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WAYNE STATE  
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DIVISION OF RESEARCH

# New Science

Volume 19

# 2011





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Letter from the Vice President for Research

# Transforming lives through research



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At Wayne State University, we are proud of the remarkable research of our faculty and their drive to enrich the lives of others. Their pioneering ideas provide the foundation for developing the knowledge workers of tomorrow and strengthening our community.

Research and creativity are key to our nation's economic and cultural transformation. Universities are the force through which life-changing discoveries are made and introduced successfully into the marketplace. For the United States to maintain a position of world leadership, new knowledge and technology must be continuous and substantial; research universities like Wayne State, are vital sources of these innovations and help keep the region and the nation competitive.

Wayne State is very engaged in the revitalization of the city of Detroit, the state of Michigan and beyond. WSU is now, more than ever, the epicenter of a transformation to create a new economy, and central to these efforts is our excellent research and the research-based education we provide. The creation of new technologies that will improve health, support the education of our children and improve our work is the core of an innovative campus, and Wayne State is committed to supporting the efforts of our faculty as they create the future.

Even in difficult economic times and shrinking support for research, Wayne State has increased its research funding over the last five years. We

continue to strengthen our communication efforts and research infrastructure, which ultimately improves our environment for enabling our researchers to contribute significantly to the excellence of our diverse institution and region. Through their exceptional work, Wayne State University continues its long commitment to engagement in the City of Detroit and beyond. Our future is bound by our commitment to community – this is who we are, and who we will always be.

I am pleased to share with you some of the exciting work that is happening at Wayne State University. I wish there were enough space to showcase all of our stories, but only a few of our successes can be highlighted in this issue of *New Science*. The stories presented span many areas, including the scholarship of the arts and humanities. The faculty in these fields bring different and valuable perspectives, talents and expertise that are significant in their own right and complement those of other disciplines to contribute to our excellence in research.

To learn more about the research achievements of our faculty and students, I invite you to visit [www.research.wayne.edu](http://www.research.wayne.edu).

I hope you enjoy this issue of *New Science*!

A handwritten signature in black ink that reads "Hilary H. Ratner".

Hilary Ratner, Ph.D.



# TECHTOWN

# Taking the complications out of pregnancy

Groundbreaking discoveries by the Perinatology Research Branch leading to healthier pregnancies and lives

The Perinatology Research Branch of the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health, located at Wayne State University and Hutzel Hospital, is leading studies on complications of pregnancy. The research team led by Roberto Romero, M.D., chief of the Perinatology Research Branch (PRB), has made seminal discoveries in the disorders responsible for premature birth, birth defects and infant mortality in the United States.

Preterm birth affects 12% of pregnancies and costs \$26 billion annually in the United States alone. Moreover, premature babies are at increased risk for short- and long-term complications such as cerebral palsy and developmental disorders. The causes of preterm birth have been a mystery, and the standard treatments aimed at stopping uterine contractions in women with premature labor have not been successful. Romero proposed that preterm labor was not simply “labor before its time,” but the result of pathologic insults that trigger the onset of labor.

The work of the PRB and WSU has identified that one of every three preterm babies is born to a mother who has a “silent” infection in the amniotic cavity. Bacteria in the amniotic fluid induce an inflammatory response that leads to the onset of premature labor. Sometimes, the bacteria in the amniotic fluid infects the fetus and can cause multiple complications such as neonatal sepsis, and the inflammatory response of the fetus may predispose to brain injury and cerebral palsy. Physicians and scientists working with Romero have

developed rapid tests for the diagnosis of infection and those patients who may benefit from early antibiotic treatment.

Preterm birth occurs more frequently when the mothers have relatives who had delivered a premature baby; also, women who were born premature themselves are at higher risk of delivering a premature baby. This suggests that genetic factors may alter the risk for preterm delivery. Romero’s team has recently identified specific DNA variants in mothers and fetuses that increase the risk of premature labor/delivery. Of interest is that many of the DNA variants that predispose to prematurity were located in genes that control the inflammatory response in mother and baby. This research recently received an award from the March of Dimes for the “Best Research in Prematurity.”

This research at the PRB provides support for the introduction of personalized medicine during pregnancy. Such personalized medicine would be unique in that it must take into account the genetic makeup of the mother and the fetus - until now, personalized medicine focused solely on one patient.

Recently, the PRB identified another major cause of preterm labor in which the mother’s immune system rejects the placenta and membranes. The placenta is considered equivalent to a transplanted organ because 50% of its genetic makeup belongs to the father. Normal pregnancy requires tolerance of this transplanted organ, however, if rejection occurs, there is a malfunction of the placenta and membranes which may lead to premature labor and delivery. Romero and his team have discovered a

molecular signature for rejection in amniotic fluid and are now working on methods to treat such rejection.

The latest groundbreaking clinical study led by the PRB of a new method for preventing premature birth in millions of women each year, was published in the medical journal *Ultrasound in Obstetrics & Gynecology*. The study, “Vaginal progesterone reduces the rate of preterm birth in women with a sonographic short cervix: a multicenter, randomized, double-blind, placebo-controlled trial,” showed that the rate of early preterm delivery in women (<33 weeks) can be reduced by 45 percent simply by treating pregnant women who have a short cervix with a low-cost gel of natural progesterone during the second trimester of pregnancy until term.

“The study offers hope to women, families and children,” said Romero. “Worldwide, more than 12 million premature babies – 500,000 of them in this country – are born each year, and the results are often tragic. Our clinical study clearly shows that it is possible to identify women at risk and reduce the rate of preterm delivery by nearly half, simply by treating women who have a short cervix with a natural hormone - progesterone.”

Romero, principal investigator of the study, and Sonia S. Hassan, M.D., professor of obstetrics and gynecology in WSU’s School of Medicine, director of the WSU/PRB/DMC Maternal-Fetal Medicine Fellowship Program and lead author of the study, also pointed out that numerous studies (many by the PRB) over the past decade have shown that ultrasound of the uterine cervix can identify





## Taking the complications out of pregnancy *continued*

pregnant women who are at high risk for preterm delivery. The ultrasound examination is simple to perform, painless and can be performed between the 19<sup>th</sup> and 24<sup>th</sup> weeks of pregnancy. Pregnant women with a short cervix (<20mm) are at very high risk for preterm delivery.

Romero added that once a mother at high risk for preterm delivery has been identified, she can be offered treatment with progesterone. Of major interest is that progesterone reduced the risk of preterm delivery not only at <33 weeks, but also at <28 weeks (one of the secondary endpoints of the study). It also reduced the rate of respiratory distress syndrome, the most common complication of premature babies.

"We believe that the data in our study speaks for itself – and we predict that it will have major implications for obstetrics."

"The findings of the study are especially good news for expectant mothers in Detroit," said Hassan. "Preterm delivery has long been a major health care problem in the city."

In 2008, more than 17 percent of births in Detroit were preterm – and they accounted for more than 70 percent of the infant mortality recorded in that year, according to the latest research from the Michigan Chapter of the March of Dimes.

The city's high infant mortality rate, preterm delivery rate and ethnic disparity in birth outcomes were important considerations in the NIH's decision to establish the PRB in Detroit nine years ago. The presence of the PRB in Detroit allows women to obtain state-of-the-art medical care and join medical

studies to improve prenatal diagnosis, monitor fetal growth, predict preeclampsia and prevent preterm birth.

The progesterone study was conducted at 44 centers worldwide during the past three years. The study included patients from the United States, South America, Europe, Asia and Africa, and screened more than 32,000 women for a short cervix.

Describing the startling results, which showed that the rate of preterm birth among the women with a short cervix had been reduced by 45 percent, Hassan noted, "The main implication for clinical practice is that universal screening of women with ultrasound examination in the midtrimester to identify patients at risk (based on a short cervix) can now be coupled with an intervention – the administration of vaginal progesterone gel – to reduce the frequency of preterm birth and improve neonatal outcome. This can be accomplished conveniently."

"We're obviously very gratified by these results," said Hassan. "Based on the findings of our clinical trial, we expect that obstetricians and clinicians will begin to consider providing expectant mothers with ultrasound screening for cervical length, and to make progesterone therapy available to those who present with a short cervix."

Our group has been working on this approach to reducing infant mortality for much of the past decade, and it's very exciting to see that the effort is paying off, and that mothers and infants will soon be able to benefit from it."

These findings are an example of research that is quickly translated into improved clinical care outcomes. The pioneering contributions of the PRB will be shared around the world to benefit pregnant women and unborn children so that they can lead healthier and happier lives.



### **About Dr. Roberto Romero:**

*Dr. Romero received his undergraduate degree from San Vicente de Paul and his medical degree, magna cum laude, from the University del Zulia, both in Maracaibo, in Venezuela. He has been*

*chief of the Perinatology Research Branch of the National Institute of Child Health and Human Development of the National Institutes of Health since 1992.*



### **About Dr. Sonia Hassan:**

*Dr. Hassan received a B.A. in psychology and communications with distinction from the University of Michigan, and an M.D. from Wayne State University. She joined Wayne State University in 2001 and has been*

*with the Perinatology Research Branch since 2006.*

**To learn more about the Perinatology Research Branch, visit:**

<http://www.med.wayne.edu/prb>





# Older pregnant women and binge drinking:

Increasing the risk of Fetal Alcohol Spectrum Disorder

Identifying maternal characteristics that increase the risk of Fetal Alcohol Spectrum Disorders (FASD) is a critical step toward creating targeted pregnancy intervention. A Wayne State University researcher discovered that one such characteristic is maternal age.

Lisa M. Chiodo, Ph.D., assistant professor in the College of Nursing, has found that children born to older mothers who binge drink during pregnancy are not as attentive as children whose mothers were younger when exposing them to alcohol prenatally. The longitudinal research study was published in the October 2010 edition of *Alcoholism: Clinical and Experimental Research*.

Attention problems are understood to be among the more common FASD in children, which can affect physical, mental and behavioral development.

Nearly 40,000 babies are born with FASD each year, and statistics show that women 34 or older are 37 percent more likely to report drinking while pregnant than their younger counterparts.

Chiodo and her colleagues examined 462 children born to inner city African-American women who were recruited from a university antenatal clinic. At the age of 7, each child was administered the Conners' Continuous Performance Test (CPT) to measure his or her inattention and impulsivity. In addition, their teacher's completed the Achenbach Teacher Report Form to assess attention problems in the classroom.

Overall, the results indicated that children whose mothers were 30 years of age or older when they were born had poorer attention scores than children born to younger mothers when exposed

prenatally to higher levels of alcohol. The CPT in particular revealed that children born to older drinking mothers had the most difficulty sustaining attention during the test and made more mistakes compared to children born to younger drinking mothers.

"It is very important that women are warned that with increasing maternal age, fetuses may be more severely affected by alcohol exposure, even when the mother's alcohol intake during pregnancy has not increased from previous pregnancies, and even older children from prior pregnancies appear to be unaffected," said Chiodo.

Moreover, Chiodo and her colleagues believe that understanding the influence of maternal age on the relation between prenatal alcohol and neurobehavioral outcome might assist in the development of focused primary care interventions for older drinking mothers.

"Our findings may justify targeting older drinking mothers for particular attention in primary care settings because their fetuses are at greater risk than those of younger drinking mothers for alcohol-related deficits in attention," said Chiodo. "Health care professionals need to be aware that increased maternal age among their pregnant patients increases the susceptibility of the fetus to effects of alcohol. Physicians need to be able to appropriately tailor their interventions to patients during standard clinical visits about the relative risks of maternal drinking to fetuses when mothers are older."

Chiodo's collaborating partners from Wayne State University include Virginia Delaney-Black, M.D., professor of pediatrics, who is the principal

investigator on this National Institute of Drug Abuse-funded project. Other collaborators were John H. Hannigan, Ph.D., deputy director of the Merrill Palmer Skillman Institute for Child and Family Development; Robert J. Sokol, M.D., director of the C.S. Mott Center for Human Growth and Development, and distinguished professor of obstetrics and gynecology; James Janisse, Ph.D., assistant professor of family medicine and public health sciences; Mark Greenwald, Ph.D., associate professor of psychiatry; and Joel Ager, Ph.D., retired professor of family medicine and public health sciences. Chandice Covington, Ph.D., interim dean at the Anita Thigpen Perry School of Nursing at Texas Tech University Health Sciences Center also is a partner.



#### About Dr. Lisa Chiodo:

Dr. Lisa Chiodo received her B.S. in psychology from the University of Michigan - Ann Arbor, and her M.S. and Ph.D. in development psychology from Wayne State University. She joined Wayne State University's College of Nursing in 2009.

For more information, visit:

<http://www.nursing.wayne.edu/faculty/profile.php?id=81774>



# When Harry and Sally met Dick and Jane

Going out with other couples may be good for relationships

Romantic relationships often start out as enjoyable or even exciting, but sometimes may become routine and boring. A Wayne State University study reveals that dating couples that integrate other couples into their social lives are more likely to have happy and satisfying romantic relationships.

Richard B. Slatcher, Ph.D., assistant professor of psychology in WSU's College of Liberal Arts and Sciences, specializes in social and health psychology. His recent research suggests that spending quality time with other couples may be an important way to improve long-term dating relationships.

His study, "When Harry and Sally met Dick and Jane: Experimentally creating closeness between couples," which appeared in *Personal Relationships*, investigated 60 dating couples in a controlled laboratory setting. The object was to better understand how friendships between couples are formed, and to learn how these friendships affected each couple's romantic relationship.

Each couple was paired with another couple and given a set of questions to discuss as a group. Half of the groups were given high-disclosure questions intended to spark intense discussion, while the other half were given small-talk questions that focused on everyday, unemotional activities.

"In this study, we discovered that those couples who were placed in the "fast friends" group felt closer to the couples they interacted with, and were more likely actually to meet up with them again during the following month," said Slatcher. "We also learned that these same couples felt that this

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"In this study, we discovered that those couples who were placed in the "fast friends" group felt closer to the couples they interacted with, and were more likely actually to meet up with them again during the following month."

— Dr. Richard Slatcher

friendship put a spark in their own relationships, and they felt much closer to their romantic partners."

The couples in the high-disclosure group reported greater increases in positive feelings after the intense interaction. They also felt the interaction was more novel and that they learned new things about their romantic partner compared to couples in the small-talk group. In addition, one-third of the couples in the high-disclosure group contacted the other couple they met in the study, while none of the couples in the small-talk group initiated contact with the couple they had met.

"This study suggests that if your romantic relationship has a case of the doldrums, having fun with another couple may help make your own relationship more satisfying," said Slatcher.

To review the full study, visit:

[http://www.richslatcher.com/papers/Slatcher\\_PR\\_2010.pdf](http://www.richslatcher.com/papers/Slatcher_PR_2010.pdf)



#### About Dr. Richard Slatcher:

Dr. Slatcher received a B.S. in business administration from University of Richmond, a Ph.D. in social and personality psychology from University of Texas at Austin and did a postdoctoral fellowship in health psychology at UCLA. He joined Wayne State University in 2009.

To learn more, visit:

<http://richslatcher.com>





Illustration by Tim Porter

# Personalizing medicine

**D**NA is the essence of biological diversity. But it's responsible for more than just the basics like eye color, hair texture or height. At a less visible level, DNA also varies our bodies' reactions to our environment. It's also the foundation of personalized medicine, a developing medical model that takes our genetic differences into account. This new approach may reshape the future of diagnostics.

But to get there, environmental effects on DNA need to be understood. That's where Douglas Ruden, Ph.D., associate professor and director of epigenomics at WSU's Institute of Environmental Health Sciences, comes in.

As part of his extensive research on lead exposure's genetic effects, Ruden is searching for genetic signatures of lead sensitivity to refine prevention and treatment of lead poisoning, which according to the City of Detroit has affected 58 percent of Detroit Public Schools' students.

Genomes are complex blueprints of our biological identities that comprise the complete sequence of our genes. Genes are stretches of DNA, and DNA is composed of billions of chemical bases named either A, T, G or C. But each person's four-letter sequence is patterned differently, with different arrangements accounting for different traits. If the manifestations of these arrangements are understood, then physicians can use this information to customize prevention and treatment for patients.

"That's sort of the fantasy," said Ruden. "We could be two years away from that or it could be 20 years. But that's the goal."

To help reach that goal, Ruden examined the genomes of both lead-exposed and healthy fruit flies – the same species that led Thomas Hunt Morgan to formulate the theory of heredity nearly a century ago. Ruden measured the flies' genetic traits, "but instead of something quantitative like height, we measured the expression of all 20,000 genes," he said.

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"Once lead binds to these transcriptional regulators... it activates several hundred genes."

— Dr. Douglas Ruden, Ph.D.

What Ruden has found thus far are nearly a dozen genetic pathways that are co-regulated by lead. Each of these genetic pathways is the sum of interactions among genes that produce the lead sensitivity trait. But when lead co-regulates this process, it is partially controlling how and at what rate proteins are being developed, activating some genes and turning others off.

"Once lead binds to these transcriptional regulators [that dictate gene expression], it activates

several hundred genes," said Ruden. "And those genes that are activated or suppressed tend to be in neural developmental processes, like synapse formation." In fact, lead poisoning manifests itself primarily in the central nervous system and can cause learning problems, memory loss and poor coordination – in addition to a host of other symptoms throughout the body.

Now, Ruden is targeting the location of these pathways to identify the transcriptional regulators with which lead co-regulates the production of many of the body's molecular elements. And finding those regulators will expand the scientific understanding of genetic and bioenvironmental interactions while bringing the world closer to a day when medical diagnostics is as particular as our DNA.

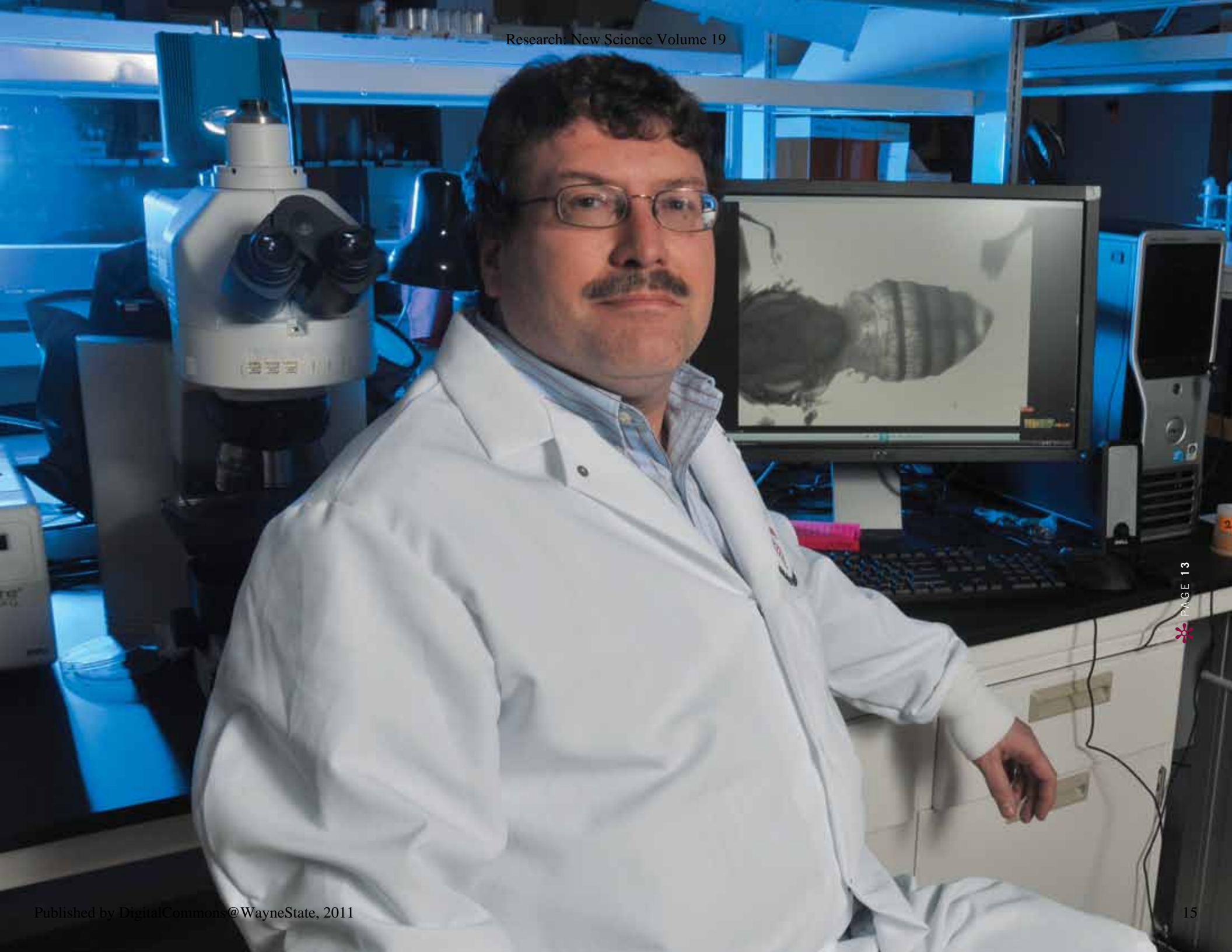
### About Dr. Douglas Ruden:

*Dr. Ruden received B.S. degrees in biology and chemistry from the California Institute of Technology and a Ph.D. in biochemistry from Harvard University. He was a postdoctoral fellow at the Max Planck Institute. He joined Wayne State University in 2004.*

### For more information, visit:

<http://www.iehs.wayne.edu/bio.php?id=44317>







# Interdisciplinary campus

## Interdisciplinary world

### Reshaping higher education for the 21st century

In recent years, interdisciplinary fields have increased in academia. Some, such as biomedical science and genomics, are pairings of disciplines that, through their combined knowledge, have created new fields with unique focuses. Others, such as urban studies and gender studies, combine politics, social science and history to create fields that educate the public and inform policymakers.

In her book, *Creating Interdisciplinary Campus Cultures*, Julie Thompson Klein, Ph.D., professor of humanities in Wayne State University's Department of English, argues that these and other interdisciplinary fields are among the most important in modern higher education. Through

recommendations and examples, the book outlines how academia in the United States can institutionalize interdisciplinary education and research in the 21st century.

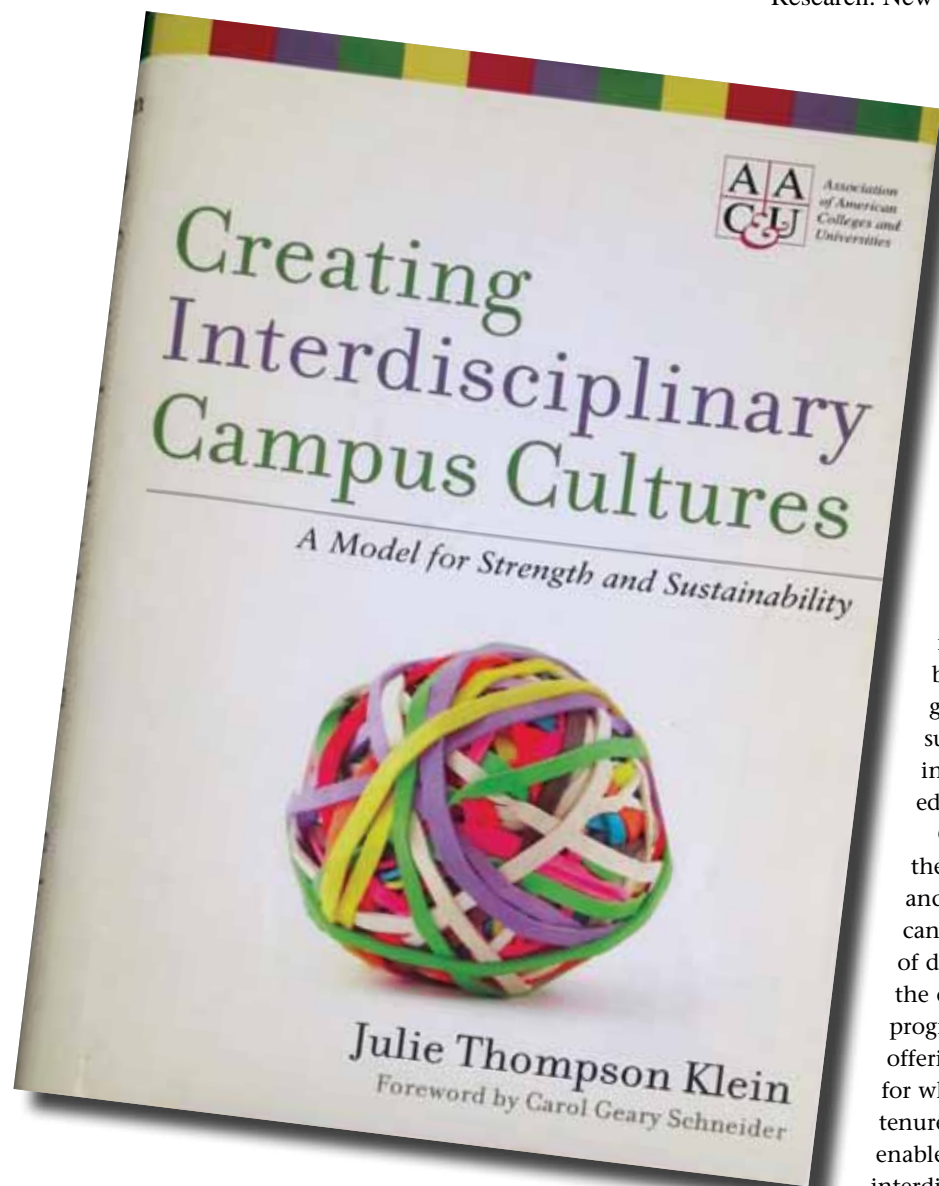
The need for interdisciplinarity stems from current global challenges. "In modern life, humans face many broad, large-scale problems, from health epidemics and global warming to challenges in renewable energy and sustainable agriculture," Klein said. "All of these problems are interdisciplinary in nature, requiring expertise from many different fields and collaborative efforts."

The demand for interdisciplinary studies reflects other large-scale changes as well. The

cultural identity of the country has changed as underrepresented groups have been increasingly incorporated into education and research. And, as sustainability becomes more paramount, environmental studies have become increasingly prominent.

These trends have led to the top 10 interdisciplinary majors at U.S. universities and colleges, according to the results of a 2006 survey by the Social Science Research Council. More than half of interdisciplinary majors are in international/global or area studies, including Africana Studies and Latin American studies. Two fields – neuroscience and biochemistry – follow a





“biology-plus” model, offering new possibilities in psychology and drug targeting. The most popular, environmental studies and women’s and gender studies, are also the oldest, having moved toward institutionalization since their birth as advocacy fields in the 1960s.

from different fields for common research and education goals.

Also important is implementing central oversight mechanisms for interdisciplinary programs and departments. While support from university leaders

Yet Klein argues that without cohesive, institution-wide support, many of these programs will not be sustained. “Today’s universities offer a lot of great interdisciplinary programs,” Klein said. “But without necessary structures in place, these efforts may be limited to being showcases or orphans.”

Klein has become an international expert sought by universities all over the globe wishing to implement sustainable models for interdisciplinary research and education.

One major recommendation is the restructuring of departments and faculty appointments. This can be done through a number of different approaches, including the creation of interdisciplinary programs and departments and offering joint faculty appointments for which researchers can achieve tenure. “Cluster hiring” also enables administrators to build interdisciplinary areas from the ground up by bringing in researchers

is essential, interdisciplinary units should have control over their budget, curriculum, majors and minors, and research focuses.

University presidents, provosts and deans can also strategize the layout of buildings on campus. “Research has shown that the further apart people are physically, the less likely they are to collaborate,” she said.

Evidence indicates that academia is recognizing the shifting demands of education. “The United States has a tremendous amount of interdisciplinary education going on, but these initiatives will see limited growth unless their universities prioritize them on an administrative level,” she said. “I am confident that the need and urgency has now been recognized and U.S. higher education can shift to meet the knowledge demands for the 21st century.”

#### **About Dr. Julie Thompson Klein:**

*Dr. Klein received a B.A., M.A., D.A. and Ph.D. in English from the University of Oregon. She joined Wayne State in 1970. She is also a faculty fellow in the Office for Teaching and Learning, working on digital humanities.*

#### **To learn more, visit:**

<http://csid.unt.edu/about/people/klein/index.html>

# Using mathematical algorithms to save lives

Advances in molecular biology, proteomics and genetic testing have brought us closer to personalized health care that can tailor treatments to an individual patient's needs. Data gathering capabilities have greatly surpassed data analysis techniques, creating a need for more effective methods to analyze a vast and growing amount of data.

Bioinformatics, the use of computer science methods and tools in the life sciences, has exploded as modern high-throughput methods have generated a deluge of information, including sequence data, structural data, chemistry data, assay results and imaging data. While pharmaceutical and biotechnology companies have begun to appreciate the potential benefit of information technology systems in improving the productivity of drug discovery and research, several hurdles must be overcome to fully capitalize on the impact this data may have on the health care industry.

With the help of more than \$3 million in competitive grants from the National Institutes of Health (NIH) and the National Science Foundation, Sorin Draghici, Ph.D. is working to develop new and effective approaches to analyze these data and identify impacted gene signaling pathways in a given condition. Draghici holds joint appointments as professor in the Department of Computer Science, College of Engineering; and the departments of Clinical and Translational Science, and Obstetrics and Gynecology in the School of Medicine at Wayne State University. In recent years, Draghici has developed several bioinformatics

software tools that utilize mathematical algorithms to extract relevant intelligence from genomics data by combining statistical analysis with existing knowledge about how these pathways work. Correctly identifying the significantly impacted gene signaling pathways in a given condition can lead to better decision-making capabilities for drug development and personalized health.

According to Draghici, current methods that aim to bridge the gap between data collection and data analysis are unsophisticated. "Many if not all existing methods treat the pathways as simple sets of genes, and either ignore or underutilize our current understanding about how the body's systems work, as well as the gene expression values made available by current technologies," he said. Draghici has developed bioinformatics tools that will lead to reliable approaches to identify the most impacted gene signaling pathway in a given condition, which ultimately will facilitate pinpointing the molecular causes of a given disease, and identifying potential therapies and possible side effects.

Using a systems biology approach, Draghici's approach identifies pathways that are significantly impacted in any condition, which may be monitored through high-throughput gene expression. His more sophisticated algorithms can also identify relevant signaling cascades that can be potentially targeted for therapeutic intervention.

Access to these tools by biotechnology and pharmaceutical companies will increase efficiency in the drug discovery pipeline and, most importantly,

reduce development costs of new therapeutics. Such tools can help organizations make early decisions on pursuing clinical trials.

The technology has been licensed to Advaita Corporation, where Draghici serves as chief executive officer and chief technology officer. Advaita has received additional funding from the NIH in the form of a Small Business Technology Transfer grant.

Draghici's novel analysis method can identify the significantly impacted gene regulatory pathways in a given condition, such as lung cancer, obesity and diabetes. Classical methods fall short and neglect to take into consideration the roles the genes play in each pathway. These classical methods can produce both false positives, pathways that are reported as being relevant when in reality they are not, as well as false negatives, relevant pathways that are not identified as being significant in the given condition.

Current analysis methods rely too heavily on the number of differentially regulated genes that fall on each pathway, rather than taking into consideration where each gene is positioned and what each gene does. Draghici's method pays close attention to these aspects and can potentially identify regulatory pathways that can open the way to new therapeutic interventions in a large variety of conditions such as cancer, pre-term labor, obesity and more, ultimately benefiting millions of people suffering from these conditions.

"Currently, most patients with health conditions such as cancer are diagnosed because of a clinical

change, such as detecting a malignant tumor,” said Draghici. “By the time the tumor is found, treatment can be an uphill battle because of complex changes including the need to kill tumor cells that might have already spread. If a physician could identify a departure from the healthy state well before the tumor is present, these changes in cells may possibly be reversed. We aim to identify qualitative changes in the state of a biological system, with the ultimate goal of eradicating diseases not by finding a cure for them, but by preventing them from ever occurring in the first place.”



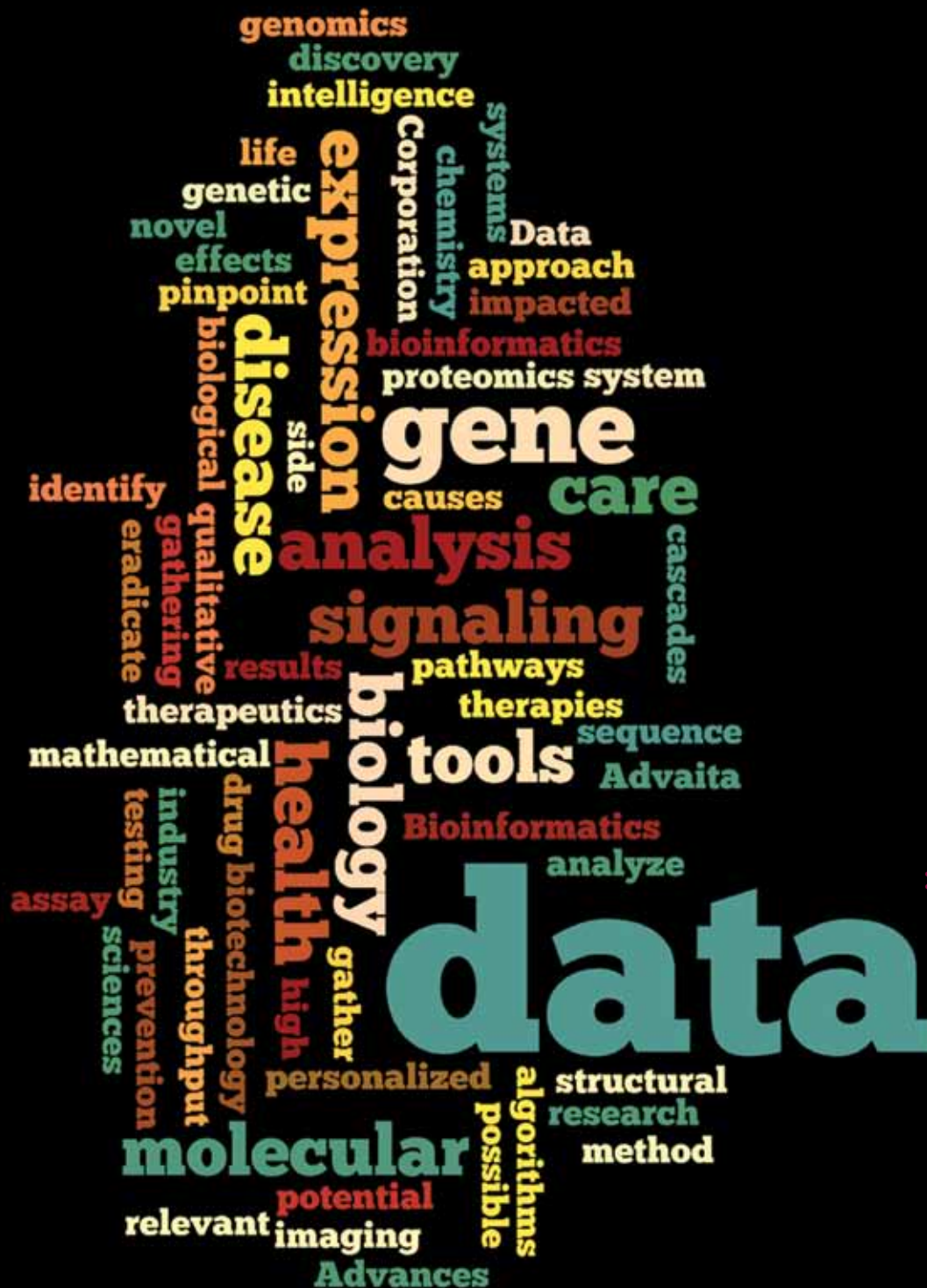
**About Dr. Sorin Draghici:**

*Dr. Draghici received a B.Sc. in computer engineering and an M.Sc. in computer science – software engineering from Politehnica University of Bucharest, Romania, and a Ph.D. in computer science – artificial intelligence from University of St. Andrews, United Kingdom.*

*He joined Wayne State University in 1996. He was recently appointed the first Robert J. Sokol, M.D. Endowed Chair in Systems Biology.*

**To learn more, visit:**

<http://vortex.cs.wayne.edu/Sorin/index.htm>



# Breaking the stigma

## In the lives of boys who dance

Dance – its training and social meanings – has a rich history and long-standing association with gender roles in world culture. While dance in some cultures is viewed as a valid vocation for men, the dominant view of Western culture positions concert dance as a predominantly female art form.

In his new book, *Stigma and Perseverance in the Lives of Boys Who Dance*, Doug Risner, Ph.D., M.F.A., associate professor in the Maggie Allesee Department of Dance in Wayne State University's College of Fine, Performing and Communication Arts, investigates the implications of the culture's prejudices toward males who dance and how dance teachers, students and families of male dancers can break the stereotype.

The book chronicles a two-year study in which Risner surveyed 75 male dancers, aged 13 to 22, in Western pre-professional concert dance training. "The experience of male dancers is fascinating in that they are frequently devalued by their culture, yet prized in their field," Risner said. "I wanted to gain a deeper understanding of the support, satisfaction and validation they feel in different areas of their lives, and what the people in their lives can do to break the stigmas surrounding the profession."

Wayne State University's 2008 Research Enhancement Program for the arts funded the study for \$38,385. Risner said the grant was transformational for his work. "As a researcher in the performing arts, when you have the additional time, resources and support that comes from this type of funding, people really take notice."

### Why do males dance?

Previous efforts to explain and encourage male participation in dance have frequently drawn parallels between sports and dance, often emphasizing competitive athleticism rather than expressive artistry. However, Risner's study found that males' motivation for dancing is very similar to their female counterparts – they dance for the enjoyment of performing, the artistry and opportunity for self-expression.

Risner believes the misconception stems from long-standing prejudices in society which seek to validate male dancing by aligning it with a more acceptable male activity. "It's almost as though to avoid the stigma of homosexuality, we adopted these inaccurate reasons for why males dance," he said. "These attempts are often well-intentioned, but they ultimately minimize the real purpose of dance and what it means to dance students."

The book addresses the statistics that show a significant portion of male dancers are in fact gay or bisexual – and those who aren't are still likely to experience harassment and discrimination. Much of the study's recommendations seek to help dancers, parents and teachers address homophobia by creating an environment of support and acceptance.

### Nurturing talent, breaking stereotypes

In order to create an atmosphere that is inclusive of all sexual orientations, dance instructors must recognize and abolish teaching methods and in-class language that reinforce narrow definitions

of femininity and masculinity. Instructors should also recognize the vital role they play in their students' lives – usually one of their most prominent sources of support – and use that influence to be positive role models.

Equally important are the parents and families of male dancers. Risner believes parents should challenge their own biases about gay, lesbian and bisexual people and evaluate whether they knowingly or unknowingly condone anti-gay sentiments. They should also support their sons' training and performances as much as possible, as this is crucial for validating and affirming the dancers' worth and work.

"By doing these things, we may begin to nurture dance students who are less affected by the stigma and stereotype of their chosen field, and in turn, can focus more on their potential as performers and artists," Risner said.



#### About Dr. Doug Risner:

*Dr. Risner received a B.F.A. and M.F.A. in choreography and dance performance, and a Ph.D. in curriculum and teaching with a cultural studies specialization from the University of North Carolina at Greensboro. He*

*joined Wayne State University in 2003.*

**To learn more, visit:**  
<http://dougrisner.com>



Photograph by Steve Clarke

# Taking a shot at eradicating *Chlamydia*

*Chlamydia*, the leading sexually-transmitted bacterial infection in the United States, can cause severe health disorders including inflammation of the cervix in women and the urethra in men; pelvic inflammatory disease; infertility and ectopic pregnancy; trachoma, a preventable, blinding disease in underdeveloped parts of the world; and an inflammatory reactive arthritis.

A Wayne State University husband-wife team is leading research to elucidate the molecular details of the synovial, or joint-related, pathogenesis process elicited by *Chlamydia trachomatis*, (*C trachomatis*), as well as developing a vaccine to protect against infection.

Alan Hudson, Ph.D. and Judith Whittum-Hudson, Ph.D., both professors of immunology and microbiology in the Wayne State University School of Medicine, have discovered that *C trachomatis* can generate persistent, difficult to detect infections of the synovium, the thin layer of tissue which lines the joint space, causing reactive arthritis. Until recently, such persistent infections had proven resistant to antibiotics and other relevant therapies.

"We have discovered that, contrary to current thinking, it is not genital strains of *C trachomatis* that cause the inflammatory arthritis," said Hudson. "Rather, only trachoma strains known for causing ocular disease, which are found in low numbers in genital inocula, appear to disseminate from the genital tract to the joint."

Further studies in collaboration with a rheumatologist/researcher at the University of South Florida's School of Medicine, demonstrated for the first time that a combination antibiotic

treatment, in lieu of single antibiotic treatment, is effective in eliminating persistent *C trachomatis* in the synovium. This has implications for treatment of disseminated chlamydial infections at other anatomic sites in addition to the synovium.

Taking a combined antimicrobial approach using one antibiotic that inhibits RNA polymerase and heat shock proteins along with another that inhibits bacterial protein synthesis, eradication of persistent chlamydiae may lead to improvement or possibly a cure for the disease.

"Our data give hope for the development of therapies to improve the clinical symptoms of *Chlamydia*-induced reactive arthritis centered on this new treatment approach," said Hudson. "These combined therapies may not only significantly improve the treatment of persistent chlamydial infections; they may also have important implications in a number of other chronic *Chlamydia*-related diseases."

## Getting closer to eliminating *Chlamydia*

After nearly four decades of research, Whittum-Hudson's research on chlamydial immunopathogenesis and vaccine development is beginning to pay off. She has developed and characterized novel vaccine candidates against chlamydial infections, and several patent applications have been possible because of these efforts.

Most recently Whittum-Hudson has identified several peptides that have potential as vaccines against *Chlamydia*. With many areas of the world lacking access to basic health care and treatments such as antibiotics, a new vaccine given orally or

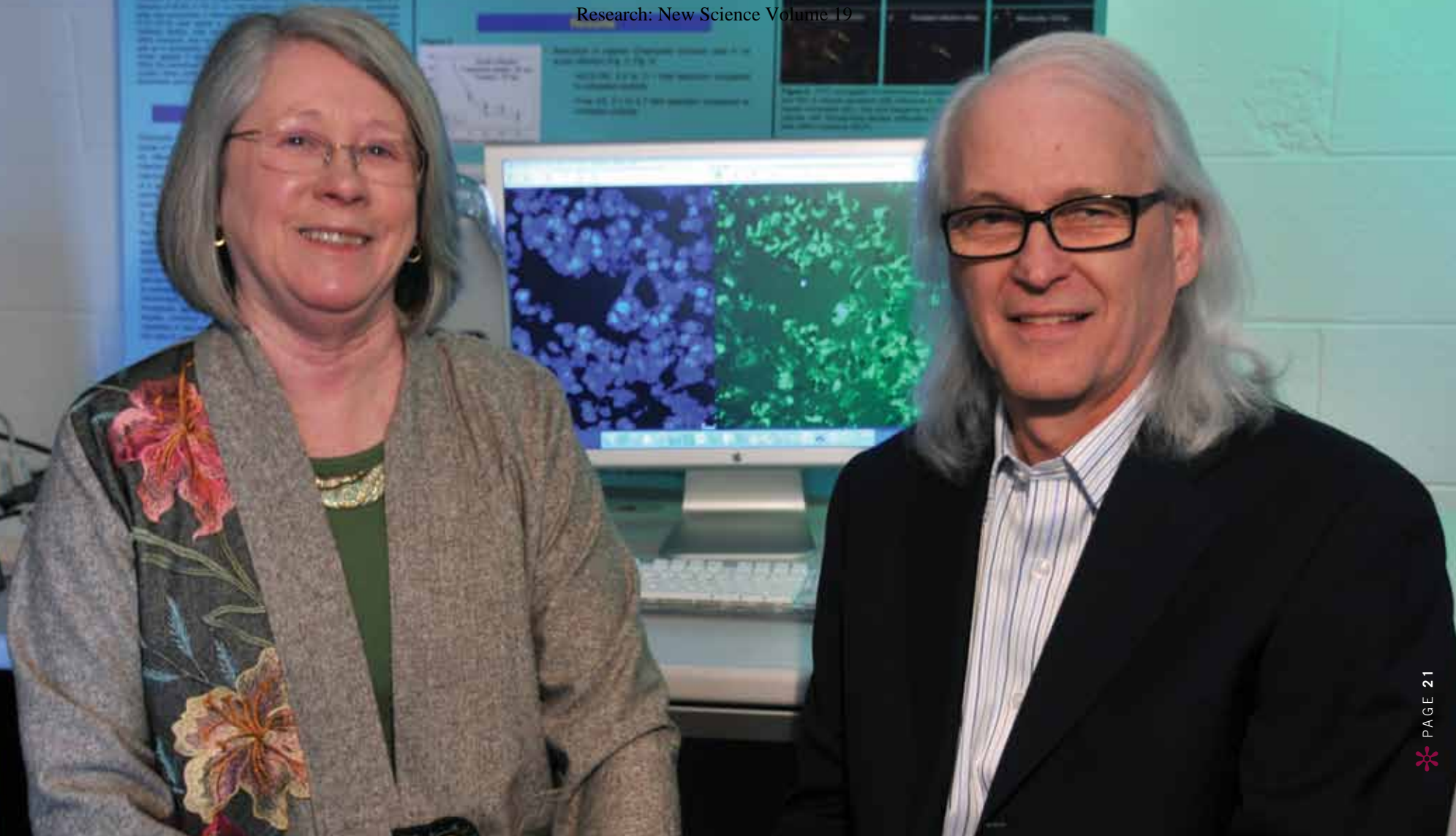
through intranasal delivery may offer more effective protection against *Chlamydia* infections, ultimately decreasing a significant number of cases of the infection.

"I am also exploring novel combinations of these and additional peptides that are mimotopes for the carbohydrate associated with a chlamydial glycolipid antigen," said Whittum-Hudson. "Because these peptides mimic the chlamydial organism, they induce antibodies and other immune responses that recognize the whole organism and may allow them to serve as vaccine candidates." An important aspect of these vaccine candidates is that they could protect against all types of *Chlamydia* capable of infecting humans as well as many animal species.

Using the same theory as vaccine delivery, the duo is also working with researchers from WSU's Department of Chemical Engineering to develop nanomedicine approaches to diagnose and deliver therapy for *Chlamydia*-associated diseases, particularly in the context of the inflammatory reactive arthritis. These collaborations have led to new nanomedicine endeavors with nanoparticles and dendrimers that specifically target infected cells for diagnosis and treatment of chlamydial infections. New patent applications and grants have resulted from these nanotechnology focused studies.

"These various research efforts demonstrate an ongoing, upward trajectory in new approaches to chlamydial research," said Whittum-Hudson. "Through this cutting-edge research, we are closer to one day eliminating diseases caused by *Chlamydia*."





**About Dr. Judith Whittum-Hudson:**

*Dr. Whittum-Hudson received a B.A. in biology from Wells College and a Ph.D. in pathology from the University of Connecticut. She did postdoctoral research training at the University of Texas Health Science Center. She joined Wayne State University in 1998.*

**To learn more, visit:**

[http://www.med.wayne.edu/immunology/pages/Faculty\\_Web\\_Pages/whittum-hudson.html](http://www.med.wayne.edu/immunology/pages/Faculty_Web_Pages/whittum-hudson.html)



**About Dr. Alan Hudson:**

*Dr. Hudson received a B.A. in biology and chemistry from Hamilton College and a Ph.D. in molecular biology from the City University of New York. He did postdoctoral research training at the University of Paris and at the University of Texas Health Sciences Center at Dallas. He joined Wayne State University in 1997.*

**To learn more, visit:**

[http://www.med.wayne.edu/immunology/Pages/Faculty\\_Web\\_Pages/hudson.html](http://www.med.wayne.edu/immunology/Pages/Faculty_Web_Pages/hudson.html)



# Ending a debate on nanoconfined water

Identifying water's behavior when confined at the molecular level has been, in the field of nanofluidics, a source of controversy – one that a Wayne State University researcher and his colleagues may have put to an end.

Peter M. Hoffmann, Ph.D., associate professor of physics and materials science in WSU's College of Liberal Arts and Sciences, has found that, at the nanoscale, liquid water transforms into a rubber-like solid when squeezed at a certain rate. The study was featured in *Nature India* and *Physical Review Letters*, with a special *Viewpoint* written by well-known researchers from University of Illinois. Only 100 out of 18,000 papers in journals published by the American Physical Society are selected for a *Viewpoint* review each year. Hoffman's study has shed new light on the nanofluidics debate over the nature of confined water's mechanical properties.

Water, which makes up nearly 70 percent of the human body, is nanoconfined between proteins that make up a cell's organelles.

"Usually the water in our cells is considered a rather static bystander," said Hoffmann. "But water is the most important liquid in the universe because it is the one essential ingredient we need to support life. Knowing how water behaves in tiny channels and tiny spaces is important for the design of future devices that would, for example, probe arterial blood and continually measure blood sugar or other markers."

Hoffmann explored how water reacts when its molecules are gently squeezed at speeds "so slow it would take a few years to just cover a distance of one foot," he said. Yet the impact of this speed, as

W  
 "...water is the most important liquid in the universe because it is the one essential ingredient we need to support life. Knowing how water behaves...is important for the design of future devices..."

— Dr. Hoffmann

Hoffmann and his colleagues have proved, alters water's behavior drastically.

A sensitive atomic force microscope (AFM) built by his team made precise nanoscale measurements possible. "When we squeezed water at a speed of 0.8 nanometers per second and beyond until the AFM tip reached the surface, the water suddenly changed from a viscous honey-like liquid to an almost solid-like material that reacted elastically, like rubber," said Hoffmann.

Hoffmann and his team also learned that water spontaneously orders into layers, each as thin as a single water molecule, when confined. To reach this conclusion, Hoffmann constricted water against a flat surface with the tiny AFM tip until the space between the two shrank to a width of only a few nanometers.

"Although the research is fundamental, the discoveries may play a role in how cellular

components move and transmit forces, as well as aid in the design of nanomechanical devices," Hoffmann said.

Hoffman's team included Shah Khan, graduate student in WSU's physics department, who performed the measurements; George Matei, Ph.D., former WSU graduate student, who built the AFM used in the study; and Shivprasad Patil, Ph.D., former postdoctoral fellow at WSU and current professor of physics at the Indian Institute of Science Education and Research in Pune, India.

To view the *Physical Review Letters Viewpoint*, visit <http://physics.aps.org/articles/v3/73>.

To view the *Nature India* feature, visit <http://www.nature.com/nindia/2010/101015/full/nindia.2010.143.html>.



#### About Dr. Peter Hoffmann:

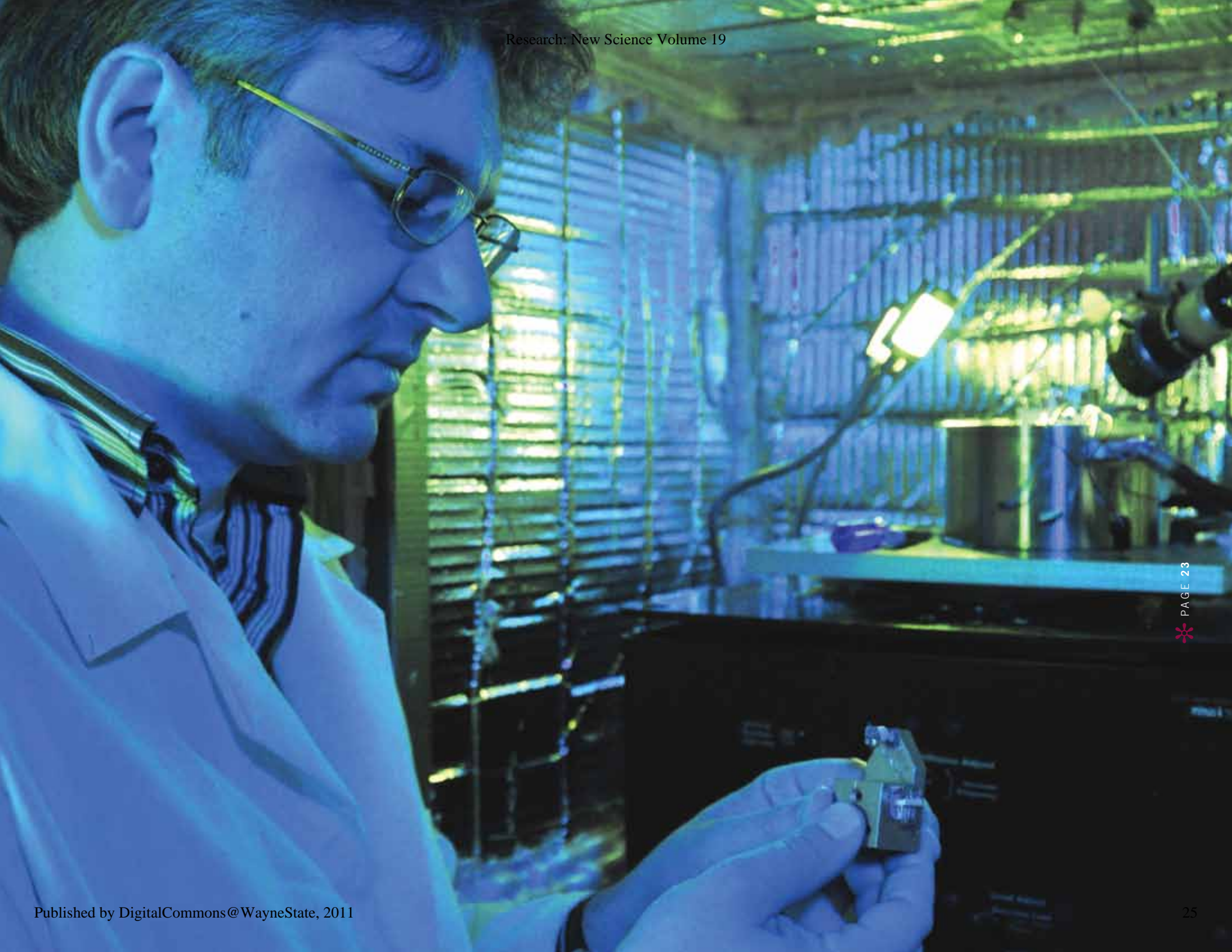
Dr. Hoffmann received a B.S. in physics and mathematics from Technische Universität Clausthal, Germany, an M.S. in physics from Southern Illinois University, and a Ph.D. in materials science from the Johns Hopkins

University in Baltimore. He did postdoctoral research at the University of Oxford in England. He joined Wayne State in 2001.

#### To learn more, visit:

<http://www.clas.wayne.edu/unit-faculty-detail.asp?FacultyID=345>





# Improving health care practices through human factor engineering methods

Think of it as using technology to help human beings take care of other technology that in turn helps to take care of human beings.

Kai Yang, professor of industrial & systems engineering in the College of Engineering at Wayne State University, recently received a \$400,000 grant from the U.S. Department of Veterans Affairs (VA) as part of the organization's effort to become a leader in using emerging technology to improve health care.

The funding follows a \$350,000 grant last year to develop Interactive Visual Navigation (IVN) software, which provides an automated, dynamic work flow process that incorporates systems with human factor engineering principles to increase the efficiency of VA technicians.

Yang's current grant will allow him to enhance and extend the use of IVN, including the integration of real-time equipment-locating systems, and implement IVN at the Ann Arbor VA Medical Center.

Yang said IVN software reduces errors in reprocessing medical equipment, provides automated data collection, supports quality management requirements and reporting, and provides better, safer care for veterans — all of which are ways VA officials say they will measure the success of the department's transformation.

Yang's IVN software uses touch-screen technology to enhance technicians' ability to achieve the top priorities of reprocessing reusable medical equipment, he said. Those priorities include traceability of equipment, cases and patients, as well as reprocessing histories.

Yang has devoted much of his research to the VA's initiatives. In 2009, the VA reached out to engineering colleges at all U.S. universities to help establish Veterans Engineering Resource Centers (VERCs), which are intended to serve as showcases for integrating engineering methods and tools into the fabric of health care delivery. Wayne State helped establish one of just four VERCs nationwide. The local VERC is a joint effort between Wayne State, the University of Michigan and Indiana University-Purdue University Indianapolis.

The VA's transformation initiative, Yang's IVN software and creation of the VERC all stem from the same basic need, he said.

"Everyone knows U.S. health care is in trouble," he said. "It costs too much and doesn't give good enough service. We spend the most money on health care of any country, but the type of service we get is less than many other countries, even though other countries pay less."

Yang says experts believe health care lags other sectors, such as manufacturing, that take advantage of industrial engineering principles.

"Health care has been slow in using industrial engineering techniques to improve the cost, access and productivity of care," Yang said.

But the IVN software is helping to do just that, he said. It first was used at the John D. Dingell Detroit VA Medical Center to help technicians navigate endoscopes, though he said it will support any other management of reusable equipment or work flow process procedure, including preventive and corrective maintenance.

Yang said endoscope reprocessing was his first target area because the devices are expensive — each costs more than a new car — and must be cleaned and disinfected after each use. "It's a very labor-intensive process," he said. "It's quite easy to get it wrong."

In developing the IVN software, Yang through observation determined that technician memory lapses, difficulty in reading standard operating procedures and not following set procedures were some reasons for errors in reprocessing.

Yang believes the future looks bright for IVN, referred to recently by one VA official as the "home run" of the four VERCs. Phase two of his project already is under way with the use of IVN at the Detroit VA Medical Center and its planned implementation at the Indianapolis VA Medical Center, perhaps as early as September, before eventually going nationwide.

Four new projects comprise the rest of phase two. The first extends use of IVN technology beyond endoscopes to other equipment that requires similarly detailed care.

The second involves integrating real-time locating badges or tags into medical devices. Functioning like a Global Positioning System unit, the tags allow health care personnel to identify all items in a given location, types or models of equipment and their locations within a facility, and a given type within a given location. Real-time locating tags also can be used to track activities of employees and patients.

The third phase, implementing the IVN at the Ann Arbor VA Medical Center, is relatively simple, Yang said, but a fourth, to be funded by a



**About Dr. Kai Yang:**

*Dr. Yang received a B.S. in electrical engineering from the East China Petroleum Institute in Shandong Province, China, and M.S. and Ph.D. degrees in industrial and operation engineering from the University of Michigan. He joined Wayne State University's College of Engineering in 1990.*

**To learn more, visit:**

<http://www.eng.wayne.edu/page.php?id=5995>

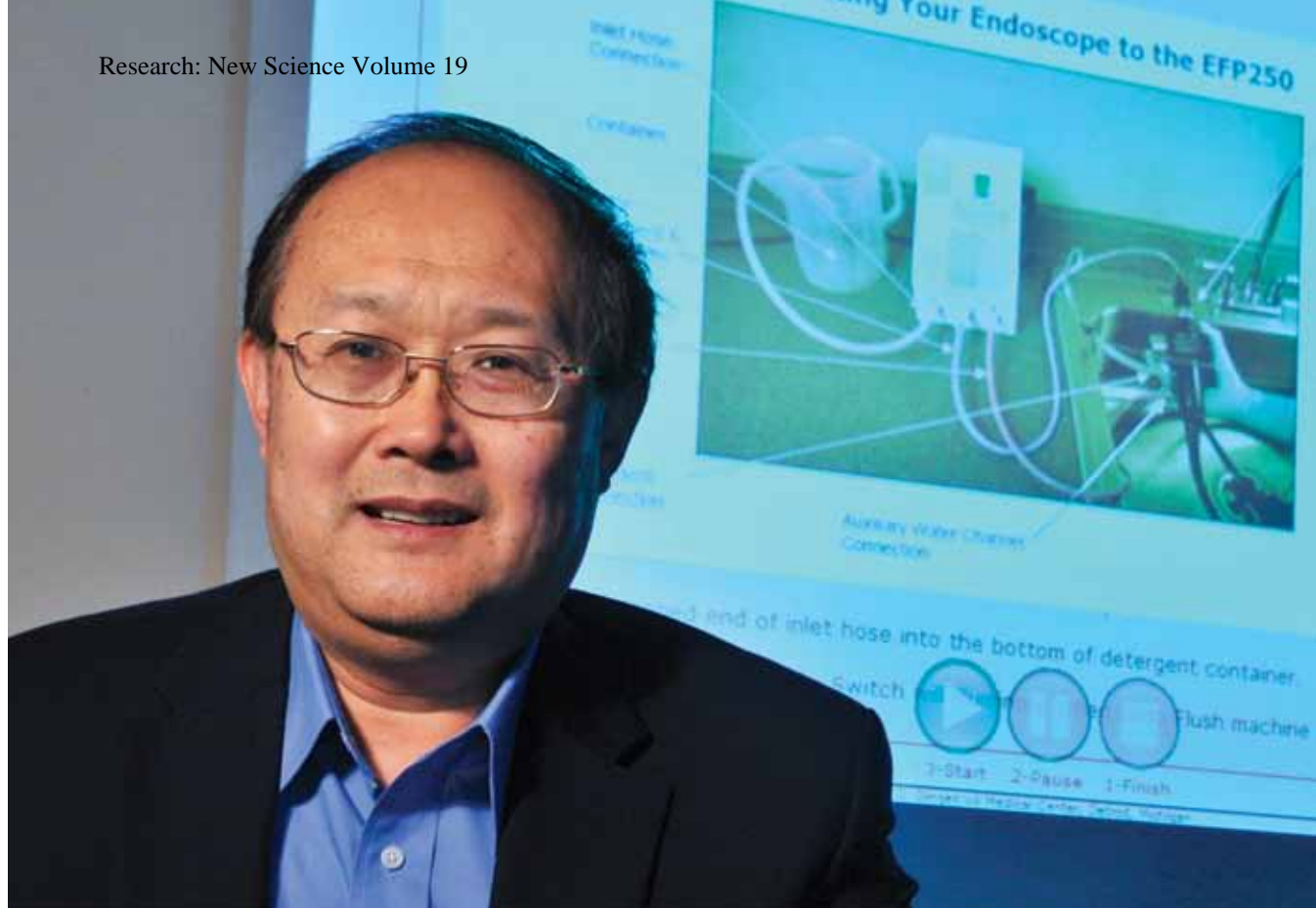
forthcoming \$100,000 VA grant, is more ambitious and addresses a key health care problem.

A big cost driver for health care systems is readmission of patients who fail to follow discharge instructions properly, he said. However, IVN technology can be adapted to track patients' conformance information, identify high-risk patients and more accurately predict who is more likely to deviate from discharge instructions. Health care personnel then can develop targeted ways to address those situations, including reminder calls or visits.

"It's kind of like you're tracking humans like pieces of medical equipment, using industrial engineering like statistical engineering and artificial intelligence," Yang said.

Current literature says health care systems can achieve higher reliability levels only by robustly characterizing management practices' impact on patient outcomes and applying valid practices based on clinical evidence.

"It is our intention to build on the interdisciplinary nature of our center to more effectively establish evidence-based management practices within VA health care delivery," Yang said.



## Navigating Interactive Visual Navigation

The IVN software uses touch-screen interactive instructions, a process Kai Yang says is far friendlier than paper-based standard operating procedures, and similar to what people may see every day at grocery store checkouts.

The IVN clusters related jobs on the screen in blocks that users can absorb easily, taking into account that people tend to react negatively to too much or too little instruction. Time constraints and automatic clocks are included when applicable.

Work times are based on observed averages of how long it takes to complete a task; the software also automatically captures time spent on a given

task. Yang said this becomes a "process signature," allowing managers to identify instances in which workers may be taking less time than recommended for a particular procedure. IVN software also provides managers information of which workers are properly trained for tasks, and those who require more training.

The software's interactive screens include hyperlinks to definitions of unfamiliar terms or depictions of the pieces of equipment being used. The displays also feature ergonomic information and descriptions showing technicians how to set up work areas properly.



# Sea waves of social change

## Telling the people's story in the Persian Gulf states

If you were to interview a mother living in Bahrain about education, what might she say? Just ask one Wayne State University researcher, who has extensive experience doing exactly that.

May Seikaly, Ph.D., associate professor of classical and modern languages, literatures and cultures at WSU's College of Liberal Arts and Sciences, recently spent a year interviewing hundreds of women, men and youth from all social strata in Qatar, the United Arab Emirates and Bahrain. Her ultimate goal is to write a book that will provide a holistic account of the region's social history.

Seikaly is working to fill a void in literature by using oral history to investigate the impact of momentous societal changes in the Gulf region, prompted by the discovery of oil. Until 40 years ago, Bahrain, Qatar and the United Arab Emirates were occupied and ruled by Western powers, so few records on the social aspect of people's lives are available. "There are so many angles and levels of history that are never written about or properly recorded," Seikaly said.

"It is especially unfortunate that women's history is not written about in a region where women's roles are so rapidly changing," Seikaly said. In 2002, women in Bahrain gained their suffrage; that same year, 42 women ran for parliament. "Within politics, women have become very, very prominent, and that's why my first choice was to study society through its women," she said.

Seikaly's book will explore politics, culture and education by weaving the voices of women – from politicians, like Bahraini Minister of Culture and Information Sheikha Mai Al Khalifa, to stay-at-home mothers. But Seikaly's research is not exclusive to women. She also interviewed youth

through focus groups at universities and men from all backgrounds. "Even though I'm looking at the story through women's eyes, I'm looking at the society as a whole," Seikaly said.

### A democratic approach to history

"History is the story of the people, not the story of what is told about the people," said Seikaly, who will connect individual stories gathered through interviews into a quilt of narrated history that delves into the interior lives of Bahrainis, Qataris and Emiratis – a technique that characterizes oral history.

"Oral history is the most democratizing process of writing social history," said Seikaly. "It's the voice of the people." Analyzing the nuances of her interviewees' expressions and subtly picking out what is said – and what isn't – reveals to Seikaly the system's effects on society. "Women would talk about the market but would put it in the context of how they buy food and how they feed their kids – issues that make sense in the social context," she said.

Seikaly explained that social topics often invoked discussion of larger issues. "When talking to a woman about education, we would come across issues such as globalization – how globalization has impacted her perceptions of culture, how globalization has negatively impacted how her life is led," she said.

Seikaly's personal history sparked her interest in this subject in the Gulf states. "I come from a culture where orality is very much a part of my legacy, my thinking and functioning," she said, recalling her childhood years in Jordan and

Lebanon listening to her father recount his life stories.

Seikaly sharpened the tools of oral history while working on her first book, *Haifa: Transformation of an Arab Society*, and has since become a well-known oral historian in the Middle East. Recently, Seikaly, who spent nine years teaching history at the University of Bahrain, was awarded a grant from the Qatar Foundation to train men and women to conduct oral history research, which she will be doing this year.

While completing her new book, Seikaly hopes to continue to develop a database of interviews she conducted with Palestinians over the course of 20 years. Her objective is to make this compilation a public resource.

"I don't want to be the only one working on memory," said Seikaly. "I want the younger generation – whether they're in journalism, theater, law or history – to hear the people, because this is the democratic voice of history. This is important for our future."



#### About Dr. May Seikaly:

*Dr. Seikaly received a B.A. in history/politics with distinction from the Lebanese American University, an M.A. in Middle Eastern history from the University of California, Los Angeles, and a Ph.D. in social history of the*

*Middle East from Oxford University. She joined Wayne State University in 1995.*

#### To learn more, visit:

<http://www.clas.wayne.edu/faculty/seikaly>



# Breaking the darkness

## Helping female victims of child sexual abuse

An ongoing study by Valerie Simon, Ph.D., is focused on how to help female victims of child sexual abuse (CSA) get the help they need to avoid sexually risky behavior and its potentially life-altering consequences.

Simon, assistant professor of psychology in the Merrill Palmer Skillman Institute, is examining the trajectories and potential mechanisms of sexual risk behavior among young adolescent females with CSA histories. Her efforts are being supported by a five-year, \$755,121 grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health.

Learning how CSA affects adolescent females' sexual risk behavior is important, Simon said, because they have disproportionately high rates of sexually transmitted infections, largely due to heterosexual contact. A recent national survey showed that over one year, as many as 320,000 children were sexually abused or assaulted.

Females with histories of CSA are especially vulnerable, she said, because in addition to benefiting less from traditional risk-reduction efforts, they tend to initiate sex at earlier ages and have frequent or unprotected sex, sometimes with a number of partners. Consequences of such risky behavior include exposure to sexually transmitted diseases, HIV infection and early or rapid-repeat pregnancies.

Previous research has shown that traditional risk-reduction programs aren't as successful with the group Simon is studying (ages 11 to 14), and she says at this point researchers don't really

understand why. Such programs, including one developed by Dr. Bonnie Stanton, chair of pediatrics at Wayne State University's School of Medicine and a pediatrician at Children's Hospital of Michigan, target children before they become sexually active, teaching abstinence skills as well as "sexual agency," or knowing how to say no and set limits on sexual behavior.

Simon said studies suggest that such risk-reduction programs are successful with other groups of vulnerable youth, including those with mental health problems, but that they are less effective with sexually abused youth.

"Some researchers have suggested that when faced with sexual possibility situations, these youths are so emotionally aroused and overwhelmed that what skills they do have just go out the window," she said. "However, there is very little research in this area other than to document problems."

Simon hypothesizes that older children or young adolescents who have been sexually traumatized may experience age-normative social stimuli as potential trauma cues. This could include everything from girlfriends talking about crushes or their first kiss, or seeing a movie with mild sexual contact.

"Learning to negotiate romance and sexuality is an important and challenging developmental task under the best of circumstances," Simon said. "In the case of CSA, ill-timed and coercive sexual experiences may distort youths' reactions to many of the typical, age-appropriate romantic and sexual stimuli in their social lives."

Sex may become associated with shame and fear rather than warmth and caring, and with concerns about dominance and submission rather than mutuality. As a result, youths who have been sexually abused may become emotionally overwhelmed or dysregulated in the face of age-normative sexual stimuli in ways that might interfere with learning to navigate romantic and sexual experiences.

"That could take the form of avoidance, unhealthy sexual behavior, or the idea that sex is something that's just given away or used to get something else," Simon said. "Feeling marginalized because of CSA experiences or traumatized by normal age-appropriate stimuli could be detrimental to their ability to form close friendships, which is part of what lays the foundation for healthy romantic relationships."

Her study comprises two phases. The first will analyze existing data from a 20-year longitudinal study of CSA to examine the relationships among mental health problems, physiological reactions during an interview about their sexual abuse experiences and later sexual risk behavior. During this phase of the study, Simon will work with Jennie Noll, Ph.D., associate professor at the University of Cincinnati College of Medicine and one of the original investigators of the longitudinal study. That data shows an average age of 13 for those girls' first sexual intercourse, often with older partners and with high revictimization rates.

Results from the first phase of Simon's study will inform a new investigation, for which she will gather data about the sexual development of 120





abused and nonabused adolescent females between 11 and 14 years old. Simon will examine differences in girls' reactions to age-appropriate stimuli, which likely will include things like word lists, video clips of boy-girl dating interactions and picture cards of such interactions that require them to make up a story. Those reactions will be assessed over time to understand whether females with CSA histories respond differently to those age-normative stimuli and, in turn, whether their reactions predict sexual risk behavior.

Resistance to techniques for avoiding sexually risky behavior may be unique to sexually abused children. Simon believes such resistance may have something specifically to do with the unique way that sexual abuse distorts sexual development.

Her hypothesis is that there is something specific about early sexual coercion that proves disruptive to sexual development. Among nonabused children, however, Simon expects that only externalized behavior problems will predict sexual risk.

"We don't really know what specifically happens to CSA victims, or the mechanisms," she said. "If we can follow them over time, we can better understand how sexual health and sexual development unfolds for these kids so we can develop for effective risk-reduction and intervention programs."

"We really need to understand what's happening as these girls enter puberty and their social worlds become more sexual, as well as how they respond and how we can better help them foster more healthy sexual development when that becomes salient to them."

"Learning to negotiate romance and sexuality is an important and challenging developmental task under the best of circumstances."

— Dr. Simon



#### **About Dr. Valerie Simon:**

*Dr. Simon received a B.A. in music therapy from Loyola University, and a Ph.D. in clinical and development psychology from the University of Denver. She completed her clinical residency at the University of North Carolina at Chapel Hill and a post-doctoral fellowship at the Warren Alpert Medical School of Brown University. She joined Wayne State University in 2005.*

#### **For more information, visit:**

<http://www.clas.wayne.edu/faculty/simon>



# Inspiration...from nature to inorganic chemistry

Coordination complexes are more than pretty colors; they are potential solutions to problems in molecular electronics, alternative energy and cancer treatment

Although it was once thought that inorganic compounds couldn't occur in living organisms, metal compounds are now known to be the driving force behind many vital processes in nature – from the mechanism of oxygen production in photosynthesis to keeping many proteins and enzymes working.

Cláudio Verani, Ph.D., associate professor of chemistry in Wayne State University's College of Liberal Arts and Sciences, is working to understand how the ingenuity of metals in nature can inspire solutions to human dilemmas – from information storage to renewable energy to cancer treatment. For these endeavors, he is using some of the most vibrant metal compounds as a starting point for developing new molecular materials in the lab.

"We call this 'bioinspired chemistry' because nature inspires our synthetic design," he said.

Verani is a bioinorganic chemist, which means he models the properties of inorganic systems to understand how important processes such as oxygen activation and electron transfer work. He is specifically focused on coordination complexes – structures consisting of a central transition metal ion that is bonded to surrounding organic ligands.

Coordination complexes are often spectacular in color because of electronic transitions caused by the absorption of light. It was this characteristic that first attracted Verani to studying them. "It comes back to color – deep blues, reds and greens. I was fascinated by this aspect," he said. "It was a combination of curiosity about the electronic mechanisms that explain the existence of such colors and the vital role of these compounds in nature that led me to my current work."

**W**  
 "We call this 'bioinspired chemistry' because nature inspires our synthetic design."

— Dr. Verani

Supported by a second cycle of National Science Foundation funding, Verani and his team of researchers are addressing an impending dilemma in computing by exploring alternative, molecule-based forms of data storage. Verani's group pioneered the use of redox-active metal surfactants for molecular electronics. These materials can stabilize charge, enabling the reading and writing of information processes in the form of organic radicals. "The growing need for information storage is a concern our society faces, and alternative technologies must be found quickly," Verani said. He proposes that these compounds could be used to create smaller circuits able to handle larger storage densities without undesired production of heat.

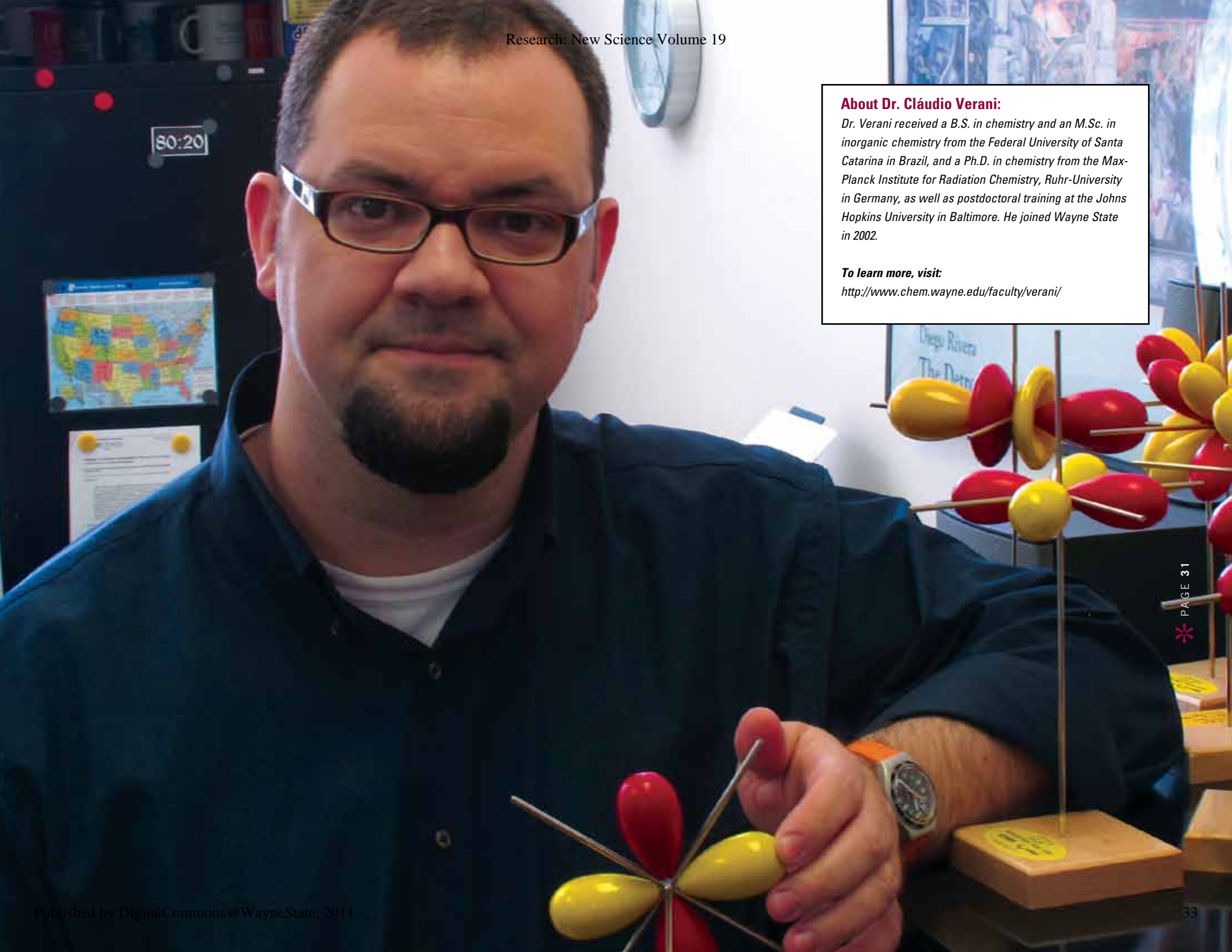
With funding from the Department of Energy, Verani is also conducting fundamental research that could pave the way to the highly anticipated hydrogen economy. Along with John Endicott, Ph.D., professor emeritus of chemistry and an authority in photophysics, and Bernard Schlegel, Ph.D., professor of chemistry and an expert in chemical computations, both from Wayne State, they are working to understand the mechanisms of water splitting. This process breaks water into

dihydrogen – a clean, renewable alternative to petroleum – and dioxygen. Inspired by photosynthesis, the team hopes to understand the design of compounds that contain several different metal centers capable of accumulating the charge needed for water splitting. Verani is also addressing the design of multimetallic catalysts capable of forming films. "If we can understand how to split water into its two basic components, we may be on our way to fuels that require only water and sunlight for production," Verani said.

In addition, Verani is working with Ping Dou, Ph.D., professor of oncology, pharmacology and pathology in Wayne State University's School of Medicine and the Karmanos Cancer Institute, to understand and develop metal-containing anticancer drugs. The pair's research targets are cellular proteasomes – large enzyme complexes that regulate the degradation of hazardous and cell-damaging defective proteins. "Proteasomes are present in healthy cells, but are much more abundant in cancer cells," Verani said. "By understanding how metal complexes bind with proteasomes, we hope to learn how to target the proteasomes of cancer cells, selectively leading them to apoptosis – programmed cell death."

In all his current work, Verani emphasizes nature's influence on the design of his synthetic compounds. "This research requires a lot of work and an open mind," he said. "Coordination chemistry offers the best starting point for our synthetic strategies. In understanding these processes, we can improve quality of life through the development of new technologies and future drugs."





**About Dr. Cláudio Verani:**

*Dr. Verani received a B.S. in chemistry and an M.Sc. in inorganic chemistry from the Federal University of Santa Catarina in Brazil, and a Ph.D. in chemistry from the Max-Planck Institute for Radiation Chemistry, Ruhr-University in Germany, as well as postdoctoral training at the Johns Hopkins University in Baltimore. He joined Wayne State in 2002.*

**To learn more, visit:**

<http://www.chem.wayne.edu/faculty/verani/>

# Lifting the weight of chronic illness

WSU social work researcher uncovering ways to cope with long-term disease and end-of-life issues

Faith Pratt Hopp, Ph.D., M.S.W., assistant professor of social work in Wayne State University's School of Social Work, recognizes that advanced chronic diseases such as heart failure and diabetes have as many psychological implications as they do medical.

A metro Detroit native, Hopp became interested in end-of-life issues while working at a nursing home in high school. "I was really struck by the fact that a lot of people there seemed very unhappy," she said.

Her father, Henry Johnson Pratt, was a WSU political science professor who specialized in policy issues related to aging. They frequently discussed Hopp's experiences at home. "I was fully immersed in the everyday issues of people facing the end of their lives," Hopp said. "At home, I discussed these things with my father, who gave me insight into the policies that influenced what I was seeing. This early awareness helped shape my path as a researcher."

Hopp conducts qualitative and quantitative research to understand the experience of those with advanced chronic illness, as well as their caregivers, with the purpose of identifying coping strategies and developing interventions. Her most recent studies were funded by a \$100,000 grant from the John A. Hartford Geriatric Social Work Faculty Scholars Program. The research was done in the context of the social worker – a job she describes as an art. "The role of a social worker is more than helping people find ways to pay their medical bills – it's helping them access all the resources in their community, both tangible and intangible," she said.

One of Hopp's main areas of focus is heart failure. In a recent paper, Hopp conducted an

in-depth analysis of those living with heart failure. The results identified difficulties in navigating the health care system, life disruption, social isolation, uncertainty about prognosis and the symptoms of heart failure as some of the condition's most common stressors.

Focusing on the urban population, Hopp conducted a study with Robert Zalenski, M.D., the Brooks F. Bock Professor of Emergency Medicine in WSU's School of Medicine and director of palliative care at Sinai-Grace Hospital, which provided a deeper understanding of African-American elders with advanced heart failure. Living scared, trying to make sense of heart failure, resiliency, spirituality and self-care were prominent themes.

She also explored the experience of African-American daughters filling the role of primary caregivers for parents with heart failure. "The study found that social workers play a critical role in supporting and advocating for caregivers, helping them cope with stressors associated with advanced illness, connecting families with culturally acceptable services and facilitating communication with health care providers," Hopp said.

Hopp also has conducted studies on the merits of home care telehealth systems on improving mental health and lowering the use of inpatient and outpatient health care. One such study, funded by a Veterans Administration Health Services Research and Development grant, found that satisfaction with the equipment was high, and further studies are necessary to determine whether it's beneficial as an adjunct to traditional at-home care. "For some, it may provide a sense of control, that they are overseeing the maintenance of their condition," Hopp said.

Among her major discoveries, Hopp has learned that the first step of a social worker is getting people to understand that they have a condition. The next step is drawing upon resources in their patients' lives and social networks, community centers and programs to strengthen each patient's sense of support. In addition, fostering a patient's sense of independence has a positive effect on quality of life. On a policy level, the research underlines the need for an adequate health care safety net for people with chronic conditions regardless of their job status.

At the root of Hopp's findings is the need for social workers to execute psychosocial interventions. "The goal of my research is to draw attention to the invaluable work of social workers, while continuing to uncover ways to improve the assistance they provide those who are managing the most difficult of life circumstances," she said.



## About Dr. Faith Pratt Hopp:

*Dr. Hopp received a B.A. in psychology from Oberlin College, an M.A. in sociology with a specialization in health and aging, an M.S.W. with a specialization in policy, and a Ph.D. in social work*

*and sociology from the University of Michigan. She joined Wayne State University in 2006.*

### To learn more, visit:

<http://socialwork.wayne.edu/faculty/bio.php?id=852>





# Amplifying cancer's signal

In the United States and most other developed countries, lung cancer is the leading cause of cancer-related death. Notoriously hard to detect in its early stages, the overall five-year survival rate for the disease is only 14 percent.

Maik Hüttemann, Ph.D., assistant professor of molecular medicine and genetics in Wayne State University's School of Medicine, along with research associate Jeffrey Doan, Ph.D., is working to improve those odds by developing a screening technique for a gene that may be indicative of lung cancer. He is developing a platform technology which utilizes probe ligation and rolling circle amplification to screen for any target gene in many different types of diseases.

To begin, though, the research has centered on cytochrome c oxidase (or COX), the "pacemaker of aerobic metabolism." The level of *COX4-2*, a lung-specific COX gene, directly correlates with the amount of oxygen in lung tissue. "And oxygen levels," Hüttemann said, "can indicate whether tissue is healthy or cancerous."

"In 70 percent of all human diseases, we find a change in the oxygen environment," Hüttemann said. "*COX4-2* levels may be one of the early indicators of that shift in lung cancer tissue."

In healthy cells, the primary type of metabolism is aerobic oxidative phosphorylation in the mitochondria. This type of metabolism produces adenosine triphosphate (ATP), biological energy that fuels most of the body's processes. In cancer cells, however, the predominant type of metabolism is glycolysis, an anaerobic process. Rather than energy, products of glycolysis and associated pathways are

W

"In 70 percent of all human diseases, we find a change in the oxygen environment, *COX4-2* levels may be one of the early indicators of that shift in lung cancer tissue."

— Dr. Hüttemann

required for the proliferating cell. "The switch from aerobic to glycolytic metabolism reflects the cancer cell's need for building blocks for DNA, lipid, and protein biosynthesis," Hüttemann said.

In an ongoing study, Hüttemann and colleagues found that *COX4-2* is dramatically downregulated in lung cancer. This was measured against the somatic form of the gene, *COX4-1*, which is expressed at similar levels in cancer and non-cancer tissue. The finding holds for various types of lung cancer and lung cancer cell lines – approximately 80 were tested – including a cell culture model simulating carcinogenesis in vivo. "In that model, *COX4-2* is downregulated from the earliest stages," he said. "And, this makes sense because we have

shown that *COX4-2* makes cells more aerobic, which is the opposite of what the cancer wants. Therefore, our results suggest that the *COX4-2* gene is a mechanism-based marker for lung cancer."

Hüttemann's current work aims to expand on these findings by investigating expression levels of *COX4-2* with greater accuracy. He is developing probe ligation and rolling circle amplification techniques to detect levels of both *COX4-1* and *COX4-2*. "Differences between the levels of these two genes may indicate the presence of cancer."

The techniques entail Hüttemann's lab synthesizing DNA segments, or "probes," that recognize and attach to the target gene. Using DNA polymerase and a circular DNA template, DNA generation amplifies the target of the gene-specific probes 1000-fold.

"Using the DNA extensions, the signals of the two genes are 'amplified,' enabling our lab to locate and quantify the levels of *COX4-1* and *COX4-2* with much greater accuracy than we ever could before," Hüttemann said.

Hüttemann's group is currently working to further develop the techniques into a robust working assay in the lab. Once this is achieved, the next step will be to test it using clinical specimens from lung cancer patients.

Improved ability to measure the levels of the COX genes may result in a test for the early screening of lung cancer. "Only 15 percent of lung cancer tumors are detected in time to do something about it," Hüttemann said. "Our hope with this assay is to develop a robust screening method. In particular, individuals at high risk for developing



lung cancer, including smokers would benefit from such a test.”

Although lung cancer is Hüttemann’s primary interest, he also aims to develop the assay as a platform technology to screen for any gene.

“Although this step is further into the future, if we can successfully develop the technology to detect a gene of interest and amplify its signal, our ability to screen for specific genes may increase dramatically,” Hüttemann said. “This, in turn, may help in the early detection of not only different kinds of cancers, but perhaps other diseases such as neurodegenerative disorders, diabetes and innumerable other health problems with a genetic footprint.”

Maik Hüttemann and his research team are developing a platform technology to screen for target genes in lung cancer and other diseases.

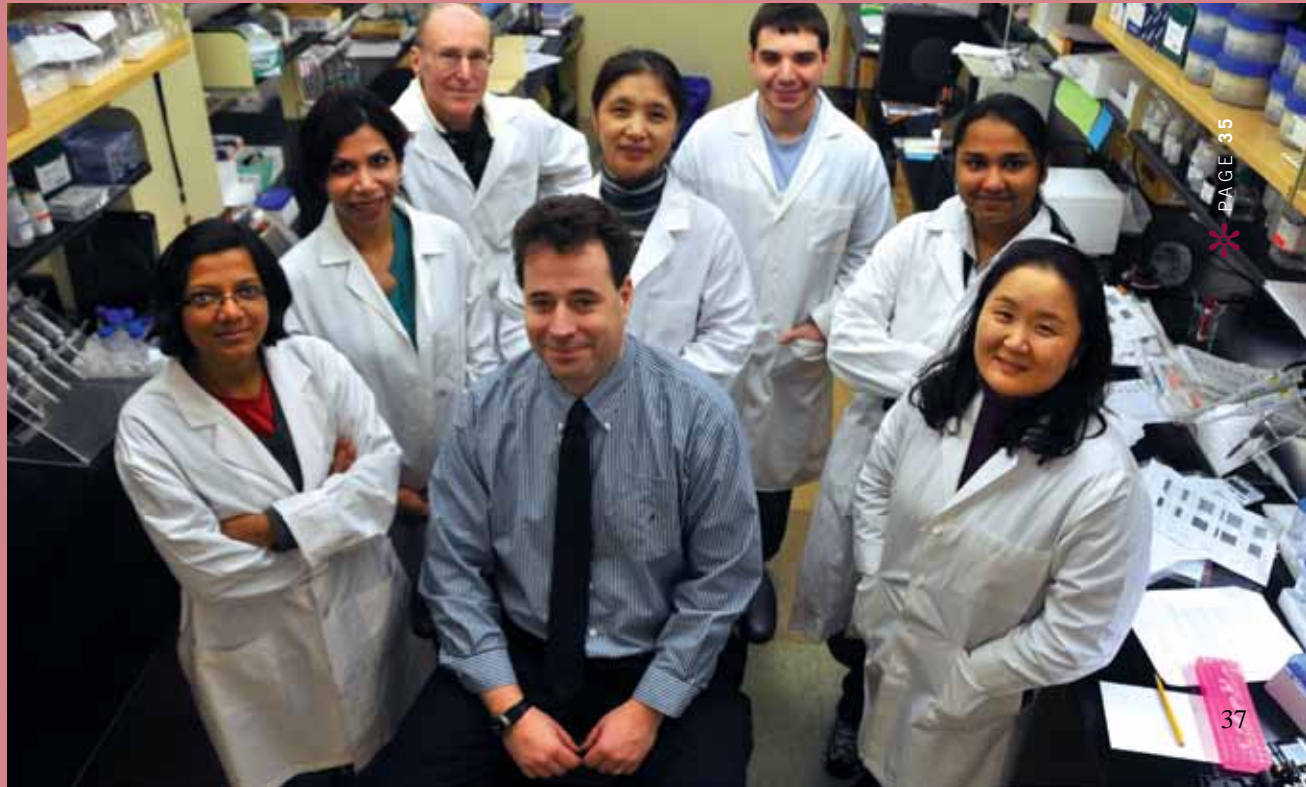


**About Dr. Maik Hüttemann:**

*Dr. Hüttemann received a B.S. and an M.S. in chemistry, and a Ph.D. in biochemistry and molecular biology from the University of Marburg in Germany. He joined Wayne State University in 2000.*

**To learn more, visit:**

<http://genetics.wayne.edu/faculty/huttemann/index.php>



# Eye tracking

## Getting a view of children's strategic reading process

A second grader is seated in front of a computer monitor in Wayne State University's children's reading lab, reading aloud from *The Wolf's Chicken Stew* by Keiko Kasza – a story of a wolf with exceptional culinary skills. As he reads, a cursor appears on the screen, marking the path that his eyes make as he reads: following the text, then zigzagging to the illustration of the wolf carrying a stack of pancakes, back to the text, then to a second illustration, showing that the time is night.

By tracking eye-movement patterns of elementary-age children while they read aloud, Karen Feathers, Ph.D., and Poonam Arya, Ph.D., both associate professors of teacher education in the College of Education, are discovering how elementary-age children strategically process text. Of particular interest is readers' use of visual cues within texts to construct meaning while reading.

"We set out to explore how children utilize both words and images to create meaning in various types of texts," Feathers said.

In their most recent study, Feathers and Arya had Detroit-area second and third graders read text from both authentic children's literature and basal readers – anthologies compiled by publishers for use in schools – on a computer screen. A camera below the monitor tracked eye movement by sending an infrared beam to the eye, determining the location of the gaze by the angle of the beam. A separate device was used to track head movement to ensure accuracy. Data was collected using an ASL model 504 eye tracker.

Robert Erlandson, Ph.D., professor of electrical and computer engineering in the College of Engineering, and Santosh Kodimiyala, research assistant in Erlandson's lab, developed EyeMotion,

a suite of software tools that provide easier viewing of eye tracking and optimize the data collection and analysis.

The analysis offered several insights into the strategies of the young readers. When a child encountered a difficult word, for example, Feathers and Arya found they used many resources and techniques to figure out the word, including rereading the sentence, rereading the paragraph, looking at other parts of the text and looking at illustrations. "When a child gets stuck on a word, they are often told to 'sound it out,'" Arya said. "But our research shows that teachers should encourage students to use a variety of strategies involving all elements of the text to help them understand."

The research also found that anthologies of children's literature can hinder effective reading



### About Dr. Karen Feathers:

*Dr. Feathers received a B.A. in English from Russell Sage College, an M.A. in English education from the State University of New York at Albany and an Ed.D. in reading from Indiana University. She is the coordinator of the Reading, Language and Literature program in WSU's Teacher Education Division. She joined Wayne State University in 1991.*

**To learn more, visit:**

<http://coe.wayne.edu/ted/bio.php?id=42231>



### About Dr. Poonam Arya:

*Dr. Arya received a B.A. in English, an M.A. in English literature and an M.Ed. in reading education from Delhi University in India, and a Ph.D. in curriculum and instruction from the State University of New York at Buffalo. She joined Wayne State University in 2005.*

**To learn more, visit:**

<http://coe.wayne.edu/faculty-staff/bio.php?id=42015>



### About Dr. Robert Erlandson:

*Dr. Erlandson received a B.S. in electrical engineering from Wayne State University and a Ph.D. in biomedical engineering from Case-Western Reserve University. He is the director of WSU's Enabling Technologies Laboratory. He joined WSU as a faculty member in 1975.*

**To learn more, visit:**

<http://ece.eng.wayne.edu/~rerlands/>



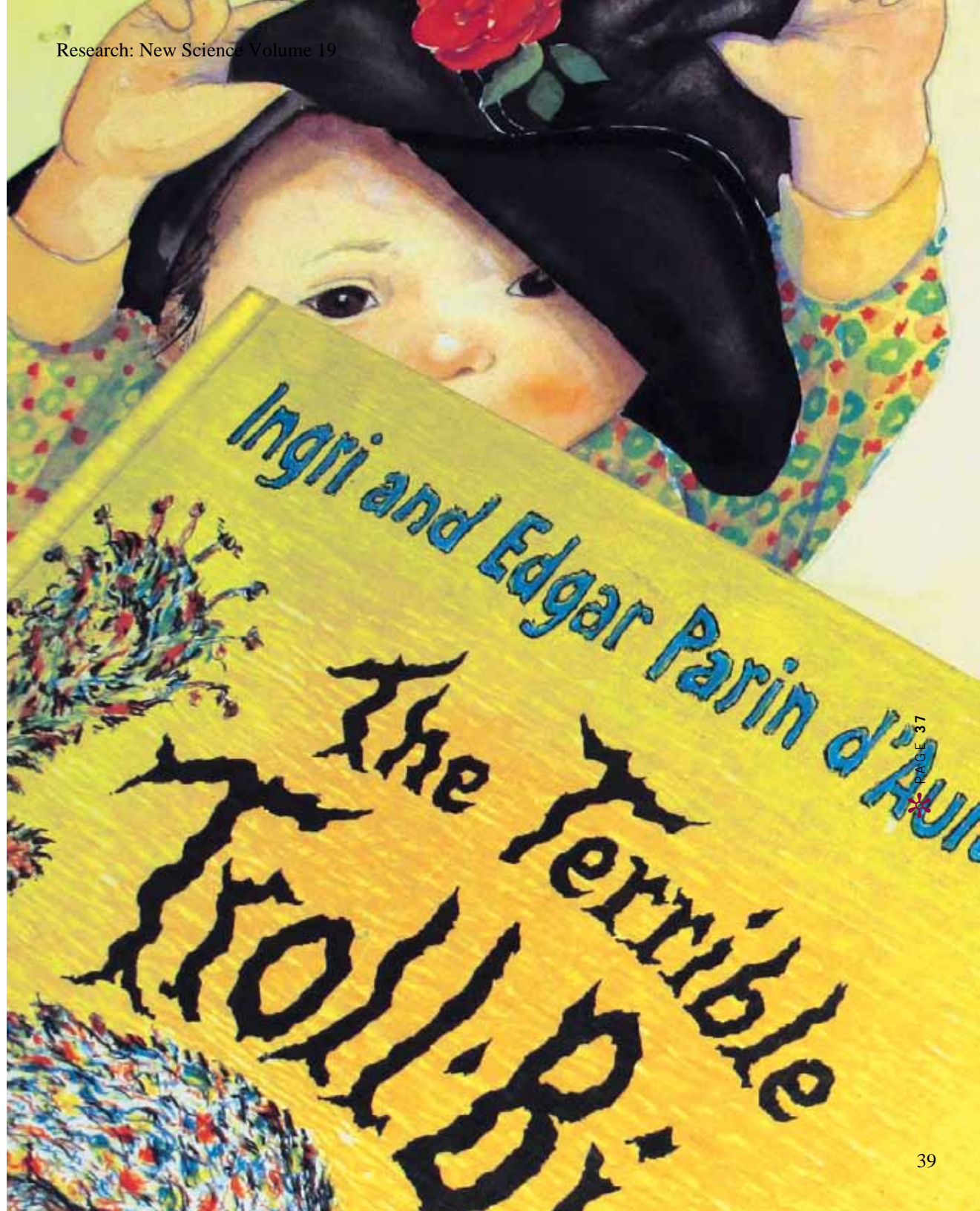
“We set out to explore how children utilize both words and images to create meaning in various types of texts.”

— Dr. Feathers

because they contain alterations to the original story. “In anthologies, chunks of the story are removed, texts are condensed and pictures are rearranged or removed altogether,” Feathers said. “These changes make it more difficult to understand the events of the story chronologically and hinder children’s ability to correct their miscues.”

Feathers and Arya hope data from their study will help teachers more effectively respond to their students’ oral reading and provide strategies to improve comprehension. The results may also influence school districts’ selection of classroom texts, as well as publishers’ editorial decisions as they adapt texts for anthologies.

An earlier study by Feathers and Arya on the strategies second-graders use to process text was accepted to the journal *Literacy Research and Instruction*. The team plans to continue to deepen their understanding of the reading process by having subjects discuss how they use images during reading. Students will be asked to explain text features that hindered or contributed to their understanding of the text. “We hope we can further identify the elements that make things click for students and what strategies optimize their comprehension,” Arya said. “The results will not only help us improve school performance, but students may also be more likely to enjoy reading.”





# Retrieving sight

WSU spinoff, RetroSense, aims to use algae gene to aid blind

Gene-therapy, the technique of inserting genes into cells to treat disease, holds promise for many areas of medicine. For Zhuo-Hua Pan, Ph.D., professor of anatomy and cell biology in the School of Medicine, and Sean Ainsworth, founder of RetroSense Therapeutics LLC, the breakthrough therapy means restoring vision to millions of people suffering with incurable blindness.

Pan, along with colleagues at Salus University, has developed a novel gene-therapy approach for treating blindness caused by age-related macular degeneration (AMD) and retinitis pigmentosa (RP) – disorders that are currently incurable. The treatment delivers a photoreceptor gene from blue-green algae, which converts previously non-photosensitive retinal cells to photosensitive cells. The result is restored light responses in the retina.

AMD is the leading cause of blindness in people over 60, affecting more than 8 million people in the U.S. alone. Worldwide, 500,000 individuals lose their eyesight annually due to AMD, which is the result of progressive deterioration of the macula, the central portion of the retina.

RP is a genetically-determined eye disease caused by any of 100 different genes. An estimated 100,000 people in the U.S. have RP, which typically manifests as night blindness and progresses to tunnel vision and sometimes complete blindness.

Other technologies being developed to restore vision in patients with AMD and RP include implanted devices and stem cell technologies. However, stem cells can cause damage to surrounding cells and implanted devices are highly invasive and suffer from poor resolution. Pan's

technology holds the potential to restore vision while avoiding these negative side effects.

Ainsworth licensed the technology from Wayne State University in an effort to eventually test the technology in humans. While there is at least six years of research and testing needed before anything can be brought to the market, FDA Phase I tests should begin in early 2012.

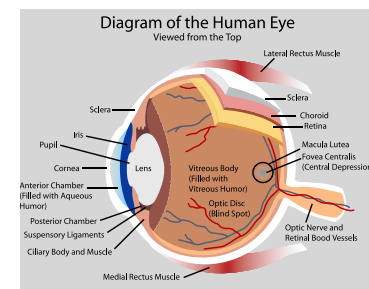
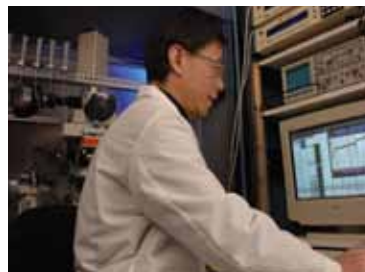
With this technology, combined the business expertise of Ainsworth, a seasoned life sciences consultant and entrepreneur, Pan is hopeful his breakthrough treatment is on the fast track to restoring a vital part of the human experience for millions of people worldwide.

**To learn more about RetroSense, visit:**

<http://www.retro-sense.com/>



RetroSense  
THERAPEUTICS



# Developing technology to address the way you heal

Currently, 25 percent of the 24 million diabetics in the United States are suffering from chronic foot ulcers, according to the American Diabetes Association. Simple and effective wound treatment is necessary to reduce the risk of amputations.

In response to the pressing medical challenge, researchers at Wayne State University and the University of Michigan confirmed the viability of applying an interactive wound dressing comprised of non-woven fabric with porous microcarrier beads and human keratinocytes - living human skin cells - directly on wounds. These findings became the platform technology for the Chicago-based start-up, KeraCure®.

KeraCure® has partnered with Genzyme, the world's leading cell-therapy company, to produce a simplified wound dressing. Known as the KeraPac®, the dressing is expected to improve the lives of more than 10 million chronic wound sufferers requiring treatment each year, including those with diabetic foot ulcers, venous stasis ulcers and pressure ulcers.

KeraCure® believes the platform technology will also advance clinical care and the delivery of gene products for stem cell delivery, cardiac repair, vascular repair, bone repair, nerve regeneration, burns and cosmetic surgery.

**For more information about KeraCure®, visit:**  
<http://www.keracure.org/>



# KeraCure®



# Wayne State startup company working to advance biofuels

**N**extCAT, Inc. is working to advance a biofuel catalyst technology developed at the National Biofuels Energy Lab at Wayne State University.

A recent license agreement is allowing NextCAT to commercialize a class of catalysts that enable biodiesel producers to use cost-effective raw materials such as waste vegetable oil, animal fats and residual corn oil, and convert them into biodiesel. This technology offers a unique process solution for an industry that has been mostly idled in the United States since 2008, when rising feedstock prices rendered the production of biodiesel uneconomical. With a cost savings of at least \$1 per gallon over traditional diesel fuel, the NextCAT solution greatly changes the economics of a biodiesel plant.

With secured seed funding from Automation Alley and the Michigan Pre-Seed Capital Fund, NextCAT is designing, building and installing a pilot reactor at an engineering center of a biodiesel equipment manufacturer. With this investment, along with other investments and grant funding, including awards from the National Science Foundation (NSF), NextCAT has received more than \$800,000 to bring this technology to market. Additional funding from NSF looks promising for the project, "Heterogeneous Catalyst for the Economical Production of Biodiesel from High Free Fatty Acid Feedstock." This Small Business Innovation Research (SBIR) Phase II project proposes a potentially viable solution for many financially stressed biodiesel producers. Producers will simultaneously be able to use low cost feedstock and greatly simplify the biodiesel production

process. In addition, currently idled facilities will be able to produce biodiesel fuel that will be cost competitive with petroleum diesel and help meet anticipated global market demand of approximately 8 billion gallons of biodiesel by 2015, along with adding jobs in economically depressed areas of the United States and bringing the nation closer to energy independence.

In addition to the cost and energy savings associated with biodiesel fuel, there are several advantages that make it a smart choice to manufacture and use. Biodiesel is nontoxic and biodegradable and therefore is environmentally safe. Advanced biofuels, in general, are produced domestically, thus lessening dependence on foreign oil. Also, producing advanced biofuels can stimulate the local economy through job creation in farming, transportation and production.

"The science team of Dr. Steven Salley, associate professor of chemical engineering, College of Engineering; Dr. Shuli Yan, research director at NextCAT; and I are excited to see our technology progressing toward usage by the biodiesel producers, and we look forward to a successful production demonstration in the near future," said Simon Ng, Ph.D., chief technology officer at NextCAT, interim associate dean for research in Wayne State's College of Engineering and the technology's co-inventor.

"The NextCAT technology offers an exciting alternative to the current biodiesel fuel production



## NextCAT

Enabling the Next Generation of Biodiesel

process," said Hilary Ratner, Ph.D., vice president for research and dean of the Graduate School at Wayne State University. "With this license agreement in place, NextCAT can now take the technology to the next level and ultimately make a major impact on our environment as well as our economy."

**To learn more about NextCAT, Inc., visit**  
<http://nextcatinc.com/>



# Opportunity knocks

## Wayne State's Front Door

From well-established businesses in need of a little expertise to first-time entrepreneurs looking for help completing a prototype, The Front Door at Wayne State University is here to join the business sector with the forefront of research.

*The Front Door* is industry's one-stop portal to Wayne State's vast amount of resources, including research expertise and consulting, core facilities, business development programs, technology licensing opportunities, student interns and soft landings for new businesses.

Through *The Front Door*, businesses can find research partners or develop, improve or validate their technology. Companies that have come through *The Front Door* include a large life sciences company that used WSU laboratory services to accelerate drug discovery and an emerging technology company that used WSU engineering expertise to complete the development of an electric car battery charger.

*The Front Door* is also the place where companies and venture capitalists looking to invest in emerging WSU technology can meet faculty members with the potential to be future business partners.

Along with the University of Michigan's Business Engagement Center and Michigan State University's Business-Connect, The Front Door completes the establishment of a business-to-research gateway at all three institutions in the University Research Corridor (URC).

"When considering the new technologies that will be made available to the marketplace, the businesses that will grow and the new research that will be stimulated, the potential of partnerships

formed through *The Front Door* is limitless," said Nancy Christ, interim director of The Front Door. "With the combined strength of our URC partners, U-M and MSU, *The Front Door* will facilitate revitalization and transformation of Michigan's economy, all by performing the simple task of making conversations happens."

To learn more about the Front Door visit:

<http://thefrontdoor.wayne.edu/>



thefrontdoor  
for Business Connections at  
Wayne State University

# 2010

Wayne State University Research

## Research and Technology Commercialization Annual Report

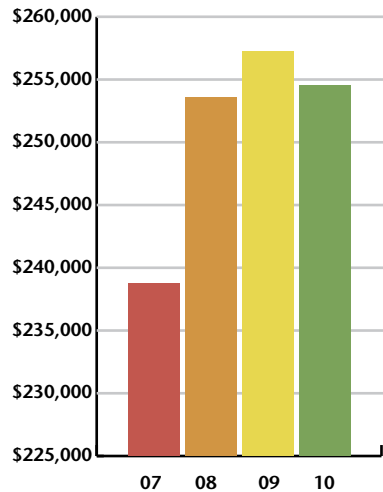


# Wayne State University Research ANNUAL REPORT

## *Year in Review*

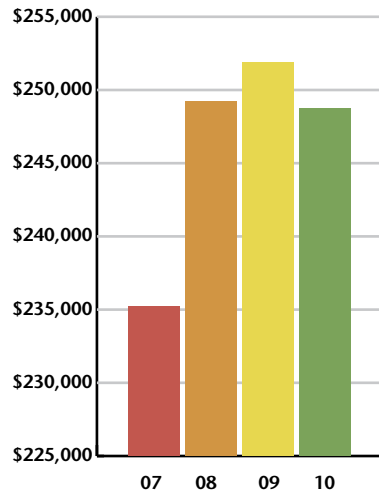
Wayne State University has a rich and diverse environment that provides faculty and student opportunities to achieve their dreams and goals. Research, scholarship and creative activity are the foundation of our achievements, providing our students an enhanced university experience that ultimately prepares them to be our future leaders, scientists, health professionals, artists, educators and entrepreneurs. Our faculty transform not only the lives of our students, but also those of the people in Detroit, Michigan and around the world with groundbreaking ideas and discoveries that lead to new ways of living.

Total Research Expenditures



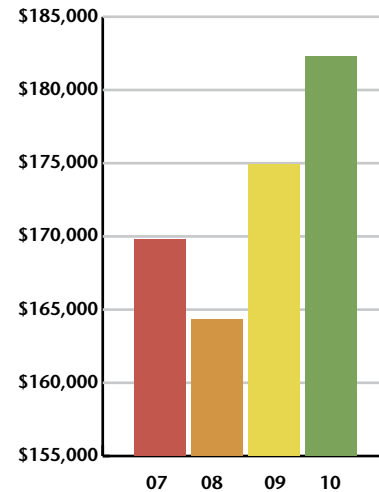
In FY2010, Wayne State University's total research expenditures dropped slightly due to new reporting requirements set by the National Science Foundation. Even with these changes, total research expenditures were nearly \$15.7 million or 7 percent higher than in previous years.

Total Science & Engineering Research Expenditures



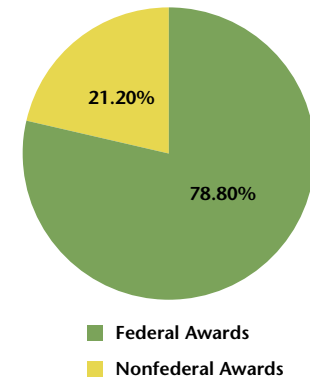
In FY2010, Wayne State University recorded over \$248.7 million in research expenditures for science and engineering fields. While this represents a slight decrease due to the National Science Foundation's new reporting standards, these figures significantly exceed FY2007 totals by over \$13.5 million.

Research Awards



Research awards made to Wayne State University faculty continued to grow in FY2010, with 1082 active awards received. Through their efforts, faculty research awards in FY2010 grew by over \$7.3 million to \$182.2 million.

Federal vs. Nonfederal Awards



The majority of Wayne State University's awards - 78.8 percent - or nearly \$143.6 million - were sponsored by the federal government.

This past year marked strong performances in research activity. Wayne State's total research awards reached over \$182 million and total research expenditures were nearly \$254.5 million. Of the current active awards, 158 have anticipated totals of \$1 million or more.

In a time of increasing competitiveness for funds to support research and a difficult economy, Wayne State University faculty continue to be successful in their quest for investment in their important work. Through their creativity, discoveries and collaborations, Wayne State faculty continue their commitment to improving the lives of others in our community and across the globe.





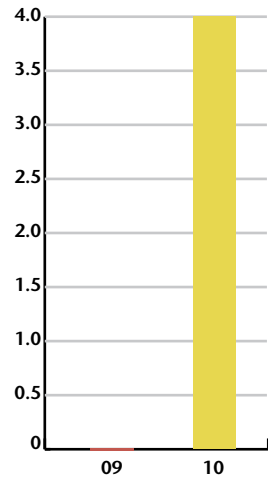
# Wayne State University Technology Commercialization ANNUAL REPORT

## *Year in Review*

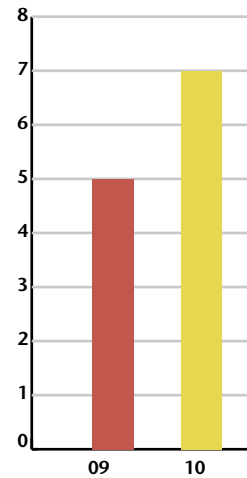
Wayne State University is a major contributor to the revitalization of Detroit and Michigan as we transition from a manufacturing-based market system to a global, knowledge-driven economy. Our research activities provide new opportunities for commercialization, bringing university-based intellectual property into the marketplace and creating start-up companies based on WSU research that generate new jobs, products and service innovations.

Wayne State University is committed to supporting and recognizing the research efforts of our faculty. We know that great ideas can impact the world, so it is critical that we have a strong

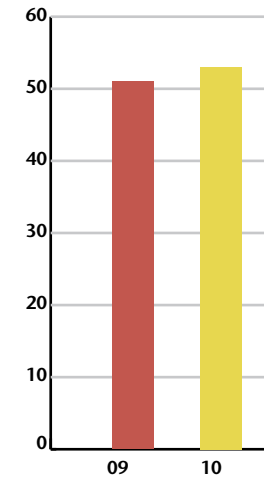
Start-up Companies



Licenses



Patent Applications (U.S.)



innovation infrastructure that leads to commercialization, entrepreneurship, and industry and job creation. All it takes is one cutting-edge, entrepreneurial idea to stimulate the creation of major industries, like the automotive industry which was born in Detroit.

Making connections within our institution and with industry is important for taking great ideas to a level that makes a real-world impact. Over the past year, WSU's technology commercialization efforts have begun initiatives to link people, knowledge and commercial opportunities. Our goal is to position WSU as an innovation partner of choice. We are committed to building on our successes with new initiatives and investment to spur further research, commercialization and economic opportunities.

This issue of *New Science* provides examples of WSU's commercialization efforts, and we look forward to the future as our faculty continue to develop promising new technologies and ideas that will benefit our community and beyond.

WAYNE STATE  
UNIVERSITY

*New Science is a publication of the Office of the Vice President for Research at Wayne State University. To obtain additional copies, please contact Julie O'Connor at [ag2712@wayne.edu](mailto:ag2712@wayne.edu). New Science is available online at <http://www.research.wayne.edu/newscience/>.*

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