled together in the department conference room, discussing and planning their research. It is obvious that Carolyn cares deeply about graduate education, which is why she has served the department as its Director of Graduate Studies (DGS) for the last 12 years. As Carolyn notes, graduate education in computer science has changed radically in the U.S. while she has been at UMD. "In earlier years, most of our students were regional; many had undergraduate degrees in other disciplines," she says. "Almost all CS graduate programs today consist largely of international

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students realize there are still jobs in the field. We hope this trend continues and encourage anyone visiting to let us know when you will be around as we sometimes ask our alumni to speak to our students about their experiences in the field and the opportunities they see. Our faculty has also been very successful this year in attracting research funding with multiple internal grants and new

external grants from NSF and NIH being received. We will continue to strive to do cutting-edge research as part of our overall goal of excellence in teaching and research.

Please stay in touch with us and stop by and visit if you are in town.

**Faculty News****Professor Pedersen's Research Team Awarded NIH Grant**

Last year we spotlighted Professor Ted Pedersen upon his return from a highly productive sabbatical year. At the time of our newsletter publication, Professor Pedersen and his UMTC collaborators Serguei Pakhomov and Brian Isetts were seeking funding from the National Institute of Health (NIH) in support of their work in natural language processing.

Ted is happy to report that the research team on which he serves as co-Principal Investigator has been awarded \$935,000 over three years for a project entitled "Semantic Relatedness for Active Medication Safety and Outcomes Surveillance."



Ted's new NIH work is an application of his earlier research, supported by the National Science Foundation (NSF), on semantic similarity and concept relatedness measures. In that work, Ted created programs and methods for performing word sense disambiguation. It turns out that this research is ideally suited for medical domains, in which crucial information is "locked" in the unstructured text (i.e., natural language representations) of electronic records.

Under his new grant Ted's team is addressing the growing problem of adverse drug reactions (ADRs). The problem of ADRs is growing due to a variety of factors: society's increasing dependence on medications; pressure on the Food and Drug Administration (FDA) to approve new drugs more quickly; aggressive marketing of prescription medications to consumers by drug companies through "direct to consumer" advertising; and an (some would say unholy) alliance between the companies that produce drugs and the FDA in the form of sizable fees paid for testing and approval.

While ADRs may be caused by a single drug (causing unintended side effects), "It's increasingly likely that people will take combinations of drugs that have never really been tested in a clinical setting," says Ted. "As a result, there are, in effect, all sorts of uncontrolled clinical trials going on in the general public. This is a concern because the number of deaths due to ADRs is estimated to be at least 100,000 per year, which makes it the fourth leading

cause of death in the USA—more than AIDS, car accidents, and pneumonia."

Part of the solution to this problem may lie in the fact that there is a wealth of medical information "out there" that is not being utilized in the identification and prediction of ADRs, i.e., reports that are written in natural language and distributed among many different care providers. "Each time a person interacts with a doctor or hospital," says Ted, "There is a record of that mostly in the form of a clinical note or report that is written in free form English text."

In addition to a patient's doctor and hospital contacts, there is an emerging practice whereby a pharmacist assists a patient in tracking all of their medications and in monitoring any particular problems they might be having. As an example, "A patient might be taking medication for heart disease, diabetes, and depression, all prescribed by different providers, and the pharmacist assists in tracking all of that and meets with the patient to discuss these matters, and in the process of which they produce a written record," says Ted.

All of this written text constitutes potentially valuable information in the detection of ADRs.

The reason Ted's NSF research on word sense disambiguation is relevant to the ADR problem is that, like nearly all natural language representations, free form medical text, though precise, can use different wordings for a given concept, and its meaning can depend on context. As Ted remarks, "The same disease, treatment, or symptom might be described differently by different doctors or even by the same doctor on different days, making it very hard to automatically analyze clinical records and spot emerging trends."

So as a part of the NIH project Ted's team will have access to a combination of clinical and pharmaceutical records written in natural language, with which they will develop some new measures of semantic similarity between concepts as represented in the National Library of Medicine. For example, "shortness of breath" is probably more related (semantically) to "an obstruction in the air passage" or "asthma" than it is "cholesterol" or "tibia", and the similarity measures the team develops will allow them to assess that quantitatively. These measures will also let them recognize that terms like "shortness of breath" and "dyspnea" are synonyms. With such measures in hand, Ted's team will use them to develop methods to essentially mine different natural language reports looking for clues that might signal the presence of an adverse drug event in an individual patient or group of patients.

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## FACULTY SPOTLIGHT CONTINUED FROM PAGE 1

students. We are fortunate to attract a number of highly qualified students, both regional and international, who serve as teaching and research assistants in the department.”



While the UMD Computer Science department is not large by the standards of, say, the UMTC department, it nevertheless has a significant focus on graduate research. “We have the luxury, due to our size, of maintaining a very interactive, hands-on type of program, which allows us to work closely with our graduate students on interesting research projects,” Carolyn says. “This research orientation, which is now uncommon outside of Ph.D. programs, is highly beneficial to all concerned. It is especially helpful to those who go on for Ph.D.s and to those who aspire to leadership/management positions in industry.”

Being a DGS, apart from requiring a commitment to research, also demands management skills: assessing and hiring grad students (sight unseen) on the basis of a written application, constant monitoring of student progress, and procuring funding for summer research support. On top of that, the job requires both academic and emotional advising for many students who are a long way from home. “The human aspect runs the gamut,” Carolyn says. “Issues with stress, homesickness, financial problems, and mental and physical health are not uncommon.”

But there are rewards as well. The most enjoyable aspect of serving as DGS, in Carolyn’s view, “is watching our grad students go through graduation (many do not have formal ceremonies at their undergraduate institutions, so this is a first for them) and getting to meet parents, who have often traveled half way around the world to see their son or daughter graduate. The long term benefit of serving as DGS is observing the very different and successful careers and lives which evolve over the years.”

While a major focus of Carolyn’s work is the research she does with her graduate students, she enjoys teaching undergraduates.

Her favorite courses focus on topics related to systems (operating systems and systems software), text processing (information retrieval), and computer security. She believes that systems courses provide an essential “from the ground up” view of how things work behind the scenes. And the processing of text, with applications including compression, encryption, and information retrieval, is important, according to Carolyn, for obvious reasons—most information processed by machine is textual in nature.

Carolyn enjoys computer science in part because the direction it moves is often unpredictable. As an example, she offers the evolution of IR as a discipline. “Early in my career my husband and I were two of about eight people who met to formulate plans for an annual conference in Information Retrieval. Those plans resulted in what is now the annual international ACM-SIGIR (special interest group on IR) conference, held alternately in the U.S. and abroad, attracting hundreds of attendees each year.”

Since that time, Carolyn and her husband Donald (also of the UMD Computer Science department) have traveled all over the U.S. and Europe attending ACM-SIGIR conferences. “We’ve crossed the Irish Sea on a ferry while the British were searching it for fugitive IRA members, had dinner in Amsterdam during the student uprisings when the nearby roofs were covered by police sharpshooters, visited all of Ludwig’s castles, and heard and met most of the pioneers in the computing field.”

One conference, held in Copenhagen, stands out in particular. “After a delightful dinner, we broke into smaller groups and began strolling through a park near the restaurant,” says Carolyn. “My husband, having forgotten something, told me to go on with the group and he would catch up with us shortly. For the next several hours, as we wandered through the park along intertwined paths, I was told by innumerable people that my husband was looking for me. I finally gave up on finding him, and as the park closed at midnight, made my way back to our hotel a few blocks away. I normally would not have felt very secure walking through a strange city at midnight, but the streets were full of cars honking their horns and people singing and shouting. As it turned out, that was the night that Denmark won the European football (i.e., soccer) championship, and the Danes were out celebrating in full force. My husband, realizing the futility of our meeting at the ark, had much earlier given up the hunt and retired to the comfort of the hotel.”

Lucky for us, Carolyn also eventually made her way back to UMD.

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In Ted’s usual spirit of open access and community software collaboration, the measures his team develops will be made available as a free software package much like his existing WordNet-Similarity package.

### Professor Willemsen’s Research Team Awarded NSF Grant

Pete Willemsen’s office in Heller Hall is located directly across the hall from his Virtual Environments Laboratory, which he established upon his arrival at UMD in 2005. On any day he can be seen beating a path from door to door or talking with students

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### FACULTY NEWS CONTINUED FROM PAGE 3

in the hall as they plan and build virtual environments that are natural and realistic. We are happy to report that the busy activity will continue due to a National Science Foundation CBET Program Award secured by Pete and his collaborator Eric Pardyjak of the University of Utah.

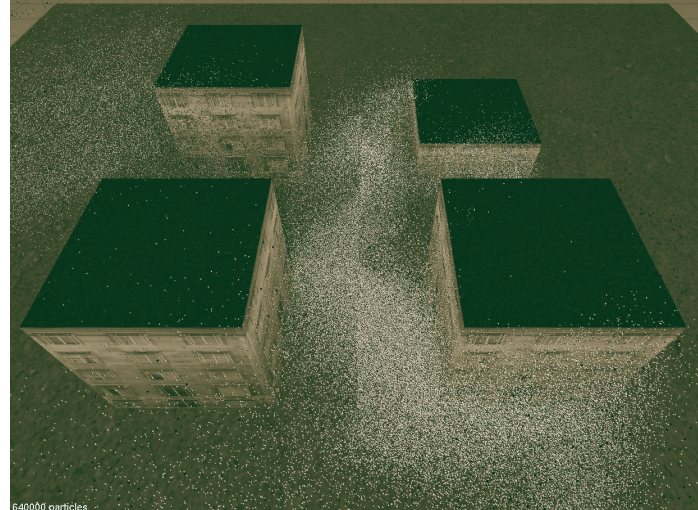


The collaborative research project is called “Optimization of Urban Designs for Air Quality and Energy Efficiency” and is worth \$341,468 over three years. It is an extension of Pete’s work on the simulation of large-scale particle dispersion in urban environments. Over the past three decades, urban planners have attempted to make cities more sustainable by reducing sprawl and espousing higher density urban design concepts. However, as urban density increases, the ability for

pollutants to be transported out of the urban area is inhibited by certain types of urban form, i.e. building size and placement.

Pete’s group is using virtual environments to determine whether urban structures and layouts exist that can minimize energy use

while also minimizing air pollution exposure. Their approach is to develop an extremely fast and inexpensive energy use and dispersion modeling tool for urban areas that builds on Pete’s previous work exploiting the unique computational parallelism afforded by graphics processing units (GPUs). Pete’s group uses GPUs, which are regularly utilized in the video game industry, to run many simulations in an effort to train an optimization algorithm for determining optimal designs for urban structures and their layout.



**Pete’s Urban Particle Simulation**

## Alumni Spotlight

### Jeff Sharkey

In 2008, Google Corporation announced the Android Developer Challenge, a contest designed to promote Android, Google’s open standard and associated software supporting mobile devices such as cell phones. A total of \$10 million was committed to award the best and most imaginative applications built using Android.

Nearly 1800 developers rose to the challenge and submitted applications. After the first round, 50 teams of developers were awarded \$25,000 each and the chance to move to the final round of judging, in which ten \$275,000 prizes and ten \$100,000 prizes were awarded in September.

We are proud to report that 2006 UMD graduate and Computer Science Department alumnus Jeff Sharkey won a \$275,000 prize for his Compare Everywhere application ([http://code.google.com/android/adc\\_gallery/app.html?id=8](http://code.google.com/android/adc_gallery/app.html?id=8)), which uses a cell phone’s camera to scan product barcodes and compare prices, display product reviews, find store locations, and get driving directions using Google Maps.

A native of Esko, Minnesota, Jeff was home-schooled and began taking courses at UMD when he was 15. In the fall of 2001 he started taking computer science courses and he quickly established himself as a very good programmer. In his spare time he managed the Computer Science Department web site, a responsibility that earned him the Computer Science Department’s Outstanding Service Award when he graduated in 2006.



Besides managing the department web site, Jeff found time to perform independent research, and in 2004 he undertook a successful Undergraduate Research Opportunities Program (UROP) project in which he built a framework for peer-to-peer file sharing applications. Written in Java, this project provided experience that would serve him well for the Android Developer Challenge, which also required Java.

In 2005, presaging his talent for winning software competitions, Jeff was an integral member of the UMD programming team that won the Collegiate Computing Competition sponsored by Digi-Key Corporation. This team beat sixteen others from eight universities in Minnesota and North Dakota. As far as programming competitions go, Jeff works equally well on a team or on

his own. It is noteworthy that out of the top ten winners of the Android Developer Challenge, Jeff was one of three programmers who competed as a team of one.

Jeff credits UMD with laying the foundation for some of his current success. "I'm really grateful for the exposure to the open-source world that UMD's CS program provided," he says. "During my years at UMD, I really identified with the philosophy of open-source hackers, and it's one of the many reasons I'm excited to be working on Android, which is itself open-source."

After graduation, Jeff entered a master's program in computer science at Montana State University where he researched intelligent, radio-based rural transportation networks and graduated in two years. Just this past December Jeff began his first full-time job, working for—who else?—Google.

We are extremely proud of Jeff and look forward to following his successful career.

(Photo courtesy of Kelly Gorham/MSU News Service)]

## Undergraduate Program News

The department conferred 24 undergraduate degrees during the 2007-2008 academic year. Students receiving degrees in Computer Science or Computer Information Systems:

<b>Christopher Anderson</b>	<b>Eric Mislivec</b>
<b>Brandon Bennett</b>	<b>Michael Neilsen</b>
<b>Travis Dahlke</b>	<b>Mark Nelson</b>
<b>Michael Grazier</b>	<b>David O'Keefe</b>
<b>JohnRoss Hammond</b>	<b>Christopher Perner</b>
<b>Evan Harris</b>	<b>Michael Rabas</b>
<b>Jeremey Hartley</b>	<b>Arifur Sumon Rahman</b>
<b>Mark Johnson</b>	<b>Christopher Saxton</b>
<b>Alex Jokela</b>	<b>Christopher Schadl</b>
<b>Eric Korolewski</b>	<b>Maria Sinn</b>
<b>Ed Marty</b>	<b>Adam Stolle</b>
<b>Aaron Miller</b>	<b>Jonathan Wentz</b>

In May, 2008, we held our annual pizza party and awards program. This newsletter would not be complete without a photo of students eating pizza.



After consuming approximately 25 boxes of pizza, our annual departmental awards were presented:

Outstanding Academic Achievement: **David O'Keefe**

Outstanding Senior: **Ed Marty**

Outstanding Service: **Eric Mislivec**

Here are Ed, Eric, and David with their awards:



You may remember the Labor Day weekend campus move-in period called Bulldog Bash. In 2008 "Bash" was replaced with "Welcome Week", and for the first time the UMD Computer Science Department hosted a freshman welcome program during the week before the Labor Day weekend. Our program was well attended with fresh faces as shown here.



Our student ACM club was quite active in 2008, creating a new web site, hosting LAN parties and picnics, taking part in programming contests, and traveling to UMTC for a presentation.



**ACM Club LAN party in May**



**ACM clubbers and ITSS staffers preparing for Richard Stallman talk in October**



**ACM club picnickers pose after playing Ultimate Frisbee in the rain in September**



**Adam Mika, Mike Jacobson, Kevin Stagman, and Kevin Higgins at DigiKey Competition in October**

### **Neilsen Earns Honorable Mention in Mainframe Contest**

Last year we reported on undergraduate **Mike Neilsen's** internship experience at the U of M Supercomputing Institute. Upon completion of his internship, Mike, a computer science and mathematics double major, decided to enter IBM's 2007 "Master the Mainframe" contest, an event that spans three months.

While mainframe computing may appear to take a back seat to today's ubiquitous networks of distributed servers and workstations, mainframes are growing in popularity: 100% of the world's top banks and 71% of Fortune 500 companies are IBM System z clients. Thus there is a need for a new generation of mainframe experts, which IBM publicizes with the IBM Academic Initiative and Master the Mainframe contest. Under Professor Tim Colburn's sponsorship, Mike completed the 2007 contest, but the results were not available to report in last year's newsletter.

For that contest, 1,750 students registered from across the United States and Canada. The contest was divided into 3 parts, which got progressively more difficult. Over 800 students, including Mike, successfully completed the Part 1 challenges to win Master the Mainframe T-shirts. For Part 2, Mike was one of the first sixty students to blaze through the challenges 100% correctly, winning a \$100 pre-paid debit card for his performance. For the difficult and time-consuming Part 3 challenges, Mike did not quite crack the top 5 list, but we are proud to report that he was one of only 15 students to earn honorable mention.

Not only did Mike do extremely well in the competition, but he also served as a watchdog on the contest organizers. "I spotted an off-by-one error in one of the sample programs they gave as part of the contest instructions, and was congratulated on that," Mike said. "This was a great experience!"

While Mike graduated with his bachelor's degree in May, we are lucky that he decided to stay on and pursue his master's degree in the UMD Computer Science Department as a 3M Science and Technology Fellow (see later article).

## Graduate Program News

The Graduate Program in Computer Science had a very successful year in 2008. With one exception, the members of the class of 2008 completed all degree requirements by the end of the summer and moved on to positions in industry. Some have remained in the region (i.e., Minnesota and Wisconsin) while others have relocated to other areas of the country. The West Coast continues to attract a number of our new graduates, with California, Oregon, and Washington high on the list. Employers of 2008 graduates include Microsoft, Intel, Oracle, ESRI, Eaton Corp., and Thomson Reuters.

Students receiving master's degrees in CS in May 2008:

<b>Salil Bapat</b>	<b>Aneerudh Naik</b>
<b>Premchand Bellamkonda</b>	<b>Ankur Nepalia</b>
<b>Prafulla Bhalekar</b>	<b>Andrew Norgren</b>
<b>Anagha Dharasurkar</b>	<b>Shruti Pandey</b>
<b>Anurag Jain</b>	<b>Darshan Paranjape</b>
<b>Sarika Mehta</b>	<b>Vishnu Pedireddi</b>

Outstanding Teaching Assistant Awards: **Shruti Pandey** and **Aneerudh Naik**

The Computer Science Graduate Program is very pleased to announce the Graduate School's authorization of a 2008-09 University of Minnesota 3M Science and Technology Fellowship for an outstanding incoming graduate student in computer science. This is the second time the Graduate School has authorized the offering of a 3M Fellowship by a UMD graduate program. The award includes two years of support. The recipient of the 2008-09 3M Fellowship is Mike Neilsen, who received a bachelor's degree in CS from UMD in Spring, 2008.

## Noteworthy Graduate Alumni Transitions

**Dr. Saif Mohammad** (MS 2003) successfully defended his PhD dissertation at the University of Toronto in January. His dissertation topic was "Measuring Semantic Distance using Distributional Profiles of Concepts" under advisor Graeme Hirst. Saif now holds a post-doctoral position at the University of Maryland-College Park, working with Bonnie Dorr on machine translation.

**Bridget Thomson-McInnes** (BS 2002, MS 2004) is a PhD student in the Twin Cities, and her dissertation research is on word sense disambiguation in the biomedical domain. She was accepted into the National Library of Medicine's Research Participation Program, spending part of 2008 there. The National Library of Medicine is part of the National Institute of Health in Washington, DC.

## In Memoriam

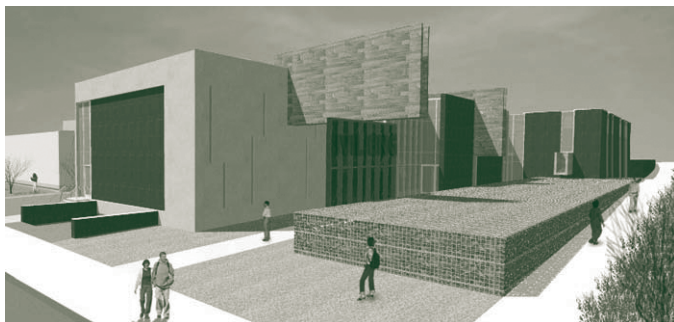
We are sad to report the death on May 6, 2008, of **Neeraj Vohra**, a 2007 graduate of our Master's program. During his first semester at UMD in the fall of 2004, Neeraj was diagnosed with a virulent form of leukemia. He subsequently underwent chemotherapy, a bone marrow transplant, and when that failed, another transplant procedure. He served as a Teaching Assistant in the department, where his courage, strength, determination and unflinching courtesy and good humor won him the affection, admiration and respect of students, staff, and faculty alike. We send our deepest sympathies to his wife, Stephanie, his parents, and brother.



## Campus News

### Civil Engineering Building Construction Underway

Groundbreaking ceremonies were held in July for the \$15 million Civil Engineering building to be constructed on the northeast corner of the campus just off St. Marie Street. The state-of-the-art teaching/training center is designed to house the new Bachelor of Science degree program in Civil Engineering which began admitting its first freshman students in fall 2008. The structure will be the 6th new building to be constructed on the UMD campus since 2000. Here is the architect's sketch of the completed building:



The 34,000 gross square foot, two-story building will adjoin Voss Kovach Hall (home of the Mechanical Engineering and Industrial Engineering programs) and will house sophisticated, specialized teaching and research laboratories as well as classrooms and administrative offices. Of the six total laboratories, two will be very large--reaching two-stories high with full glass walls providing "Engineering on Display" from hallways as well as the outside. These "large labs" will showcase to viewers what civil engineers actually do and will provide a whole new look to the North East end of the campus.



Set for completion in time for September 2010 fall classes, the building is designed to be a LEED certified "green building". LEED stands for Leadership in Energy and

Environmental Design, a rating system established by the U.S. Green Building Council. LEED certification is a rigorous process that evaluates the environmental sustainability of building design, construction and operation.

### Labovitz SBE Building Dedicated

UMD held grand opening ceremonies in September for the stunning, new \$23 million Labovitz School of Business and Economics Building. The school is named for Duluth natives Sharon and Joel Labovitz who made a gift of \$4.5 million for the new building.



Located on the northwest corner of the UMD campus, the dramatic three-story structure in-

cludes state-of-the-art facilities to provide business education in a knowledge-based global economy. The 65,000 gross square foot building contains the latest in advanced technology with modern computer labs, facilities for distance learning and conferencing, and multipurpose classrooms. The remarkable Financial Markets Lab, located just inside the front entrance, provides students with

hands-on learning and participation in the financial markets. The Labovitz SBE Building also was awarded LEED certification.

### UMD Football Team Wins National Championship

UMD's 2008 football team completed a "season for the ages" by holding off Northwest Missouri State University 21-14 in the NCAA division II championship on December 13 in Florence, Ala. With the historic victory, UMD finishes the year a perfect



15-0—one of only three NCAA II schools to ever reach that mark. It was UMD's first NCAA II championship in any sport. Before the season began, Malosky Sta-

dium underwent a facelift. The local news corps was particularly pleased with the heated press box, shown here. Solar panels have been added to the roof since this image was made.