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Division of Research
Wayne State University

WAYNE STATE UNIVERSITY
DIVISION OF RESEARCH

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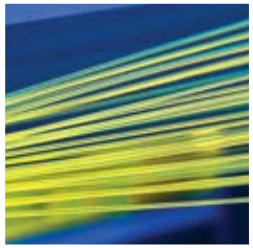
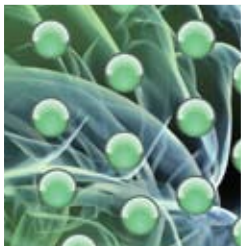
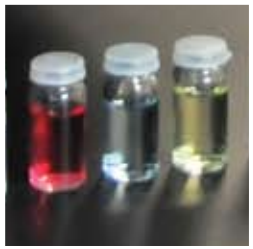

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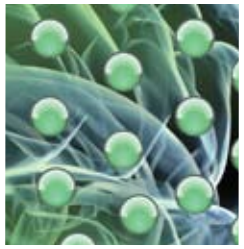

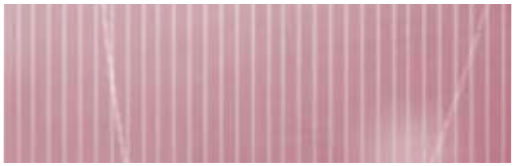

Including The Wayne State University Research Annual Report

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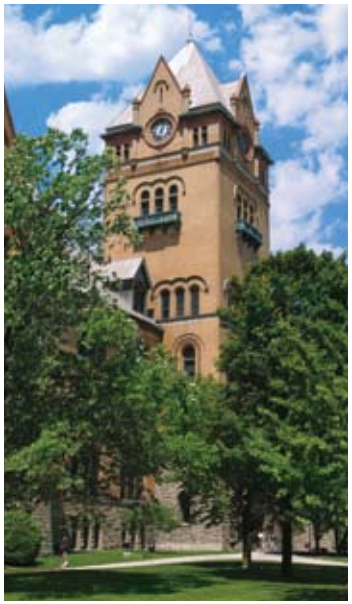
Letter from the Vice President for Research



At Wayne State University, we take great pride in a rich and diverse environment that provides faculty and students 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, educators, artists 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.

This issue of *New Science* showcases faculty and students from across the university who are making remarkable discoveries through creative and innovative approaches to their work. From engaging art to help families cope with pediatric cancer and developing nanodevices to aid in the diagnosis and treatment of maternal infections and fetal brain injury, to improving the health of the Great Lakes, Wayne State faculty are translating sophisticated new ideas into revolutionary approaches that transform health, industry, education and the environment to create better lives for us all.

Wayne State University is playing a major part in 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, as we transfer university-based intellectual property into the marketplace and create start-up companies that generate new jobs and product and service innovations. TechTown, Wayne State's research and technology park, is home to many of these new ventures and brings the resources of Wayne State to high-technology startup companies to diversify and strengthen Michigan's economy in emerging high-growth industries.

Wayne State University also reaches beyond our campus to partner with the University of Michigan and Michigan State University in the University Research Corridor, which is accelerating economic development in Michigan. By facilitating collaborative research projects and large initiatives, the University Research Corridor is sparking innovation and fostering an entrepreneurial spirit that is critical to the future of Michigan. Stories of this transformation are included here.

Of course, only a few of our successes can be highlighted in this issue. To learn more about us I invite you to visit www.research.wayne.edu.

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

Hilary H. Ratner, Ph.D.
Vice President for Research

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The art of healing

Helping families cope with pediatric cancer

by Julie O'Connor

Coping with the diagnosis and treatment for cancer is one of the most difficult things a person or family may face. In children it is not only difficult, but also is a traumatic experience that can create negative behavioral and psychological reactions to treatments, and can even affect the long-term survival and quality of life of the child.

Through a creative research program funded by Wayne State University's President's Research Enhancement Program, a collaborative team of faculty from the Karmanos Cancer Institute, the School of Medicine's department of family medicine and public health sciences, and the departments of theatre and art in the College of Fine, Performing and Communication Arts are designing new ways to use creative expression to reduce anxiety of children and their parents during distressing cancer treatments.

While waiting for a procedure, families participating in the study will be assigned to one of two settings: waiting in the reception area with toys, video and TV access and an enhanced waiting period with an art making activity for the child and parent to work on together. Interactions of the parent and child during the project will be captured on video, and then analyzed to determine the impact of the project on reducing parent and child anxiety before a procedure.

"This family-centered care agenda is the vision of the top leaders at Children's Hospital of Michigan" said Terrance Albrecht, Ph.D., principal investigator and professor of family medicine and public health sciences at WSU's School of Medicine, associate center director for population sciences and program leader of population studies and prevention at KCI. "It is great leadership in the WSU Office of the Vice President of Research and at Children's Hospital of Michigan that has helped bring our extraordinary team together, and they are our true inspiration for this research project."

The funding will allow the research team to study the treatment, stress and trauma that not only the child experiences, but the entire family. "Kids can be strong and resilient, but we have found that the parents face great fear that can often lead to less than constructive responses," said Albrecht. "Through this program, we aim to help them orient through

treatment through creative expression

the treatment process together and channel their energy to create positive moments with their child that can help them through treatment."

Albrecht doesn't know what the long-term effect will be, but this small pilot will allow them to see if there are differences in anxiety levels by comparing the research participants to the control group. "If it makes even a small dent, that's good," said Albrecht. "We can then think of longer-term interventions that include creative elements, and help families cope in a positive way through creative distractions."

An intensive qualitative analysis also will be conducted by Dr. Steven Peters, co-principal investigator and associate dean of academic affairs and research, and professor of theatre in the College of Fine, Performing and Communication Arts. Verbal and non-verbal behavioral data will be re-contextualized as performances, and then analyzed as four kinds of survival energy: the mover, or one who initiates a plan of action; the opposer, or one who challenges the mover's actions; the follower, or one who supports the mover or the opposer; and the bystander, or one who withdraws from interaction to observe from afar or leaves the room. By viewing the interaction between the parent and child with and without the art project, an assessment of parent social support can be made, and how anxiety and tension between them is heightened or lessened.

"The field of performance studies provides an analytical lens through which we can decode the interactions (performances) between the parent and the child during the art intervention that occurs at the time of treatment. Social interactions reflect the type of context or story that parents have chosen as a compass for survival during the health crisis. Their story frames a likely pattern of events they expect will unfold. Each parent casts themselves and their child (and everyone else they encounter during treatment) in that story," said Peters. "Some stories have happy endings with themes of validation or support. Others are stories of loss and victimization. Still other stories center on blame or abandonment. The question for me is whether or not the story that the parent chooses has a bearing upon the outcome of treatment.

This project will give Fine, Performing and Communication Arts students valuable insights on the role that their own and other people's stories actually play in the creating and shaping of their lives. Art, dance, drama and music will play a significant complementary role in 21st century medicine because of their survival value, and will be profoundly normalizing and supportive for those undergoing medical treatment. Creative expression in a medical setting can ultimately rebuild a child and their family's sense of hope, identity and coping through safe expression of feelings.

"Essentially, we grow up, we dream and we live our entire lives through stories," said Peters. "Stories are mother lodes of energy that charge us with power, contextualize the images of what we want to happen and that happen to us, determine the construction of our identities in relationships, and become the essential imaginative vehicles of our survival."

About Dr. Steven Peters:

Dr. Peters received a graduate degree in theatre arts from Baylor University and a Ph.D. from Texas Tech University. He joined Wayne State University in 2008.

About Dr. Terrance Albrecht:

Dr. Albrecht received a B.A., M.A. and Ph.D. in communications, and a Master's degree in Labor and Industrial Relations from Michigan State University. She joined Wayne State University in 2003.

To learn more, visit: http://www.med.wayne.edu/fam/faculty/albrecht.asp and http://www.cfpca.wayne.edu/

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Changing

Bringing sustainability to the Great Lakes

by Amy Oprean

With aging infrastructures, many of the nation's cities now are faced with the challenge of restructuring their water systems to address the need for energy efficiency and water conservation. Detroit is no exception, as the need for smart, innovative uses of the Great Lakes continues to grow.

Taking on the challenge of optimizing Detroit's water transmission distribution is Carol Miller, Ph.D., P.E., chair and professor of the Department of Civil and Environmental Engineering in the College of Engineering. Her team is collaborating with a hydraulics specialty firm, TYJT Inc., and researchers at the University of Dayton and University of Illinois.

"Living in the center of the largest fresh water source in the world, it's incredibly important that we're good stewards of it," Miller said. "As it turns out, improving the health of the Great Lakes is strongly correlated with becoming more energy efficient."

Funded by a $1.5 million grant from the Great Lakes Protection Fund, Miller is developing a software package that will minimize the consumption of the Detroit Water and Sewerage Department (DWSD) water system while improving the health of the Great Lakes. The software has the potential to reduce the energy required to run the DWSD water system 15 to 20 percent and improve the health of both Lake Huron and the Detroit River. The pilot program will be tested on

Currents

the DWSD water system, which provides water to more than four million people in Detroit and 124 surrounding communities. If successful, the new software package could be applied to water systems across the country.

The software is intended to utilize sensors already in place in the DWSD water system that provide real-time data on operational, weather and energy distribution conditions and use the information to provide "on-the-fly" optimization. This can be done in many ways, such as reducing overload on the water works' infrastructure; detecting leaky infrastructure where water is being wasted; and reducing the total amount of water needed to be treated and processed.

Miller's software will aim to reduce the peak load on energy and water systems by moving some transmission and distribution to non-peak hours. Due to the overload it puts on both power grids and water infrastructure, most waste occurs when energy and water demand spike during the day. Water transmitted and distributed during non-peak hours is less expensive, uses less energy and puts less pressure on the network. The approach would require efficient methods of storing energy and water, both of which also are being developed.

The groundbreaking software also will adjust for the inclusion of alternative energy sources, such as wind and solar, into the system. It will have the ability to adjust for predictable factors such as hot, arid days when water and energy use tend to spike. Preparing the system by storing energy and water ahead of time will put less pressure on the network when such heat waves occur.

> "Living in the center of the largest fresh water source in the world, it's incredibly important that we're good stewards of it."
>
> — Dr. Carol Miller

"We're designing this software with other breakthroughs in mind," Miller said. "Every way that energy can be more efficient in the future, we want this software to be compatible with it."

Sensor tracking will pinpoint areas of infrastructure where water is being wasted. It is estimated that in a typical "aged" water system, 15 to 30 percent of water is lost by the time it reaches the user because of old infrastructure, leaky pipes and water idling in pipes connected to empty parts of the city. "This software will feed us the information that will allow better accounting of water and energy losses, and the causes and potential solutions."

Ultimately, Miller's cutting-edge work on energy and water conservation has a very specific goal in mind – improving the health of the Great Lakes.

About Dr. Carol Miller:

Dr. Miller received her B.S.E., M.S.E. and Ph.D. in civil engineering from the University of Michigan. She joined Wayne State University in 1984.

Using less energy per unit of water distributed will reduce the negative environmental impacts associated with energy generation. By transmitting and distributing a more efficient amount of water from Lake Huron and the Detroit River, the DWSD will reduce the amount of airborne contaminants released from power plants. It also will reduce the amount of warm water being released into the lake and river after it's used for the treating process – bi-products that negatively impact the ecology of the Great Lakes.

After considering the complex challenges of revamping an entire water system, Miller is confident Wayne State's expertise and collaborative spirit will contribute to their success. "We have specialists in every area needed to make this project team cohesive and successful. From hydraulics experts to electrical engineers and economists, we have the expertise to develop a comprehensive, real-life solution that can be applied to entire water systems."

To learn more, visit: http://www.eng.wayne.edu/page.php?id=524

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A facelift for fossil fuel

by Amy Oprean

As scientists around the world scramble to develop a viable alternative to fossil fuels, one Wayne State researcher is working to improve the traditional oil refining process for a cleaner, more securely-obtained gasoline.

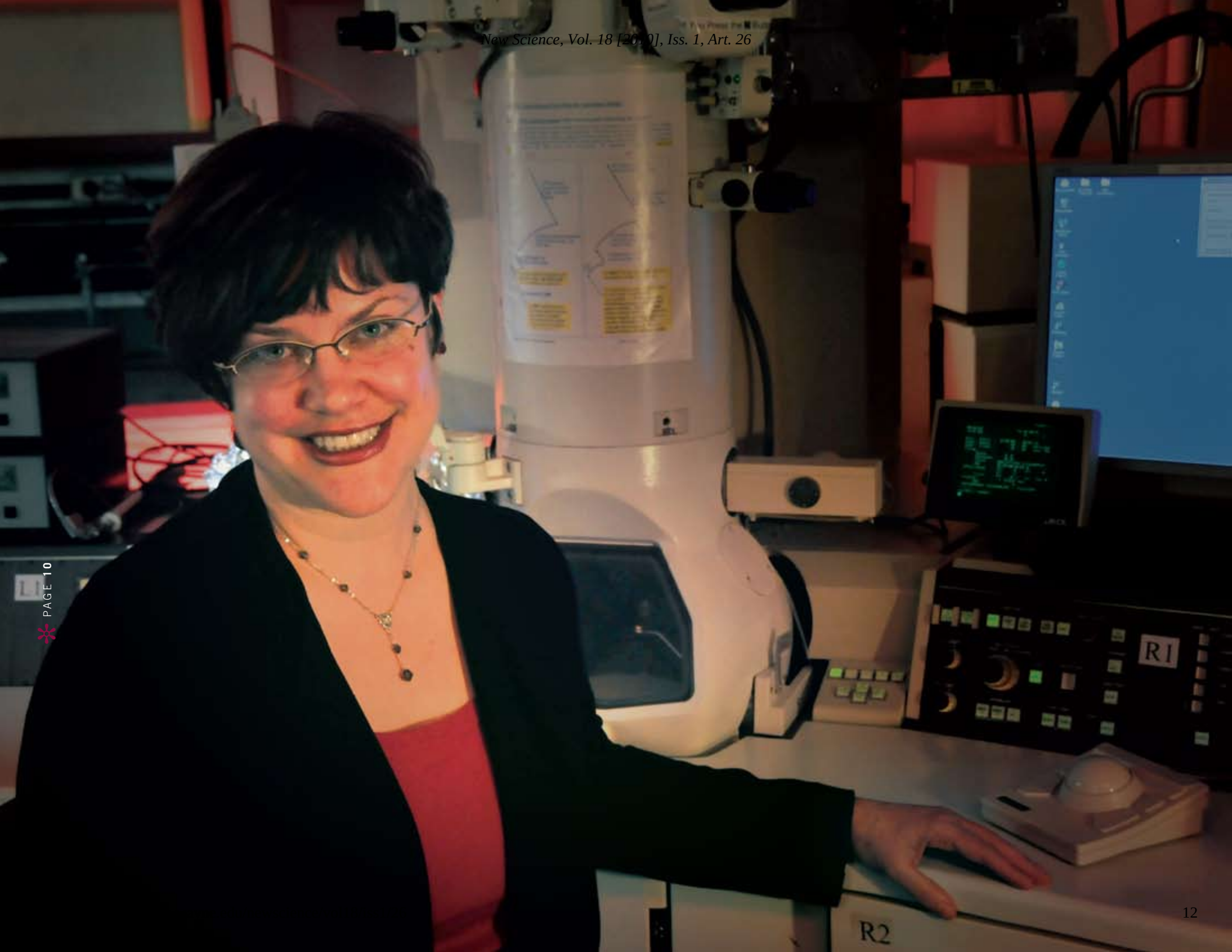
Stephanie Brock, Ph.D., professor of chemistry in the College of Liberal Arts and Sciences, is working as a co-investigator with Mark Bussell, Ph.D., professor of chemistry at Western Washington University, to modify the process by which sulfur is removed from crude oil – a vital step in turning oil into usable fuel. The goal is to synthesize catalysts to make a refining process that's fit to handle the impurities of North American oil sources while reducing harmful emissions to meet Environmental Protection Agency standards.

"Our challenge is twofold: Reducing the emissions of sulfur and nitrogen oxides from burning fuels, and doing so with oil that contains significantly more sulfur impurities," Brock said. "The key to addressing this challenge is synthesizing new catalysts that facilitate a more rigorous and efficient refining process for sulfur removal. The resultant ultra-low sulfur fuels in turn enable the use of advanced emissions control systems that reduce the formation of nitrogen oxides."

The traditional refining process uses sulfide catalysts, which have been known to become "deactivated" over time, removing less and less sulfur from the crude oil until they stop completely. Brock and Bussell will test the potential of nickel phosphides as an alternative catalyst. "What we'd like to have is a catalyst with a greater efficiency and a longer lifetime," Brock said. "Metal phosphides are more resistant than conventional sulfides to losing their functionality. They also seem to have a higher rate of activity and can remove more sulfur overall."

> W
> "Our challenge is twofold: Reducing the emissions of sulfur and nitrogen oxides from burning fuels, and doing so with oil that contains significantly more sulfur impurities."
> — Dr. Stephanie Brock

For the study, Brock's lab has taken the role of synthesizing the nickel phosphide nanoparticle catalysts of different sizes and shapes, with Bussell's lab then performing catalytic studies. The studies will determine the factors, such as particle surface area and crystal face reactivity, which are important for achieving optimal sulfur removal.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A facelift for fossil fuel continued

Oil security

Metal phosphides' high catalyst potential may prove useful for developing a refining process rigorous enough and economically viable for use on North American crude oil sources, which have greater impurities than Middle Eastern sources and are more difficult to refine. "Sulfur is one of several impurities that are more abundant in North American oil sources than that of places like Saudi Arabia," Brock said. "If metal phosphide catalysts are shown to remove a larger amount of sulfur from a more impure source, we would be significantly closer to independence from foreign oil."

Cleaner air

Brock's research also aims to lower the amount of sulfur dioxide and nitrogen dioxide that gasoline releases into the atmosphere. Sulfur dioxide contributes to respiratory illness, particularly in children and the elderly, and aggravates existing heart and lung diseases. It also is a primary contributor to the formation of acid rain, which damages trees, crops, historic buildings and monuments; and makes soils, lakes and streams acidic. Nitrogen dioxide contributes to the formation of ground-level ozone and fine-particle air pollution and is linked with a number of adverse effects on the respiratory system.

The EPA has set diesel fuel standards that reduce allowable sulfur emissions from 500 parts per million to 15 parts per million by 2010, and nitrogen oxide emissions from engines from 4 to 0.2 grams per brake horsepower hour. These standards are expected to become even more rigorous in the future. Brock's research could provide essential information to enable these standards to be achieved. "If we can determine which aspects of these nanoparticles influence how active they are as catalysts, then we may be able to use them in a refining process that meets the EPA's goals," she said.

The benefits of alternative catalysts are not limited to cars that burn cleaner. Fuel cells that run on hydrogen could also benefit from an improved refining system, since a common method of obtaining hydrogen is from hydrocarbon fuels – a reaction requiring the same sulfur-removing process. The catalysts could also lead to lower emissions from traditional power plants.

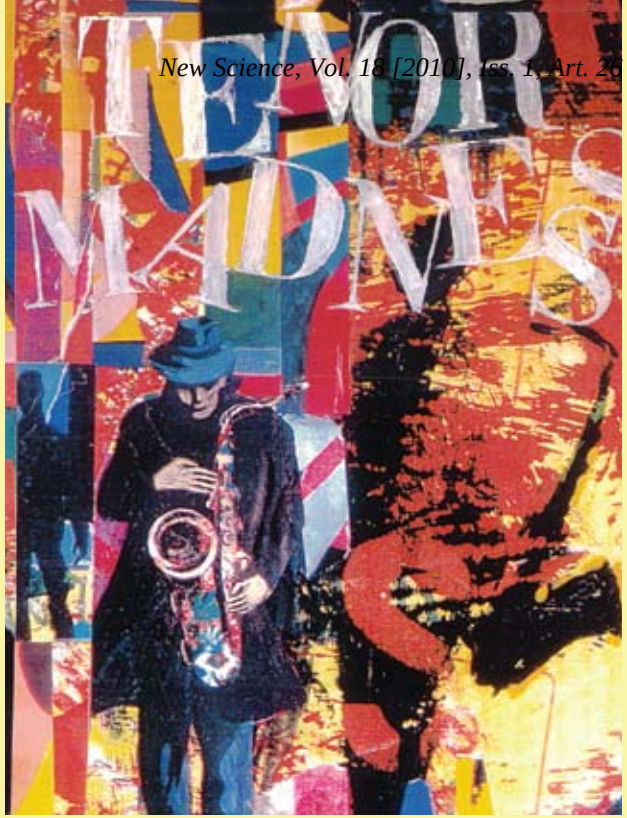
Near-future solutions

As advancing technologies such as solar and hydrogen power are making headway as viable forms of energy, Brock sees the potential of her research as a more immediate improvement to the country's most pressing energy issues. "I think it's understood that we're going to continue to need fossil fuels for transportation, at least in the short term," Brock said. "Because of this, it's very important that we develop solutions to problems of the current system – meeting environmental regulations and addressing the energy security issues – while other alternatives are being developed."

About Dr. Stephanie Brock:

Dr. Brock received a B.S. in chemistry from the University of Washington, a Ph.D. in chemistry from University of California, Davis and was a postdoctoral associate at the University of Connecticut. She joined Wayne State University in 1999.

To learn more, visit:
http://chem.wayne.edu/brockgroup



Chris Collins and Emanuele Cisi are converging American and European Jazz and Art to bring together two cultures musically, visually and educationally.

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Urban Jazz

by Julie O'Connor

One may not think of Torino, Italy, and Detroit as having much in common. But according to Chris Collins, director of Wayne State's Jazz Studies in the College of Fine, Performing and Communication Arts, they have enormous connections and he is at the forefront of creating a new one.

"Torino is often called the Detroit of Europe," said Collins. "It's an industrial city much like Detroit. It blends a very diverse culture of residents, industries, large and small businesses, clubs and entertainment – all molded with many people living in one area."

Not only is Torino an urban environment with the auto industry at its heart, it also has a rich music history much like Detroit and the United States. "America is the birthplace of jazz. The European jazz scene, and in fact the global jazz scene, grew from the foundations laid by American jazz luminaries of the late nineteenth and early twentieth centuries," said Collins. "Torino started playing jazz on the radio very early on and had one of the earliest jazz radio stations in Europe."

Collins, who has performed around the world, devoted his travels to performing, networking and researching jazz music. One of these travels led him to a Torino connection, which is now playing a major role in his career and is the center of an international collaborative project initiated by WSU.

Synaesthesia

While in New York City, Collins met a musician, Emanuele Cisi, from Torino. Collins and Cisi, a saxophone player like Collins, discovered they were very much alike. Both grew up during the same era

International Style

in an urban setting that largely influenced their music. "When we met, we were amazed at how many similarities we shared despite growing up in two different countries, and how much the urban culture impacted our music and the foundation of what we love about jazz."

That meeting sparked new ideas, and a collaboration was formed. In 2006, Wayne State's Presidential Research Enhancement Program funded the *Detroit/Torino Urban Jazz Project (DTUJP)*. The project began as an artistic exploration of two cities bound by their parallel post-industrialized urban histories, but has evolved into a significant and artistic entity that has brought together two cultures musically, visually and educationally.

Collins and Cisi set off to create a message that was synaesthesia, "the union of the senses or the interchangeability of sensory perceptions," according to Collins. "In the art world, it typically refers to a type of multimedia performance presentation, which aural and visual art forms are blended."

The first generation of the project artistically captured the common cultural, financial and political challenges and successes of the people and places within Detroit and Torino through music and imagery performances. Now enjoying additional corporate sponsorship, the second phase of the project will create new works for string orchestra and jazz quartet commissioned from composers James Hartway, distinguished professor of music at Wayne State University, and Carlo Boccadora, noted composer from Torino, Italy. The world premiere of the two unique commissions will take place in May 2011 at one of the premiere orchestral venues in Europe, the 1,800-seat Teatro Regio (The Royal Theatre) in Torino, Italy. This event will take place during Italy's country-wide celebration of 150 years of unification.

The pieces will feature Collins and Cisi with the Symphony Orchestra of the Teatro Regio, a double-saxophone jazz quartet representing Detroit and Torino and projected comparative images of both cities from the project's photographers, Piero Ottaviano (Turin) and Geoff George (Detroit). There will be installations of the photographs and performances by the jazz quartet in various European cities in the weeks leading up to the world premiere. The performance will be the result of the highest level of jazz, composition and visual arts combined into a stunning multimedia performance that represents true collaboration and makes a powerfully positive statement about cultural unity and the potential of global cooperation and cultural respect. The project plans to repeat the premiere in Detroit.

In addition, an international student collaboration is being formed to engage a new stratum of the cultures. Select jazz students from Wayne State and the Torino Conservatory will work with artists from the DTUJP to develop collaborative ensembles and compositions to be performed at various venues including jazz festivals, educational institutions and other venues in the two cities.

The DTUJP collaboration is a unique representation of international challenges and opportunities through a variety of artistic disciplines. "This project is a stunning combination of technology and artistry, bringing two cities with unique similarities including the homes of Fiat and Chrysler, to the forefront," said Gloria Heppner, associate vice president for research at Wayne State. "Collins and Cisi have truly formed a celebration of globalization by providing us an opportunity to enlighten and inspire through an internationally dynamic and inspiring artistic venue."

"This project unites two cultures through art with jazz and the urban experience as the common threads," said Collins. "In addition, through comparative visual arts, we are able to showcase the diversity, architecture, and community of urban life in Detroit and Torino, showcasing the similarities and celebrating the differences in our cultures. Ultimately, the project aims to build networks for other artists and collaborative interests, engage both populations, inspire the next generation of artists in both communities and demonstrate the power of honest international collaboration. The end result will be a sum larger than its parts and a product that truly belongs to both urban cultures."

To learn more, visit: http://music.wayne.edu/profile.php?id=104

About Mr. Christopher Collins:

Mr. Collins received a Bachelor of Music from Wayne State University and a Master of Music from Northern Illinois University. He joined Wayne State University's faculty in 1994.

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Syncing up cyberspace

by Amy Oprean

About Dr. Monica Brockmeyer:

Dr. Brockmeyer received a B.S. in mathematics and statistics, and an M.S. and Ph.D. in computer science and engineering from the University of Michigan. She joined Wayne State University in 1999.

When Monica Brockmeyer received a Faculty Early Career Development (CAREER) award from the National Science Foundation in 2004, her goal was to make the Internet – a vast network of servers and other computers communicating with one another – more timely and predictable. Five years and countless algorithms later, she has reached her goal with the Predictable Services Overlay Network, or PSON, an overlay system which integrates communication timeliness and predictability into the Internet.

"When messages are sent on the Internet, they do not take a direct route, but bounce from router to router, each one sending it a little bit closer to its destination," said Brockmeyer, associate professor of computer science the College of Liberal Arts and Sciences. "Because you don't know what path a message is going to take when you send it, it's difficult to make guarantees about how long it will take. There's also the chance that servers will simply discard a message if they are too busy."

The difference between one second and 100 milliseconds might not be a major concern for e-mail, but this unpredictability poses problems in several areas of computing. One example is scientific simulations carried out on different computers that are connected by the Internet. In these simulations which model everything from brain function to world climate patterns, a lack of synchrony can lead to erroneous results. "Say you are doing a model of global warming, and are looking at a migration pattern. There could be an error where a population appears to be at one location on one computer, and a different location on another, which could disrupt the entire simulation. Timely communication is important to keep everyone's view of the simulation consistent."

The world of gaming also can experience problems from Internet asynchrony. Games such as World of Warcraft, which involve millions of people interacting through Internet servers across the world, occasionally experience asynchrony during fast-paced battles. "There are instances in gaming where the actions of one player get mixed up and little reconciliations must be made," Brockmeyer said. "One gamer's computer screen might show that he is standing 10 feet from his opponent, whereas another screen might show them standing right next to each other. It can lead to situations where, for example, a player thinks he has gotten out of harm's way in time but then suddenly dies."

Although total synchrony may never be achieved, Brockmeyer demonstrated partial synchrony by engineering timeliness into the internet through the PSONs, which are deployed on top of the internet over a wide area to guarantee reliable and timely communications between routers and data centers.

Clouds of data

As the nature of computing has shifted, the potential role of PSONs has evolved as well. In recent years, large IT companies including Microsoft, Google and Amazon have begun to offer their extensive IT infrastructures as a resource for outsourcing computing power and data storage space – a service widely referred to as "cloud computing." Because of their immense computing power, data centers can now process even the largest applications within one "cloud," potentially eliminating the need for multiple servers to perform large computing tasks.

Brockmeyer sees the further development of PSONs moving in step with developments in cloud computing technology. "The PSON model fits nicely into the cloud computing concept, because companies that offer cloud computing will need to provide guarantees of timeliness to their customers. PSONs are designed to guarantee this type of efficiency."

PSONs also could be used for their original function, in the form of communication guarantees between data centers. Although data centers have the capacity to hold very large amounts of information, institutions still may wish to split up their data between servers for security and fault tolerance.

"Cloud computing, if turns out to be the preferred method of large-scale computing, poses interesting challenges in communication," Brockmeyer said. "You'll have data centers, where all the different pieces of information are really close and reliable, and then you'll have these massive virtual wires between data centers around the world that are relatively unreliable and slow. PSONs could be the solution to making both types of communication more timely and predictable."

To learn more, visit:
www.cs.wayne.edu/~mab

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E3
Electrifying the Economy
Educating the Workforce

Driving on Empty

by Julie O'Connor

With the growing need to create more efficient, cost effective, high performance and environmentally friendly vehicles, the automotive industry is quickly transforming its reliance on fossil fuels to electricity. In the near future, electric drive vehicles will be as mainstream as a microwave oven because of their tremendous potential to lessen our dependence on gasoline and protect our environment from harmful emissions.

As the automotive industry transforms, there will be an increased need for a new pipeline of automotive workers who have skills necessary for the advancement and maintenance of electric vehicles, plug-in hybrid electric vehicles and fuel cell vehicles. To meet future industry needs, engineers, automotive technicians and technologists must have education and experience in advanced automotive technologies. With no specific training and education programs in existence, automobile manufacturers are currently training electric drive vehicle engineers in-house, ultimately raising manufacturing costs and delaying product development and launch.

Wayne State University is partnering with Macomb Community College and NextEnergy to meet this need through a new electric drive vehicle engineering program, known as E3 – Electrifying the Economy, Educating the Workforce. With the help of a $5 million U.S. Department of Energy grant funded by the American Recovery and Reinvestment Act (ARRA), the three partners will build educational programs in support of President Barack Obama's goal of having one million plug-in hybrid electric vehicles on the road by 2015.

"The objective of this program is to prepare our current and future workforce with the education and skills necessary for the advancement and maintenance of electric drive vehicles," said Hilary Ratner, vice president for research at Wayne State, and chair of E3's executive advisory board. "It is our intent to ensure we have the most innovative curriculum that can meet the needs of the automotive industry as energy policy evolves over the next few years. This is a key area of growth in the automotive area, and this partnership with Macomb Community College and NextEnergy will provide the next generation of automotive workers with critical skills necessary for engineers and technicians to advance and support electric drive vehicles."

The program will develop and implement a comprehensive set of advanced educational programs in electric drive vehicles including a master's degree in electric drive vehicle engineering; a bachelor's degree in electric transportation technology; an associate's degree in automotive technology and electronic engineering technology; and an undergraduate concentration and graduate certificate program in electric drive vehicle engineering.

"These components and systems are very much in a state of rapid scientific and technological development," said Simon Ng, interim associate dean of research in the College of Engineering, and project director for the E3 program. "Through this program, we will be able to partner with industry to train a new generation of skilled workforce with the highest level of engineering and technology education."

About Simon Ng:

Dr. Ng received his B.S.E, M.S.E. and Ph.D. in chemical engineering from the University of Michigan. He joined Wayne State University in 1986.

The program will also host national workshops, offer education opportunities for the general public, K-12 teachers and first responders; and will create a web site to serve as a main portal of the most comprehensive and up-to-date information in electric drive vehicle technology and educational programs in the nations.

"In addition to educating the workforce of the future, this partnership will contribute to the economic growth of Michigan, the Great Lakes region, and the nation," said Ng. "We are at a critical point in automotive history, and this transformative program is essential in meeting the goals of our nation's leaders."

For more information about E3, visit: www.eng.wayne.edu/eve

In Partnership With: NEXTENERGY Macomb Community College WAYNE STATE UNIVERSITY

Major Depressive Disorder

Too many patients; too few treated

by Julie O'Connor

Only about half of Americans diagnosed with major depression in a given year receive treatment for it and even fewer – about one-fifth – receive treatment consistent with current practice guidelines, according to data from national surveys supported by the National Institute of Mental Health of the National Institutes of Health. Among the groups surveyed, African-Americans and Mexican-Americans are truly falling through the cracks, having the lowest rates of depression care.

Major depressive disorders (MDD) is the main cause of disability in the United States, and it is projected that over the next 20 years MDD will be the second leading cause of disability around the globe.

A team of researchers from Wayne State University, the University of Michigan, the University of California, Los Angeles and Harvard University have given a more a detailed picture of the care received for major depression among different ethnic/racial groups and factors that contribute to disparities. Their paper published in the January 2010 edition of the *Archives of General Psychiatry* reports that too few Americans with recent major depressive disorders receive adequate depression care, and most receive no care at all. Of those receiving care, most received psychotherapy versus medication treatment.

African-Americans and Mexican-Americans, in particular, may be facing greater barriers to mental health care. "Contrary to our expectations that most Americans with depression would be using antidepressant drugs, we actually found higher psychotherapy use, especially among ethnic and racial minorities," said Hector González, assistant professor, Institute of Gerontology and Family Medicine and Public Health Sciences Department in the School of Medicine at Wayne State University.

Mexican-Americans make up more than two-thirds of Latinos in the U.S. "We found in our study that there are really distinctive differences in mental health care use between Mexican-Americans and other Latino subgroups that have not been previously reported," said González. The authors note that Latinos will make up one-third of the U.S. population by mid-century, and suggest that Mexican-Americans should be a focus of efforts to reduce health disparities to ensure the nation's health in coming decades.

The authors provided evidence of well-defined disparities in depression care that mostly affected African-Americans and Mexican-Americans. "The problem with most previous research we have seen is that ethnic groups, particularly Latinos, are inappropriately lumped together rather than examining important ethnic subgroups," said González. "I believe our study sets a new standard for understanding health care access disparities."

All groups were more likely to have received psychotherapy than pharmacotherapy. Caribbean blacks and African-Americans were particularly unlikely to receive pharmacotherapy consistent with APA guidelines; enabling factors such as education, health insurance, and income did not explain the lower rates of medication use. The authors note possible reasons for this, including research indicating that perceived discrimination can shape health care seeking. They speculate that the non-immigrant status of Puerto Ricans–and with that, greater predominance of English language use within this group–may be factors in their relatively high rates of health care use.

About Dr. Hector González:

Dr. González received a B.S. in psychology from the University of New Mexico and a Ph.D. in clinical psychology, behavioral medicine and health psychology from the California School of Professional Psychology, San Diego. He joined Wayne State University in 2005.

Findings from this study will inform future research on adherence to various depression therapies, and the factors that shape differences in care among racial/ethnic groups. "Future studies," said the authors, "should explore the extent to which patients' subjective experiences of racial bias may affect their access and utilization of mental health care."

The other researchers participating in this study are William Vega of UCLA's Department of Family Medicine, David Williams of Harvard School of Public Health, Wassim Tarraf of WSU's Institute of Gerontology and Department of Family Medicine, and Brady West and Harold Neighbors of the University of Michigan's Center for Statistical Consultation and Research and Institute of Social Research, respectively.

For further information about this study, please visit http://research.wayne.edu/communications/forms/gonzalez_depression_care_12-15-09_-_journal_synopsis.doc

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Silent Struggle

Confronting anger in African-American women

by Amy Oprean

In the field of mental health, disorders such as anxiety and depression have been recognized for decades as debilitating ailments that often require professional treatment. In stark contrast to this, unhealthy anger has far fewer treatments in place, despite studies that suggest it may be an equally detrimental and widespread problem. Research-backed treatments are especially sparse for women and minorities, whose symptoms of unhealthy anger are often internalized rather than outwardly expressed.

Antonio González-Prendes, Ph.D., and Shirley Thomas, Ph.D., assistant professors in WSU's School of Social Work are working to change this with collaborative research that could lay a foundation for anger therapy in one of the most overlooked groups – African-American women. Their approach focuses on social messages on race and gender roles, which they suspect are major influencers on the experience and expression of anger.

"Women and men of different races receive very different messages about anger, both in terms of how they experience anger, and the socially acceptable ways to act on their emotions," González-Prendes said. "We believe it's essential for therapists to approach anger therapy in the context of these unique perspectives."

Anger's role in mental illness first came to González-Prendes' attention while he was a community mental health clinician. There, he noticed that unhealthy anger was an issue for many of his patients but discovered very little information available for treating the problem. "The vast majority of research on anger therapy focuses on college-age men," he said. "There is also no diagnosis related to unhealthy anger in *The Diagnostic and Statistical Manual of Mental Disorders* (DSM) of the American Psychiatric Association. I welcomed the opportunity to come to Wayne State to begin addressing this gap in knowledge."

> "Women and men of different races receive very different messages about anger, both in terms of how they experience anger, and the socially acceptable ways to act on their emotions."
>
> — Dr. Antonio González-Prendes

Since becoming a faculty member in 2005, González-Prendes has studied the unique forms that anger takes on in each gender and race. He joined Thomas, who studies the sociological aspects of mental health in African-American women, to begin to unravel the reasons behind this group's unique experience with the problem.

The 'superwomen'

González-Prendes and Thomas hypothesize that women receive messages that imply expressing anger could be harmful to their relationships. Because of this, women often internalize or divert their anger, which can then resurface in a number of unhealthy ways such as substance abuse, self-cutting, eating disorders, heart disease and hypertension. In addition to physical symptoms, women who divert their anger experience heightened levels of anxiety.

González-Prendes and Thomas explained that African-American women face additional barriers of culture-bound messages that characterize their role as the "pillars of strength" for their family and community. In striving to play this role, some African-American women may deny themselves the right to fulfill their own needs and express their emotions. "On one hand, this expectation of being a 'strong black woman' could serve as a virtue by which African-American women are collectively motivated and encouraged to overcome adversity," Thomas said. "On the other hand, it places an unrealistic goal of being a 'superwoman,' who serves others no matter how great the cost to her own well-being."

The problem is further compounded by the "powerlessness" that González-Prendes and Thomas say is experienced by African-American women as well as other minorities and oppressed members of society. In a study performed by González-Prendes and Thomas, they found that the disproportionate number of black women with low income, low positions of power, low education levels and

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Silent Struggle continued

high poverty levels significantly lowered their chances of attaining a sense of empowerment and control over their lives.

"The rigid expectations for black women to be unwaveringly strong is a paradox, in a sense, because black women have less access to the things that have been shown to influence a person's sense of empowerment within society," González-Prendes said. "We have theorized that this paradox causes stress and anger."

Confronting anger

With their current study, González-Prendes and Thomas hope to further investigate what they suspect are the main influencers of anger in African-American women. Using focus groups and evaluations, they are assessing African-American women's perception of cultural strength as well as the most prominent variables in their experience and expression of anger. Information obtained from the study will serve as the beginning of a database of anger profiles, and will provide the basis for cognitive behavioral therapy for anger geared specifically toward African-American women.

"Our goal is to make women aware of the messages that have shaped the role of anger in their lives and then help them rewrite the script of those messages in a more balanced, rational and realistic manner using cognitive behavioral therapy," González-Prendes said.

Both González-Prendes and Thomas are hopeful their studies will be the start of a more comprehensive, effective approach to a widespread, yet under-researched problem. "The study of anger in African-American women and other minority groups, and its related consequences, is a topic that has more or less passed under the radar until now," González-Prendes said. "Our research aims to provide a foundation of knowledge on the topic, and to develop and test out culturally sensitive therapy methods that will help women overcome their anger issues and live happier lives."

> "On one hand, this expectation of being a 'strong black woman' could serve as a virtue by which African-American women are collectively motivated and encouraged to overcome adversity. On the other hand, it places an unrealistic goal of being a 'superwoman,' who serves others no matter how great the cost to her own well-being."
>
> — Dr. Shirley Thomas

About Dr. Shirley Thomas

Dr. Thomas received a B.A. in sociology from Adams State College, a Master's in social work from the University of Denver, an M.A. in sociology and Ph.D. in social work and sociology from the University of Michigan. She joined Wayne State University in 2004.

To learn more, visit: http://research.socialwork.wayne.edu/index.php?option=com_content&view=article&id=149&Itemid=94

About Dr. Antonio González-Prendes:

Dr. González-Prendes received a B.S. in psychology from Spring Hill College in Mobile, Alabama, a Master's in social work and Ph.D. in counseling from Wayne State University. He joined Wayne State in 2004.

To learn more, visit: http://research.socialwork.wayne.edu/index.php?option=com_content&view=article&id=142&Itemid=82

Fighting cancer with folate

Investigating the link between nutrients and disease

by Amy Oprean

Over the past decade, a growing body of literature has emerged suggesting that nutrients play an important role in regulating gene expression, particularly as it relates to the development of disease. Ahmad Heydari, Ph.D., professor of nutrition and food science, is at the forefront of this growing field with his investigation of the link between folic acid and gastrointestinal cancer prevention and treatment.

"Powerful developments in genetics research have uncovered the potential of nutrients in controlling gene expression and even preventing DNA damage," Heydari said. "In terms of cancer, a disease caused primarily from DNA damage, the potential for improvements in prevention and treatment is huge."

Different effects of folate

Funded by the National Cancer Institute, Heydari's research is a continuation of several years of studies by his lab that uncovered the link between cancer and folate – a form of vitamin B found in leafy vegetables, beans, peas, liver products and some breakfast cereals. In these studies, Heydari's lab showed that a folate deficiency can induce the development of gastrointestinal cancer tumors, with one hypothesis suggesting that folate deficiency assembles the wrong "recipe" of DNA building blocks, raising the risk of cancer development.

The lab has also uncovered evidence that a folate deficiency inhibits the base excision repair (BER) DNA pathway, one of the body's mechanisms for fighting cancer once it has begun to develop. "We have data to show that a folate deficiency can not only raise the risk for developing cancer, but accelerate tumor progression by inhibiting one of the pathways designated for fighting cancer," Heydari said.

Yet Heydari's lab has also shown that in other situations, a folate deficiency can prevent cancer. In studies where animal models with damaged BER pathways underwent heavy exposure to carcinogens, Heydari's found that folate deficiency actually decreased instances of cancer. One possible explanation is that the combination of a BER deficiency and a folate deficiency damaged cells beyond repair, causing the body to move to plan B – programmed cell death. Since cancer cells were completely wiped out, they were not able to divide and spread to other areas of the body.

"The findings of these studies were very exciting because they backed something we already suspected – that the effect of a nutrient can be very different depending on the environment and genetic makeup," Heydari said.

In his current study, Heydari aims to determine the causes behind the varied effects of folate deficiency on cancer development. He will use different enzymes and amino acids to mimic the effects of folate deficiency on an animal model that lacks a BER pathway. He hopes to determine the mechanisms by which folate deficiency aids and hinders cancer development and characterize the genetic and environmental factors that determine which role a deficiency will have.

"The goal of this research is to achieve a better understanding of why a folate deficiency is good in some cases and bad in others," he said. "Once we understand this on a deeper level, we will be able to use folate as a tool for gastrointestinal cancer prevention and treatment in at-risk populations."

About Dr. Ahmad Heydari:

Dr. Heydari received a B.S. in microbiology and an M.S. and Ph.D. in biological sciences from Southern Illinois University. He joined Wayne State University in 1997.

Personalized nutrition

Eventually, Heydari sees the knowledge gained from his research leading to personalized nutrition plans that lower the risk and increase survival rate of people with gastrointestinal cancers. Such breakthroughs would contribute to the growing field of nutrigenomics, the study of the effects of food and food constituents on gene expression. Nutrigenomics aims to create a knowledge base for personalized nutrition, with the ultimate goal of developing specific plans based on an individual's genotype and life circumstances.

"The most exciting part of this research is that it is making us see human nutrition in a whole new light," he said. "Where traditionally it has been associated with weight loss and metabolism, nutrition is now a powerful tool in controlling gene expression. The next decade of research will be monumental in transforming this basic research into clinical applications that could save people's lives."

To learn more, visit: http://141.217.91.198/

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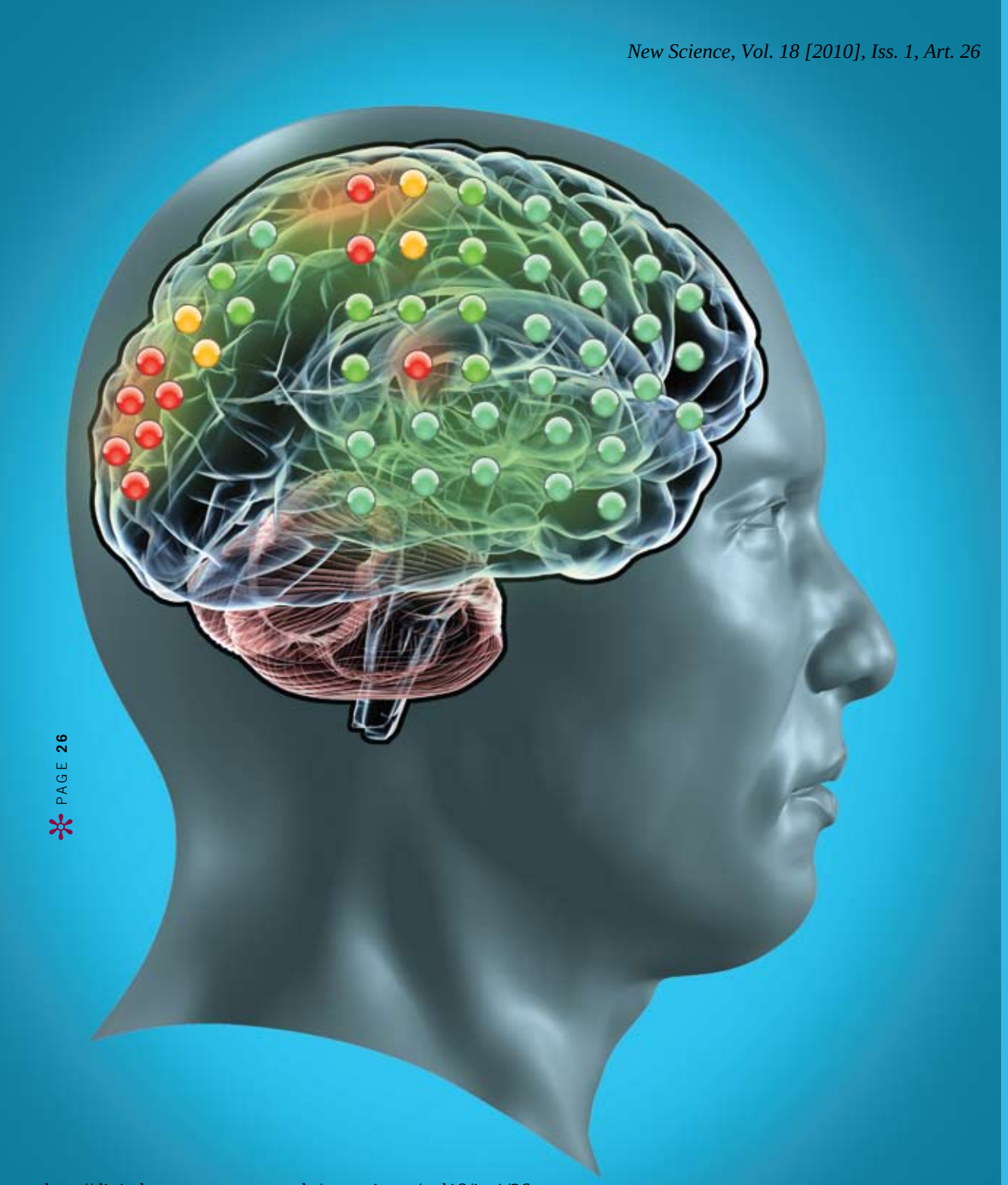

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Epilepsy at

by Amy Oprean

Caused by birth trauma, malformation, stroke, brain tumor or head injury and affecting as much as 1 percent of the population, epilepsy is one of the least understood human disorders in the most complicated of organs – the brain.

Groundbreaking work to unlock the disease's cure is in motion in the lab of Jeffrey Loeb, M.D., Ph.D., associate professor of neurology, member of the WSU/DMC Comprehensive Epilepsy Program and associate director of the Center for Molecular Medicine and Genetics in the School of Medicine. By applying a systems biology approach to the study of human epileptic brain tissue, Loeb and his team are working to identify a "final common pathway" of genes consistently induced at human epileptic foci. Using this pathway as a drug target, Loeb and his team will work to develop drugs that successfully prevent epilepsy, first in rats, then in humans.

This work is being performed with the Systems Biology of Epilepsy Project (SBEP), a multi-disciplinary collaboration between Wayne State experts in areas ranging from neurosurgery to information technology. The project catalogs donated human epileptic brain tissues into an integrative, one-of-a-kind database, using the power of systems and computational biology to understand the disease through its electrical, anatomical and molecular features. Funded by WSU's President's Research Enhancement Program and the National Institutes of Health (NIH), the goals of the SBEP are to find biomarkers – substances or other characteristics that can be used for diagnosis – and drug targets for epilepsy therapeutics.

every Angle

A Systems Biology Approach to a Cure

The project has several distinct advantages over other epilepsy research, one being the ability to study the disease in human brain tissue. "With many diseases, particularly those of the brain, researchers treat animals and then try to bring the treatment to patients, and that doesn't always work," Loeb said. "That's why donated brain tissue is such an invaluable gift; it gives us the unique opportunity to start with the human disease and understand it at a level that we never could before."

Another unique aspect of the project is its use of systems biology – the ability to obtain, integrate and analyze complex data from multiple experimental sources using interdisciplinary tools. "From the neurosurgeons performing brain-removal surgery to the IT experts that maintain our database, it's the collaboration of first-rate researchers that makes this project work," Loeb said.

Donated from epilepsy patients who underwent brain surgery at Harper University Hospital and Children's Hospital of Michigan, each epileptic tissue sample has a profile in the database that includes the patient's clinical information, genes and proteins expressed and a 3-dimensional computer rendering of the tissue with a heat map of hot spots of electrical activity. The map identifies the location of seizures as well as interictal spikes – the minor, more frequent electrical discharges in the brain that occur between seizures.

The database can then process common characteristics and other relational information about the tissues. "We don't look at one particular gene, pathway or protein, but at everything simultaneously and determine which variables are the most important to the diagnosis and treatment of epilepsy," Loeb said. "I am not aware of any other programs with a database that catalogs epileptic tissue so comprehensively."

From animal model to human medicine

Loeb recently received NIH funding for a drug development facility and is partnering with drug companies to develop human drugs from his animal model. If successful, the human version of the drug will prevent human epilepsy in its early stages, before seizures ever occur. "I call it the epilepsy morning after pill," Loeb said. "If you're out riding a bike without a helmet and you fall and hit your head, taking this drug after the accident could prevent you from developing epilepsy."

Loeb will also investigate if the same drug can be used to cure epilepsy in patients months or years after a brain injury, when seizures begin.

Another major goal of the SBEP is improving diagnosis. Current noninvasive EEG techniques can only detect very large interictal spikes, with the more subtle electric activity requiring surgery in which the scalp is removed and electrodes are placed directly on the brain. Loeb is working to develop more powerful noninvasive screening methods.

"By developing a method that gives us a higher resolution, we would dramatically improve our ability to treat epilepsy patients on a number of levels, from greater success in early diagnosis, to finding more biomarkers and developing better therapeutics," Loeb said.

About Dr. Jeffrey Loeb

Dr. Loeb received his M.D. and Ph.D. in biochemistry and molecular biology, his S.M. in biochemistry and his A.B. in chemistry from the University of Chicago. Following a neurology residency at Massachusetts General Hospital and postdoctoral work in the Department of Neurobiology at Harvard Medical School, he joined Wayne State University in 1998.

Loeb will continue to build and maintain the database of epileptic tissue with the ultimate goals of developing diagnosis and disease-curing treatment for epilepsy at every stage by building and maintaining the project's growing database of epileptic tissue. "We're hoping to be successful on all fronts of disease diagnosis and prevention," Loeb said. "This work would not be possible without the strong Wayne State expertise and the patients who allow us to study their brain tissue in hopes to put an end to this life-altering disease."

To learn more, visit: http://www.sbep.wayne.edu/joomla/index.php?option=com_frontpage&Itemid=1 and http://www.genetics.wayne.edu/jloeb

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Homegrown

by Amy Oprean

As cities across the country experiment with different approaches to urban agriculture and local food systems, one Wayne State researcher has become an important player in a city-wide movement to make Detroit the model city for food sustainability.

Kami Pothukuchi, Ph.D., associate professor of urban planning in the College of Liberal Arts and Sciences, is the director of SEED Wayne, a volunteer-based organization dedicated to building sustainable food systems on the campus of Wayne State University and in Detroit communities. Through a dedicated core group of staff, volunteers and community partners, SEED Wayne approaches its goal through research projects on and off campus that explore Detroit's potential for sustainability.

"We're working to figure out what a campus like Wayne State can do to support urban agriculture and sustainable food systems – and we're finding out that we can do a lot," Pothukuchi said.

A sustainable food system uses practices that are environmentally, economically and nutritionally beneficial to the local community; embody principles of social equity; and builds community capacity.

SEED Wayne's activities focus on improving community access to healthy food, strengthening the local economy by supporting local growers and encouraging people in the community to take an active role in decisions that affect their food systems. This is done through on-campus programs such as SEED Wayne's two urban gardens and a weekly farmers market, and off-campus projects in partnership with institutions that are

in Detroit

well-established in the city's food system such as Eastern Market, the Capuchin Soup Kitchen and the Greening of Detroit.

An important component of SEED Wayne's projects is "action research" – documentation, analysis and experimentation to overcome the obstacles of the programs as they arise. "I think an important role of universities is to develop pilot programs to understand what is possible and demonstrate how ideas for sustainability can be carried out," she said. "There's no formula or model that we can use as a reference; we're creating the knowledge base right now."

One such working model is "healthy corner stores," a pilot program taking place in the neighborhood around the Capuchin Soup Kitchen on Detroit's east side. Pothukuchi connected three liquor stores with local produce distributors to test out the viability of selling fresh fruits and vegetables in a neighborhood that does not have a full-scale grocery store. The project hasn't gone without a fair share of challenges, including equipping stores not accustomed to selling produce and marketing the food. "People are not used to buying healthy food in corner stores," Pothukuchi said. "Part of our task is to help change the perception and make sure people are aware of what's available."

Pothukuchi hopes to incorporate "mobile markets," a program initiated by the Earth Works Urban Farm, in which volunteers buy produce from Eastern Market and deliver it to liquor stores to sell. "Once we have a few stores that are functioning well, we can build a distribution system," Pothukuchi said. "Then, with a little entrepreneurship, the system could transform into a self-sustaining business."

> "We're working to figure out what a campus like Wayne State can do to support urban agriculture and sustainable food systems – and we're finding out that we can do a lot."
>
> — Dr. Kami Pothukuchi

SEED Wayne is also working with Shawn McElmurry, assistant professor of Civil and Environmental Engineering in the College of Engineering, to develop a roof top garden on a Wayne State parking structure. In addition to providing produce, this "green roof" would help reduce temperatures on the parking structure, reduce the reflective glare that contributes to global warming and absorb rainwater that would otherwise flood the storm water system. "There isn't another system out there that is lightweight, mitigates heat and wind and collects rainwater; we are designing it from scratch," Pothukuchi said.

The collaboration is also actively researching air-borne lead deposition in gardens, a proven health hazard to those working in the garden and eating its products. The results of the research will be of interest to the many organizations in Detroit working to turn much of the city's vacant land into farms and gardens.

"There's a lot of good news to be told when it comes to urban agriculture in Detroit," Pothukuchi said. "What we're doing at SEED Wayne is really one of many efforts. Detroit has a constellation of organizations that work collaboratively even as they have their own independent interests and initiatives in the community."

Research is a very important aspect of what SEED Wayne does, but so are education, engagement and operations. "With all of these components working together, we can succeed in engaging the community and improving the way people live right now, while also developing and testing models that can be applied to other neighborhoods of Detroit, and ultimately, other cities," Pothukuchi said.

To learn more, visit:
http://www.clas.wayne.edu/seedwayne/

About Dr. Kami Pothukuchi:

Dr. Pothukuchi received her B.Arch from University of Mumbai, India. She received her M.U.P, M.Arch and Ph. D. in Urban, Technological, and Environmental Planning from the University of Michigan. She joined Wayne State University in 1998.

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Scientists in Wayne State's College of Engineering and School of Medicine are creating a novel drug-carrying nanodevice for the treatment of cerebral palsy and other neuroinflammatory diseases.

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Cerebral Palsy

by Julie O'Connor

Cerebral palsy, a neurological disorder that appears in infancy or early childhood and permanently affects body movement and muscle coordination, affects 10,000 newborns yearly and 800,000 people overall in the U.S. It occurs as a result of injury to the developing brain that happens before birth or sometimes during the first few months or years of life. Conditions such as prematurity, maternal infections, placental abnormalities and infections such as meningitis or encephalitis that occur in the newborn period may result in brain injury producing cerebral palsy.

A team of researchers from the College of Engineering, School of Medicine and the National Institutes of Health's Perinatal Research Branch have been collaborating to discover and develop new nanodevices that will aid in the diagnosis and treatment of neuroinflammatory diseases and infections that currently are difficult to target and treat.

The team led by Rangaramanujam Kannan, Ph.D., professor of chemical engineering in the College of Engineering, with collaborators Sujatha Kannan, M.D., assistant professor of pediatrics in the School of Medicine and Roberto Romero, M.D., chief of the National Institute of Child Health & Human Development's Perinatology Research Branch (PRB) housed at Wayne State University and the Detroit Medical Center, is developing a therapeutic approach that will target and treat neuroinflammation in cerebral palsy. By developing nanotechnology-based diagnostic and therapeutic approaches for prevention and treatment of maternal infections and fetal brain injury, this

Wayne State University giving hope in a *small* (*nano*) way

team's promising approach may one day eliminate or lessen the incidences of cerebral palsy, along with other neuroinflammatory diseases such as age-related macular degeneration, Alzheimer's, multiple sclerosis, amytrophic lateral sclerosis and Parkinson's disease.

These dendrimer-based nanodevices will target and deliver drugs across the blood-brain barrier. According to the research team, their results are the first to show that dendrimers are able to target the specific site of injury in the brain in a neuroinflammation model. Using this nanotherapeutic approach, the targeted drugs are 10 to 100 times more effective than free drugs upon intravenous administration.

"There is an increasing body of literature, in addition to evidence from our own research relating to the disease mechanisms, that suggests that neuroinflammation plays a key role in the pathogenesis and evolution of cerebral palsy and other diseases," said R. Kannan. "We hope to develop therapeutic approaches that will target and treat neuroinflammation resulting in significantly improved treatment outcomes."

A wide variety of neurological diseases are very difficult to treat due to lack of technology able to target the affected regions in the central nervous system. "We believe that our novel drug-carrying nanodevice will offer solutions for treatment of such conditions by delivering drugs to the specific target," R. Kannan added.

Dr. Sujatha Kannan has established an animal model of inflammation that results in a phenotype of cerebral palsy. She, in collaboration with Dr. Diane Chugani, professor of pediatrics and radiology in the School of Medicine, and the Positron Emission Tomography Center, has shown that the presence of neuroinflammation can be detected at a very early stage using noninvasive imaging by Positron Emission Tomography. Clinical translational studies for the detection of neuroinflammation in at-risk newborns are ongoing.

"The PRB has established a unit to develop applications of nanotechnology in perinatal medicine under the leadership of Dr. R. Kannan because we are convinced that this approach will enhance early diagnosis of inflammation *in utero* as well as treatment," commented Dr. Romero. "Dr. Sujatha Kannan and Dr. R. Kannan have explored potential mechanisms to prevent and treat inflammation-induced cerebral palsy. Application to humans requires new methods for diagnosis and drug delivery into the amniotic cavity. Such goals could be accomplished using nanotechnology and, hence, the partnership between Dr. Kannan and the Perinatology Research Branch," Dr. Romero added. The PRB nanotechnology lab now has six postdoctoral researchers and two graduate students with broad research expertise ranging from chemistry, engineering, neuroscience, pharmacology, cell biology, animal model development and imaging.

This novel and high-risk research was initially funded by the Ralph Wilson Medical Research Foundation, which provides money for cutting-edge research in the hope that a breakthrough will be made to find a cure for devastating conditions such as cerebral palsy. Rapid advancements in maternal-fetal medicine have been enabled by the support from the PRB. Through the technology being developed by the Kannan and PRB team, there soon may be a more effective and safe treatment method for treating the fetus/newborn for cerebral palsy and a variety of neurodegenerative conditions that are difficult to treat.

To learn more, visit: http://www.kannangroup.com

About Dr. Rangaramanujam Kannan

Dr. R.M. Kannan received his B.E. in chemical engineering from the Birla Institute of Technology, and a Ph.D. in chemical engineering from the California Institute of Technology. He joined Wayne State University in 1997.

About Dr. Sujatha Kannan:

Dr. Sujatha Kannan received her M.B.B.S degree from the Jawaharlal Nehru Institute of Postgraduate Medical Education and Research (JIPMER, India), and completed her pediatric residency and critical care medicine fellowship at WSU/Children's Hospital of Michigan. She joined WSU/Children's Hospital of Michigan as faculty in 2003.

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Wayne State University is empowering its students to advance their learning by providing research experiences and intensive entrepreneurial training.

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Jumpstarting

by Amy Oprean

In recent years, a growing number of entrepreneurial thinkers from different sectors of Detroit have united for the purpose of lifting the city out of its economic despair and into a new, more prosperous era. Just as the leaders and risk-takers behind these ventures are using bold, new approaches, Wayne State is empowering its students with fresh and creative outlets to advance themselves and the city where they live. From prepping medical school hopefuls with research experience to providing intensive business training to promising student entrepreneurs, Wayne State is helping some of its most promising students excel toward their goals that will ultimately contribute to the movement for a better Detroit.

Med student got feet wet as undergraduate researcher

Whether she was observing surgical techniques, preparing blood samples, or analyzing cognitive data, Samantha Staley's undergraduate research experience gave her an expansive understanding of the science behind medical breakthroughs – and an edge up on her med school peers.

Upon recruitment from Flushing High School in Flushing, Mich., in 2004, Staley learned she would have the opportunity to work as an undergraduate in WSU's renowned bioengineering research lab under Dr. Cynthia Bir, professor of biomedical engineering in the College of Engineering.

Staley's three and a half years of experience that followed included involvement in Bir's cutting-edge research on traumatic brain injury (TBI) caused by improvised explosive devices deployed in the Iraq and Afghanistan wars.

careers in Detroit

Additionally, Staley assisted a Ph.D. candidate in assessing the effects of conducted electrical weapons such as Tasers. "Medical schools really took note of my research experiences during interviews, because not many undergrads get to be involved at that level," she said.

Now a student in WSU's School of Medicine, Staley said her undergraduate research continues to give her a deeper appreciation for the vital role of research in the medical field.

"Understanding research is very important for anyone going into the sciences, especially medicine, because it's research that pushes medicine forward," Staley said. "Approaching the things I see in the clinic with a research perspective is something that will build my character, build my background knowledge and help me be a better doctor."

Staley said she's interested in remaining in Detroit for her residency. "Detroit is exciting and constantly changing. I love it here."

Student entrepreneur gets ahead

Thanks in part to a Wayne State summer entrepreneurial program, mathematics graduate student David Collins is well on his way to launching a business in the alternative energy field.

Collins' company, Qisol, was one of the six winners of WSU's E2 Challenge, a program that supports WSU students in exploring the potential of their own start-up company and preparing it for outside investment. The program is funded in part by the Michigan Initiative for Innovation & Entrepreneurship and is housed at TechTown, WSU's research and technology park. The student groups that won the challenge received financial support and a summer-long mentoring program to develop their business ideas.

The idea for Qisol, which will provide meters for monitoring the performance of solar hot water heaters, began a few years back when Collins became curious about the amount of energy his own solar hot water heater produced.

The E2 Challenge helped Collins move his idea forward by educating him on marketing and corporate structure as well as providing the backing that made conversations with industry leaders possible. "The biggest benefit of the E2 Challenge was being able to say I got a grant to develop my business," he said. "Once I could say somebody else believes in me, somebody is supporting me to do this, people wanted to listen. It made me more than just some guy with an idea."

Collins now has two electrical engineers and two Web designers working for him. His second generation prototype will be installed in five locations and his product launch is set for mid-year 2010.

Launching COOL School Technologies

The E2 Challenge was also instrumental in the creation of COOL (Creative Online Opportunities for Learning) School Technologies, a company founded by three WSU instructional technology Ph.D. students.

"E2 helped us write a business plan, executive summary, plan our budget and understand important copyright issues – we had no idea how to do any of that," said Lin Zhang, COOL's multimedia specialist.

COOL is aimed at improving Detroit Public Schools' (DPS) graduation rate through online and face-to-face curriculum that facilitates emotional and social support for students.

Inspiration for the company had existed for years as an idea between founders Ashara Shepard, and Leah Robinson, friends from Detroit's Renaissance High School. "Leah and I were both born and raised in Detroit and are strongly committed to the city," said Shepard, a DPS teacher of 15 years. "We had always talked about how we'd like to see the school system improve, but it wasn't until we decided to apply for the E2 Challenge that we really sat down and developed these ideas."

The company's social media interface includes e-mail, chat, discussion forums along with cartoons that encourage students to confront problem issues. This format improves student skills in social media – another problem area for DPS students – while they address their emotional problems. "We really wanted to capture their interest," Shepard said. "Students are lectured to all the time. We wanted to try something new."

The group has completed a curriculum package and is working with several computer training companies as they further develop their product. Robinson, who is the company's CEO, said she hopes the company will bring about the change she wishes to see in DPS. "We not only want to see more DPS students finish their high school careers, but to enter the next stages of education with technological skills that are on par with their peers. COOL School Technologies is one way we can make this happen."

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Project collaborators from top left to bottom right: Noreen Rossi, M.D., Javier Sala-Mercado, M.D., Ph.D., and Tadeusz Scislo, M.D., Ph.D.

Rhythm of

by Julie O'Connor and Philip Van Hulle

Heart failure is the leading killer of men and women in the United States, according to the National Heart, Lung and Blood Institute of the National Institutes of Health (NIH). When blood flow to a section of the heart muscle decreases or becomes blocked, the heart is deprived of oxygen and begins to die.

Oxygen demand by muscles like the heart during exercise is many times greater than during a resting state. This increased oxygen delivery is accomplished by increased cardiac output and redistribution of blood flow to skeletal muscles. Exercise presents one of the greatest challenges to cardiovascular control, a challenge exacerbated in subjects with cardiovascular diseases such as heart failure and hypertension, often leading to coronary ischemia, impaired ventricular function, arrhythmias and even sudden cardiac death. A team of researchers at Wayne State led by Donal O'Leary, Ph.D., professor of physiology in WSU's School of Medicine, is investigating what causes the reduction of blood flow to muscles and the heart during exercise in patients who suffer from heart failure.

A hallmark feature of heart failure is decreased exercise tolerance, the team noted. "Even under normal circumstances, whole body dynamic exercise is one of the greatest stresses to the cardiovascular system," said O'Leary. "The heartbeat races and blood flow to inactive areas shuts down. With the compromised performance of the heart, even blood flow to the muscles – including the heart itself – is limited."

The cause of these abnormal responses to exercise in heart failure is unknown. Through this research, O'Leary and his collaborators, including Javier

the heart

Sala-Mercado, M.D., Ph.D., assistant professor of physiology and the Cardiovascular Research Institute; Tadeusz Scislo, M.D., Ph.D., associate professor of physiology; and Noreen Rossi, M.D., professor of Internal Medicine, will investigate the potential role of reflexes arising from the muscles as well as reflexes regulating blood pressure in mediating the extreme responses to dynamic exercise seen in subjects with heart failure.

Dynamic exercise in heart failure patients often brings on profound increases in sympathetic nerve activity that can elicit vasoconstriction, or narrowing of the blood vessels, of the coronary circulation as well as the active skeletal muscle, explained O'Leary. His research aims to determine the roles of the muscle metaboreflex and arterial baroreflex in this altered control of integrative cardiovascular function during exercise in heart failure and the functional consequences of the heightened sympathetic tone on ventricular function and skeletal muscle blood flow.

"It is well known that exercise can have extreme responses to heart failure; however, how these responses occur remains unclear," said O'Leary. "Our objective is to shed new light on the mechanisms responsible for these responses, which is the first step in identifying treatment regimens."

The ultimate goal of this research, funded by the National Institute of Heart, Lung and Blood of the NIH through the American Recovery and Reinvestment Act (ARRA) of 2009, is to provide compelling new information on the altered mechanisms of cardiovascular control during exercise in heart failure.

In a second study, also funded by NIH through ARRA, O'Leary will analyze abnormal responses to exercise in patients with well-established hypertension.

Hypertension, or high blood pressure, affects nearly 1 in 3 adults in the United States, and is a major factor for a broad range of cardiovascular diseases, including stroke, congestive heart failure and renal disease. These patients have abnormally large increases in arterial pressure and heart rate in response to exercise, often leading to sudden, adverse cardiovascular events such as myocardial infarction and stroke. Unfortunately, there is little understanding of the mechanisms mediating these abnormal cardiovascular responses to exercise in patients with hypertension.

Through powerful and innovative models, O'Leary and his colleagues hope to uncover information on the effects of hypertension on cardiovascular responses to exercise, ultimately resulting in aiding exercise regimes for hypertensive patients, as well as increasing the understanding of the impact of hypertension on neural control of circulation during one of the greatest challenges to cardiovascular control.

A third project, also funded by the NIH, investigates the role of adenosine as a neuromodulator in the area of the brainstem that integrates sensory information from the cardiovascular system and is ultimately important in control of autonomic nerve activity. "Adenosine levels in the brainstem increase in extreme stressful situations such as the 'fight or flight' defense response, severe hemorrhage, very low oxygen levels, high G stress maneuvers such as those done by Air Force pilots in very high performance aircraft – real life or death situations," said O'Leary. His team is investigating how adenosine is involved in the overall integration of central neural control of the cardiovascular system and how this is differentially regulated to different parts of the body.

"Ultimately, our success is due mainly to the outstanding team we have developed over the last two decades here at Wayne State," said O'Leary. "Without this teamwork, these studies would not be possible."

To learn more, visit http://physiology.med.wayne.edu/profile.php?id=41599

About Dr. Donal O'Leary:

Dr. O'Leary is professor of physiology and director of cardiovascular research in the Department of Physiology. He received his B.A. in zoology and chemistry from Miami University (Ohio) in 1980 and his Ph.D. in physiology from the University of Texas Health Science Center in San Antonio in 1986. He joined Wayne State in 1989.

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Delivering the Goods

Creating materials to aid regenerative medicine

by Julie O'Connor

Imagine a time in the future when human lifespan is extended because "broken parts" are simply replaced by regenerated ones. Lives may be lengthened by several decades because of new technologies that create cells, tissues and organs for patients who may need them. Research at Wayne State is putting us closer to the day when this will happen.

The development of biomaterial scaffolds plays a central role in regenerative medicine by providing the chemical, biological and mechanical cues necessary for tissue formation or regeneration. Successful regeneration strategies require a distinct sequence of phases driven by multiple signals with appropriate spatial and temporal control. This creates a major challenge in how to design materials that direct the growth, differentiation and organization of cells in the process of forming new tissue.

A multidisciplinary team of collaborators from the Eugene Applebaum College of Pharmacy and Health Sciences and the College of Engineering is combining their expertise to develop thin DNA films that can be easily deposited onto the surface of a wide range of biomaterial "scaffolds" by a sophisticated delivery method of multiple therapeutic genes triggered by cell attachment.

"Successful tissue regeneration depends on the right combination and sequence of pieces of information that have to be provided to the cells so that they can grow, differentiate and organize themselves into a functional tissue or organ," said David Oupicky, Ph.D., associate professor of pharmaceutical sciences. "We have developed multilayered films consisting of multiple genes that serve as those pieces of information telling the cells what to do and when to do it. The films are unique in that they provide an unprecedented level of control over the sequence of the signals. The films are also universally applicable to virtually any combination of genes, which makes them applicable to a large variety of tissue regeneration strategies."

Because the study requires a wide range of expertise ranging from material synthesis and characterization to biological evaluation, it was critical for Oupicky to collaborate to nurture and develop smart biomaterials. Dr. Guangzhao Mao, professor of chemical engineering and materials science in the College of Engineering, and her research lab had the right blend of knowledge to guide the characterizing of materials.

Once Mao's group makes the DNA-containing films, they characterize them to ensure reproducibility of the film-making method. "We characterize the films to determine film thickness, surface roughness, chemical composition and mechanical properties because all these factors will impact the film's ultimate use as coatings for localized gene delivery," said Mao.

According to Mao, this collaborative team has obtained preliminary results that show the films are promoting cell attachment and gene expression, and they expect to apply this technology for regenerative medicine.

The team's future goals are to focus on incorporating multiple DNA plasmids instead of single reporter genes into the layer-by-layer thin films. These can then be transcribed sequentially into functional proteins inside human diseased cells. The newly produced proteins will play the role of treating and preventing diseases.

"We have great expectations for this technology," said Oupicky. "We are at a stage where we have confirmed in vivo feasibility and safety of our approach." The next step, according to Oupicky, is to form new collaborations with clinical researchers and start a more translational development of these films. Through their efforts, Oupicky and Mao are one step closer to providing a sophisticated delivery method suitable for regeneration of bone, neural tissue and more.

About Dr. David Oupicky:

Dr. Oupicky received a M.S. in polymer engineering from the Institute of Chemical Technology, Prague, and his Ph.D. in macromolecular chemistry from the Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague. He was a post-doctoral research fellow at the CRC Institute for Cancer Studies at the University of Birmingham, United Kingdom. He joined Wayne State University in 2002.

For more information, visit: http://cphs.wayne.edu/bio.php?id=224

About Dr. Guangzhao Mao:

Dr. Mao received a B.S. in chemistry from Nanjing University, P.R. China, and a Ph.D. in chemical engineering from the University of Minnesota. She was a post-doctoral associate of materials science at the University of Minnesota. She joined Wayne State University in 1995.

For more information, visit: http://www.eng.wayne.edu/page.php?id=507

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About Dr. Frederic Pearson

Dr. Pearson received his B.A. in political science from Oakland University and his M.A. and Ph.D. in political science and international relations from the University of Michigan. He has twice been designated a senior Fulbright scholar and has been a WSU Charles H. Gershenson distinguished faculty fellow. He joined Wayne State University in 1990.

To learn more, visit: http://www.clas.wayne.edu/unit-faculty-detail.asp?FacultyID=836.

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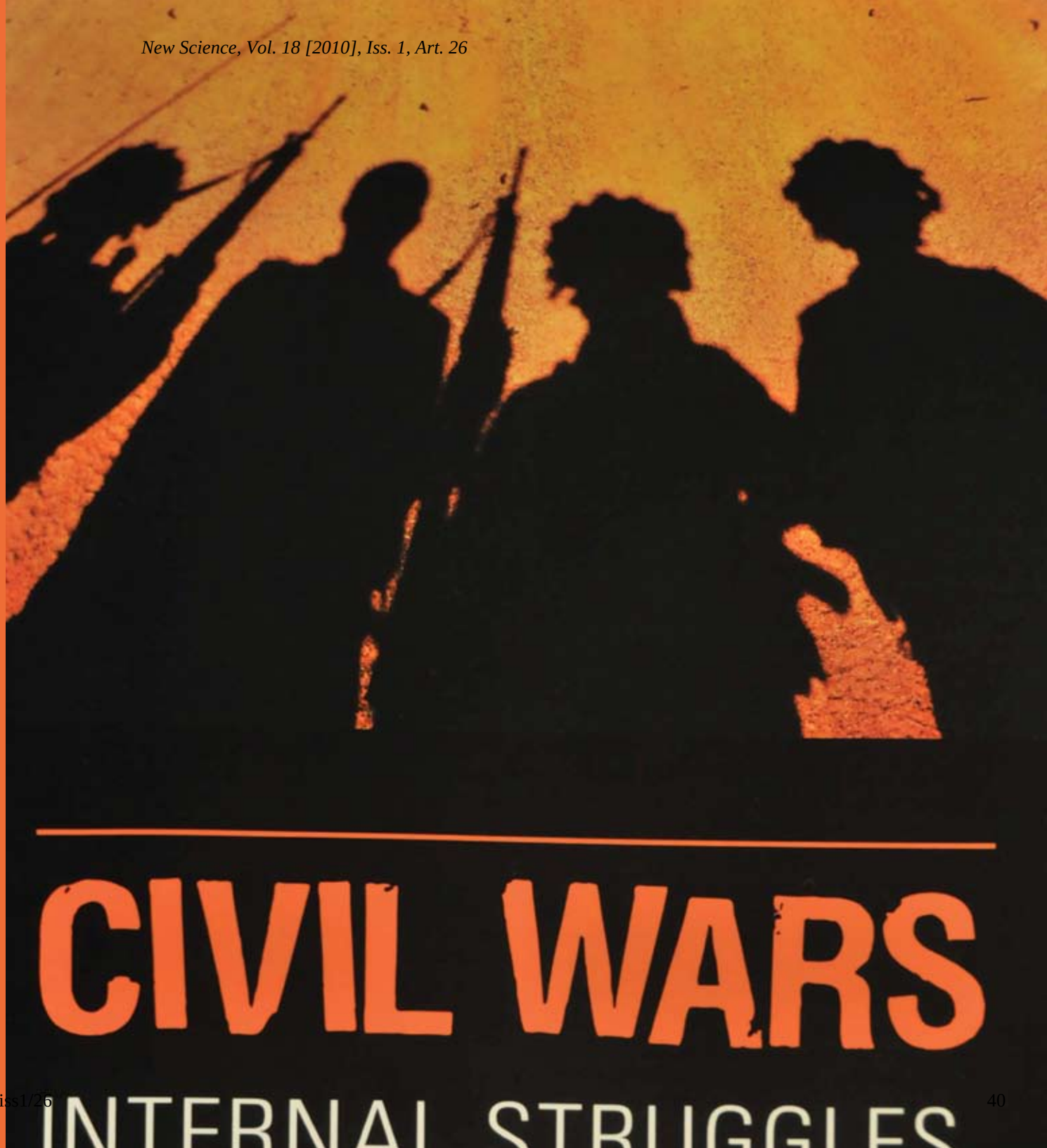

Anatomy of War

Civil conflict at every angle

by Amy Oprean

What makes a country ripe for civil war? Its ethnic rivalries? Its regime? Its wealth, or lack thereof? The profile of a nation in civil war is riddled with contributing factors that are both unique and complex. Yet, as a book co-authored by a Wayne State scholar explains, there are common themes linking internal conflicts happening across the globe. These themes offer clues for successful conflict resolution and sustained peace.

Frederic Pearson, Ph.D., professor of political science and director of Wayne State's Center for Peace and Conflict, and Marie Olson Lounsbery, Ph.D., assistant professor of political science at East Carolina University, co-authored *Civil Wars: Internal Struggles, Global Consequences*, to be a comprehensive study of war that occurs within states. Pearson and Lounsbery surveyed the literature on civil wars and infused it with their own research to create a composite picture of the factors that ignite civil wars, the dynamics of ongoing civil war and the components of successful and permanent resolutions.

"Despite the fact that civil wars around the world have been more numerous than international wars since the '70s, the majority of research still focuses on the latter," Pearson said. "We decided there needed to be a comprehensive look at the concept of civil war from all angles and all levels."

Fueling conflict

Among the trends that their research uncovered, Pearson and Lounsbery provide evidence that civil wars are largely a phenomenon of countries in transition – a change in leaders, a change in regime or gaining independence after colonialism. "Democracies don't have them as often, and neither do full-scale dictatorships," Pearson said. "It's the in-between stages, for example, when a regime has been overthrown, that are the riskiest."

It's during this time of instability that a country is most likely to see a resurfacing of pent-up ethnic or regional rivalries, which are often initiated by leaders or groups that use it for their own gain. Other factors include the amount of qualified leadership a country has during its time of transition, and whether it has the resources – such as oil or diamonds – to fund ongoing war. Even the topography of a country can have a significant impact on its risk for civil war. "Destabilized countries that are mountainous, such as Afghanistan, are ripe for civil war because mountains provide sanctuary for insurgents."

The new rules of war

In addition to exploring its causes, Pearson and Lounsbery examine historical successes and failures at resolving civil war, gathering clues for the most successful cases and tactics. One of the most prominent findings is that most successful civil war settlements are those negotiated through a third party guarantor. This guarantor, which can be a country, group of countries, regional organizations or the United Nations, pledges protection to the parties without picking a side in the conflict. Pearson says to the extent that third-party negotiators have assured both sides a measure of security and followed through, the higher the chances a resolution can be reached and sustained through negotiation.

The U.S.'s role as a third party negotiator between Israel and Egypt during the Camp David peace accords in the 1970s and since, is one example of success in this model of conflict resolution. "In that situation, the U.S. was a guarantor to both sides, and it fostered an era of relative peace between them that has been maintained to this day," he said. "We even have troops in the Sinai mountain passes in Egypt to guarantee there won't be a surprise attack from either side."

In addition to serving as a university textbook and catalyst for further civil war research among scholars, Pearson hopes the book will influence constructive policy making by the U.S. government in its ongoing involvement in civil wars such as Iraq and Afghanistan.

"As a country – despite our own history – we've never had a good understanding of the dynamics of civil war; what changes occur during such wars, what keeps them going," Pearson said. "Our findings on this topic would be very helpful to the U.S. as a negotiator in the Middle East and elsewhere."

Pearson is hopeful the book will provide a much-needed source for information on many aspects of civil war, fostering more informed decision-making and a more informed public.

"We certainly don't have all the answers," Pearson said. "These are extremely complex conflicts that are uniquely shaped by a country's people, its history, and many other factors. But it's important that we are well-versed on these conflicts so that we can make informed choices in our attempts to bring peace."

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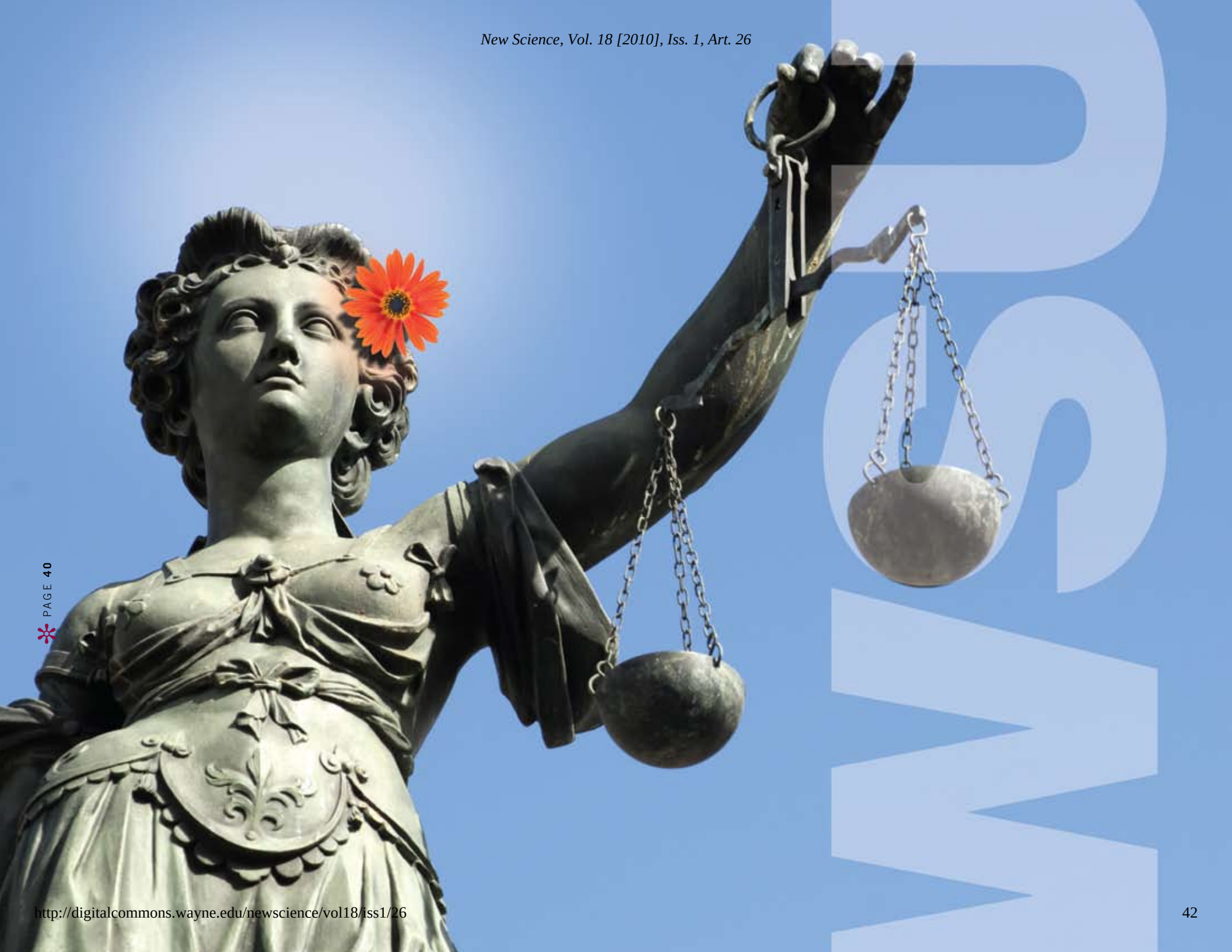

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Lessons in environmental law

by Amy Oprean

From battling the entrance of an invasive species into Lake Michigan to investigating health-related problems of Detroit's incinerator, a WSU law clinic is giving students a comprehensive understanding of what it takes to pursue some of the most pressing local, regional and state-level environmental cases in Michigan.

The Environmental Law Clinic, taught by Nick Schroeck, adjunct professor in WSU's Law School, gives students the opportunity to work alongside lawyers at the Great Lakes Environmental Law Center, a nonprofit organization founded to protect the Great Lakes and the communities that depend on them. Established in 2008 by Noah Hall, assistant professor of law in WSU's Law School, the center represents the public's interest in legal cases concerning environmental health and sustainability for Michigan and its resources. Among its major environmental projects are reducing greenhouse gas emissions, transitioning to clean energy and reforming water law.

Schroeck said the center, which was founded on the belief that law students can and must play a significant role in shaping the future of environmental law, enables its students to hit the ground running after graduation. "The first day on the job, our students will know things such as where to look for problems in permit applications, the inner workings of the Freedom of Information Act and how to challenge agency decisions," he said. "That's the goal for WSU – to turn out law students who are not just book smart, but have the practical experience that lets them jump right in and be effective attorneys from day one."

Among the students' projects in the spring of 2010 – the clinic's second semester – was to prepare an amicus brief to the United States Supreme Court from a bi-partisan group of Michigan legislators addressing the threat of Asian carp entering the Great Lakes. The students' work supported the argument for temporarily closing the locks that connect a Chicago shipping canal to Lake Michigan, demonstrating that keeping the locks open would potentially be more damaging to Michigan than closing the locks would be to Illinois – to the degree of billions versus millions of dollars.

Along with working for Michigan interests, the center is equally dedicated to offering legal services to people or community groups that have been affected by environmental law violations and cannot afford representation. On these projects, students learn the skills necessary for investigating potential cases, including where to look for potential violations.

"When working in an urban area, it's important to know that the biggest polluters often locate in the poorest areas," Schroeck said. "These are the types of real-world lessons we teach our students, so that they can find violators and stand up for the people who are being affected."

Schroeck said the students' work has helped grow the center's reputation as an advocate for environmental sustainability and a watchdog for public health.

"For the first time, Michigan has a public interest environmental law organization dedicated to ensuring that environmental laws are being followed, and it has been made possible because of the students' work," he said. "It sends the message to polluters and state and federal agencies that we're watching, we're doing the research, and if rules are being broken, we will be in touch. Hopefully, our students will continue to apply that ethic long after they graduate."

About Nick Schroeck:

Mr. Schroeck received a B.A. in urban studies and political science from Elmhurst College in Illinois and a J.D. from Wayne State University Law School. He joined WSU as an adjunct faculty member in 2009.

To learn more, visit: http://www.law.wayne.edu/students/clinics.php and http://www.glelc.org/

Walk On

Helping former drug users manage leg ulcers

by Amy Oprean

It is one of the lesser known consequences of injection drug use, but one that stays with former users for the rest of their lives. Chronic venous insufficiency, or CVI, which occurs when veins cannot pump a sufficient amount of blood from the legs back to the heart, is a result of veins that have collapsed from damage. Symptoms begin with swelling and enlargement of varicose veins, followed by discoloration and thickening of the skin around the legs and ankles. In its most severe stages, ulcers form and can cover the entire lower leg.

Although common in the elderly population, CVI can also occur much earlier in people who have injected illicit drugs, especially in their legs, feet and groin. Wayne State researcher Barbara Pieper, Ph.D., professor of nursing in WSU's College of Nursing, is working to understand the link between injection drug use and early onset CVI to develop better methods for the prevention and management of the disease.

As a nurse practitioner providing wound care in WSU's university health care center for nearly 20 years, Pieper has seen an extensive amount of injection-related CVI. "Venous leg changes tend to occur as we age," Pieper said. "But while you typically don't see the disease in the general population until you get to the 65 and older age group, I see people with advanced CVI in their 30s and 40s. These are essentially young people with an older person's disease."

Although previous studies by Pieper and her collaborator Thomas Templin, Ph.D., professor of psychology in WSU's College of Nursing, suggested a link between injection drug use and early onset CVI, their most recent study has the relationship more defined than ever before. The study, funded by National Institute of Nursing Research of the National Institutes of Health, assessed the experience of more than 700 people with varying drug consumption habits at 12 different drug treatment centers in Metro Detroit. They found that injecting illicit drugs into the groin, legs and feet was the greatest risk factor for developing early onset CVI. Those who injected in their legs – with or without injecting in the arms – were nine times more likely to develop venous ulcers than those who injected just in the arms and upper body, and 35 times more likely to develop venous ulcers than drug users who had never injected at all.

In addition, subjects who had injected drugs into their legs had lower daily physical activity scores, and in some cases, were at higher risk of falls. "These results show that we have relatively young people who aren't exercising or even walking because of the chronic pain in their legs – making them much more susceptible to other health problems associated with an inactive lifestyle."

Among Pieper's future plans for her research is an investigation of how to motivate those with CVI to continue exercising, as well as determining whether exercise improves CVI status. She also hopes to spread awareness of the consequences of this disease. "This is a chronic problem that will continue to evolve and probably worsen as people age, so the more we can do to protect the legs early on could really reduce long-term health care costs and help people with CVI live healthy, active lives."

About Dr. Barbara Pieper:

Dr. Pieper received a B.S.N. from Michigan State University, and a M.S.N. and Ph.D. in nursing from Wayne State University. She joined Wayne State as a faculty member in 1980.

To learn more, visit: http://www.nursing.wayne.edu/Faculty/Directory/ab5813fp.html

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Windows to the young brain

by Julie O'Connor and Philip Van Hulle

There have been incredible strides in imaging technology over the past 40 years. Where scientists were once blind to the structure, chemistry and function of the living brain, they are now able to extract detailed information using structural, chemical and functional magnetic resonance imaging.

From these methods, new understanding of the precursors and the bases of psychiatric disorders in the brain have emerged that one day may lead to more effective therapies for numerous disorders.

Using these methods effectively is a challenge facing a team of psychiatrists from Wayne State's divisions of Child and Adolescent Psychiatry and Brain Research and Imaging Neuroscience. Drs. David Rosenberg, Jeffrey Stanley and Vaibhav Diwadkar have joined forces to try to understand the vulnerability for, and the bases of, psychiatric diseases such as attention deficit hyperactivity disorder, obsessive compulsive disorder and more in children and adolescents.

Brain tracking

According to the National Institutes of Mental Health (NIMH), attention deficit hyperactivity disorder (ADHD) is one of the most common childhood illnesses, affecting 3 percent to 9 percent of children, and accounting for 30 percent to 40 percent of child referrals to mental health services. In addition, the condition can persist into adulthood in nearly 60 percent of cases, affecting 4 percent of adults.

One study at WSU using brain imaging technologies and other forms of testing will track the development of ADHD in the brains of children and teens.

> "Initial findings at Wayne State University have shown that glutamate plays a key role in OCD, Glutamate is the brain's light switch that helps turn serotonin and other chemicals off and on. Our research has shown that glutamate abnormalities in OCD have significant treatment implications. This new study will further our research by combining imaging and genetics, something never assessed in OCD patients."
>
> — Dr. David Rosenberg

"The primary aim is to track at what age and where in the brain developmental differences start to occur in ADHD compared to the developmental course of healthy individuals," said Jeffrey Stanley, Ph.D., associate professor of psychiatry and behavioral neurosciences, co-director of the Division of Brain Research and Imaging Neuroscience, and program director and graduate officer of the Translational Neuroscience Program in the School of Medicine.

"The cause and progression of this illness is poorly understood biochemically, anatomically and functionally," Stanley said. "The goal of this study, funded by the NIMH, is to map out the developmental course of ADHD using neuroimaging biomarkers and to identify at what age and where in the brain changes are occurring in ADHD that deviate from the normal development course of healthy children. Certain brain areas or networks mature earlier than others, and we anticipate seeing neuroimaging alterations occurring in later maturing areas, such as the prefrontal cortex, that were potentially influenced by maldeveloped earlier brain areas."

"By conducting functional imaging studies in parallel to studies of structure and chemistry, we will also be able to assess the impact of altered neurodevelopment on the functions of developing networks in the brain - networks that are important for basic and lifelong behaviors such as attention, memory and emotion," said Vaibhav Diwadkar, Ph.D., assistant professor of psychiatry and behavioral neurosciences and co-director of the Division of Brain Research and Imaging Neuroscience.

The age that brain networks change in children with ADHD or how those early impaired networks influence other networks within the brain is unknown. Early identification of affected networks

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Dr. Vaibhav Diwadkar **Dr. David Rosenberg** **Dr. Jeffrey Stanley**

Windows to the young brain continued

and charting changes, Stanley said, is critical for researchers to gain a greater understanding of the development and progression of the condition, and in developing more-effective therapies.

"The early identification of impaired networks and charting temporally impaired networks in ADHD is critical in gaining a greater understanding of the development and progression of ADHD," Stanley said. "This will result in developing better targeted and age-appropriate cognitive and behavioral therapy for ADHD."

Combining imaging and genetics

Wayne State is leading the first-ever combined imaging and genetics research study on obsessive-compulsive disorder (OCD) in child psychiatry, funded by the National Institute of Mental Health at the National Institutes of Health.

The project, *Brain Chemistry and Genetics in Pediatric OCD,* led by WSU, with collaborative partners at the University of Michigan and the University of Toronto/The Hospital for Sick Children (SickKids), is focused on OCD, a severe, prevalent and chronically disabling disease. OCD affects approximately 1 percent to 3 percent of the population nationwide and about 50 percent of all OCD cases begin in childhood and adolescence.

"Initial findings at Wayne State University have shown that glutamate plays a key role in OCD," said David Rosenberg, M.D., the Miriam L. Hamburger Endowed Chair of Child Psychiatry and professor of psychiatry in the School of Medicine at Wayne State University and the principal investigator of the project. "Glutamate is the brain's light switch that helps turn serotonin and other chemicals off and on. Our research has shown that glutamate abnormalities in OCD have significant treatment implications. This new study will further our research by combining imaging and genetics, something never assessed in OCD patients."

By performing critical imaging and genetic tests of glutamate genes in 200 OCD and 200 healthy control patients, this group of scientists aims to examine glutamate changes in brain regions implicated in OCD, and to combine this information with a detailed exploration of variants within genes influencing glutamate transmission.

Brain processes visualized using magnetic resonance imaging are thought to be closer to the action of genes compared with complex behavioral phenomena like OCD. By combining the two powerful techniques of neuroimaging and genetics, Rosenberg and his collaborators hope to speed the discovery of risk genes.

Results will have significant scientific implications as well as key "translational" importance in bringing research from the bench to the bedside with clinical ramifications. By combining unique clinical assessment, magnetic resonance imaging and genetics expertise, the team of researchers will investigate biological, genetic and behavioral variables that may one day lead to a better understanding of pediatric OCD, and in turn, the development of new diagnostic and treatment approaches.

For more information visit: http://brain.wayne.edu

About Dr. Vaibhav Diwadkar:
Dr. Diwadkar received a B.S. in psychology and Computer Science from Coe College, Iowa. He received a Ph.D. in cognitive science and psychology from Vanderbilt University. He joined Wayne State University in 2005.

About Dr. David Rosenberg:
Dr. Rosenberg received a B.S. in biomedical science and a M.D. in general psychiatry from the University of Michigan. He completed his general and child psychiatry residency at the University of Pittsburgh and post-doctoral research fellowship at the National Institute of Mental Health. He joined Wayne State University in 1996.

About Dr. Jeffrey Stanley:
Dr. Stanley received a B.S. and M.S. in physics from the University of Waterloo, and a Ph.D. in medical biophysics from the University of Western Ontario. He joined Wayne State University in 2004.

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Sprawled across an area larger than 50 soccer fields and anchored beside the Burj Khalifa, the world's tallest man-made building, the Dubai Mall officially opened Nov. 4, 2008, in the United Arab Emirates. As the largest mall in the world, the Dubai Mall piques the curiosity of tourists around the globe. The complex houses 1,200 stores, an underwater zoo, a SEGA indoor theme park, an Olympic-size ice rink, a 22-screen Cineplex and the world's largest gold market.

Along with being a record-shattering marvel of tourism and retail, the Dubai Mall is also a place of opportunity for citizens of neighboring countries seeking employment – given they can overcome many language and cultural barriers.

Monica W. Tracey, Ph.D., associate professor of instructional technology and administrative and organizational studies in WSU's College of Education, developed an instructional process and model that enabled a diverse group of workers to learn the job duties required for the housekeeping mall staff with maximum efficiency. Her customized, multi-cultural instruction manuals

Cross-cultural commerce

Speaking a universal language at the Dubai Mall

by Amy Oprean

successfully trained employees from Bangladesh, Nepal, India, the Philippines and many other surrounding countries – many of which didn't share a common language – and comprise a working process and model for cross-cultural instructional design.

"It was a very enriching experience for me," Tracey said, who ran her own instructional design consulting company before entering the academic community at Wayne State. "This region of the world has the utmost respect for education and they fully embraced the expertise that WSU brought to the table. Given the three-month window we had for the entire project, their support was critical."

Tracey spent a week assessing the requirements of the project and after a short trip back to the U.S., began a rapid prototyping process of designing instruction materials for both workers and supervisors. With a multi-cultural, multi-language learner in mind, she designed a series of processes utilizing colors, symbols and pictures that were then adapted to the different cleaning programs. "We knew learners would be relying heavily on visuals, so we designed the materials to emulate the visuals of the environment and the tools the workers would actually be using."

The words that did accompany the illustrations were in English and Hindi – the two most common languages among the trainees – in very simple, consistent sentence structures with an emphasis on teaching employees key words."It was very important that our translators and graphic artists worked together, so that there was little ambiguity in the instructional materials," Tracey said.

To help navigate the customs of the multiple cultures involved in this project, Tracey relied on several international Wayne State students as "cultural experts" to quickly familiarize her with important customs. "Because United Arab Emirates is primarily an Islamic culture, the mall includes many prayer rooms which must be used by Muslims several times a day," she said. "These prayer rooms should only be cleaned by Muslim workers and female prayer rooms can only be cleaned by females. Knowing important cultural information like this allowed us to avoid possible errors in design that would have slowed the process."

Tracey's prototype was put into effect immediately, training the mall's first group of employees for its official opening. She continued to modify and improve her design for several more weeks, correcting problems of ambiguity in the instruction language or other inefficiencies as they became apparent. "This was a perfect example of 'design and development' research," Tracey said. "The model was developed in the field and continuously evaluated and improved while in use."

By the end of the project's run on Nov. 30, 2008, Tracey had trained 320 people. Of these, 82 percent passed the required instructional assessment. With the same instructions continuing to train new employees at the Dubai Mall today, she considers the project a resounding success. "We created a process and customized instruction that is being utilized by the largest mall in the world," she said. "We reduced cost by reducing manpower and trained more than 300 people who speak different languages how to perform their jobs."

About Dr. Monica Tracey:

Dr. Tracey received a B.S. in education from Central Michigan University, an M.A. in education and an education specialist certificate in instructional technology and a Ph.D. in instructional technology from Wayne State University. She joined WSU as a faculty member in 2007.

The work done by Tracey in Dubai serves as a model for efficient, cross-cultural instructional design with potential use in numerous work processes involving learners of different cultures and languages. With continued research validating this process, she hopes her model can be generalized to address the growing demand for instructional design for multi-cultural workforces. "Here in the U.S. and abroad, our workforce is changing," she said. "More than ever, we need to be able to design and deliver effective instruction for numerous cultures working together. The Dubai project was a starting point for applying the elements of instructional design, including effectiveness, efficiency and appeal for the benefit of the culturally diverse workforce around the world."

For more information, please visit: http://www2.coe.wayne.edu/aos/it/bio.php?id=43086

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A Search for a Cure

One step closer to eliminating breast cancer

by Patricia A. Ellis and Julie O'Connor

In 2009, there were more than 194,000 new cases of breast cancer, and more than 40,000 deaths caused by this most common form of cancer among women in the United States.

Human epidermal growth factor receptor-2 (HER2) positive breast cancer is one of the more aggressive forms of breast cancer and is prevalent in about one of every three cases of breast cancer. This protein is made in low levels by normal breast cells, but is produced in excessively high levels in HER2-positive breast cancer. In addition, HER2-positive tumors grow faster, recur more often than other breast tumors and are less responsive to hormone treatments.

Wayne State University in conjunction with the Barbara Ann Karmanos Cancer Institute is on the cusp of a new discovery that may someday save many lives. Wei-Zen Wei, professor of immunology and microbiology in the School of Medicine and at Karmanos, is leading a research team that has developed a cancer vaccine that recognizes HER-2 positive cancer cells, and helps to prevent their spread and destroy them.

Currently being tested on tumor cells of mice that no longer responded to other HER2 treatments, results to date have been remarkable, with the vaccine preventing further growth and eliminating toxicity that often occurs with other forms of treatment.

The power in the DNA vaccine is its ability to stimulate a patient's immune system to prevent the disease.

"We each have an immune system to help fight off disease," explained Wei. "However, when cancer develops, the immune system can't always distinguish tumor cells from normal cells, so the full power of the immune system is not harnessed to fight the disease. This vaccine helps to educate the immune system so that it recognizes HER2-positive cancer cells, helps destroy them and prevents them from spreading."

The vaccine consists of "naked" DNA – genes that code for the HER2 receptor – as well as an immune stimulant. The researchers used pulses of electricity to deliver the injected vaccine into leg muscles in mice, where the gene produced a huge quantity of HER2 receptors that activated both antibodies and killer T cells.

"While HER2 receptors are not usually seen by the immune system when they are expressed at low levels on the surface of normal cells, a sudden flood of receptors alerts the body to an invasion that needs to be eliminated," said Wei. "During that process, the immune system learns to attack cancer cells that display large numbers of these receptors."

"Both tumor cells that respond to current targeted therapies and those that are resistant to these treatments were eradicated," said Wei.

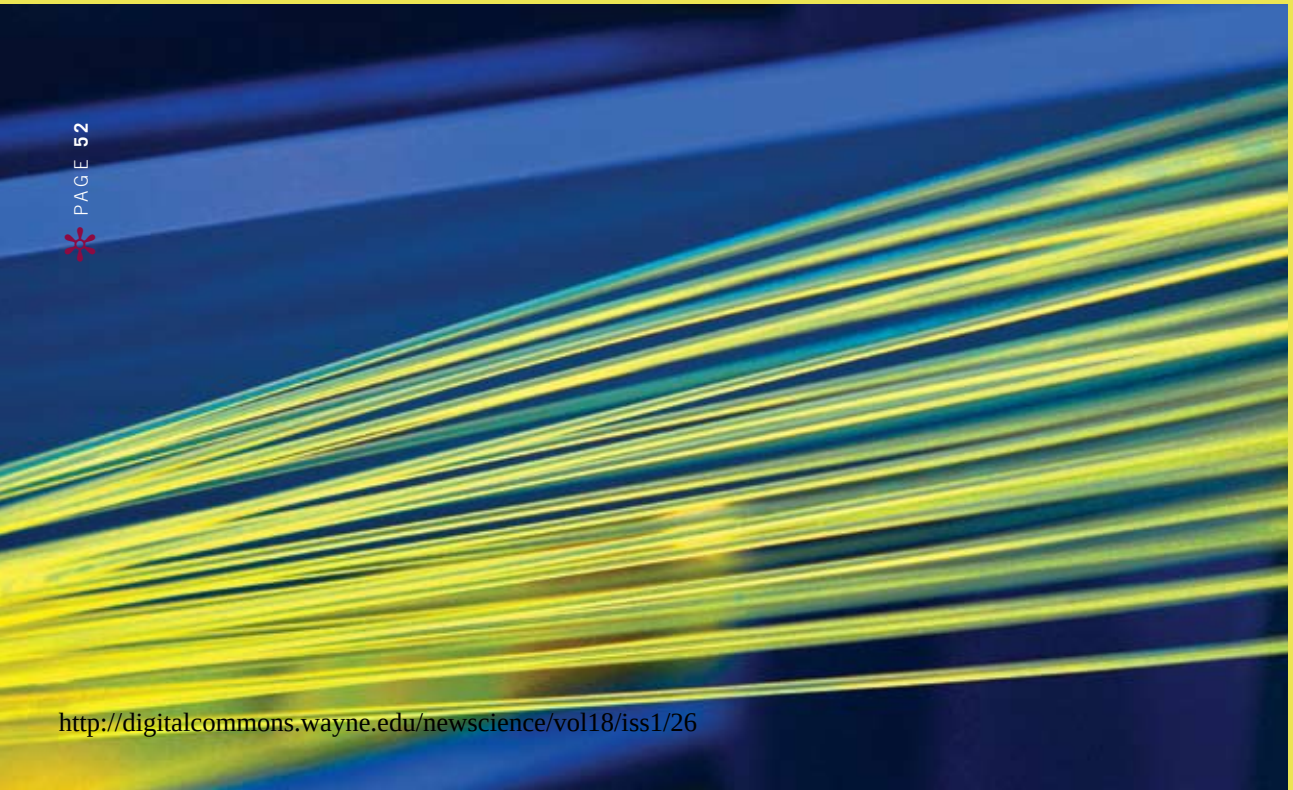
"The incredible efforts of Wei and her research team are bringing us closer to new answers for patients with HER2 tumors that are resistant to current treatments available," said Gloria Heppner, associate vice president for research at WSU. "One day soon I hope we will be entering human clinical trials, ultimately putting us one step closer to eliminating breast cancer."

About Dr. WEI-ZEN WEI:

Dr. Wei-Zen Wei received her B.S. in plant pathology from National Taiwan University, her M.S. in medical microbiology from State University of New York and a Ph.D. in biology from Brown University. She joined the Karmanos Cancer Institute in 1983 and Wayne State University in 1994.

For more information, visit:
http://www.med.wayne.edu/immunology/Pages/Faculty_Web_Pages/wei.html

Wayne State University researchers are playing a major role at CERN, one of the world's largest scientific research centers.



Backing the

by Julie O'Connor

CERN, the European Organization for Nuclear Research, one of the world's largest centers for scientific research, is focused on providing new insight into the understanding of matter, fundamental forces, what the universe is made of, and how it works. Thousands of physicists, engineers, computer scientists, and many other scientists have gathered at CERN to build and carry out research at the Large Hadron Collider (LHC), incontestably the world's largest and most complex scientific instrument ever built, to study the basic constituents of matter — fundamental particles and their interactions. And two groups of researchers at Wayne State University are playing a major role in this prestigious project to learn what happens when these particles collide, ultimately helping us to deepen our understanding of the laws of nature.

A new view of the universe

The LHC, the largest and most complex particle accelerator ever built, embarked on a new era of discovery at the high-energy frontier in 2008. It immediately faced technical issues that required a one-year shutdown for repair and upgrades but came back online with a vengeance in November 2009. In just a short time, it has beaten the proton beam energy world record twice, the first time in November 2009 with energy of 1.18 TeV, and then in March 2010 with energy of 7 TeV. This gigantic scientific instrument, located 330 feet in a ring underground 16.5 miles around near Geneva at the border between Switzerland and France, will enable scientists from around the world to understand what gives matter its mass, what 96 percent of the

Big Bang

invisible universe is made of, why nature prefers matter rather than antimatter, how matter evolved from the very beginning and more. By studying the smallest known particles using the LHC, scientists will peer deep inside the atomic nucleus in an effort to discover more about dark matter that pervades our vast universe.

Inside the LHC, two beams of subatomic particles called "hadrons" – either protons or lead ions –travel in opposite directions inside the circular accelerator, gaining energy with every lap. Physicists will use the LHC to recreate the conditions that were present just after the Big Bang, by colliding two beams head-on at very high energy. Physicists will study the particles created in the collisions using special detectors in a number of experiments.

A team of nuclear physicists at Wayne State is working on the ALICE (A Large Ion Collider Experiment) experiment at the LHC to study the matter produced in lead-on-lead nuclear collisions. These violent collisions will produce nuggets of matter reaching a temperature of one trillion degrees, about one million times the temperature of the core of the sun. At this tremendous temperature, matter dissolves into elementary constituents known as quarks and gluons. This matter, known as Quark Gluon Plasma, or QGP, permeated the universe right after the Big Bang for about one micro-second.

Recreating the past

The team, which includes Rene Bellwied, Ph.D., Thomas Cormier, Ph.D., Claude Pruneau, Ph.D. and Sergei Voloshin, Ph.D., all professors of physics in WSU's College of Liberal Arts and Sciences, along with post-doctoral researchers and graduate students in the Department of Physics, contributed to discover the QGP at the Relativistic Heavy Ion Collider (RHIC) located at Brookhaven National Laboratory, Long Island, NY. They now aim to study its properties in greater detail at the LHC. Essentially, they are interested in recreating the past, which ultimately could impact our future. Their role in the LHC has been to construct the electromagnetic calorimeter (EMCal) for ALICE.

Parts for this huge, heavy calorimeter, or heat detector, are being constructed in the basement of WSU's Physics Building, module by module. In all, WSU is building 2,200 of the 50-pound detector modules, which are layers of lead and insulators, laced with fiber optic bundles attached to complicated electronics. Once constructed, the modules are shipped to Switzerland to be installed on a support structure, with the entire structure ultimately weighing 80 tons.

"Wayne State University has by far made one of the largest hardware contributions to the LHC experiment," said Cormier. "While there are much larger hardware components elsewhere in the project, those have come from mega-collaborations of universities and national laboratories. The ALICE EMCal is exclusively a WSU project that can be associated with a specific set of physics goals."

Searching for Higgs

In addition to the ALICE project, WSU physicists are also collaborating on the Compact Muon Solenoid (CMS) experiment at the LHC. The CMS experiment is searching for the Higgs boson particle and other undiscovered particles that may help explain why matter has mass, and what dark matter consists of.

"This is an exciting and prominent experiment to use the Large Hadron Collider to search for the Higgs boson, which could explain the origin of mass of elementary particles, and to study the previously unexplored million-million volt energy scale of nature, over the next ten years," said Paul Karchin, Ph.D., professor of physics at WSU. According to Karchin, WSU researchers and students are stationed at CERN and at Fermilab in Batavia, Ill, to help maintain round-the-clock operation of these experiments and rapidly analyze the data captured. In addition to Karchin, Robert Harr, Ph.D., associate professor of physics, Mark Mattson, Ph.D., assistant professor of physics and Caroline Milstene, lecturer of physics are working on these experiments.

While there are many ideas of what may result from these unprecedented large energy collisions, Wayne State researchers can say for sure that a whole new world of physics will emerge from the ALICE and CMS projects. Indeed, with the LHC, the scientific world is entering a new era that will bring to life new discoveries and perhaps even unexpected new paradigms. These two Wayne State groups stand proudly with their extensive efforts in this amazing worldwide collaboration.

For more information about this project, visit: http://public.web.cern.ch/public

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Fast track

Detroit's hub for research and

by Amy Oprean

Since the U.S. ban on stem cell research was lifted on March 9, 2009, many pockets of promising research have sprung up across the country as scientists scramble to recharge their efforts in a field that holds tremendous potential.

Through a multitude of funding opportunities and exceptional expertise, Michigan's University Research Corridor – the alliance between Wayne State University, University of Michigan and Michigan State University – has positioned the state to be a major hub for stem cell advancement. Detroit holds particular promise, housing both Wayne State University and Stem Cell Commercialization Center located at TechTown, the university's research and technology park. Together, these entities are creating a gravitational pull for researchers and stem cell-based businesses around the world.

"We've set the stage not only for Detroit to be a place of important breakthroughs, but a place where breakthroughs will see a speedy crossover into the market and into people's lives," said Carol Brenner, associate professor of physiology in WSU's School of Medicine. Brenner is one of Wayne State's head stem cell researchers who is looking forward to advances this hub of innovation will make possible.

"This is the place that I've wanted to see research my entire life," Brenner said. "We are without a doubt still in the basic stages of research, but the possibility of what we can accomplish grows tremendously when there are this many minds in one place."

Having worked in both fertility clinics and academia, Brenner's 25 years of experience

for Stem Cells

commercialization

with stem cells have the rare combination of embryology and basic research. A diverse set of experts is also what brought her to Wayne State, where a multidisciplinary group of mitochondrial, embryonic and basic stem cell biology experts is one of the few of its kind in the country. The group, which is headed by Brenner and James Eliason, Ph.D., associate professor of internal medicine, is working to develop a new method for inducing pluripotency that may produce stem cells that are safe for therapeutics and can be used to model diseases.

Improving technology

Brenner and the team are focusing on adult pluripotent stem cells, specialized cells that have been reprogrammed to take on many of the characteristics of embryonic stem cells. First formed in 2006 from mouse cells and in 2007 from human cells, pluripotent stem cells bypass ethical and legal issues related to embryonic stem cell research. The current industry standard for inducing pluripotency involves using lentiviruses. Although these stem cells can be very useful in modeling diseases, they would cause serious defects if put back into the body.

The group is working on a new method of inducing pluripotency invented by Jianjun Wang, Ph.D., associate professor of biochemistry in WSU's School of Medicine. Gyula Acsadi, M.D., Ph.D., associate professor of pediatrics and Graham Parker, Ph.D., assistant professor of pediatrics in WSU's School of Medicine, have joined Brenner and Wang in developing a method using "protein transduction" instead of viruses to induce pluripotency, with the goal of producing stem cells that can be put back into the body for therapeutics. "Once we successfully develop a method for producing therapeutic stem cells, the door is open for making precursors to specific organs, to making larger quantities of cells needed for therapies and even getting more use out of bone marrow," Brenner said.

With the expertise of Michael Shy, Ph.D., professor of neurology in Wayne State's School of Medicine, the group is also using pluripotent stem cells to model neurodegenerative diseases. Their focus is on the role of mitochondria in the dysfunction of motor neurons, a phenomenon that occurs in nearly every neurodegenerative disease. "We suspect that many neurodegenerative diseases may share many common pathways that are related to the dysfunction of motor neurons," Brenner said. "Previous studies at WSU suggest that mitochondria are somehow involved with this dysfunction."

To start, the team is zeroing in on motor neuron dysfunction in patients with Charcot-Marie Tooth disease, a nerve disorder characterized by loss of muscle tissue, and Spinal Muscular Atrophy, a neuromuscular disease characterized by degeneration of motor neurons. By inducing pluripotency in cells from people with these diseases, they will be able to observe the disease from its very beginning stages through development, allowing them to not only observe the role of mitochondria, but to identify biomarkers and develop a model for the disease.

"Returning the cells back to an embryonic state allows us to go back to the early development and to try to understand the entire process of how the disease manifests," Brenner said. "It's like looking at an embryo with that disease."

Getting a foot up on bringing the research into the next stage, Eliason has also started a company to commercialize the research. Mitostem, at TechTown, was formed to commercialize neural regeneration technology as it's developed.

The commercialization center, which is headed by Eliason as executive director, will be a diverse hub for resources and collaborators that will accelerate advances in stem cell-based therapies while stimulating Detroit's economy through its role as a stem cell-specific business incubator. Some businesses have developed their own technology for things such as bone repair therapy. Many others are biobanks that facilitate faster research by supplying stem cells lines or nutrients required for keeping stem cells alive and healthy.

MitoStem recently received a $200,000 Small Business Innovation Research Phase I grant from the National Institute of General Medical Sciences of the National Institutes of Health to optimize its revolutionary stem cell technology developed at Wayne State University. Issued under the American Recovery and Reinvestment Act of 2009, the grant will allow researchers to develop new stem cell lines relevant for a variety of diseases, and enable the creation of stem cells from patient's own cells for replacement of diseased and damaged tissues.

"Growing stem cells is not a trivial thing; it's tricky," Eliason said. "One of the great things about this center is that it will build up the expertise in

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Fast track for Stem Cells continued

producing and maintaining good stem cell lines. It will take a lot of the tedious aspects off scientists' hands and give them more time to do interesting research. At the same time, it will allow bio companies to make a name for themselves in this area of growing demand, boosting the economy of Detroit in the process."

With the multidisciplinary group and commercialization center up and running, Brenner sees the coming years being prosperous both in terms of business growth and in crossing the threshold from basic stem cell research to clinical applications that will change people's lives.

"We're really getting all the necessary players in one place to advance basic research and bring it to the next phase as quickly as possible," Brenner said. "It will be incredibly exciting to see where the innovation takes us."

About Dr. Carol Brenner:

Dr. Brenner received a B.Sc. in genetics from Queen Mary College at the University of London, a Ph.D. in molecular embryology from Tufts University in Medford, Mass, and was a post-doctorate in molecular embryology at the University of California, San Francisco. She joined Wayne State in 2007.

Multidisciplinary stem cell team at Wayne State University

Wayne State's unique group of mitochondrial, embryonic and basic stem cell biology experts are working to model neurodegenerative diseases with adult pluripotent stem cells and develop a new method for inducing pluripotency that could finally make stem cells safe for therapeutics. Here is a breakdown of their areas of focus:

Co-principal investigators:

Carol Brenner, Ph.D., associate professor of physiology, School of Medicine
http://www.med.wayne.edu/Embryo/Carol%20Brenner.html

James Eliason Ph.D., associate professor of internal medicine, School of Medicine and executive director of MitoStem http://techtownwsu.org/

Developing "protein transduction," a potential alternative method of inducing pluripotency in adult stem cells, that does not require lentiviruses.

Jianjun Wang, Ph.D., associate professor of biochemistry, School of Medicine
http://www.med.wayne.edu/biochem/BMB_Faculty/Wang.html

Testing different culture conditions that could eliminate stress in reprogrammed stem cells.

Randall Armant, Ph.D., professor of obstetrics and gynecology, School of Medicine
http://www.med.wayne.edu/Anatomy/department/armant.htm

Dan Rappolee, Ph.D., associate professor of obstetrics and gynecology, School of Medicine
http://www.med.wayne.edu/anatomy/department/Dan.html

Creating human stem cell models for neurological diseases.

Gyula Acsadi, M.D.,Ph.D., associate professor of pediatrics, School of Medicine
http://neurology.med.wayne.edu/department/profile.php?id=1838

Graham Parker, Ph.D., assistant professor of pediatrics, School of Medicine
http://www.med.wayne.edu/crcm/laboratories/parker.asp

Michael Shy, Ph.D., professor of neurology, School of Medicine
http://www.genetics.wayne.edu/faculty/shy/index.php

Studying stem cells in relation to tissue repair and regeneration strategies, and in vitro tissue models.

Howard Matthews, Ph.D., professor of chemical engineering and materials science, College of Engineering
http://www.eng.wayne.edu/che/matthew.htm

Wayne State University Research

ANNUAL REPORT

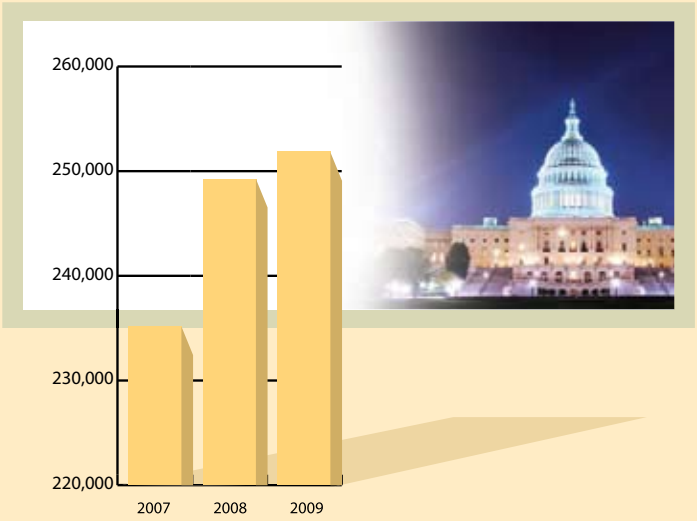
Wayne State University is home to leading researchers and scholars who are committed to improving our world. Through exceptional research, scholarship and creative activity, our faculty contribute significantly to the excellence of our diverse institution, improve the quality of life in the region and nation and provide an outstanding educational experience for our students.

WSU has many strengths related to research, scholarship and creative activity, reflecting our rich history and long tradition of innovation in addressing urban issues, enhancing urban communities, developing new technologies and drawing upon the broad diversity of our faculty and students to bring new perspectives to the arts and humanities. These strengths reflect our dual designation as a Carnegie "Very High Research" and "Community Engagement" University, which describes a select few public urban institutions.

Sponsored program research support is an integral part of WSU's research portfolio, and continues to increase even during these difficult economic times. Through creative scholarship, collaboration and discovery of new ideas, Wayne State faculty contribute to improving our community and our contemporary world.

Total Research Expenditures for Science & Engineering Fields

(Dollars in Thousands)



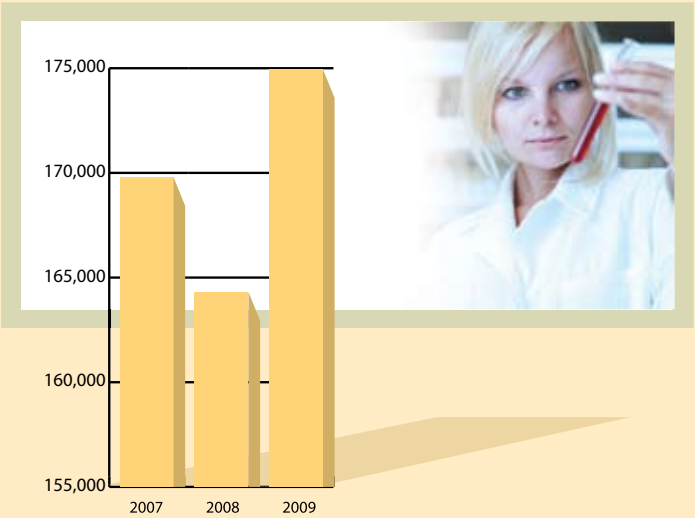
Research expenditure totals for all fields including non science and engineering fields are $238.7 million in FY2007, $253.6 million in FY2008 and $257.2 million in FY2009.

In FY2009 Wayne State University recorded a historic high in research expenditures for science and engineering fields of more than $251.8 million. This represents an increase of more than 6.6 percent ($16.6 million) in comparison to FY2007's total of $235.2 million.

WAYNE STATE UNIVERSITY

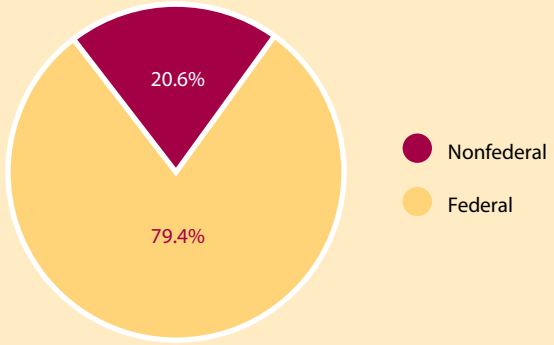
Research Awards

(in Thousands)



Wayne State faculty are enhancing their interdisciplinary approach to research through increased collaborations across campus and beyond. Through their efforts and improved research administrative processes, research awards in FY2009 grew by nearly $10 million to $174.9 million with more than 1114 active awards.

Federal vs. Nonfederal Awards



The majority of these awards – 79.4 percent – or nearly $139 million – were sponsored by the federal government.

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. New Science is available online at http://www.research.wayne.edu/newscience/.

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