Ke y a rea s o f U W M r e s e a r c h a n d p a r t n e r s h i p s p o w e r i n g t h e n e W e c o n oMy:

A D V A N C E D A U T O M A T I O N
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F R E S H W A T E R S C I E N C E

O n t h e C o v e r:
Harvey Bootsma (L), associate scientist at UWM’s Great Lakes WATER Institute, and Qian Liao, assistant professor of civil engineering and mechanics, are working together to study nutrient cycles in Lake Michigan. This interdisciplinary faculty partnership is one example of the many collaborations UWM is fostering community-wide – some with Fortune 500 companies – launching new ventures to boost the region’s economy.
During these challenging economic times, the role of research universities in building a foundation for economic development has never been more important.

At the University of Wisconsin–Milwaukee, we have a long history of working in partnerships across the academic research spectrum. In established areas like advanced automation and health care, and emerging fields such as freshwater sciences, we seek new knowledge that will improve the quality of our lives and the health of our economy.

And we are making great progress in helping to fund the important work of our faculty. Through UWM’s Catalyst Grants, foundations and corporations are investing in promising research in engineering and the sciences. These grants have enormous potential to improve the local economy through the commercialization of our research activities. Our Research Growth Initiative is a competitive university program that invests millions of dollars in faculty research projects judged to be of exceptional quality. And, with the support of Wisconsin Gov. Jim Doyle and the Wisconsin State Legislature, the hiring of new faculty in key research clusters is under way, with dozens of new engineers, scientists and other researchers scheduled to be at work in our laboratories later this year.

All of these developments are vital to regenerating economic prosperity in our region.

Our success is dependent upon the amazing work done by our faculty and staff, and the many organizations with which we partner.

Carlos E. Santiago
Chancellor
University of Wisconsin–Milwaukee
Pu t s t e e l u n d e r a Po w e r f u l m i c r o s c o Pe, r e v e a l i n g i t s  
mi c r o s t r u c t u r e, a n d Pr ePa r e t o b e s u Pr i s e d. Kn o w n f o r i t s  
st r e n g t h, t h e m e t a l w i l l aP Pe a r Pi t t e d a n d P o cKe d.  

“It is intrinsic to the material,” says Carolyn Aita, a Wisconsin  
Distinguished Professor at UWM. “A pit can begin to develop from a  
physiochemical defect in the steel itself.”

The pitting is cause for concern for companies like Rockwell Automation,  
a global industrial controls supplier headquartered in Milwaukee.  
Rockwell’s materials engineers are interested in protecting the metal  
parts the company manufactures – like enclosures that house electronics,  
for example – from conditions that cause corrosion.

But the research of Aita, who has an international reputation in the field  
of thin films for advanced materials, can help.  
In her state-of-the-art lab at the College of Engineering and Applied  
Science, she has developed a host of coatings that heal shallow pits and  
fractures on almost any material – from metal to glass to silicon – and they  
are designed to protect the material from an equally wide range of adverse  
conditions, even salt spray and boiling oil!
Aita’s research has been continuously supported by industry – a requirement of the Wisconsin Distinguished Professorship – since the program was launched by the UW System in 1988. That year she became the first faculty member in the UWM College of Engineering and Applied Science to hold the professorship.

In her current work, which is funded by Rockwell Automation through a Catalyst Grant from the UWM Research Foundation, Aita and her graduate students are creating new coatings that can adjust to corrosive conditions in an industrial setting.

In addition to natural imperfections, materials like stainless steel are susceptible to high humidity, temperature and industrial contaminants, says Christopher Genthe, a materials project engineer in Rockwell’s Chemistry & Materials Engineering group who also is one of Aita’s graduate students.

The “smart” nanolaminate coatings Aita’s lab is developing are applied to the metal surface in ultra-thin layers, and together they adjust in response to a wide range of adverse conditions.

Achieving the right characteristics for these protective coatings depends on choosing the right combination of elements and manipulating them to act in a precise way.

For the Rockwell project, the team in Aita’s Advanced Coatings Experimental Laboratory (AceLab) uses hafnia, zirconia and alumina. The tiny crystals in the layers transform to surround and contain the defect.

It’s the arrangements of the molecules in the tiny crystals embedded in a layer that ultimately determine film characteristics, says Aita.

“We understand how to make the tiny crystalline building blocks,” she says.

She and Genthe are investigating the coating named in the funding, but they have since developed a second coating used for the same purpose.

“The results of Professor Aita’s research will not only have a large impact on extending the life of Rockwell’s products in industrial environments, but also the local economy, which still includes many manufacturing-related industries,” says Sujeet Chand, Rockwell’s chief technical officer and senior vice president for advanced technology.

“Working together brings ideas for cost savings and improved products.”

Aita’s lab group was the first to demonstrate the advantages of using nanolaminate architectures in ceramic films. Today, there is intense R&D in this area worldwide.

The work has applications in a wide range of industries, including manufacturing, optical products and biomedical devices, an area in which Aita holds two patents.
**LAUNCHING A GENETIC REVOLUTION**

UWM is one of four institutions involved in a project that is predicted to launch the next revolution in health care. The Wisconsin Genome Initiative’s ultimate aim is to stop illness before it begins by searching a patient’s DNA to uncover individual health risks.

**TRACKING DATA IN REAL TIME**

Wisconsin Distinguished and Tata Consultancy Services Professor Hemant Jain is working on the Real Time Enterprises Research Program. By attaching intelligent cyber-devices (connected through the Internet) to physical objects, many types of enterprises can suddenly have “situational awareness.” Rockwell Automation, a leader in industrial automation products, software and services, has partnered with Jain to track manufacturing data throughout the enterprise.

**USING TINY BIOSENSOERS TO ‘RECOGNIZE’ DISEASE**

Blood carries oxygen, life-giving nutrients and crucial information – biomolecules such as proteins and DNA that hold details of our medical past, and molecules that are markers of various diseases.

Many diagnostic tools are available to extract this information from blood, but they are usually expensive, tedious and time-consuming.

David Klemer, UWM associate professor of electrical engineering who also is a physician, believes he has found a better way.

Klemer is developing a novel, low-cost biosensor for detection of disease that holds the potential for high sensitivity and specificity. Now he and researchers at BloodCenter of Wisconsin are joining forces to test the device.

His unique fabrication method, similar to those used by the semiconductor industry to make computer chips, can produce an inexpensive device capable of rapid diagnosis from a patient’s “molecular signature” in a single drop of blood.

One way the device works is by taking advantage of a “lock and key” mechanism similar to that used by the body’s immune system, Klemer says. Antibodies are proteins in blood that the immune system uses to identify and destroy invaders that cause disease. They do the job by finding and binding to a molecule called an antigen that is associated with a specific disease-causing pathogen.

With Klemer’s sensor a biomolecule, such as an antibody protein, can be attached to the surface and used to “recognized” the corresponding marker for a particular disease in the patient’s blood.

A change in the electrical properties of the sensor is the sign that a match has been made.

But the device could potentially find other evidence of health threats – molecular markers for the presence of cancer, antibodies that indicate exposure to an infectious disease, or fragments of DNA that indicate the presence of a genetic abnormality.

Funded by a Bradley Catalyst Grant from the UWM Research Foundation, the work may help advance the field of “personalized medicine,” using information in a person’s genes to predict disease before it begins and customize treatment for an individual’s health concerns.

Klemer and Brad Pietz, director of the Product Development Laboratory at BloodCenter’s clinical diagnostic laboratory, hope to use the sensor to detect a marker of a platelet disease called Neonatal Alloimmune Thrombocytopenia (NATP).
BloodCenter is a world leader in research on and testing of this disease, an incompatibility between the platelets of a pregnant woman and her fetus that can result in serious complications, including fetal intracranial hemorrhage and fetal death. NATP can occur during a woman’s first pregnancy.

But detecting the potential for NATP is a costly and involved process, says Pietz.

The primary molecular determinant for this disease was discovered about 20 years ago by BloodCenter scientists. Since then, researchers have discovered the DNA sequences coding for about 20 additional antigens that can cause NATP.

“If we had a quick and inexpensive test for the predominant NATP-causing antigen, all first-time mothers could be screened for their predisposition to the disease,” he says.

If successful with NATP, the scientists will test the device for the detection of other molecular markers.

“Contributions from researchers who have expertise across a wide range of disciplines make this innovative research possible,” says Jacquelyn Fredrick, president and CEO of BloodCenter of Wisconsin. “It’s one of the advantages of pairing the resources at UWM with other research talent in Southeastern Wisconsin.”
Responding to rapidly changing technology and the marketplace are the goals of two “niche” graduate programs developed by UWM’s College of Engineering and Applied Science (CEAS), with input from two high-tech companies.

One, created with GE Healthcare Ltd., offers GE Edison Engineers (a select group of GE employees) a jump-start on a graduate degree. CEAS coordinates and sets the curriculum for the first three courses needed for the degree, while GE professionals teach the courses at their offices.

Employees then complete the master’s degree in engineering on campus. There are currently a dozen GE Edison Engineers enrolled in UWM’s graduate programs through this cooperative agreement.

CEAS has just created two new interdisciplinary graduate programs in energy engineering and is talking with Johnson Controls Inc., about becoming involved by providing instructors or sponsoring student fellows.

The interdisciplinary graduate degree and certificate program are currently open to engineering students, but the long-term plan is to collaborate with other schools on campus to expand the program.

The companies also may offer graduate co-ops and internships to UWM graduate students in these fields.

“It’s a great opportunity for them not only to train their own people, but also to screen talent and hire UWM students who are already familiar with their companies,” says CEAS Dean Michael Lovell.

These programs illustrate Lovell’s commitment to creating closer ties with Milwaukee business as he reinvigorates the college to help grow the local economy.

Educational partnerships like these are important to meet the needs of industry, but also the needs of all engineers, says Bill Berezowitz, vice president and general manager of imaging sub-systems for GE Healthcare.

“The half-life of an engineer is short,” says Berezowitz. “Much of what you learn in college becomes obsolete several years later. So it’s really about lifelong learning.”
**SPARKING KIDS’ INTEREST IN SCIENCE AND TECHNOLOGY**

The U.S. is lagging behind other countries in the number of college students graduating in the vital STEM fields (Science, Technology, Engineering and Mathematics), posing a potential threat to the economy.

“The Milwaukee area is not just competing with Chicago and the Twin Cities, we’re competing with Beijing, Shanghai and the Indian subcontinent,” says Colin Scanes, UWM vice chancellor for research and development.

A key to improving science literacy and increasing the number of scientists in the U.S. is good teaching.

“Students’ interest in science either peaks or is formed based on experiences with science, technology and mathematics during their formative years in elementary school,” says Tracy Posnanski.

Posnanski and Craig Berg, both associate professors of curriculum and instruction in UWM’s School of Education, are leading a partnership between UWM and Milwaukee Public Schools (MPS) to increase elementary teachers’ science knowledge and improve science-teaching techniques.

The Wisconsin Department of Public Instruction is funding BEST (Better Elementary Science Teaching), which will involve 60 MPS teachers. “I’m very excited about this project,” says Antonio Rodriguez, MPS science curriculum specialist and member of a team that also includes UWM science faculty and faculty specializing in English language learning and exceptional education. “A strong science curriculum in elementary school is a building block for future learning.”

UWM has a number of other collaborative projects designed to improve science teaching. Posnanski is working with UWM Geosciences Professor William Kean and two retired MPS literacy specialists on a project to integrate science with language arts in elementary classrooms.

Berg works with a group of seven MPS schools on the Science and Mathematics Engineering project, designed to help junior and senior high students develop interest and expertise in those subjects.

The School of Education’s MACSTEP (Milwaukee Area Collaborative Science and Mathematics Teacher Education Program) involves close collaboration among UWM science and education faculty, and experienced MPS teachers. Berg says: “If we do not develop highly qualified teachers during the certification program and build the foundations of exemplary teaching, it is only a catch-up game thereafter, so the MACSTEP program strives to prepare high-quality teachers who are on track to becoming the very best.”

**PARTNER:**

Tracy Posnanski (L) and Craig Berg (R), associate professors of curriculum and instruction, and Antonio Rodriguez, MPS science curriculum specialist
SCANNING THE SKIES FOR GRAVITATIONAL WAVES

The work of astrophysicists at UWM is figuring prominently in the international search for gravitational waves, powered by specialized observatories called LIGO. The federally funded search has produced several UWM faculty members, who completed their graduate training at lead LIGO research universities Caltech and MIT.

BUILDING THE FUTURE IN 800 SQUARE FEET

A team of UWM architecture and engineering students was chosen from an international field to compete in the Solar Decathlon 2009, sponsored by the U.S. Department of Energy. The team is designing an 800-square-foot house powered entirely by solar energy. The UWM house will be constructed on the National Mall in Washington, D.C., for judging.

SOLVING WATER POLLUTION MYSTERIES WITH SCIENCE

IT ALL BEGAN WITH A SIMPLE QUESTION: “WHERE IS THE BACTERIA THAT IS CLOSING MILWAUKEE BEACHES COMING FROM?”

The search for answers spawned an eight-year investigation for scientists at UWM’s Great Lakes WATER Institute, in partnership with the Milwaukee Metropolitan Sewerage District (MMSD), a search that looked into multiple aspects of lake and river pollution.

“Many people assumed that sewage overflows were the only source of bacteria that closed beaches,” says MMSD Executive Director Kevin Shafer. “We had years of anecdotal observations to the contrary, but we decided that a thorough scientific analysis was needed to address solutions to the problem.”

So the district offered grant funding to Sandra McLellan, an associate scientist at the WATER Institute, to determine the culprit.

Using a DNA-based method she developed, McLellan found that the bacterial contamination in shallow waters near the beaches and in surrounding rivers was not from sewage.

Instead, it was primarily from gull droppings and storm water runoff, which flows off pavement, washing substances like gasoline, animal waste and fertilizers into the waters.

“The techniques we developed to answer these questions since 2000, we can apply to all sources of pollution now,” says McLellan. “We refined those techniques as we used them.”

In 2004, after finding the source of the beach closings, McLellan worked jointly with an engineering firm, CDM (Camp Dresser & McKee Inc.), to develop a model for MMSD to accurately predict where bacteria released into Lake Michigan would travel in the event of a sewage overflow.

It proved to be perfect timing. In May 2004, during heavy rains, the City of Chicago complained to the Environmental Protection Agency (EPA) that Milwaukee’s sewage overflows were the cause of the Windy City’s own fouled beaches.

“But the completed model showed exactly where the bacteria from sewer overflows was going,” says Shafer.

Looking for reliable data on the question, EPA contacted the WATER Institute, and McLellan’s extensive fieldwork proved Milwaukee’s overflows were not reaching Chicago.

That year, the results were published in a peer-reviewed scientific journal. The modeling is an important tool for other large cities that are situated near freshwater, says Shafer. Being able to predict the fate of contaminants.
in waterways is useful in managing urban storm water runoff and determining cost-effective measures for freshwater protection.

Using the same DNA-based methods that were developed to investigate beaches, MMSD also was able to locate problems in the storm water system that allowed sewage to seep in and contaminate rivers.

Since its work with McLellan began, MMSD has commissioned studies with other WATER Institute scientists on issues such as the threat of pharmaceuticals in lake water and the effects of the alga Cladophora that washes up on the beaches.

To protect Milwaukee’s most vital resource and help reinvent the city as a hub of freshwater technology, UWM hopes to build on the research at the WATER Institute by launching a graduate school of Freshwater Sciences – the first of its kind in the country. Approval for the new graduate school is currently under consideration by the state legislature.

Commissioning the study was one of the most important decisions MMSD made in the last eight years, Shafer says.

“The neat thing for me is to see how the public discussion is changing because of the research,” he says. “It’s helping people understand that we need to address all sources of water pollution, using science to determine where we can get the biggest return on clean-water investments.”
Most of the water on Earth — 97 percent — is salty, while clean, fresh surface water is a vanishing commodity worldwide. These conditions call for new ways of removing salt and contaminants from water, making it safe for human use.

Novel treatment and purification processes, both in high demand globally, are some of the technologies that Procorp Enterprises develops. One of the company’s newest innovations is a method of softening water that eliminates the use of chloride salts completely.

“Water solutions are not something we should wait for someone else to develop,” says Eric Fessler, chief operating officer of Procorp Enterprises. “Milwaukee was built on ‘wet’ industries, and we should take a leading role in making those water-dependent industries sustainable.”

Procorp’s softening method extracts calcium, along with other minerals
that cause hard water, producing limestone pellets as a byproduct. “This method softens the water without producing wastewater,” says Fessler. “It also eliminates 2 million pounds of chloride in water for every 1 million gallons softened with conventional processes.”

Now the company is working on refining the technique so that radioactive radium can be removed from well water as part of the softening process. Radium is a naturally occurring radioactive isotope that can be harmful in high quantities.

Testing the technology in the western suburb of Waukesha, where radium in well water has been a problem, Procorp erected a 25-foot-tall reactor as a pilot unit that eliminates radium along with calcium and other minerals. The limestone pellets resulting from this process inherently contain traces of radium — at levels similar to those naturally occurring in rocks and within acceptable standards for amounts found in landscaping stone.

The advantage of Procorp’s technology is that radium levels can be controlled precisely so the pellets can be used safely.

To find a sustainable purpose for them, Procorp’s research and development team is working with Konstantin Sobolev, a UWM associate professor of civil engineering and mechanics, who believes the pellets can be used as a replacement for sand in concrete.

In small quantities, the pellets also can be milled with Portland cement without affecting its quality. Replacing some volume of the cement, the carbon dioxide-emitting “glue” that holds the concrete mixture together, will produce a “greener” concrete.

In addition to environmental advantages, Sobolev says, the pellets promise to improve the flow, strength and durability of the concrete itself.

“Our idea is to test the performance of these byproduct pellets in concrete,” he says. “These are very strong and perfectly spherical granules.”

Sobolev, who specializes in developing high-performance cement and concrete from waste materials, is also investigating the effectiveness of such byproducts in adding flexibility to concrete.

“We have the technology to make concrete last much longer,” he says. “Why not do it, rather than incur the cost of doing repairs more often?”

So far, tests at Procorp’s reactor site have been successful. The company hopes its new process will be the answer to supplying cleaner and safer water to households in Waukesha County and other affected communities across the country.
“In an ever-changing global economy, Southeastern Wisconsin needs strong research programs to spark the innovations that build upon our regional strengths. The partnerships forged between UW–Milwaukee and the business community are a key part of this ecosystem – benefiting all of us, inside and outside the lab.”

Daniel J. Bader
President
Helen Bader Foundation
“Research partnerships are a catalyst for solving complex medical problems, bringing hope and cures to people around the world. Together, we’re also building a powerhouse of innovative, expert talent for future development.”

Jacquelyn Fredrick
President and CEO
BloodCenter of Wisconsin

“Research and innovation have an intrinsic value in furthering human knowledge, but when their byproduct improves the quality of life for individuals and drives the economic health of the community, the benefit of the work becomes more tangible and vital to all of us.”

Michael W. Grebe
President and CEO
Lynde and Harry Bradley Foundation
Winds over Lake Michigan are stronger on average than they are over land. In fact, the lake is one of the windiest spots in the nation, and perhaps a good place to locate wind turbines as a source of clean, renewable energy.

“There has been talk for many years about capturing wind energy offshore,” says Carl Siegrist, senior renewable energy strategist for We Energies. “But before anyone would even consider investing in wind development on the lake, there are still many unanswered questions.”

UWM meteorologist Paul Roebber believes supplying the right weather data can address some of those questions.

With support from We Energies, the state’s largest utility, he is collecting measurements that will help determine, for example, how much more wind energy could be generated on the lake compared to on land. The measuring equipment is installed on the Coast Guard platform in the Racine Reef, south of Milwaukee.
Currently, most wind measurements are collected near the shore or on buoys, which are fairly close to the surface of the water, says Siegrist. “There isn’t much wind condition data on the lake. Paul’s study might help quantify this,” he says.

In a second part of the study, Roebber will investigate how forecasting can better predict energy-harvesting probability.

Wind, like all weather, is highly variable, he says. “Weather forecasting will always have a certain margin of error. But adding the element of wind is another uncertainty in the system.”

Roebber’s job will be to create a predictive model that will mitigate wind forecast errors.

The information will give utilities and developers a head start in preparing for wind die-downs by substituting another form of energy during those times.

“We already have a good idea of the electrical demand,” says Siegrist. “Knowing what the wind will do a day ahead or several hours ahead would be valuable to us as we balance the sources of energy available.”

Although wind is the fastest-growing renewable energy source in Wisconsin – and the world – much more power must come from wind and other renewable sources in the next five to 20 years to meet new state and federal regulations.

Currently, state law requires that 10 percent of the state’s electricity be generated from nonpolluting, renewable sources of power by 2015. Gov. Jim Doyle’s Task Force on Energy Efficiency and Renewables recommends that 25 percent of the state’s electricity come from renewable sources by 2025.

“Our priority is to comply with the state’s renewable energy standards,” Siegrist says. “It likely will be years before we have the information we need to decide on offshore wind turbines, but this is a good first step.”

Already, We Energies is operating two wind parks in Wisconsin in Fond du Lac County, and is proposing another one for development in Columbia County.

One particularly appealing aspect of Roebber’s project, he adds, is that the resulting data will be available to anyone who may want to build on it in the future.

“We rely on weather forecasting to let us know when wind will be a threat,” he says, “such as when a storm will blow down power lines. But looking at wind as an asset is a relatively new concept for us.”
Improving Workplace Safety

The U.S. Occupational Safety and Health Administration (OSHA) has renewed its partnership with the UWM Center for Ergonomics. Under the leadership of Phyllis King, professor of occupational therapy, and Arun Garg, professor of industrial and manufacturing engineering, the center pursues the priorities of the OSHA Alliance: preventing workplace injuries through ergonomics research.

Supporting Family Caregivers

Rhonda Montgomery, Helen Bader Endowed Chair in Applied Gerontology, has designed a program with partner agencies nationwide that helps care managers design individualized plans for family caregivers. TCARE (Tailored Caregiver Assessment and Referral) protocol guides caregivers to support services that help ease their workload and reduce stress.

Treating Alcoholism with Better Drugs

“Every person reacts differently to a drug,” says James Cook, UWM Distinguished Professor of Chemistry. “We want to give physicians new, improved and safer options for treatment.”

But Cook, who synthesizes novel chemical compounds that are the foundation for new drug development, can only get those pharmaceutical options into the hands of doctors through the marketplace.

And that is what Frank Langley and his business partners at the Wauwatosa, Wis., biopharma firm MPP Group LLC intend to do.

Earlier this year, MPP Group licensed the patent from the UWM Research Foundation on a series of Cook’s compounds that may be useful in the treatment of alcohol addiction. MPP Group and its partners hope to produce an FDA-approved therapeutic agent for the treatment of alcohol addiction, which affects about 17 million Americans.

These compounds appear to interact with certain neurotransmitters in the brain to block the euphoric effects of alcohol without inducing anxiety or sedation, says Cook, who is funded by a Catalyst Grant supported by the Bradley Foundation and administered by the Research Foundation.

“There are a number of drugs on the market to treat alcoholism,” says Langley, MPP Group’s president and chief executive officer. “But none of them has the added potential advantage of also treating the anxiety patients feel during abstinence.”

The group of licensed compounds also may help treat other addictive behaviors and disorders.

This is not the first time Cook’s compounds have been licensed by a pharmaceutical company for drug discovery. But it does represent a perfect match.

Many of the compounds he develops target diseases and disorders of the central nervous system. MPP Group, only a year and a half old, already has other compounds in its portfolio, including a drug currently in preclinical toxicology studies for another central nervous system disorder.

Langley wants to build on that portfolio.

Among the hundreds of chemical compounds that have been synthesized in Cook’s lab, the alcohol addiction group caught Langley’s eye because of its potential benefit to society. But there were other factors, too.

“There were several of Dr. Cook’s compounds we were interested in, but the compounds we licensed had some history behind them,” says Langley. “They are the new generation of a line of research Cook’s lab had previously done for quite a while.”

Because of that, Cook also has well-established collaborators that MPP Group can immediately get involved with, Langley adds.
“Those kinds of quality relationships take a while to identify and nurture, and do not happen overnight,” he says.

In his 30-year entrepreneurial career, Langley has started, managed and sold several life science companies in Milwaukee and Minnesota. “I’ve been a cheerleader for UWM for a long time now,” he says. “One reason is that I see the tremendous potential that UWM has for helping to transform the economy in Southeastern Wisconsin.”

Because it is driven by research, high-tech manufacturing is important to that transformation, and UWM can be a valuable contributor.

For example, Langley says, he was president and CEO of a Brown Deer, Wis., biotech firm called Pel-Freez Clinical Systems, which designed, manufactured and marketed blood and molecular biology products for human organ transplants. The company grew to employ more than 70 people, most of whom held advanced technical degrees. The company was ultimately purchased by a Norwegian biotechnology company that closed down its other U.S. operations and consolidated in Brown Deer.

High-tech manufacturing requires hiring highly trained, compensated and creative people. These companies also need and attract high-tech suppliers, which add to the economic domino effect from these kinds of businesses.

“There are a number of value-added steps between a compound coming through the front door,” Langley says, “and a drug going out the back, and ultimately to patients.”
“My mission as a researcher is to help give voice to a group that is seldom heard in American society,” says David J. Pate Jr., assistant professor of social work in UWM’s Helen Bader School of Social Welfare.

Pate’s research involves face-to-face interviews with groups of black men who have incomes of “negative” to $12,000 a year. For Pate, the key to connecting with these individuals is partnerships with organizations such as the Milwaukee Fatherhood Collaborative (MFC) and neighborhood sites, including New Concept Self Development Center Inc. and Milwaukee County Parks’ Dr. Martin Luther King Jr. Community Center.

Working with Pate are Albert Holmes, former president and co-founder of MFC, and Charles Richardson, current president of MFC and a parent educator at Vincent Family Resource Center. Pate says Holmes and Richardson have been invaluable in helping him connect with men in the community who are willing to sit down and talk about their lives.

Pate meets with focus groups of five to 12 men at various sites in Milwaukee’s central city on Saturdays. These groups discuss myriad issues
– access to health care, incarceration, unemployment, hunger, custody and child support, and the larger questions of what it means to be a man, and the perception of race in Milwaukee.

According to Holmes, it means a lot to Pate’s focus group members that someone is actually asking them about their issues. “These are men who are trying to stay in touch with their children,” Holmes says. “When they can’t support their families financially, that creates a great sense of urgency. They want to be part of finding a solution.”

Six men from Pate’s focus groups have been interviewed and videotaped by UWM students during the past year. Pate taught the students how to interview and collect oral histories. Portia Cobb, UWM associate professor of film, trained the student interviewers in basic camera work for taping the interviews and is assisting with post-production editing.

“We have 22 hours of film,” says Pate. “The men describe what it’s like to grow up poor, black and male in Milwaukee.” There will be a major screening of the interviews in spring 2009, sponsored by the Milwaukee County Board of Supervisors Task Force on Workforce Reform for Men and Milwaukee County Parks.

Pate’s initial research was funded through a grant from the Center for the Study of Cultural Diversity in Healthcare at the UW–Madison School of Medicine and Public Health. The research has twice earned a Community/University Partnership Grant from UWM’s Cultures and Communities Program. Pate also has received support from the UWM Foundation. For 2008-09, Pate is one of three faculty members to receive the first annual Scholarship of Engagement Faculty Research Fellowships awarded by UWM’s Institute for Service Learning.

Studies over the past five years by the UWM Center for Economic Development document how joblessness among working-age African-American males has grown in Milwaukee since the 1970s. Once an opportunity-filled urban labor market, by 2000 Milwaukee registered as home to one of the highest rates of black male joblessness and largest racial disparities in jobless rates.

An October 2008 research update reports that in 2007, 51.1 percent of metro Milwaukee’s working-age African-American males were out of work: either unemployed, or, for various reasons (including incarceration), not in the labor force. This is the highest jobless rate among working-age black males ever recorded in Milwaukee.

“The men we interviewed put a human face to the statistics,” says Pate. “As researchers, we are tapping their knowledge of what it’s really like to be in their position.”
INVESTIGATING INFORMATION RESOURCES IN AFRICA

UWM School of Information Studies faculty member Dick Kawooya leads a team of researchers from eight African countries investigating the links among copyright law, education and economic development in Africa. Canada’s International Development Research Centre and South Africa’s Shuttleworth Foundation provide $1.5 million in support.

ADVOCATING FOR THE GREAT LAKES

U.S. Sen. Herb Kohl has requested $300,000 in federal funds to help UWM establish a high-tech business accelerator close to its WATER Institute, one of the largest aquatic research centers on the Great Lakes. It will boost a city that already is home to more than 100 water-related industries.

TRANSFORMING PATIENT CARE

UWM’s College of Nursing is one of three partners transforming patient care through a unique, pioneering project that combines technology and nursing knowledge.

The College of Nursing, health technology giant Cerner Corporation and Aurora Health Care have been working together since 2005 to build a nursing “knowledge repository” and translate that information into a user-friendly, computerized information system nurses use in making decisions about patient care.

“There is nothing like this in the world,” says Norma Lang, director of the project. Lang is Wisconsin Distinguished Professor and Aurora Distinguished Professor of Healthcare Quality and Informatics at UWM.

“What we’re doing is bringing together the university, a premier health care system and an international health information technology company to synthesize the best knowledge and get it to the nurse right at the point of care.”

The effort is called the ACW project for key initials of the three partners.

“We have taken nursing research that says how best to care for a patient and moved it into the electronic medical record using technology,” says Ellen Harper, an executive with Cerner Corporation. “The system provides a combination of decision support, documentation, assessment questions and surveillance – all of which are embedded into the nursing workflow so nurses can deliver the highest-quality care.”

As the project continues, “we’ll be building on the information we gain from the experiences of staff nurses and patients at Aurora St. Luke’s Medical Center,” says Sally Lundeen, dean of UWM’s College of Nursing and co-principal investigator on the project.

This fall, the three partners agreed to a multi-million-dollar contract extension to continue ACW’s development and roll it out to additional clinics and, potentially, to the entire Aurora St. Luke’s Medical Center and the Aurora Health Care system.

Currently, two nursing units at Aurora St. Luke’s Medical Center are testing the system on five aspects of nursing care – including prevention of patient falls.

When a patient is admitted, nurses conduct a bedside assessment using the ACW content. That assessment, incorporated on a computer screen, helps guide care. For example, if patients use a cane or walk with
an uneven gait, they are at higher risk for falls. If they have brittle bones or use blood thinners, they run the risk of serious injury or excessive bleeding as a result of falls. The nurses can then refer to the software for evidence-based practices, or protocols, that help prevent falls, including teaching patients how to prevent falls in the hospital and at home.

Staff nurses already using the system give it rave reviews.

“Working with the UWM and Cerner partners has been a tremendous experience,” says Susan Ela, executive vice president of Aurora Health Care and president of Aurora’s Metro Region. “The excitement, pride and professionalism of the staff nurses who are implementing the project is so rewarding. Consistent with the Magnet designation, they are truly transforming the delivery of care at Aurora.” Magnet designation, granted by the American Nurses Credentialing Center, is the nation’s highest honor for nursing excellence.
China has 21 percent of the world’s population but only 7 percent of the world’s freshwater. Officials from UWM and Beijing Normal University recently signed an agreement with UWM to explore opportunities for joint research and education programs in freshwater science and public health.

UWM nursing faculty members work with colleagues from Marquette University and Children’s Hospital of Wisconsin. The Consortium for Pediatric Nursing Research funds and mentors nurse researchers working to improve the health of children and to support families of chronically ill or hospitalized children.

Knowledge-based businesses need accurate, immediate access to information that may be stored in mountains of data.

That’s why Milwaukee’s GE Healthcare turned to UWM’s School of Information Studies (SOIS) to help improve management of the vast stores of information that are vital to the company’s continued success. GE Healthcare is a major Milwaukee-area employer and an international player in biosciences and medical devices.

“The health-care industry and design of medical products is extremely complicated,” says Robert Senzig, GE Healthcare chief engineer for computer tomography. “There’s a tremendous amount of information to digest, understand and synthesize for each project. The easier it is to access that information, the better it is for us.”

Rhonda Garriott, a GE Healthcare information technology project manager, who was working toward her master’s degree in information studies at UWM, was instrumental in bringing the partners together, says Senzig. Garriott realized what she was learning in class about managing and retrieving information could benefit her employer.

In the spring of 2007, UWM faculty members Xiangming (Simon) Mu, Wooseob Jeong and Jacques du Plessis, all assistant professors of information studies, began working with Garriott, Senzig and Michael Barber, GE Healthcare’s chief technology officer, to assess the company’s knowledge-management and data-modeling systems and make recommendations for improvements.

The team, which also included SOIS students and interns, found a number of key issues.

For example, the metadata, or “data about data,” used to identify, describe and locate information resources often weren’t specific enough.

“Their system was fast,” says Jeong, “but if you’re searching for a word like “CT Tube” or “MRI,” and a search quickly retrieves a million documents in no particular order and with no ranking of relevance, that’s not very helpful.”

In addition, locating a specific document was challenging if the user didn’t have a critical identification number randomly assigned to each document. “It is similar to having a dry-cleaning tag with a number,” says Mu. “If you lose the tag, you need other ways to search for the garments – by name or date or phone number.”
The SOIS students are also helping GE Healthcare create a summary of each paper document with a physical location to link to the online system.

“If very few people know where these documents are and they’re retiring, the company can lose knowledge,” says Mu. “This way, the knowledge is integrated into the system.”

The SOIS team is developing a proposal to work with GE Healthcare on the second phase of the project – carrying out the recommendations. “This is an opportunity for us, because we are doing a presentation to real clients in a real company,” says Mu.

“I think it also helps our students understand that information studies is not just limited to the traditional library domain,” he adds. “The knowledge accumulated by an enterprise like GE Healthcare is most valuable to the company. As companies move from file cabinets to online, managing information and knowledge plays a vital part in maintaining a competitive edge.”

**PARTNER:**

Rhonda Garriott (L), GE Healthcare information technology project manager; Simon Mu and Wooseob Jeong, assistant professors of information studies; and Robert Senzig, GE Healthcare chief engineer for computer tomography

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something great in mind 23
Innovation is built on diverse and creative teams.

Resource constraints are forcing innovative companies to be even more creative in how they approach the development of new ideas and future products. Strategic partnerships among government agencies, private corporations and the area’s public research university are one way new ideas can have the maximum impact on our region’s economy.

At UWM, ideas and solutions resulting from targeted research are staples of what we do, and the effort is powered by our students, who will be the work force of tomorrow.

UWM research is enhancing established and emerging regional clusters in advanced automation, biomedical engineering, health care and freshwater science, and has enjoyed enormous economic support from regional partners – as the stories in this publication illustrate.

Some of the area’s largest and most influential companies and community organizations already have collaborative research ties with UWM faculty – relationships that are key to maintaining the global competitiveness of Wisconsin companies.

We are committed to expanding these links.

UWM’s Office of Research and Economic Development/Graduate School is responsible for growing the university’s research enterprise and thereby facilitating economic development in Southeastern Wisconsin. Pivotal to our strategy is developing close working relationships and strategic partnerships with regional companies and communities.

The UWM Research Foundation fosters corporate partnerships, attracts funding for promising research, creates spin-off companies and manages UWM’s intellectual property. Since its formation, the Research Foundation has secured close to $2 million in grants provided by area businesses and foundations.

The Research Foundation also has guided a dozen faculty researchers in producing more than 25 issued or applied-for patents and two licenses. These are the seeds of the state’s next successful licenses and startup companies.

Do you have something great in mind? We look forward to hearing from you. Together, we can power the future of Southeastern Wisconsin.

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The University of Wisconsin–Milwaukee makes its home along the shoreline of Lake Michigan, just a few miles north of the economic and industrial center of Wisconsin. Almost 30,000 students, 155 degree programs and a world-class faculty drive UWM’s progress as a top research university and engine of economic development for Southeastern Wisconsin and beyond.