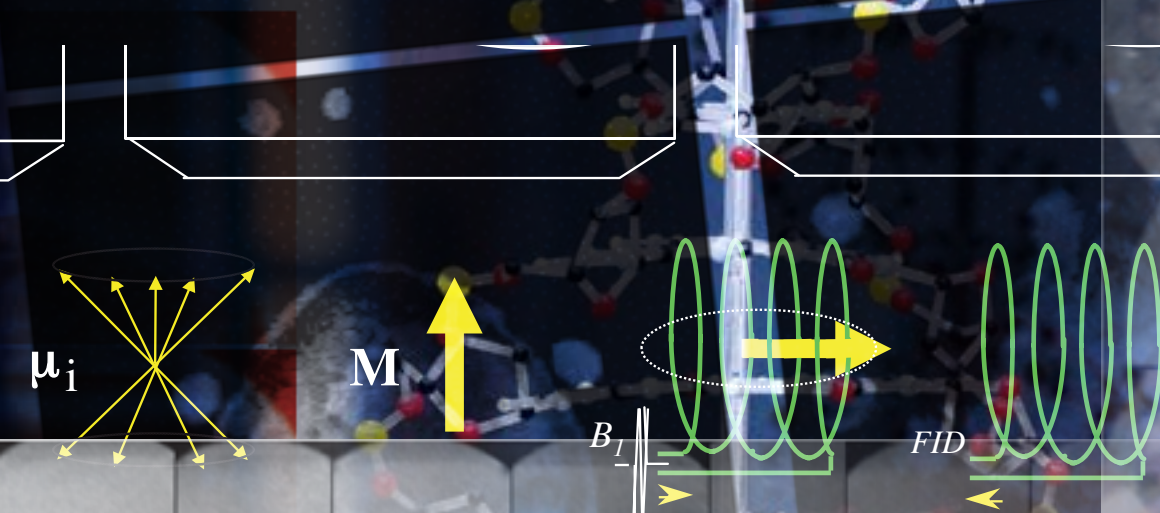


OAKLAND UNIVERSITY » Fall 2008

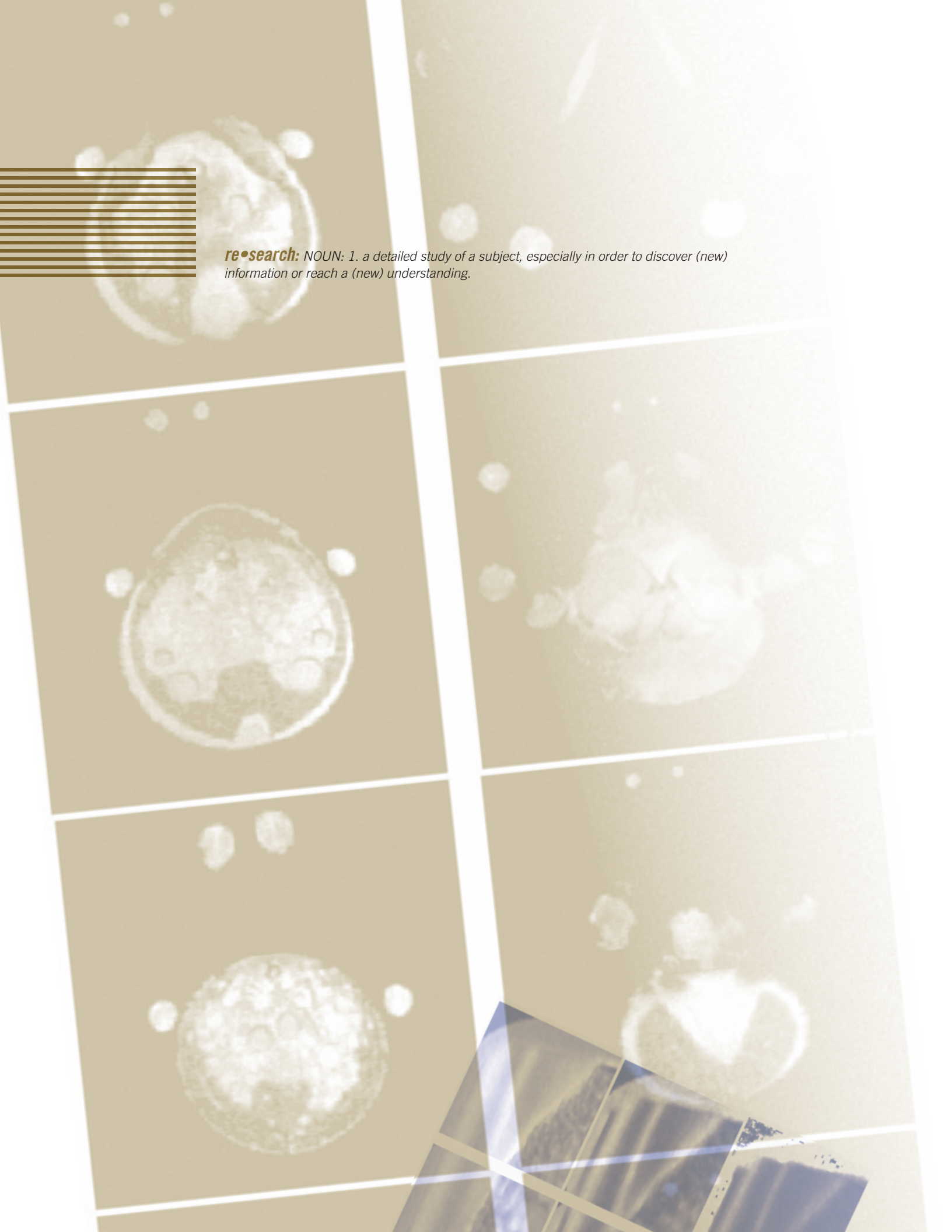
OU RESEARCH

Volume 1, No.1



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re•search: NOUN: 1. a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding.

Message from Virinder Moudgil

Dear Friends,

Since its founding in 1957, Oakland University has emerged as one of the fastest growing public universities in Michigan, and is recognized as a doctoral/research intensive university by the Carnegie Foundation for the Advancement of Teaching. We are extraordinarily proud of this accomplishment of our faculty, students and alumni. As illustrated in this publication, passion and support for research and creativity are top institutional priorities at Oakland.

As a known leader in many applied research disciplines including biomedical research, nanotechnology, manufacturing information technology, alternative energy/power train and homeland defense, Oakland University connects the outcome of our research to impact the greater good. This publication demonstrates that important, significant connection.

At Oakland, external funding for research is at an all-time high, a direct result of the important and cutting-edge work of our faculty and student investigators. On campus, we designate more than 53,000 square-feet of space directly to research.

Just as gratifying is the extensive involvement of our students in research projects in all disciplines — nursing, engineering, education, natural and social sciences, business, health sciences, visual and performing arts, the humanities, and information literacy. Our students excel in their research, scholarship and creative endeavors.

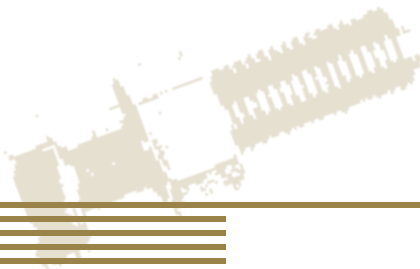
Oakland University is committed to our vision of enhancing an intellectual and ethical environment that prepares students to lead and serve in the local and world communities. We do that in part through extensive opportunities for research. Our faculty and student experiences link theory and research with community engagement to create solutions to challenges, advance technology and discover new truths. Turn the pages of this publication and you will witness the depth of our impact — from addressing the plight of the tiny honey bee to strengthening global business experiences, to discovering the effects of sunshine on cataracts — at Oakland University we touch real lives with real research and new understanding.



A handwritten signature in black ink that reads "Virinder Moudgil". The signature is fluid and cursive, with the first name being more prominent.

Virinder Moudgil
Senior Vice President for Academic Affairs and Provost

Moudgil is an OU professor of Biological Sciences whose more than 30 years of research on steroid hormone action and breast cancer has resulted in more than \$3 million in external funding from the National Institutes of Health. His early work examined structural and functional alterations in the steroid receptor proteins induced by a process of phosphorylation, and his laboratory was the first to report a link between differential actions of ovarian hormones (estrogen and progesterone) and induction of p53 in T47D breast cancer cells. Along with his team of graduate and undergraduate students and a faculty colleague, Moudgil is currently investigating hormonal regulation of tumor suppressor proteins, p53 and retinoblastoma, in human breast cancer cells. He is the series editor of *Hormones in Health and Diseases* and chairman of the Scientific Committee, Meadow Brook Conferences on Steroid Receptors in Health and Disease.



OUR RESEARCH

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RESEARCH AT OAKLAND UNIVERSITY

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Frank Giblin
professor of Biomedical
Sciences, director of
Oakland's Eye
Research Institute

Giblin received his Ph.D. in biochemistry from the State University of New York at Buffalo, N.Y. Giblin has conducted NIH-funded metabolic and biochemical studies on the lens and cataract for more than 25 years, becoming the director of the Eye Research Institute in 2002. Giblin has authored numerous research papers, serves as a Lens Section Editor for *Experimental Eye Research* and was a member of the NIH VIS-A Study section from 1995-99.



Seeing the light

Research pinpoints oxygen, ultraviolet light as possible catalysts for cataracts

Fresh air and sunshine. Mom always told us to get plenty of it for good health. However, research conducted by Frank Giblin, professor of Biomedical Sciences and director of Oakland's Eye Research Institute (ERI), is investigating the roles that oxygen and ultraviolet light play in the formation of nuclear cataract, a main cause of blindness. Giblin, who received a five-year, \$1.9-million National Eye Institute award for his research project *Proteins of Normal and Cataractous Lenses*, is working in conjunction with a number of researchers including surgeons from Beaumont Hospitals.

Cataracts are a condition seen increasingly in people as they age resulting in blurry, cloudy vision in the center of the lens. It is the main cause of blindness in 1.5 million people worldwide. More than 1.5 million cataract surgeries are performed each year in the United States.

As part of his study, Giblin is testing the hypothesis that age-related liquefaction of the vitreous humor, the gel behind the lens, allows oxygen to migrate from the retina into the center of the lens, causing nuclear cataract. In a healthy eye, Giblin says, the lens allows light to filter through to the macula. "The role of the lens is to stay transparent. It is like a piece of glass, and as we age it often becomes less clear because of cataracts."

Giblin says the film which forms a cataract is essentially proteins that have bound together. "In a transparent state, crystallin proteins are found 'floating' independently in the lens. However, when a cataract forms, the proteins bind together," he explains. "The eye requires a sensitive balance of oxygen. When more oxygen gets into the eye, proteins within the lens bond, creating large aggregates, which scatter light and lead to loss of vision."

He says the compound glutathione (GSH) exists in an unusually high concentration in the lens, where it functions as an essential antioxidant vital for maintenance of the tissue's transparency — and is a protection against cataracts. GSH protects the proteins from binding together. Giblin has found, however, that if the level of oxygen increases in the lens or if the eye is exposed to large amounts of bright ultraviolet light (causing oxidation to occur), the proteins begin to bind together. Through his research, Giblin is investigating which proteins in the lens are binding together, and why.

The effects of elevated levels of oxygen are relatively unresearched.

In addition, Giblin also will examine whether a separation of the vitreous humor from the retina (a posterior vitreous detachment or PVD) provides a way for oxygen to enter the lens from the back of the eye. He and his fellow researchers are studying whether vitrectomy surgery, a procedure commonly performed to treat retinal disorders such as retinal detachment, vitreous hemorrhage and a macular hole, could also increase oxygen flow from the back of the eye into the lens, increasing the risk for cataracts. As an alternative, researchers are measuring whether the injection of certain enzymes into the vitreous humor would serve as a possible replacement for vitrectomy surgery.

His co-researchers at Beaumont include Michael Trese, M.D.; Polly Quiram, M.D., P.h.D.; and David Goldenberg, M.D. The results of their research, Giblin says, may eventually be used to create effective treatments and preventive practices for cataracts.

The Eye Research Institute at Oakland University was founded in 1968, funded by a National Institutes of Health construction grant. The ERI was recognized as a center of excellence in 1984, and developed a research partnership with William Beaumont Hospital in 1989. Since its founding, ERI faculty have received nearly \$50 million in research grant support from private and federal agencies.

By Susan Thwing-McHale

"The role of the lens is to stay transparent. It is like a piece of glass, and as we age it often becomes less clear because of cataracts."

— Frank Giblin, professor of Biomedical Sciences



Stung!

Educators address honey bee extinction threat

Albert Einstein is said to have predicted that if bees were to disappear, man would follow only a few years later. That could soon be put to the test, as many factors have led to a 90 percent decline in the United States' feral honey bee population over the last 50 years.

"Right now there are virtually no remaining wild or feral honey bee colonies in the United States," says Dyanne Tracy, professor of Education in Oakland's School of Education and Human Services. According to Tracy, the bees are dying due to pests, pesticides, loss of habitat, and a mysterious disease known as Colony Collapse Disorder.

"The hallmark of our lives in suburbia is mowed grass, which does not provide the plant nutrients necessary for supporting bees," she explains. "As we make our lawns beautiful, we are also mowing down the habitat of one of our most important environmental resources."

To help combat the threat to the bee population, and raise awareness about their plight, an \$85,000-grant from the Environmental Protection Agency (EPA) is funding the Michigan Teachers' and Students' Honey Bee Apiary Project for Ecology (MiTSHAPE). Through the grant, 18 Michigan teachers were given the opportunity to take a three-credit-hour intensive graduate course from Oakland University about honey bees and their care. The course, taught by Tracy, covered how to be good beekeepers. The course also provided EPI-PEN certification training (to administer medicine in emergencies), safety procedures, opportunities for hive observations and hive management. The educators, who teach grades ranging from kindergarten through college, developed curriculum units at the completion of the course.

The grant also provided a hive, four student bee suits and tool sets, three pounds of honey bees and a queen to be installed at the recipients' schools. Teachers integrated their curriculum into the classroom in winter/spring 2008, and the results can be viewed in a movie found at www.oakland.edu/MiTSHAPE/movie.html.

To further expand the reach of the program beyond the classroom setting and into hands-on research, Tracy is working in conjunction with Linda Schweitzer, OU associate professor of Environmental Chemistry and Environmental Science Program Coordinator, who also participated in MiTSHAPE. Schweitzer plans to introduce a four-credit class in apiculture science next summer at Oakland. She is

currently working with students on an apiary project (a place where honey bee hives are kept) on the OU campus.

"Bees have been around for 200 million years. They have survived numerous other major extinctions, so the fact that they are struggling now is a big concern," Schweitzer says. "This illustrates the importance of incorporating environmental sustainability into the curriculum so that students become involved in solving the problems of declining wildlife and become good environmental stewards."

The Oakland course will help address the issue of environmental sustainability and, thus, economic sustainability. Within the course, students will do field work observing worker bee behaviors such as feeding, communicating, guarding and foraging.

Tracy said learning about honey bees is crucial to maintaining a healthy environment and ecosystem. "Raising awareness of this environmental concern and educating people about the importance of bees is essential," she says. "Honey bees will not survive unless we have beekeepers to take care and give attention to them."

Tracy said the average age of current beekeepers is 61 years old. Inspiring a new generation of beekeepers is critical to the survival of bees — and, in turn, the survival of our food crops.

"More than one-third of our food crops are dependent on pollination from honey bees," Tracy explains.

Carol Jones, science consultant with the Macomb Intermediate School District, says studying honey bees is a hands-on opportunity for students at any grade level to learn essential lessons about the environment and real-world cause and effect, as well as topics such as life cycles, ecosystems, chemistry, biology and math.

"This is a wonderful way to teach students and engage them in the subject with the added bonus of instilling in them the importance of being a good steward of our environment," Jones says.

By Susan Thwing-McHale

"Raising awareness of this environmental concern and educating people about the importance of bees is essential. Honey bees will not survive unless we have beekeepers to take care and give attention to them."

— Dyanne Tracy, professor of Education





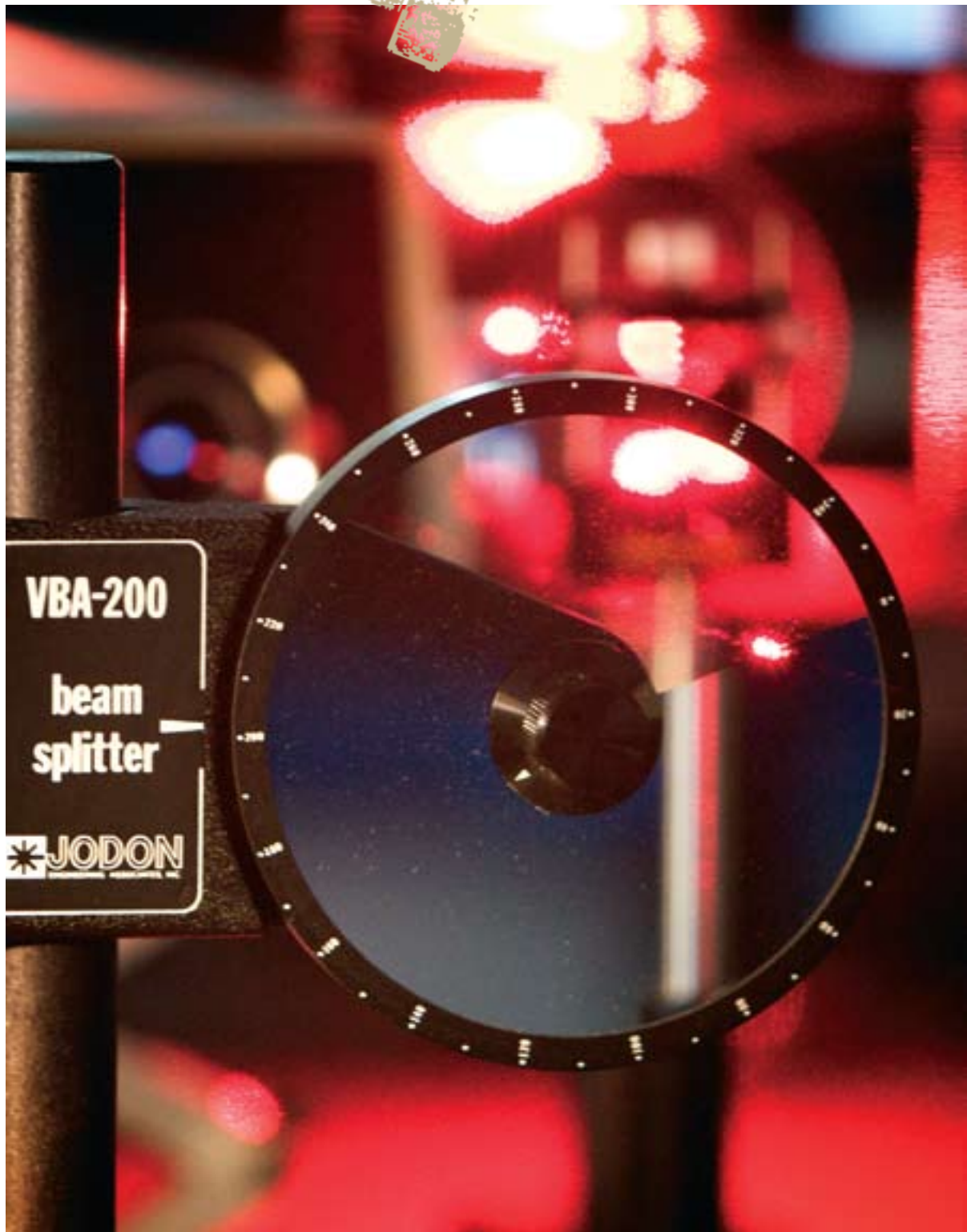
Dyanne Tracy
professor and chair,
Department of Teacher
Development and
Educational Studies

Tracy earned her Ph.D. in Curriculum and Instruction from Indiana University. She has received funding for her research from MEEMIC Foundation for the Future of Education and the Environmental Protection Agency. She has participated in Math and Science Partnership (MSP) grants that support innovative partnerships to improve K-12 student achievement in mathematics and science.



Sayed Nassar
professor of Mechanical
Engineering and
founding director of
FAJRI

Nassar earned his Ph.D. in aerospace engineering from the University of Cincinnati. A world-renowned expert on fastening and joining of materials, he received more than \$8 million in research grants during his first five years at OU. He is a frequent guest lecturer for academia and industry world-wide, has published more than 150 technical articles and presentations and is the co-author of the *Handbook of Bolts and Bolted Joints*. Nassar is a Fellow of ASME International and is a member of SAE International.



Excellent outcomes

FAJRI hits a major milestone

Excellence is its own reward, but it's so much the better when someone else notices. For Oakland University's Fastening and Joining Research Institute (FAJRI), that someone else is the U.S. Department of Defense, which is in the final stages of recognizing the institute as a leading candidate for a long-term research affiliation.

"It is almost official, but not quite in writing yet," says FAJRI founding Director and OU Professor of Mechanical Engineering Sayed Nassar. "We will be designated as a federally funded National Center of Excellence in fastening and joining research."

The designation is more than just about bragging rights for the five-year-old institute. It means continuous funding to keep the facility dedicated solely to the fastening and joining of materials which includes bolting, welding, adhesive bonding and advanced riveting technology. FAJRI faculty and students have become a problem-solving source for industry and manufacturing. Recent examples include solving a bolted joint problem that shut down the Fermi 2 nuclear power plant near Monroe, Mich.; and analysis and design optimization of many automotive joints, which saved millions of dollars in warranty costs and significantly improved the safety and reliability of passenger vehicles and trucks.

This one-of-a-kind research institute is currently funded until the end of 2010, but becoming a National Center of Excellence (NCE) would mean it would become a line item in the core research budget of the Department of Defense. Although the paperwork will take months, the funding is expected to begin in April 2009. The institute has also received funding from the National Science Foundation, DTE and Chrysler LLC.

"After five years we've earned our niche," Nassar says. "We've convinced the army of the need, our uniqueness and our area of core competence."

The anticipated NCE will receive \$11.5 million over five years. Some \$5 million of that will need to be raised from external partners, a prospect that does not worry Nassar. "Chrysler has generously given \$1 million," he explains. "Overall, we have close to \$3 million pledged and I'm confident we'll be able to reach our goal with the kind of support we have in the industrial community. We're fortunate to be in such a strong position."

The funding will be used for three major initiatives. The first will support work on a vehicle to replace the Army's M1/A1 battle tank. "They call it a light-weight combat vehicle," Nassar says. "We're talking about ceramic and advanced material armor. So we are involved in how that armor is going to be attached to the structure."

The second initiative involves development of smart bolt fastening systems. "By that we mean relying on something other than the torque it takes to tighten a bolt. In our field we know that torque is the least reliable way to tighten a bolt," adds Nassar.

He says that two competitive Non-Destructive Testing (NDT) technologies are being explored. The first involves using ultrasound transducer in the socket to send waves through the bolts to read bolt force in real time. The second smart system uses laser optics to "sense what the joint is 'feeling' and that is the tightness."

The third NCE initiative is concerned with optimizing advance composite mobile bridges for the Army Corps of Engineers. "These are collapsible and lightweight, but strong enough for heavy tanks to cross," he says. "You can have a much better strength to weight ratio in composites."

With the impending 2010 mothballing of the Space Shuttle Program, Nassar was recently asked to represent FAJRI at NASA to lend his expertise to develop NASA-wide fastener standards for its space program. This includes the upcoming shuttles Constellation and Orion and the International Space Station programs. Technical task forces were created in four areas. In each area, fastening and joining were considered critical.

"So by the end of the meeting I ended up serving on all four teams," Nassar says with a grin.

Such is the price of excellence.

By Tom Schram



"After five years we've earned our niche. We've convinced the army of the need, our uniqueness and our area of core competence."

— Sayed Nassar, FAJRI founding director and professor of Mechanical Engineering

Knees, hips, elbows

Taking a closer look at osteoarthritis

Osteoarthritis is the most common form of arthritis, affecting more than 20 million people in the United States. Caused by the breakdown of articular cartilage in one or more joints, osteoarthritis gradually worsens with time and no cure exists.

It is an age-old, vexing problem that Oakland University Physics Professor Yang Xia is quite literally looking into. Using three types of technologically advanced imaging — microscopic magnetic resonance imaging, infrared imaging and polarized light microscopy — Xia is seeking to detect subtle changes in the cartilage that could preserve it through early intervention.

With a recent \$2.4-million grant from the National Institutes of Health, Xia is zooming in on the mechanical properties of the articular cartilage that serves as load-bearing tissue in joints.

“In the past, we incorporated these mechanical properties as one of many parameters,” he says. “Now we are going to target the mechanical properties as a major signature. It is our focus and we are using other techniques — the imaging — to support the mechanical measurements. At the end of the day, the story is that we want to know the mechanical properties based on what we discover with the imaging.”

Why is discovering the mechanical properties important? Because typically, osteoarthritis is discovered when patients begin to feel pain in their joints.

“At this moment there is no blood test, no imaging test, not a single test that can tell you the tissue has just begun degrading,” Xia says. “By the time you feel the pain in the joint, it is often too late. Then it is bone against bone.”

Xia’s research could eventually lead to identifying the disease before it is too late to intervene.

“The question is, how do we discover the problem before there is severe pain? We have found some markers in the tissue that we can image,” he says. “These markers closely reflect the biochemical and physical properties of the tissue so that one day we can use these markers in the clinic to monitor the tissue or even do a screening and, at a later stage, to see which drugs are more useful.”

Xia explains that ideally a cartilage screening could become part of a regular physical examination. The screening would

be no less common than blood tests. This would create an individual baseline that would be regularly monitored.

“If we have a way to do a pre-disease screening, we will do much better when the tissue goes wrong,” he adds.

As people grow older, continued screening will better detect problems before they become untreatable. Drug intervention would then become more tenable.

“If I’m the drug company, I have maybe 1,000 compounds,” Xia says. “How do I know which one is useful? I want a measure that is irrelevant to the pain, because the threshold of feeling pain is different for every person. What is unbearable pain to one person could be a nagging pain to another.”

By imaging the cartilage and measuring its mechanical properties, Xia hopes to develop markers that will answer the pharmacological questions of which drugs are best suited to the individual patient. Xia will use the new five-year grant to image the mechanical properties of osteoarthritis at rest and under stress from its earliest stages to just before it becomes untreatable.

“We’re going to study this tissue at different disease stages so hopefully we get some sensitive markers which are related to the stage of the disease in clinics,” he says.

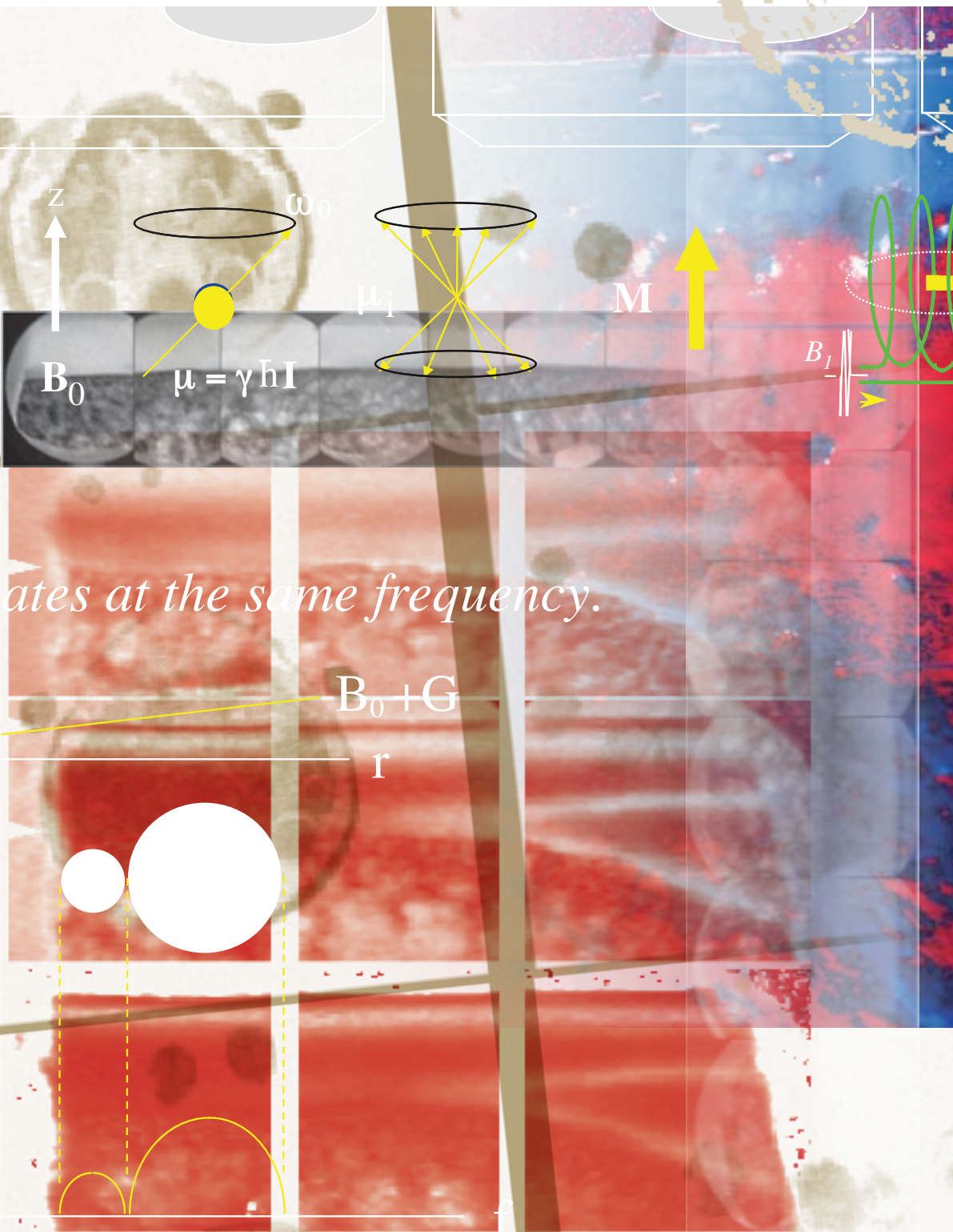
“Also, we found in some studies we did two or three years ago that if you image the tissue while it is being squeezed, you have a better chance of figuring out what’s going on.”

The objective is not a cure, but an intervention. If the problem can be caught early on, it is possible that pain can be avoided. And for Professor Yang Xia, that possibility is well worth looking into.

By Tom Schram

“At this moment there is no blood test, no imaging test, not a single test that can tell you the tissue has just begun degrading. By the time you feel the pain in the joint, it is often too late.”

— Yang Xia, professor of Physics



Yang Xia
professor of Physics
 Xia earned his Ph.D. at Massey University in New Zealand and completed post-doctoral work at Cornell University in New York. He has authored more than 120 research papers and abstracts, several book chapters and presents regularly on advanced imaging techniques for detecting changes in cartilage at national and international conferences.



Daniel Aloï
associate professor
of Electrical and
Computer Engineering

Aloï earned his Ph.D. in Electrical Engineering at Ohio University. He has received funding for his research from numerous sources including the Federal Aviation Administration, Sony Electronic and OnStar. He has authored numerous papers on his GPS research and was named the Key Technical Advisor to the FAA Satellite Program Office's Local Area Augmentation System (LAAS).



Can you hear me now?

Analyzing antenna strength

When Daniel Aloï, associate professor, Electrical and Computer Engineering came to Oakland University almost seven years ago, the former college basketball player was destined to think big. After finishing his doctorate at Ohio University in Athens, Ohio, he went to work for GM's OnStar, Inc. in Troy.

"I found that when you work at the OEM level (original equipment manufacturer), it's more program management. You don't have the opportunity to dive down into the details," says Aloï.

Knowing that he wanted to work with electromagnetics, antenna design and Global Positioning Systems (GPS) at the research level, Aloï accepted a position at Oakland University in 2002, and has received nearly \$2 million in external funding to support his research endeavors. Last year, he received OU's New Investigator Research Excellence Award.

This spring, the 14- by 14-foot concrete shelter that appeared near Oakland's Pioneer Drive entrance and Lonedale Road is the result of Aloï's big plans, but what's built parallel to the ground 30 yards away is really something to see.

The Applied Electromagnetic and Wireless Lab's on-campus Automotive Antenna Measurement Instrumentation (AAMI) includes a six-meter diameter turntable with a 30-foot radius gantry that can be positioned from parallel to the ground to straight up in the air (or zero to 90 degrees). Think of a dockyard crane that can raise and lower like the span of a drawbridge over a giant metal turntable. Now picture a car on the turntable that can spin 360 degrees while the crane is adjusted to various elevations.

When the \$650,000 equipment in this outdoor facility is tucked away, it's hardly noticeable, but when in use, the visual image is impressive, as is its application.

"What makes this facility unique is that with the turntable and arch, you can measure the performance of an antenna on a car. You have to be able to measure them and the shape of the radiation pattern to make sure the levels are correct. On your cell phone, if your antenna pattern isn't good, there will be a dropped call, or the voice will not be clear. With navigation, too, if your pattern is bad, you lose GPS," says Aloï, who received \$400,000 in funding through the National Science Foundation's 2005 Major Research Instrumentation grant. OU contributed the balance, which will be recouped via usage by companies.

While the AAMI is not the first in Michigan, Aloï says it is the first non-privately owned system intended to provide faculty, students, researchers and industry personnel with state-of-the-art antenna research instrumentation.

The AAMI is a spherical near-field antenna measurement system capable of measuring on-vehicle antenna performance in the frequency ranges 800 MHz to 7GHz. The major components of the system include the network analyzer that measures power levels, a single source and receiver segment that generates the radio frequency test signal and collects measurements, and the positioning and control equipment.

In the past eight to 10 years, with the onset of GPS, satellite digital audio radio and wireless-based voice commands, the need to integrate antennas has escalated. Otherwise, says Aloï, cars could be in danger of becoming antenna farms.

To maximize an antenna's performance, it must be tested at the development stage, and that's where the AAMI becomes a valuable tool.

After a car is driven onto the turntable, the gantry can move at incremental degrees, taking measurements that could include thousands of spatial points. As the computer records the information, antenna patterns are plotted and performance parameters such as directivity or gain can be calculated.

Aloï says that with the AAMI, researchers are also able to gain insight into the measurement process itself. "I do a lot of antenna modeling, and when you do that, having the data validates the theoretical simulation results," he adds.

For those whose knowledge of antennas left off at the time when orange foam balls were considered their hot accessory, consider the fact that anything wireless has an antenna. Technology may have made it nearly invisible or entirely internal, but it's there. From cell phone emergency notification to keyless entry to that bothersome, yet effective, backup beep when you put your car in reverse, antennas make it all possible.

With the AAMI, Aloï sees applications for students, faculty and corporations. "Obviously electromagnetics is pretty abstract, so it is a nice tool for the classroom and we can even put together short courses for industry. In the new 600 antenna design course, students will be able to go through the whole design process and test it using the AAMI, which is a powerful asset for gaining employment in the industry."

By Alice Rhein

"What makes this facility unique is that you can measure the performance of an antenna on a car."

– Daniel Aloï, associate professor, Electrical and Computer Engineering

Culture cues

Understanding African immigrants in North America

Research by Associate Professor of Sociology Abdi Kusow will help employers, policy makers, social service providers and others better understand the cultures of African immigrant populations.

Professor Kusow is an internationally recognized expert on social transformation and conflict in the East African region. He is currently studying assimilation problems that African immigrants experience when they settle in the U.S. and Canada.

“Because racial identification is one of the most important categories of social, political and economic differentiation in the world today, any understanding of specific cultural differences will help not only with policy making but with efforts to create unity out of diversity,” Kusow says about the impact of his studies.

Kusow, whose work has appeared in flagship journals such as *Symbolic Interaction*, *Ethnic and Racial Studies*, and the *Journal of Ethnic and Migration Studies* and who recently participated in a UNESCO (United Nations Educational, Scientific and Cultural Organization) conference, notes that this area of study is particularly important in light of a recent Pew Research Center report revealing that nearly one in five Americans will be an immigrant or ethnic minority in 2050. Kusow’s ever-expanding body of research sheds light on how cultural differences impact African immigrants in North America, how they cope with those challenges and how they, as a group, impact their adopted countries — culturally, economically and from a sociological perspective.

One of the African immigrant groups he studies, Somalis are one of the largest groups of African Muslim immigrants in North America today. The experience of Somali immigrants is very important in our understanding of race relations in the United States. In Somalia, residents face “clanism” discrimination, a system of social differentiation based on clan membership. Because Somalis have no visual indications of ancestry that are common in a more diverse population — such as differences in hair, eye or skin color — determining who to discriminate against takes more effort.

“They engage in an interesting process of figuring out who is who through conversations and stories,” Kusow says. “In essence, Somalis have to know something about you before becoming prejudiced against you.” This is similar, he says, to the religious conflict in Northern Ireland, where people can’t determine who is Protestant or Catholic simply by looking at them.

Because there is no discrimination based on skin color, Somalian immigrants are unprepared when they encounter this bias in other parts of the world. Kusow studies how they adjust in communities where skin color is the primary source of social stratification.

Kusow conducted nearly 100 face-to-face interviews. Using open-ended questions about their experiences and understanding of race in their homeland as well as in the U.S. and Canada, Kusow uncovered why Somali immigrants do or do not assimilate fully in the traditional “melting pot” sense.

The research revealed that many Somali immigrants ignore or reject attempts to classify them according to skin color. Instead, they choose — like many other “black ethnics” — to be discriminated against because of their culture and religion.

Kusow continues his research to determine if the tendency toward social isolation will prevail or if Somalis will adjust to the American racial framework over time. He hopes to track newer immigrants for as long as 10 years.

He is currently working on a comparative study of racial formation and patterns of socioeconomic achievement among African immigrants in the United States. The purpose is to determine if recent African immigrants assimilate into the cultural and socio-economic patterns of the majority African American population, or develop segmented and/or parallel assimilation patterns. This research is the more sociologically relevant in light of the increasingly popular assumption that black immigrants are on the average more educated and economically successful than native African Americans. It is intended to clarify the recent upsurge by the media which suggests that elite U.S. universities enroll a disproportionate number of African-American immigrants as opposed to African Americans.

He expects his research will generate public policy discussions to address black immigrants as American leaders begin to grasp the impact of the demographic changes revealed in the Pew research.

“Employers can use it to better understand and communicate with employees who are African immigrants while a service business might use what it learns from this research in its marketing efforts,” he adds.

By Sandra Beckwith

“Racial identification is one of the most important categories of social, political and economic differentiation in the world today.”

— Abdi Kusow, associate professor of Sociology



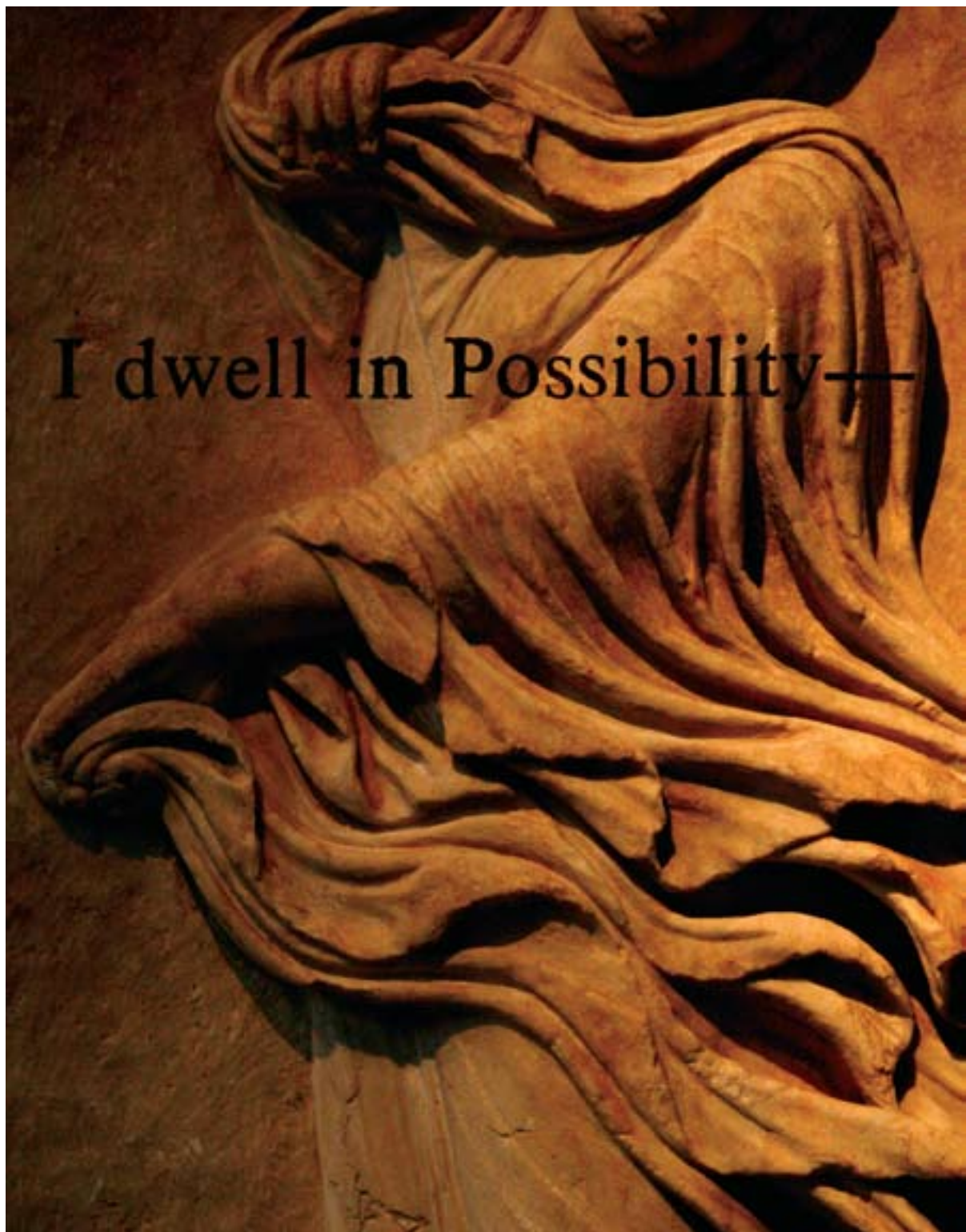
Abdi Kusow
associate professor
of Sociology

Kusow received his Ph.D. from Wayne State University. He has participated in several international policy forums sponsored by UNESCO, Italian and European NGOs, and Aalborg University in Denmark. His work has been cited in a wide range of academic disciplines including health education, cross cultural health, demography, fertility and mortality, race and ethnicity, international migration, psychiatry, and methodology. Over the past year alone, his research has been cited by more than 30 scholarly articles, books and book chapters.



Andrea Eis
Doris and Paul Travis
professor of Art

Eis earned her M.F.A. in Photography from Cranbrook Academy of Art in Bloomfield Hills, Mich. She has received grants from the National Endowment for the Arts and the Michigan Council of Arts and Cultural Affairs. She recently had a solo exhibition of her photography at the Center for Hellenic and Mediterranean Studies in Athens, Greece. Her photographic book, *Ancient Finds*, is distributed by Printed Matter, New York City, N.Y.



Moving statues

Bringing ancient history to life

Andrea Eis can picture Greece — for herself and others.

Associate professor and chair of the of Art and Art History department, Eis shows Greek art in a new light. As a photographer with a contemporary spin, Eis' photographs are captivating and thought-provoking.

It's been more than 2,500 years since Greece made its greatest advancements in the arts, but Eis believes there's much we can glean from the past. Having published a photographic book entitled *Ancient Finds*, Eis made her sixth visit to Greece with a 2006 OU faculty research fellowship to study sculptures and architecture. Since then, she's produced exciting new photography and video collections and is expanding her art exhibitions internationally.

Eis' artwork transcends time by connecting Greek artifacts with emotions we can recognize and appreciate today — and she does it with classic beauty.

Eis' research project, *Walking the Labyrinth*, aptly describes her journey. An ancient symbol, the labyrinth traces a winding path to its center and back out again to the world. Likewise, Eis traveled a circuitous route in Greece, collecting data and taking photographs of artworks from various periods.

She regularly studies Greek mythology, poets, philosophers and scholars. She frequents Greece's ancient sites and museums, and has spent considerable time in Athens libraries, poring over authentic Greek textbooks.

The story behind Eis' brand of art is as unique as the artwork itself.

"I became quite ill when I was in graduate school," she says, "and I wasn't able to go into the darkroom to develop my photographs...so I used a Polaroid camera, re-shooting images...analyzing them...then adding rub-on letters to the photography. I found my artistic focus on image/text relationships."

Eis continues a more sophisticated process of this today. Combining photographs with prose or historic Greek text, she creates an illuminating picture.

Eis has an eye for detail. When photographing sculptures, she narrows her focus — shooting a portion rather than the whole. The result is a fixed quality, but with an illusion of

motion. "I'm not interpreting Greek art," she explains. "I'm reinterpreting it, with an emphasis on the universal emotional aspects."

Scholars, artists and Greeks have all viewed Eis' work, intrigued by differing aspects. But her favorite audience is her students.

In addition to incorporating her research into her teaching, Eis recently took students on a study abroad trip to Greece.

"This was about slowly soaking in the experience and 'walking the walk.' Running around to 14 places in five days...isn't always what is best," she says.

The students got a bird's eye view of Greek philosophy.

"The Greeks believed the twists and turns you take before you actually arrive at a place will change the way you view it," Eis explains. "So I took my students on a winding, visually complex, step-by-step journey up a mountain at Delphi...emphasizing the impact of each turning point until we reached the temple. The Greeks saw that kind of journey as helping to provide meaning to a place."

Additionally, Greeks saw the past as being in front of them — they could "see" it because they'd already experienced it, and they felt the future was behind them because it was unknown.

Eis, however, believes she might know a portion of her own future. "I love the sculptures because they're so expressive," she says. "But I'm also intrigued now with landscapes and temples."

For Eis, her artistic passion holds a purpose: to show the world that with art, time doesn't stand still — it has the ability to move us.

By Mary Gunderson-Switzer

"I'm not interpreting Greek art. I'm reinterpreting it, with an emphasis on the universal emotional aspects."

– Andrea Eis, associate professor of Art and Art History



Detecting DNA damage

Looking at the effects of radiation

In the spring of 1953 the race to unravel the foundation of life was won when Cambridge University scientists James Watson and Francis Crick first published the structure of DNA. That discovery of the double helix was only a decade old when Michael Sevilla, distinguished professor of Chemistry, Oakland University, received his bachelor's in chemistry from San Jose State University. Sevilla completed his Ph.D. and post-doctoral work at the University of Washington in Seattle, but his vast knowledge of DNA and work in the investigation of radiation damage to DNA has essentially grown out of scrupulous professional development.

Today, Sevilla's lab, where undergraduate and graduate students and doctoral scientists assemble each day to conduct innovative research, has several areas of investigation. Current research, funded by the National Cancer Institute (NCI), looks into fundamental mechanisms of chemical processes that occur after radiation strikes DNA.

"We are looking at the direct effects of radiation on DNA where radiation actually impinges on the DNA and causes ionization, or an excitation in the DNA, and this leads to subsequent damage," explains Sevilla. "Before our work, not a lot was known about this pathway from the initial ionization through to the biological damage, or the molecular products that led to the biological damage. We've been filling that in."

Working with gamma rays and ion beams, Sevilla's lab compares the damage to DNA caused by the two forms of high-energy radiation. The advantage of the ion over a gamma is that the ion beam travels only so far and then stops and does its damage at the end of its track, making it much easier to control. In the case of a cancer tumor, an ion beam can deposit energy from a number of directions right at the end track, and damage to the surrounding tissue is far less.

"It's like a bullet, it goes into tissue and the damage is done at the end where it deposits more energy," says Sevilla.

Sevilla's lab looks at the damage to DNA caused by this form of radiation. Ionized particles that damage DNA and cause cell death are good when the cell is cancerous, yet potentially harmful if the cell is functioning normally.

For Deepti Khanduri, a graduate student in Sevilla's lab, the opportunity to make DNA samples and test them has been an invaluable experience. "This is a high-performing lab,"

she says. "We are looking at something that is very major [in the fundamental science that could lead to improved cancer treatment]."

Following the chemistry that takes place from the original ionization to the molecular product, research has discovered that damage to DNA can include a strand break, which can cause cell death, or damage to the DNA base. Either way, in cancer treatment, that is a good thing.

Sevilla found that the initial effect of radiation produces ion radicals on the DNA bases and DNA radicals on the sugar phosphate backbone. These directly lead to strand breaks and biologically relevant damage. Sevilla's research has also focused on the use of theoretical chemistry to treat free radicals formed in biomolecules to understand their mechanisms of reaction.

While Sevilla and his colleagues publish five to six journal articles a year, a recent one in the *Journal of the American Chemical Society* was particularly rewarding. "We made a little discovery that we were very happy about," says Sevilla.

It is known that once you ionize DNA, there is the loss of an electron so a positive center is created. Physicists call these holes. What isn't known is the extent and nature of transfer of the hole through DNA. "It has been of interest because it has to do with whether damage can occur far away from the initial site," says Sevilla.

Using ESR (electron spin resonance) spectroscopy, his team found that once the hole is created in the adenine base (one of the four bases that make DNA), if it's near another adenine, they will join together and share a charge between them. This allows a stack of adenine to act as a conductor for DNA holes, an area that is ripe for further research.

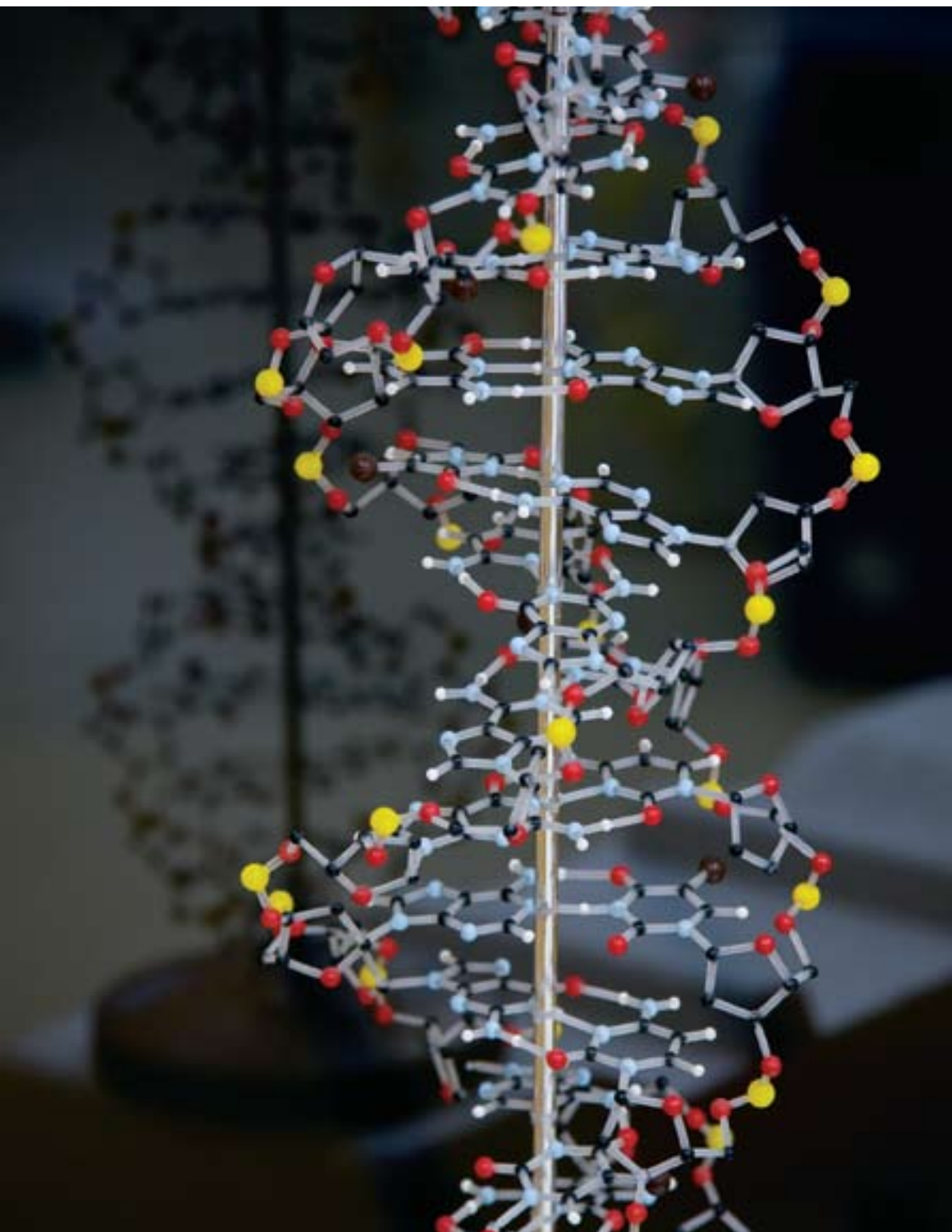
As for Sevilla, his lab will continue to experiment, evoke discussion and explain the damage done to DNA in the hope of providing greater precision and effectiveness for cancer radiation treatment.

By Alice Rhein

"We are looking at the direct effects of radiation on DNA. Before our work, not a lot was known about... the molecular products that led to biological damage."

– Michael Sevilla,
distinguished professor
of Chemistry





Michael Sevilla
distinguished professor
of Chemistry

Sevilla earned his Ph.D. at the University of Washington. He has authored more than 170 publications on the topic of radiation damage to DNA, free radical chemistry, photochemistry and electron spin resonance spectroscopy of biological systems. He served as president of the Radiation Research Society in 2006.





Ron Gellish
assistant researcher,
School of Health
Sciences

Gellish received his MBA and MS degrees in Exercise Science from Oakland University and is an ACSM-certified Clinical Exercise Specialist. He combines his academic and clinical internship experience with a background in quantitative analysis and systems development to conduct health care research.



Keeping the doctor away

Metabolic Syndrome and mental health

Meadow Brook Health Enhancement Institute. To an outsider, it might conjure up an image from a sinister Robin Cook novel. But to the Oakland University community, the institute (MBHEI for short) represented a pioneering cardiovascular rehabilitation concept when it was founded on the OU campus in 1979.

The facility closed in 2003, but during the nearly 25 years it was open, approximately 5,000 people enjoyed superior post-operative as well as preventive care designed to help them become more heart healthy. Monitored by an on-site physician and a team of nurses, members received instruction, guidance and motivation from exercise physiologists — the gold standard in personal training.

Just as importantly, institute members were required to have an annual on-site health assessment that included a physical exam with blood tests, treadmill stress test, nutrition counseling and meal record-keeping, and interviews with health care professionals who covered everything from medications to emotional well-being. While the typical member had two or three such annual exams, some had eight or more. One participant had a history of 23 yearly checkups. All together, nearly 12,000 medical physical exams were administered to the institute's members over a quarter century of operation.

Knowing that these medical records of members contained valuable information about the impact of treatment options on their physical and mental health, OU's Prevention Research Center in the School of Health Sciences (SHS) committed its resources to saving the information in a searchable format when the facility closed. The center's research staff and students converted the medical records from a paper format to digital so the university could study the resulting database for trends or patterns.

The goal? To apply what it learned about patient care at the institute to the present community at large.

Ron Gellish, assistant researcher for the SHS, led the effort to create a database that would help researchers identify positive health care strategies.

"This database is unique in that it gives us more than the snapshot in time that is more typical of patient records in this type of research," Gellish says. "We have, instead, information that lets us study how members responded to exercise, dietary counseling, and medication over a long period of time."

The first topic being studied from these computerized records is Metabolic Syndrome (MetS), a condition that afflicts nearly half the population in their 60s. MetS is a term used to describe people with at least three of five common risk factors: abdominal obesity, elevated blood pressure, high glucose levels, low HDL levels, and high triglyceride levels. These medical conditions increase an individual's risk of developing cardiovascular disease and diabetes.

The information OU researchers have uncovered so far has been published in several peer-reviewed journals. For example, *Metabolic Syndrome and Related Disorders* published Reversal of Metabolic Syndrome Characteristics by Gellish and Kenneth Hightower, SHS dean; Ronald Olson, professor of Health Sciences; Gary Russi, OU president; Brian Goslin, associate professor of Exercise Science; and Virinder Moudgil, senior vice president for Academic Affairs and Provost. Gellish is currently focusing on whether psychological problems such as depression, schizophrenia and bipolar disorder are related to MetS. An initial review of journal articles and other literature revealed that there is a definite relationship between taking certain antipsychotic drugs and a patient's development of MetS.

"Our Meadow Brook database research shows that a healthy diet and regular exercise can often prevent or reverse MetS, so health care providers using antipsychotic medications to treat patients need to both understand and stress the importance of proper diet and exercise to their patients' long-term health," says Gellish.

He is currently exploring subgroups within the institute's records to identify patterns between antipsychotic medication use and MetS. "I'll be looking at men versus women, those under and over 50, and certain criteria for aerobic capacity to identify further connections between those being treated for various psychological issues and the development of MetS," he says.

"We know from larger studies that reversing metabolic syndrome can prevent stroke, heart attacks and diabetes," adds Kenneth Hightower, dean of the School of Health Sciences and director of the Prevention Research Center.

"Now we are asking about the link between the syndrome and mental health — using a historical database. We are enthusiastic about the potential to translate our findings to information that will help the broader community."

By Sandra Beckwith

"... health care providers using antipsychotic medications to treat patients need to both understand and stress the importance of proper diet and exercise to their patients' long-term health."

– Ron Gellish, assistant researcher, School of Health Sciences



Waving hello to the future

Harnessing high frequencies

The wave of the future is emerging in a small laboratory in Oakland University's Science and Engineering Building. OU Physics Professor Gopalan Srinivasan is using several grants from the U.S. Office of Naval Research, Army Research Office and the Defense Advanced Research Projects Agency to experiment with microwaves and even higher frequency millimeter waves to make smaller and more powerful devices that have both military and civilian applications.

For example, cars of the future could be outfitted to automatically take measures to avoid collisions. Miniaturized high-wave antennas could make battle field communication radios small and missile tracking systems compact.

"The whole spectrum of these waves has the same speed: The speed of light," Srinivasan explains. "It's constant."

Broadly speaking, it's the high-frequency waves Srinivasan is after.

"As you go smaller and smaller in wavelength (and higher and higher in frequency), the devices get smaller and the resolution becomes higher. That's the whole point."

Srinivasan's devices operate at frequencies of up to 110 gigahertz (GHz), much greater than typical devices. The technology has numerous potential applications including missile defense, commercial airline industry, satellite communications, auto collision avoidance systems and high-speed wireless data transfer.

Take air travel, for example. Millimeter wave whole-body scanners could quickly check passengers for hidden objects. Look-down radars at the airport will help to keep track of planes and vehicles on the ground and avoid catastrophic runway collisions. "But traditional radar cannot deal with what is happening on the ground. Millimeter wave radars can."

The advantages of high-frequency devices are clear.

"When the frequency increases, the devices get smaller and smaller," Srinivasan adds. "So they are portable, small and lightweight. And also they have very good resolution because of the small wave length."

Srinivasan is also working on miniaturizing existing devices. Equipment in the 1-18 gigahertz is currently the standard. But it presents a common problem.

"For example, phased array radars in use now in this frequency are not small; they're big," Srinivasan says.

"They use generators to create a tunable magnetic field. If you want to have a tunable magnetic field, it requires high electric power and the size increases. It will also slow down the radar response time. What we are trying to do is to make new light-weight, rapid-response components for radars using composites."

Working with four OU post-doctoral researchers, a graduate student and three local high school students, Srinivasan combines ferrites and ferroelectric materials into rectangular chips of about the thickness and surface space of a dime, varying the volumes of materials on each chip and testing them on various frequencies.

"Our approach will solve two problems: Miniaturization and fast response," he says. "We know what kind of materials to choose. Our innovation is using the composite to do the work. Composites of magnetic and dielectric materials can be tuned with a voltage. So all you need is a battery to tune it. That is the innovation — size reduction using voltage tuning of magnetic devices."

Alexey Ustinov is a postdoctoral scientist working with Srinivasan. Ustinov is an associate professor in microwave electronics at St. Petersburg Electrotechnical University in Russia.

"I came here because the work is interesting," Ustinov says. "I wanted to work with these materials and develop new devices. This experience has broadened my knowledge in this area."

Srinivasan has been teaching at Oakland University since 1988 and experimenting on microwave and millimeter wave devices for the last eight years. He said that "many times" he has hit dead ends and seen a month's work or more go down the drain. He keeps a positive attitude.

"Nothing's easy," he points out. "I have good people working for me. We have made substantial progress. We are pioneers in this kind of work and we have generated a lot of interest. Sure, some frustration goes with the research. I get down for maybe a day, but no more."

For Srinivasan, it's hard to stay downcast when you are looking up at the waves of the future.

By Tom Schram

"As you go smaller and smaller in wavelength (and higher and higher in frequency), the devices get smaller and the resolution becomes higher. That's the whole point."

— Gopalan Srinivasan,
professor of Physics



Gopalan Srinivasan
professor of Physics

Srinivasan received his Ph.D. in Condensed Matter Physics at the Indian Institute of Technology in Bombay, India. He has received numerous grants for his research from prestigious institutions including the National Science Foundation, Delphi Corporation, Chrysler, the Office of Naval Research, Army Research and the Defense Advanced Research Projects Agency. He has authored or co-authored more than 170 professional papers on magnetoelectric composites and high-frequency wave devices. He has obtained three patents on composite based sensors and devices.



Melodie Kondratek
assistant professor of
Physical Therapy

Kondratek is a NDT certified-Adult Hemiplegia, a Certified Therapeutic Touch practitioner and a credentialed clinical instructor through the American Physical Therapy Association. She has published numerous research articles and received the 2008 Toby Long Award for the best-written research paper published in *Pediatric Physical Therapy*.





On their feet

Procedure makes movement easier for kids with CP

It wasn't long after Melodie Kondratek began her research into the effects of Selective Percutaneous Myofascial Lengthening (SPML) or Percs surgery on children with cerebral palsy (CP) that she realized the surgery is a very good thing — the bright smile on 16-year-old Alyssa Francisco's face tells her already that the benefits are significant.

"I saw Alyssa two weeks after having the surgery and she was absolutely glowing," Kondratek, Oakland University assistant professor of Physical Therapy says. "She's walking with normal step lengths and her feet are flat on the floor. She is much more independent."

Kondratek's study, *Outcomes of Selective Percutaneous Myofascial Lengthening in Children with Cerebral Palsy*, will document the surgery's impact on the cardiopulmonary and gross motor function of children with cerebral palsy.

"Percs is a very promising procedure that warrants further investigation," says Ira Zaltz, M.D., a Beaumont Hospital physician and a member of Oakland Orthopaedic Surgeons who specializes in the surgery. Zaltz and Susan Youngs, M.D., an Oakwood Hospitals pediatric physiatrist, are collaborating with Kondratek on the research. Dr. Zaltz performed the Percs procedure on Alyssa.

"Children with CP commonly experience abnormal muscle tone, shortened muscles, and difficulty with gross motor skills which increases the energy expended to perform daily tasks," Kondratek says. "Open muscle and tendon lengthening procedures are commonly used to increase muscle length. Percs, a less common minimally invasive procedure, is used to selectively release fascial and muscle restrictions in shortened and/or spastic muscles in children with CP."

Kondratek explains the advantages of Percs: tiny incisions (no stitches needed); minimal blood loss, immobilization time, and pain experienced; no hospital stay; and rapid return to functional activities. The functional outcomes of Percs have not been described in current literature.

"Children with cerebral palsy do not have free movement. They have difficulty walking and making movements we take for granted because of increased muscle tone and shortened muscles," Kondratek says. "This procedure can give the children more mobility and, therefore, more freedom in their lives. In this research I want to document the difference the surgery can make and raise awareness of

its success so that it might become a more mainstream procedure."

Susan Youngs, M.D., who is assisting with the research, says raising awareness is key.

"This is very under-published information in the medical community," she says. "However, what we see are a lot of kids like Alyssa who benefit significantly from this procedure. Raising awareness of that will increase the possibility that more physicians will see Percs as an option to help their patients."

Research to help cerebral palsy patients is not a new venture for Kondratek. Her research poster, *The Effect of Joint Mobilization on Knee Flexion Contractures in an Adolescent with Cerebral Palsy: A Case Report*, received the Michigan Physical Therapy Association 2006 Award for Outstanding Clinical Poster.

Through her current research, which is funded by Oakland University, Kondratek will evaluate the patients pre-surgery, and at three, six and 12 months after surgery to assess changes in their overall functional ability, gross motor function and range of motion. She will also measure the patients' cardiopulmonary capacity, including heart rate, respiratory rate, blood pressure and oxygen saturation.

"Children with cerebral palsy struggle to move and this stresses the cardiopulmonary system. We've already noticed that this surgery has a positive cardiopulmonary result, as the children don't have to exert as much effort to move," she says.

Kondratek will follow a total of 30 patients for 12 months after surgery to measure the changes in what children can do before and after their procedure. When completed, the research will quantify the outcomes of this minimally invasive procedure, illustrating the quality of life factors that make this surgery important to cerebral palsy patients.

For Alyssa's mother, Susie Delage, the results are already in.

"Three hours after surgery I saw the changes and it just got better after that," Delage says. "Her endurance is much better, she can move much easier. And she's so excited. It's been a fantastic experience for her."

By Susan Thwing-McHale

"Three hours after surgery I saw the changes and it just got better after that. Her endurance is much better, she can move much easier. And she's so excited."

— Susie Delage, Alyssa Francisco's mom



World markets

SBA programs reach way beyond the classroom

A two-year program implemented by the School of Business Administration (SBA) has allowed the university to strengthen the international content of its business curricula while giving students, faculty and local business leaders invaluable international market experience.

The Global Challenges Project established a Center for International Business Initiatives within the SBA, enhanced the global capabilities of local small businesses, added a Global Policies and Strategies course and a special topics seminar on emerging markets to the curriculum, hosted study abroad trips to three countries (India, China and South Korea), placed four students in overseas internships, sponsored faculty teaching and research exchanges, and hosted or supported several global business conferences.

The project was implemented in partnership with Automation Alley, a non-profit collaborative of technology businesses in eight counties surrounding the university, and the Pontiac Export Assistance Center of the United States Commercial Services of the United States Chamber of Commerce. Financial support was provided by the Title VI B Business and International Education Program of the U.S. Department of Education, the Chrysler Education Foundation, OU's Office of Academic Affairs, and the SBA.

Ravi Parameswaran, chair of the Management and Marketing department and project director, notes that the project met all of its objectives in spite of significant start-up hiccups. In addition to losing the project's visionary when the professor accepted a position at another university shortly after the initiative was funded, the SBA also had to replace its industry partner on the grant application when economic issues prevented the original partner from participating.

With the three-year cycle completed in June 2008 and the school now seeking additional funding to continue key aspects of the program, Parameswaran stresses the importance of the school's ongoing interest in globalization. "This is the wave of the future, but the wave is already here in that most business schools provide some global interaction for students."

Over the three-year period, 12 graduate students, four OU employees and three business leaders traveled to India. Twenty graduate business students and six OU representatives also went to China and South Korea. Three MBA business students interned in India and an undergraduate student participated in an internship in Australia.

In addition, two SBA faculty members taught at T.A. Pai Management Institute in Manipal, India, and one at Symbiosis Institute of International Business in Pune, India, in each of the grant years. The schools reciprocated by sending faculty members to visit and teach at OU.

"The student interns considered it a life-changing experience because they discovered they were capable of working in a foreign environment," Parameswaran says. "We teach this to them in classes, but when they experience it firsthand, it's a whole different ball game."

David Carmany, SBA '06, can attest to that. He spent five weeks interning at Imperial Tobacco Company, a large multinational corporation in Bangalore, India, in late 2006.

"It was really eye-opening to see the variations in how they do things compared to American companies," he says. "I think one of the big differences was the creativeness with which they approach problems. It's a relatively new economy so they don't have set ways of doing things the way we do in industries that have been around a long time like manufacturing."

Carmany, who currently works as an operations manager at a chemical company in Detroit, Mich., adds that India was a good choice for him. "I wanted experience with a new growing economy so India was an excellent opportunity. If you're not dealing with India today, chances are you will be at some point."

Students also had an opportunity to help local businesses research and evaluate export opportunities, while business leaders learned more about global potential at the Center for International Business Initiative's conference, *Michigan in the 21st Century Globalized Economy: A Requiem or Renaissance?*

The SBA recognizes the importance of providing students with a global perspective and global experiences. To this end, Parameswaran is working with SBA leaders to create virtual exchange experiences while seeking funding for additional face-to-face experiences.

"We had an extremely positive experience with this program and hope to continue to leverage or expand its benefits in the months and years to come," he says.

By Sandra Beckwith

"I wanted experience with a new growing economy so India was an excellent opportunity. If you're not dealing with India today, chances are you will be at some point."

— David Carmany
SBA '06



Ravi Parameswaran
professor of Marketing,
chair of the Marketing
and Management
Department

Parameswaran earned his Ph.D. in Marketing from Georgia State University. His research interests include marketing measurement issues and global business strategies. He has published numerous articles in leading journals including the *Journal of Marketing Research*, *Journal of International Business Studies*, *Journal of the Academy of Marketing Science* and *Global Finance Journal*, *Journal of Advertising* and the *Journal of Business and Industrial Marketing*.

Barbara E. Harrison
assistant professor
of Nursing *(below, left)*

Harrison received her Ph.D. in Biobehavioral Nursing at the University of Michigan. She has received numerous grants for her research from the American Academy of Nurse Practitioners, Beaumont Hospitals, and the Michigan Nurses Association. She has presented at international and national nursing conferences as well as authored numerous papers on dementia and adult nursing care.



Ann Whall
visiting distinguished
professor of Nursing
(above, right)

Whall received her Ph.D. from Wayne State University and currently serves as OU's Maggie Allesee Endowed Chair in Gerontology. She has led more than 25 funded studies, representing more than \$3 million in funding. Whall received the Doris Schwartz Award for *Visionary and Exemplary Contributions to Geriatric Nursing* from the Gerontological Society of America as well as two international awards as a Fulbright Distinguished Visiting Scholar to Great Britain/Northern Ireland.



Why do they fall?

Research seeks to reduce risk of falls in elderly

More than one-third of adults, ages 65 years and older, fall each year causing significant injury and even death. And according to statistics, more than 75 percent of the falls that occur in hospitals could be predicted.

Fortunately, a study being conducted on the effects of impulsivity on falls in older hospitalized patients is examining a better way to predict and, thereby, reduce the incidence of falls in the older population. The research, *Impulsivity and Its Relationship to Injuries in Hospitalized Older Adults*, is being conducted by Ann Whall, visiting professor of Nursing at Oakland University; Barbara Harrison, assistant professor of Nursing at OU; Cathy Campbell, director of Nursing Scholarship, Quality, and Research Services at Beaumont Hospital; and Michael Maddens, M.D., chief of Medicine and former chief of Gerontology at Beaumont. The team is being assisted by OU nursing students, including DNP student Marisa Ferrari. The research is funded by Beaumont Hospital Foundation, the Allesee Endowment and support from Justine Speer, former Nursing dean at OU.

“Determining the causes and predictability of falls in older hospitalized patients is very important,” says Campbell. “As our population ages, patients are much more frail. When they fall, it can lead to greater injuries and complications including infections. We are looking for a way to reduce these types of injuries.”

In the U.S. today, about one in every eight Americans is 65 years or older, according to the Department of Health’s Administration on Aging. By 2030, there will be about 71.5 million older persons, more than twice their number in 2000. At Beaumont, says Maddens, they are seeing an increasing prevalence of patients who are 80, 90 and even 100 years old.

Whall says part one of the study identified cognitive measures that nurses already use as predictors of patients who are at high risk for impulsivity related falls (IRF). By reviewing all falls of patients at Beaumont-Royal Oak who were 65 years and older in 2007, the retrospective portion of the study evaluated the relationship between cognitive features of IRF in older hospitalized adults. Twenty-eight percent of the falls that occurred were due in part to patients having some type of cognitive impairment.

“Older adults are more frequently hospitalized than younger people. They also receive medications, which can further

impair their cognitive ability,” she says. “Impulsivity is a common risk factor in older people who fall. For example, if someone wakes up, is confused about where he or she is, and immediately jumps up to go somewhere, they are more likely to fall. This especially is the case if they are in an unfamiliar hospital setting.”

The second phase of the research seeks to develop an Impulsivity Questionnaire that caregivers can use to identify patients at highest risk for falls. Whall notes that by targeting patients who are most at risk, hospitals can save the expense of assigning “sitters” to stay with patients who are not at risk.

“Currently hospitals often pay sitters or use bed alarms to prevent falls in many, if not most, older patients. But just because someone is older, doesn’t mean they need this service,” she says.

Maddens gives the example of a nursing home patient who is hospitalized for eye surgery.

“Because he had an eye patch, caregivers thought he would have a risk of falling, but in this instance, he was perfectly fine,” he says. “It’s very important to be able to distinguish who will be at risk from those who do not need extra help to maximize patient comfort and freedom.”

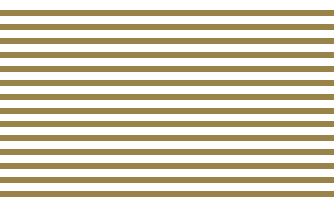
To develop the risk assessment instrument, researchers will review histories, observe patients and interview at-risk patients and their families. They will then create and refine questions that will produce the needed data.

Although there are fall assessment questionnaires being used in hospitals, Harrison says, “the questionnaire resulting from this study will be unique because of its focus on detecting impulsivity, a common issue in falls among hospitalized older patients.”

The study will be completed in March, and the research team plans to present results to the Gerontology Society of America at its conference next November.

By Susan Thwing-McHale

According to statistics, more than 75 percent of the falls that occur in hospitals could be predicted.



Research facilities by school

College of Arts and Sciences

Using state-of-the-art equipment such as a DNA synthesizer, PCR and Real Time PCR machines, electron- and confocal-microscopes, flow-cytometer, ultracentrifuges, and advanced molecular imaging equipment, Oakland's **Biological Sciences** department completes research in all critical areas of life sciences.

The **Department of Physics** operates field-specific laboratories for students, including the Bennett Nuclear Magnetic Resonance Facility. The labs focus on areas such as high-pressure optics, condensed matter physics, biomagnetic research and microscopy. The department has developed a 100-node super-computer cluster for computational research.

The **Department of Chemistry** houses advanced laboratory facilities containing state-of-the art instrumentation. Students engage in research on cancer, Alzheimer's disease, drug synthesis/discovery, and radiation, analytical, and environmental chemistry.

The **Department of Political Science's** Public Affairs Research Laboratory (PARL) provides services to local governments and municipalities as well as research opportunities for our students.

The **Department of Sociology and Anthropology** conducts archaeological research in Michigan in cooperation with the Cranbrook Institute of Science and other institutions.

The School of Business Administration

The **School of Business Administration's** Computer Center provides the tools for successful student presentations. Students have access to the OU Branch of the MSU Federal Credit Union Instructional Technology Lab, and the Michael and Diane Grieves Open Student Computer Lab. The school has established the Center for Integrated Business Research and Education to actively engage business and institutional partners to address critical business challenges along several business themes, including decision analytics, health care management, global business studies and public and social policy as well as offering educational innovations and opportunities for undergraduate and graduate students.

School of Education and Human Services

School of Education and Human Services students have access to the Educational Resources Library, which

includes networked computers, laminators, bookbinders, teacher and educational training materials.

School of Engineering and Computer Science

State-of-the-art learning systems in the **School of Engineering and Computer Science** include hardware, software and technology based labs. These include the Stephan and Rita Sharf Computer Integrated Manufacturing Lab, the Ross Family-supported Active Suspension System Lab, the Ford Motor company-supported Virtual Vehicle Systems Simulation Lab and the General Dynamics-supported Virtual Vehicle Simulation Lab.

School of Health Sciences

Internships, practica, and Senior Culminating Experiences provide **School of Health Sciences** students exposure to the latest techniques, facilities and equipment at area clinical and wellness/fitness sites. On campus, important hands-on research and study is conducted in the Occupational Safety and Health labs, Wellness, Health Promotion and Injury Prevention lab, Exercise Physiology lab, and Physical Therapy labs. Research data collection also takes place at facilities located in the community, enhancing the integration of professional practice with the acquisition of new knowledge. SHS offers several undergraduate research scholarships for semester or year-long research activities as they team up with their favorite faculty, some of whom participate in our Prevention Research Center.

School of Nursing

The **School of Nursing** is home to its own networked computer lab and practice lab that resembles a hospital unit. Students also gain experience on the SIM family, a high-tech simulator that provides realistic patient care scenarios, and in the Crittenton Multi-Media Lab.

Kresge Library

In addition to its online catalog, **Kresge Library** provides access to over 100 research databases across the scholarly disciplines, and to thousands of journals in electronic format. To assist users with their research skills, librarians provide research consultations for individuals and information literacy instruction for classes. Rapid interlibrary loan service is available for materials not held at OU. For the full range of library collections and services visit <http://library.oakland.edu>.

Research centers and institutes

Center for Biomedical Research

The mission of the Center for Biomedical Research at Oakland University is to vigorously promote and support biomedical research and education at Oakland University and allied institutions, to recruit and retain outstanding biomedical scientists, to facilitate collaborative biomedical research projects and finally to develop gift, grant, and contract support for biomedical research programs, graduate and undergraduate training, as well as core facilities and equipment.

Eye Research Institute (ERI)

The ERI has a history of 35 years in vision research and has received more than \$40 million from external funding sources, mainly the National Eye Institute (NEI). NEI funding to the ERI in 2002 was 10 percent of the total NEI funding to the State of Michigan. Each year the institute, in conjunction with the Center for Biomedical Sciences, awards competitive \$3,000 Summer Vision Research Fellowships to OU undergraduates. In addition to conducting vision research, the ERI is also formally associated with the Department of Ophthalmology at William Beaumont Hospital.

Fastening and Joining Research Institute (FAJRI)

The Fastening and Joining Research Institute is the only known facility of its kind in the world: an academic, nonprofit research facility dedicated solely to the fastening and joining of materials. This one-of-a-kind facility pursues fundamental and applied research to develop and disseminate new technologies in fastening and joining engineering. Through its research, FAJRI helps improve the safety and reliability of equipment, machinery and mechanical structures. The research conducted also significantly improves the mobility and combat readiness of military vehicles.

The English as a Second Language Center (ESL)

The ESL Center is an academic unit within the Linguistics Department charged primarily with

monitoring and implementing the English Proficiency Requirement on campus. The center offers a full range of ESL courses at all skill levels and supervises the ESL Endorsement Program, the ESL Institute Programs, the Individual ESL Instruction Program, and the Hispanic Outreach Program (HOP). For the past seven years, HOP has been supported each year by a \$25,000 grant from the General Motors Foundation.

Center for Applied Research in Musical Understanding (CARMU)

The mission of the Center for Applied Research in Musical Understanding is to build and advance a research-based pedagogy of teaching for musical understanding, as well as support pre-K to 12 music educators in Michigan, the United States, and internationally. The center seeks national and international eminence in applied research in musical understanding and support faculty, graduate, and undergraduate research in musical understanding.

Galileo Institute for Teacher Leadership

The Galileo Institute for Teacher Leadership is dedicated to improving the learning of all students, elevating the education profession, enhancing the leadership skills of teachers, and fulfilling the vital role of public education in achieving a civil, prosperous and democratic society. The commitment to the concept of developing teacher leaders, to defining what teacher leadership is and why it is so important is at the heart of the institute. It was launched and is supported by funds from the W.K. Kellogg Foundation and its partner, Fieldstone Alliance.

Ken Morris Center for the Study of Labor and Work

The Ken Morris Center for the Study of Labor and Work is a division of the Department of Human Resources Development in the School of Education and Human Services. Founded in 1972 as a Labor Education Program, the center was renamed in 1983 for Ken Morris. Its primary goal is to help develop potential leaders who

possess the analytic, interpersonal and organizational skills to respond to human needs in an era of rapid social change. The program seeks to join education, skill development and service in the pursuit of this goal. Decision making abilities are enhanced through field experiences and hands-on internship assignments.

OU Center for Autism Research, Education and Support (OUCARES)

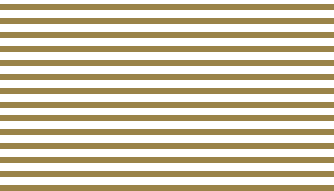
The OUCARES program integrates academic coursework, knowledge and research with hands-on work in the community to prepare professionals to be leaders in the autism community. Through these academic and service programs, Oakland University also provides supportive individual and family programs. OUCARES, housed in the School of Education and Human Services, encourages the exchange of ideas relating to the education and support of individuals with autism spectrum disorder as well as providing services and support needed to improve daily living.

OU SmartZone Business Incubator (OU INC)

Oakland University's SmartZone Business Incubator provides entrepreneurial resources and strategic business solutions to develop intellectual property. The incubator supports existing and grows new technology-based and life science businesses with university resources, decision support technology, business counseling services and financial/capital acquisition assistance.

Prevention Research Center

The Prevention Research Center is designed to promote community health through education, promotion, and translational research. Translational research discovers which strategies work in the community: the community of youth, or the community of women, or the community of senior citizens — all at high risk. The center brings experts from OU and the community together to make a difference in people's lives.



Major research awards and grants, 2007–08

College of Arts and Sciences

Charles Lindemann, professor of Biological Sciences, received a \$172,946 grant from the National Science Foundation for “An Investigation of the Mechanism Producing Rhythmic Beating in Cilia and Flagella.” Flagella and cilia are self-contained biological machines that convert chemical energy into useful mechanical work in the form of motility. This project is directed at understanding, at a precise molecular and physical level, how cilia and flagella work. The major goal is to experimentally gather critical physical information about the flagellum and to incorporate it into a theoretical and computational model of flagellar mechanics.

Yang Xia, Professor of Physics, received two awards from the National Institutes of Health totaling nearly \$800,000. The first study, “Adaptability of Articular Cartilage to External Loading by Microscopic Imaging” is designed to detect the early changes in the molecular architecture of diseased articular cartilage. Xia’s second project is “Quantitative Molecular Imagings of Articular Cartilage,” which extends the imaging study further into the clinical application using a whole-body MRI scanner. This information elucidates, nondestructively, various biophysical, biochemical and biological mechanisms and properties of articular cartilage.

Andrei Slavin, professor of Physics, Physics Department Chair, received \$50,000 from the United States Army TACOM and \$86,700 from the University of Colorado at Colorado Springs. His project, “Role of Polarization Effects in the Design of Nano-Sized Oscillators” is an investigation of man-made nano-sized structures and attempts to use polarization of electromagnetic waves and electron spins in the generation and processing of high-frequency signals. His project “Gigahertz Electromagnetic Wave Science” is research devoted to the development of a theoretical model of a multi-function nonlinear microwave signal processor.

School of Business Administration

Huirong Fu, assistant professor of Computer Science and Engineering, has received a National Science Foundation grant for \$115,096 with colleagues **Xiaodong Deng**, associate professor of Management Information Systems, and **Patrick Corbett**, professor at Cooley Law School. The funded project, “Information Assurance and Security Education with a Multidisciplinary Collaborative Approach in a Realistic Environment” seeks to integrate technological, business and legal topics in Information, Assurance and Security (IAS) into courses across the

schools of engineering, business and law. The project will be made available to a broad collection of constituencies including educators, government information assurance officers, industry information professionals, undergraduate students and pre-college students and their parents.

School of Education and Human Services

Julie Ricks-Doneen, assistant professor of Education, received one of two faculty grants from the Early On Center for Higher Education for her research project “Collaborating for Early Intervention in Early Childhood Settings.” The research involves case studies of triads of parents, early childhood providers and early intervention specialists collaborating to meet children’s needs.

Gwendolyn McMillon, associate professor of Education, Reading and Language Arts, received a \$223,000 Michigan Department of Education Title II Part A(3) — Improving Teacher Quality Grant titled: “Whom Are We Serving? Building on Students’ Home and Community Literacy Experiences to Improve Literacy Teaching and Learning in Urban Schools.” McMillon is the principal investigator working with teachers and administrators from two urban elementary schools in Saginaw to improve classroom instruction in their five greatest areas of need: examining parts of a story; increasing comprehension through vocabulary development and text structure analysis; improving writing; cross-text analysis; and focusing on the reading-writing connection.

She is also co-principal investigator on a recently funded grant from the Max and Bessie Bakal Foundation titled: “Raising a Standard of Excellence: Teaching African American Mothers Who Attend Church How to Successfully Navigate the Educational Experiences of Their Struggling Readers.” Investigators have identified 10 low literate families whom they will follow for an entire school year to assist them with becoming literate about school.

School of Engineering and Computer Science

Fatma Mili, professor of Computer Science and Engineering, received \$89,384 and \$148,135 from the National Science Foundation for two projects. “Undergraduate Computer Research for Women at Oakland University” is a continuation of Mili’s “Undergraduate Computer Research at Oakland University” project which consists of recruiting eight students primarily from undergraduate institutions to receive intensive mentorships in a summer research program. The primary objective of Mili’s second project,

“Summer Institute in Bioengineering and Health Informatics” is to promote graduate studies and careers in Bioengineering and Bioinformatics to bright, talented undergraduate minority students.

Hoda Abdel-Aty-Zohdy, professor of Engineering, received a \$125,000 award from the University of Dayton Research Institute and a \$184,715 award from the United States Air Force Research Laboratory for the research “Graphite Mesh for Optical Computing.” The purpose of the project is to establish a new approach to computing using optical techniques and hybrid materials.

Jia Li, assistant professor of Engineering, received a \$90,000 and a \$95,000 award from the National Science Foundation as well as a \$286,959 grant from General Motors Corporation to fund the research project “NOSS: Ultra-Wideband Sensor Networks for Automotive Vehicles.” The automotive industry has been limited by the available sensor technology. The major objective of this research includes the design of a UWB intra-vehicle sensor network.

School of Nursing

Diane Norris, assistant professor of Nursing, associate dean, received both a \$350,000 grant and a \$213,800 award from Beaumont Hospitals to create a Clinical Placement System, which will be a web-based method for clinical placements and requirements for undergraduate students.

Thomas Schumann, executive director, Center of Nursing Education, received \$743,588 from the Warren Connor Development Coalition for work with the Healthcare Career Center. The Detroit Medical Center, Oakland University School of Nursing, The Partnership for Economic Independence, and Warren Conner Development Coalition jointly operate a Healthcare Career Center as part of the City of Detroit’s Workforce Development Department industry-specific, career-focused approach to job training. The Healthcare Career Center assists customers in preparing for gainful and rewarding careers as part of specific Nursing, Allied Health, and Medical Operations training tracks.

School of Health Sciences

Jackie Drouin, associate professor of Physical Therapy, received \$15,000 in support from an Oakland University William Beaumont Institute Multidisciplinary Award for investigation of “Energy Expenditure, Fatigue, and Hemoglobin Measures During Radiation Treatment for Breast Cancer.” The study utilizes oncology nurses from Beaumont Hospital in Troy.

Charles McGlothlin, program director, Occupational Safety and Health, received two Chrysler Foundation grants: one for \$29,000 to develop and equip an industrial ergonomics lab and one for \$10,000 to support scholarships for study in the Occupational Safety and Health career field.

Eye Research Institute

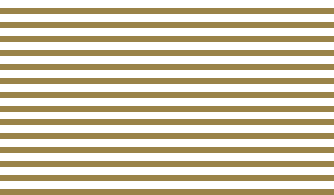
Andrew Goldberg, associate professor of Biomedical Sciences, received a total of \$703,104 from the National Institutes of Health and \$80,000 from the Matilda Zeigler Foundation for the Blind for his research. “Molecular Scaffolding for Photoreceptor Outer Segment Structure and Renewal” studies retinal photoreceptors which provide the cellular basis for sight. This research attempts to define the molecular scaffolding that underlies the dynamic architecture of vertebrate rod and cone photoreceptor outer segments. “Novel Assay and Screen for Protein-Protein Interactions Linking Photoreceptor Structure” is research to develop a method of a bimolecular fluorescence complementation to investigate the network of interactions that underlie photoreceptor architecture.

Frank Giblin, professor of Biomedical Science, Director ERI, received awards of \$367,471 from the National Institutes of Health, \$96,261 from Vistakon and \$50,000 from ThromboGenics for his work on “Proteins of Normal and Cataractous Lenses.” The research objective is to evaluate the role of oxidative stress in the development of human nuclear cataract, the most common type of lens opacity in older adults, and the type most likely to require surgery.

Kenneth Mitton, associate professor of Biomedical Sciences, received a \$275,015 award from the National Institutes of Health for his work “Intercellular Coordination of Gene Expression in the Developing Retina.” Throughout development, and in the mature retina, precise control of gene expression is essential for photoreceptor integrity and function, including control of time, place, and level of expression.

OU INCubator

David Spencer, executive director, OU Smart Zone Business Incubator, received \$98,100 from the Community Foundation for Southeast Michigan to support the Adams Entrepreneurship Fellowship. The award supports a full-time OU INC Entrepreneurship Fellow to operate the Collaboratory project, a “center without walls” in which participating businesses can conduct research without regard to physical location, interact with colleagues, access instrumentation, and share data and resources.



Student research award recipients, 2007–08

Student award recipients receive financial assistance to support their research as well as the opportunity to receive travel support to present their research at a professional conference. The program is sponsored by the Office of the Provost.

University Research Committee Student Research Awards

Video Portfolio Assessment in the Choral Ensemble

Student Researcher: Jonathan Busch

Faculty Member: Joseph Shively, associate professor of Music

Investigation of Physical Therapy Services Provided by Established Pro-bono Physical Therapy Clinics throughout the United States

Student Researcher: Michael Studnicka

Faculty Member: Beth Black, adjunct instructor of Physical Therapy

Women's Attitudes about Physical Therapy who have Undergone Breast Cancer Treatment

Student Researcher: Lori Zywiol

Faculty Member: Patricia Wren, assistant professor of Health Sciences

Provost Undergraduate Student Research Award

Kangaroo Care: The Importance of Father Infant Bonding

Student Researcher: Megan Renda

Faculty Member: Cheryl Riley-Doucet, assistant professor of Nursing

Slavic Costume Studies

Student Researcher: Christa Koerner

Faculty Member: Kerro Knox, associate professor of Theatre

*Comb and Brood Recognition in the Paper Wasp *Polistes dominulus**

Student Researcher: Amanda Bellestri

Faculty Member: George Gamboa, professor of Biological Sciences

Slavic Scenic Studies

Student Researcher: Joshua Rotarius

Faculty Member: Kerro Knox, associate professor of Theatre

Information Availability Relative to the Degree of Application Software Customization and Data Integration within Small Business

Student Researcher: Benjamin Smith

Faculty Member: Mark Simon, associate professor of Management

Provost Graduate Student Research Award

Flirting With Power: Women and Political Identity in the Early Republic

Student Researcher: Jennifer Laam

Faculty Member: Todd Estes, associate professor of History

Study of Misfolded Protein Aggregates in Alzheimer Disease

Student Researcher: Jyothi Digambaranath

Faculty Member: John Finke, assistant professor of Chemistry

Creativity, Appearance, and Sites of Authority

Student Researcher: Angela Kayi

Faculty Member: Tamara Machmut-Jhashi, associate professor of Art History

My Counseling, My Self: Factors Impacting Identity Development in Counseling Students

Student Researcher: Kirsti Reeve

Faculty Member: Lisa Hawley, associate professor of Education/Chair of Counseling

The Challenges and Rewards of Working in a Pro Bono Physical Therapy Clinic

Student Researcher: Andrea Staley

Faculty Member: Beth Black, adjunct instructor of Physical Therapy

The Effect of Stretching on ITB Injury Prevention in Collegiate Female Long Distance Runners

Student Researcher: Teresa Bongiovanni

Faculty Member: Brian Goslin, associate professor of Exercise Science, program director of Exercise Science

"The Interaction Between Offspring Size and Competitive Ability in a Pond-Breeding Amphibian"

Student Researcher: Robert King

Faculty Member: Keith Berven, associate professor of Biological Sciences

Perceived Comfort Level and Factors Affecting Physical Therapists Addressing Patient Sexuality in the Clinic

Student Researcher: Jennifer Conner

Faculty Member: Sue Saliga, adjunct professor of Physical Therapy

*The Effect of an 8-Week Rotational Strength Program
on the Driving Distance of Collegiate Golfers*

Student Researcher: Todd Wohfeil

Faculty Member: Brian Goslin, associate
professor of Exercise Science, program director
of Exercise Science

*Reasons for Student Debt Following Physical Therapy
Education at Oakland University*

Student Researcher: Leandrea Handford

Faculty Member: Kristine Thompson, special
instructor, Physical Therapy

*Nurses' Knowledge and Attitudes Toward
Breastfeeding Support*

Student Researcher: Elaine Webber

Faculty Member: Carrie Lynn Motyka, assistant
professor of Nursing

*Heart Rate and Blood Pressure Assessment at
Physical Therapy Clinical Facilities*

Student Researcher: Nicole Lopes

Faculty Member: Kristine Thompson, special
instructor, Physical Therapy

Disaster Preparedness for Advanced Practice Nurses

Student Researcher: Susan Leegstra

Faculty Member: Frances Jackson, associate
professor of Nursing

*Social Capital and Non-Profit Participation among
Latinos in Pontiac, MI: A Case Study*

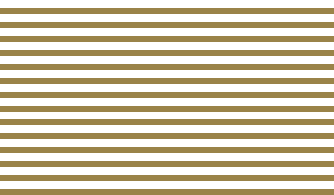
Student Researcher: Natania Swirski

Faculty Member: Michelle Piskulich, associate
professor of Political Science/associate dean,
College of Arts and Sciences

*Reactivity of Branched-Chain Xenobiotic Carboxylic
Acids with Hepatic Acyl-CoA Synthetases*

Student Researcher: Abhijit Ghosh

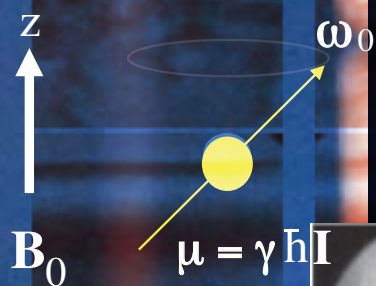
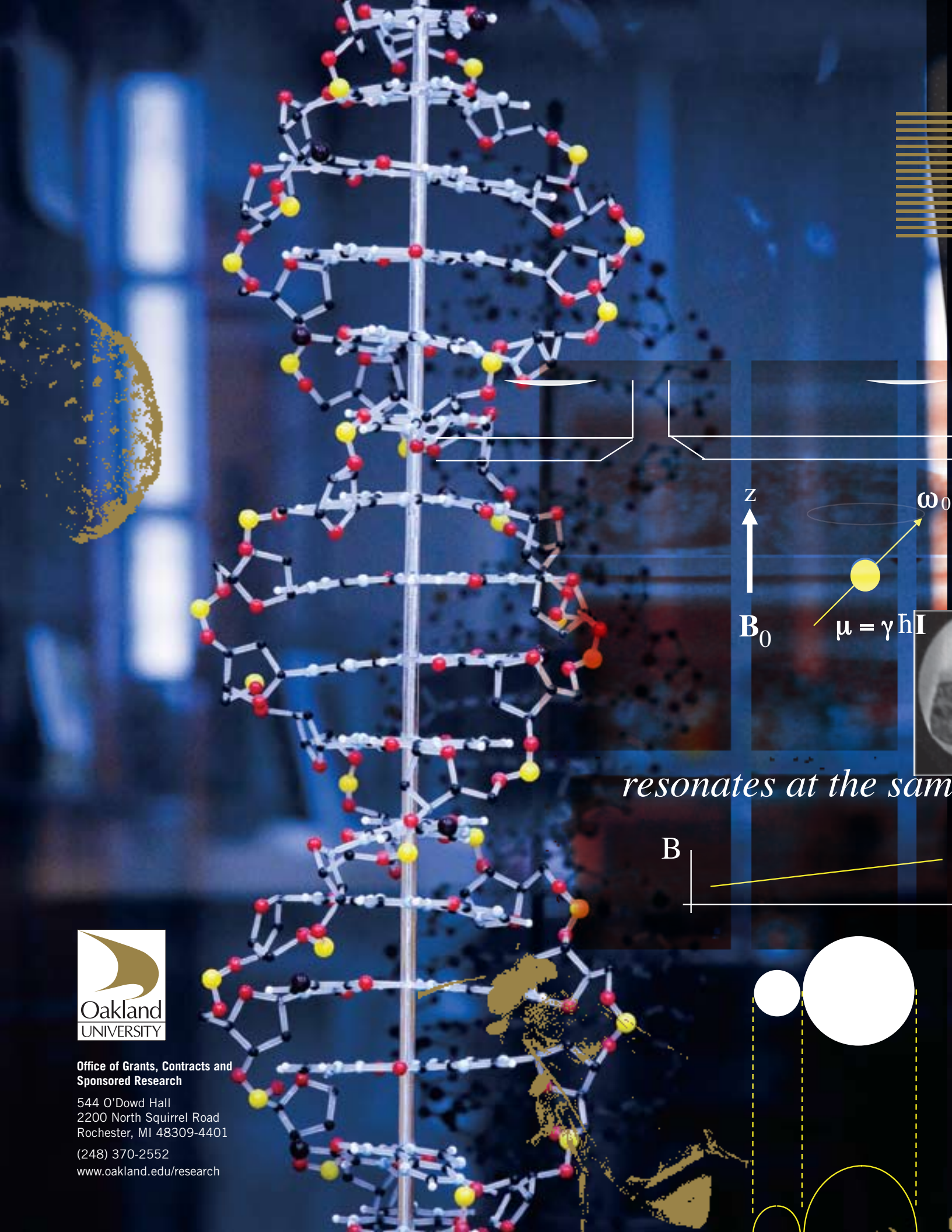
Faculty Member: Kathleen Moore, professor
of Chemistry/associate dean, College of Arts
and Sciences



Grants and contracts agency list – FY 2007

American Academy of Nurse Practitioners Foundation	Oakland Schools
American Chemical Society	Office of Naval Research
Battelle Memorial Institute – Pacific Northwest Division	Reading Recovery Council of North America
Beaumont Hospitals	Rehabilitation Institute of Michigan
Benteler Automotive Corporation	Research Corporation
Cadillac Products Automotive Company	Software House International
China First Heavy Industries	Southeast Michigan Resource Conservation and Development Council
Chrysler L.L.C.	State of Michigan
Continental Teves, Inc.	The Association of Retinopathy of Prematurity and Related Diseases
Crittenton Hospital Medical Center	ThromboGenics
EDS	Trier University of Applied Sciences
Environmental Protection Agency	United States Army
Federal Aviation Administration	United States Automotive Materials Partnership
FEV Engine Technology, Inc.	United States Department of Education
General Dynamics Land Systems	University of Colorado at Colorado Springs
General Motors Corporation	University of Dayton Research Institute
Great Lakes Commission	University of Illinois Chicago
Health Resources and Services Administration	University of Michigan
Indiana University	W. K. Kellogg Foundation
JADI, Inc.	Wayne County Department of Public Health
Kettering University	Wayne State University
Macomb Intermediate School District	Windsor Utilities Commission
Merck Institute for Science Education	
Michigan Council for Arts and Cultural Affairs	
Michigan Department of Education	
Michigan Economic Development Corporation	
Michigan Space Grant Consortium	
Michigan State University	
Michigan Universities Commercialization Initiative	
National Institutes of Health	
National Science Foundation	
National Writing Project	





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