DREXEL REACH | A MAGAZINE OF DREXEL RESEARCH

RESEARCH

SPRING 2008

Drexel
UNIVERSITY

FROM STEPHEN DIRECTOR, PROVOST

Drexel University is a place where researchers, scholars and creative professionals are reaching beyond their laboratories, classrooms and offices.

Drexel REACH showcases our culture of "use-inspired" research, scholarship and innovation. Drexel faculty members routinely transcend traditional academic boundaries.

Today, the world faces challenges — from global terrorism to global warming — that seem to defy solution. At this moment in history, we don't know where the next breakthrough will come from.

Donald Stokes wrote that the annals of science are "rich with cases of research that is guided both by understanding and by use, confounding the view of basic and applied science as inherently separate realms." Such "use-inspired" research is what you will read about in these pages.

Signature to Come

FROM KENNETH BLANK, VICE PROVOST FOR RESEARCH

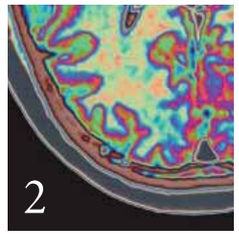
The Drexel University Office of Research is committed to facilitating the research and scholarly activities of the faculty across the institution. Our research mission — with our outstanding graduate and undergraduate research programs — greatly influences the content of our academic curriculum. This first issue of Drexel REACH clearly shows the exciting future of the research enterprise at Drexel University and the discoveries that our faculty and students will contribute to the nation and the world.

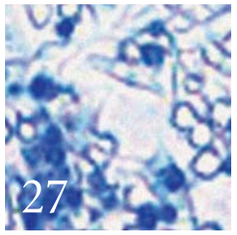
In the past ten years the research enterprise at Drexel has grown rapidly. The nature of university-based research and scholarship also has changed dramatically. Increasingly our work now tends to focus on highly complex, multidisciplinary topics that address significant issues that have societal impact. Drexel faculty have responded to these national trends by developing and participating in the growth of multi-investigator programs that produced "cutting edge" research and technology, resulting in technologies that are successfully introduced into the world through our Office of Technology Commercialization.

We do good work at Drexel University, and our work does good in the world. I hope you enjoy reading about it.

Signature to Come

Drexel UNIVERSITY





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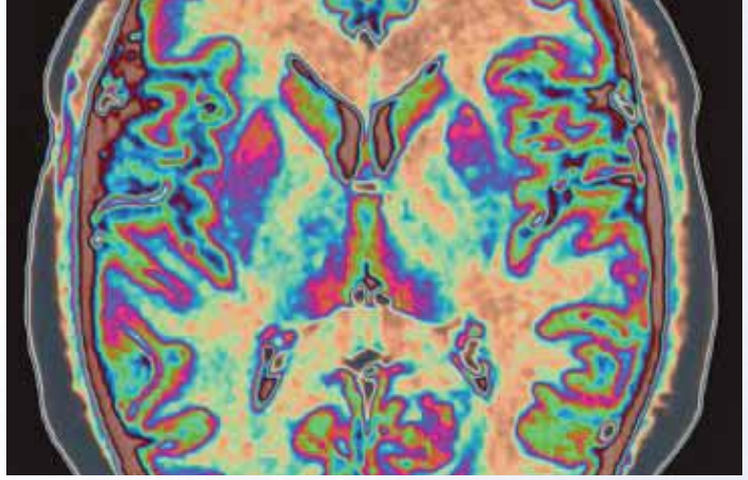


WHAT'S ON YOUR MIND?

SMALLER, FASTER, CHEAPER TECHNOLOGY FOR MEDICAL APPLICATIONS

KAMBIZ POURREZAEI | SCHOOL OF BIOMEDICAL ENGINEERING, SCIENCE & HEALTH SYSTEMS

What's going on in your head? People have been wondering about that since they first started wondering. Technology now exists in the laboratory that claims to tell us which candidate we're likely to vote for, what brand of toothpaste we prefer, and whom we will love forever. Trouble is, we don't vote, buy toothpaste, or fall in love in the laboratory. That's why Drexel research is lowering the cost and increasing the availability of "brain scans" and other biomechanical technology.

Images of our brains are powerful persuaders. But the science of brain imaging has a big drawback: the technology, such as magnetic resource imaging (MRI) or positron emission tomography (PET), is hard to use. "Mind reading" might as well be science fiction, if you can only perform it in a controlled laboratory with expensive and unwieldy tools. Kambiz Pourrezaei, a professor of biomedical engineering and electrical engineering, and his colleagues at Drexel and elsewhere, are providing an easy-to-use alternative that can be utilized anywhere.

Translating breakthroughs in science labs into technology that works in the world is what Pourrezaei does.

As the director of strategic initiatives at the School of Biomedical Engineering, Science & Health Systems, Pourrezaei and David Luzzi of the University of Pennsylvania have received a $10.5 million grant to establish a regional Nanotechnology Institute. Pourrezaei, in collaboration with Banu Onaral and Ata Akin, also received a $1.3 million research contract from the Advanced Research Projects Agency. Pourrezaei is leading the research activity that merges nanotechnology with biomedical applications. The three major research areas identified at Drexel University are biosensors, drug delivery, and tissue engineering. These multidisciplinary research efforts exemplify the University's commitment to "life-saving solutions."

Pourrezaei's leadership in the "nanobiosensor" program has led to development of novel sensing systems for medical emergency response and homeland security applications. In neuroengineering, he is working with a team of biomedical and device engineers, device developers, signal processing, and communications experts in partnership with neuroscientists, psychologists and psychiatrists, and neurologists to develop a new modality to monitor brain activation. The mission that unifies all his interdisciplinary and interdepartmental enterprises is to deliver new technology to the grasp of clinicians in the trenches of medicine.

Functional near-infrared sensing (fNIR), developed in the 1950's to detect breast cancer, enables real-time, noninvasive monitoring of cognitive activity by measuring the brain's hemodynamic and metabolic responses. An fNIR device looks like an electronic headband and contains light-emitting diodes (LEDs) that send near-infrared light through the forehead at the relatively shallow depth of two to three centimeters. The light detects oxygen consumption which reports on neural activity.

The disadvantage of fNIR is that it doesn't go very deep. But it's easy to peek into the forebrain, where a lot of high-level processing goes on in our heads. The most exciting use of fNIR technology in recent years has been as a means to measure cognitive activity.

fNIR instrumentation allows for safe, portable, and low-cost cortical monitoring that can be applied in the laboratory as well as field conditions. Human performance and cognitive activities such as attention, working memory, and problem-solving can be assessed with fNIR technology. When compared with EEG and fMRI studies, the results from fNIR are consistent.

Pourrezaei notes that "automated signal processing algorithms can solve problems that arise due to the time-scale disparity between EEG and fNIR signals."

It's the signal processing that matters. Much like an x-ray, which requires the trained eye of a radiologist for interpretation, an fNIR scan is only as good as the person "reading" it.

Other faculty members are exploring this frontier as well.

Scott C. Bunce, Ph.D., an assistant professor of psychiatry at the College of Medicine and member of the biomedical faculty, is exploring the brains of addicts. Bunce has considerable experience in affective neuroscience, theory of mind, and the effects of psychological trauma on information processing. He has been using fNIR to assess information and emotional processing that cannot be reported by an addict.

Jay Horrow, M.D., chairman of the Drexel University College of Medicine's Department of Anesthesiology, is looking at anesthesia. He hypothesizes that it could be possible to measure whether a patient is truly feeling no pain. According to Horrow, who recently oversaw the pilot study using fNIR, clinicians now have few ways to monitor depth of anesthesia because indicators of response such as movement, high blood pressure, and fast heart rate are frequently inhibited by muscle relaxants in anesthesia.

Jahangir Maleki, M.D., an assistant professor at the College of Medicine, is using fNIR to try to measure objectively the precise feelings of subjective pain in the brain. When the doctor asks, "On a scale from one to 10, how bad does it feel?" he wants to have an objective measure to combine with the subjective measure.

Maria T. Schultheis, Ph.D., a research associate professor of psychology in the College of Arts & Sciences, is looking at the rehabilitation of cognitively impaired populations, including traumatic brain injury (TBI), multiple sclerosis, and stroke. She applies the new fNIR technologies for assessment and rehabilitation in everyday tasks such as driving. Before the advent of the portable fNIR technology, it was almost impossible to monitor a driver's brain function while driving.

Patricia A. Shewokis, Ph.D., an associate professor in the College of Nursing and Health Professions at Drexel University with a joint appointment in the School of Biomedical Engineering, Science & Health Systems, is studying bodily movement with the help of fNIR. She is a member of the Neuroengineering Major Research Initiative (see p. 26) and the Brain Optical Sensor team in the school. A collaborative research team, they address mechanistic, technological, and clinical research questions regarding the interdependent roles of cognition and motor function during motor skill learning.

> The fNIR system provides clinicians a reliable and inexpensive "window to the brain."

The fNIR system is also being developed for use in testing awareness of coma patients and gauging fatigue levels of pilots and air traffic controllers.

But it's not all about brain research, according to Pourrezaei. Michael S. Weingarten, an associate professor of surgery at the Drexel University College of Medicine, is using fNIR to study the healing of chronic diabetic wounds.

There is much more work to be done surveying the breadth and depth of fNIR.

"This is a most promising and useful technology," Pourrezaei says, but it's only one of many under development at the School of Biomedical Engineering and partner laboratories in US and Europe.

Kambiz Pourrezaei has a Ph.D. from Rensselaer Polytechnic Institute, a Master of Science from Tufts University, and a Bachelor of Science from Tehran University. He concentrates on the areas of biomedical and pharmaceutical applications of nano- and micro-technology. He actively researches fNIR imaging of biological tissues for brain imaging. His research also involves the use of micro-technology for studying the attachment of protein and cells to surfaces of biomaterials.

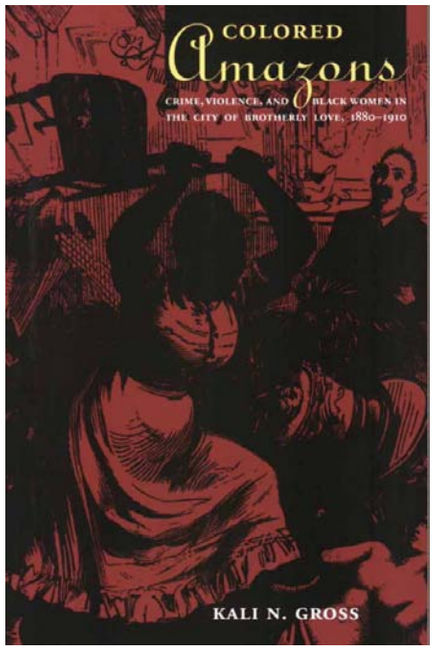
http://www.biomed.drexel.edu/fNIR/

BEHIND BARS

THE TRUE STORY OF BLACK WOMEN INCARCERATED IN THE CITY OF BROTHERLY LOVE

KALI N. GROSS | COLLEGE OF ARTS & SCIENCES

Of the women incarcerated in the United States, African-Americans make up about half and are the fastest growing population in today's jails and prisons.



Kali N. Gross, assistant professor of history and director of the Africana Studies Program in the College of Arts and Sciences, knows that the problem isn't new: its long and troubling history offers insight into the volatile mix of race and gender in American society. It is a history that Gross knows well. She has been studying the crimes and imprisonment of black women in Philadelphia following the Civil War and recently published *Colored Amazons: Crime, Violence, and Black Women in the City of Brotherly Love, 1880–1910* (Duke University Press, 2006).

To understand these events in their proper historical context, Gross reconstructs the crimes committed by, and attributed to, black women, as well as their portrayal in the popular press and in the pamphlets and speeches of urban and penal reformers. She considers what these crimes signified about the experiences, ambitions, and frustrations of these women. The perpetrators and the state, Gross argues, jointly constructed black female crime. According to Gross, for some women, crime functioned as a means to attain personal and social autonomy and for the state, black female crime justified a host of urban reform initiatives that reaffirmed white, middle-class authority.

She relates how news accounts exaggerated black female crime, trading in sensationalistic portraits of threatening "colored Amazons." She also considers criminologists' interpretations of the women's criminal acts, interpretations largely based on notions of hereditary criminality. Gross contends that the history of black female criminals is in many ways a history of the rift between the political rhetoric of democracy and the legal and social realities of those marginalized by its shortcomings.

To write the history of black women criminals at the end of the 19th century, Gross had to grapple with problematic and challenging primary sources. When black women appeared in the pages of Philadelphia's newspapers, they were commonly described in eroticized horror stories as "Black Amazons." The news coverage offered titillation for contemporary readers. In her research, these accounts provided Gross with a historical record that reveals much about the racism of the accusers — the courts and the press of the times — but little about the accused — the women. And yet: "If they didn't have criminal records these women wouldn't show up at all [in history]," Gross says.

The historian's work is to interpret such a vast assortment of contradictory data. Gross's research methods involved painstaking close study of an astonishing array of raw materials: statistics, scandal rags, prison records, official trial transcripts, news accounts, and occasional mug-shots.

Gross addresses women's experiences of abuse and their own acts of violence, both property and violent crime in the context of political, social and economic disenfranchisement. Gross says her narrative reveals the ways in which "criminal acts and courtroom and prison behavior were also expressive acts — they were texts to be read" for a deeper understanding of history. But she resists the tendency to romanticize these women as "primitive rebels."

"I use the criminal records and the crimes themselves as texts," she says.

For example, "badger theft," as Gross reads it "is a crime that speaks volumes about frustration and rage."

Many of these women were freed slaves or the children of slaves. Gross says that when she had completed her research, she "was actually shocked that there wasn't more crime."

While noted for its Quaker tolerance, "Philadelphia had its own brand of racism," Gross says. She demonstrates the obvious difference in tone in two accounts of the same crime in two Philadelphia newspapers, one of which thought the assailant was black, the other white. Was the weapon, as the *Philadelphia Inquirer* reported, "a large pocket-knife," "plunged into the back"? Or was it a "small knife that she happened to have in her hands," as the *Times-Philadelphia* reporter, who thought the assailant was white, wrote?

Gross spent hours poring over crumbling newspapers, fading photographs, and dry prison records, but Gross recalls that her scholarly exploration of black women in prison didn't begin in any dusty archive.

"This book began behind bars, when I team-taught a seminar to female inmates at the State Correctional Institution in Muncy, Pennsylvania in 1999," she says.

"This book began behind bars, when I team-taught a seminar to female inmates at the State Correctional Institution in Muncy, Pennsylvania in 1999," Kali Gross says.

"The badger game" was a trick that an enterprising black woman might employ against a white man: she would lure him into an out-of-the-way nook with a promise of prostitution and then rob him before the act. Most often, the shame of having solicited a black woman prevented the victim from pressing charges. If he did, he would be the butt of ridicule in court. Gross infers that many cases of this crime must therefore have gone unrecorded.

It was a dangerous game. The risk of death was always present, as it was in the lives of all black men and women in Philadelphia at that time.

The crimes she describes are often shockingly violent. Gross wanted to know, "How did these women learn to be so violent?" Black Philadelphia was a place where crime was often a way for the powerless to assert some control over their lives — Gross refers to a "tropic of violence." Black women not only reflected a violent environment, they often had to turn to violent crime to establish any agency in a racist and sexist society.

In the course of her research, Gross learned to appreciate the efforts of black women to take some place in a society that excluded them.

"One accused thief wrote a letter to the court — a rare case where we have the actual words of a black woman," says Gross — that she was "trying to enjoy the rights of my citizenship."

"I wanted to use my expertise as a historian to educate and empower these women." But Gross soon found that she was, "telling uplifting tales of noble suffering and perseverance — themes that dominate much of African-American history — to women who, by those accounts, would be thought failures."

Colored Amazons was a way to tell their story. Gross is unequivocal about why she does it.

"The subject of black female criminality merits much more scholarly attention—from historians and politicians, too."

Kali N. Gross, Ph.D., has an extensive background in the study of race and crime and in the experience of blacks in the U.S., the Caribbean, and in South America. She received a Bachelor of Arts in Africana Studies from Cornell University, and a Master of Arts and a Ph.D. in American Civilization and History from the University of Pennsylvania. Gross has been the recipient of numerous awards and fellowships, including a Ford Postdoctoral Fellowship hosted at Princeton University, a postdoctoral fellowship at the Schomburg Center for Research in Black Culture in New York City and the Letitia Woods Brown Memorial Prize, presented by the Association of Black Women Historians.

http://www.drexel.edu/coas/histpol/Gross.asp

MICHEL BARSOUM | COLLEGE OF ENGINEERING

THE SECRET OF THE PYRAMIDS – THE BUILDING BLOCKS OF OUR FUTURE

THE BUILDING MATERIAL OF TOMORROW: INEXPENSIVE, ENVIRONMENTALLY SUSTAINABLE AND WIDELY AVAILABLE. AND, 4,500 YEARS OLD.

The builders of the Great Pyramids of Giza didn't consider their carbon footprint. And Michael Barsoum, an Egyptian-born professor in Drexel's Department of Materials Science and Engineering, wasn't an Egyptologist.

But their paths are now linked forever as Barsoum has rediscovered an ancient technology that has the power to transform the modern world.

Unlocking the ancient secret of how the Great Pyramids of Giza were constructed was not Barsoum's life goal.

"This is not my day job," he insists.

It all began in 2001, when Barsoum took a cold call from a friend of a retired colleague who asked how much Barsoum knew about the Great Pyramids of Giza, the only remaining member of the Seven Wonders of the World. The caller described to Barsoum a familiar image: thousands of slaves hauling carved limestone blocks up ramps hundreds of meters long.

But in 1982, that centuries-old image was shattered when a French researcher suggested that the stones were actually made of an early form of concrete, created using a simple mixture of limestone, clay, lime, and water.

"It was at this point in the conversation that I burst out laughing," recalls Barsoum.

If the pyramids were indeed cast in concrete, not stacked blocks of stone, he says, it could be proved with just a few hours of modern electron microscopy of the structure of the materials.

So, Barsoum and his colleague did just that. They proved beyond a doubt that some of the blocks of the pyramids were indeed made, not from limestone, but from concrete.

"What started as a two-hour project turned into a five-year odyssey for me and one of my graduate students, Adrish Ganguly, and a colleague in France," said Barsoum.

John Noble Wilford wrote in *The New York Times* that, "this would be the earliest known application of concrete technology, some 2,500 years before the Romans started using it widely in harbors, amphitheaters, and other architecture."

Upon conducting a mineralogical examination of the stones, Barsoum's team found that parts of the Khufu pyramid contained mineral ratios unknown in naturally occurring limestone sources. From the geochemical mix of lime, diatomaceous earth and limestone aggregate, they concluded, "the simplest explanation" would be that it was cast concrete.

Construction with limestone concrete could help explain how the Egyptians were able to complete such massive monuments so long ago. They used concrete blocks, Barsoum said, on the outer and inner casings and probably on the upper levels, where it would have been difficult to hoist carved stone.

"The sophistication and endurance of this ancient concrete technology is simply astounding," Barsoum wrote in a report in the December 2006 issue of *The Journal of the American Ceramic Society.*

But the miracle of Barsoum's discovery didn't only come in realizing that these blocks were made from concrete — it came when he invented, or re-invented, a way to reproduce this ancient building material.

"How energy intensive or complicated can a 4,500-year old technology really be?" asks Barsoum. "It isn't very complex or costly."

Barsoum and his team have duplicated the same material the ancient Egyptians used — an inexpensive, environmentally sustainable, and widely available building material.

"This ancient variety of concrete can be made just about anywhere in the world from readily available materials, at a very low cost, and without producing the pollution of traditional methods," says Michael Barsoum.

What makes Barsoum most proud is the potential practical application of the "geopolymer" that he and his team have reconstructed.

It isn't its aura of romantic adventure and ancient mystery that excites Barsoum about this research. It's much more practical. After all, he says, "At the end of the day, we may be wrong about the pyramids. Nature is very resourceful. What I know for sure is that we are now making this geopolymer. And the ingredients are simply dirt, dirt, dirt, and water."

When he mentions "dirt, dirt, dirt, and water," Barsoum's eyes light up. The importance of such a simple recipe for such an extraordinary material is also firing the imagination of his engineering students.

"This ancient variety of concrete can be made just about anywhere in the world from readily available materials, at a very low cost, and without producing the pollution of traditional methods," says Barsoum.

It's easy to make. Barsoum's undergraduates work with it all the time. He keeps a cast representation of a cat in his office, and it's beautiful: as smooth and shiny as marble. The possibilities are limitless for housing, transportation, and infrastructure, particularly in places where energy and financial resources are scarce.

"The basic raw materials used for this early form of concrete — limestone, lime, and diatomaceous earth — can be found just about anywhere." Barsoum adds quickly that this simple construction method would be cost-effective, long-lasting, and more environmentally friendly than the current building material of choice. It is estimated that the manufacture of Portland cement — the most commonly used cement — puts 6 billion tons of CO_2 annually into the atmosphere. The ancient Egyptian method is practically pollution-free.

"Ironically, it turns out the study of these four thousand year old rocks," Barsoum says, "isn't about the past, it's about the future of the planet."

Michael Barsoum, Ph.D., is a distinguished professor in the Department of Materials Science and Engineering, and received the Drexel University Research/ Scholarship Award in 2007 for the discovery of the kinking non-elastic deformation, a fully reversible deformation mode which is observed in a wide range of materials including geological materials, ceramic materials, graphite, and hexagonal metals. This discovery is expected to have major ramifications for the development of new high-damping, high-strength, and high-toughness structural materials.

http://www.materials.drexel.edu/Pyramids/

THE MYSTERIES OF AUTISM

THIS COMPLEX DISEASE HAS COMPLEX CAUSES: THE CURE WILL NOT BE SIMPLE

CRAIG NEWSCHAFFER | SCHOOL OF PUBLIC HEALTH

Craig Newschaffer, professor and chairman of the department of epidemiology and biostatistics at the Drexel University School of Public Health, is one of the world's leading authorities on autism. He warns that the search for a "magic bullet" to cure the multiple diseases we call autism will likely fail. His next research project — a massive study of all the causes — is a call to action. The U.S. Congress is listening.

In the past 20 years, the number of reported cases of autism has increased — everyone agrees. But has autism increased more than we expected? Are we in the midst of an autism epidemic?

After the release of data from the Centers for Disease Control and Prevention (CDC) on autism prevalence in the spring of 2007, Newschaffer was invited to speak to the Congressional Caucus on Autism Research and Education to offer his expert opinion on the new data from the CDC Autism and Developmental Disabilities Monitoring (ADDM) project.

The project indicated that among eight-year-olds, nearly seven in 1,000 have an autism spectrum disorder. The data, collected across multiple project sites nationwide, represents the best available estimate of the prevalence of autism in the United States. Is it more than he expected? Newschaffer says it's hard to say.

"For one thing," Newschaffer notes, "autism probably isn't just one disease. It's likely a spectrum of disorders. That means autism has different and perhaps unknown causes, risk factors, and genetic predispositions."

It is widely believed that the increase in autism is due, at least in part, to improved diagnosis. There is little doubt that there are children who would previously have been diagnosed with mental retardation. There are also children who would previously not have had any diagnosis at all who are now diagnosed with an autism spectrum disorder.

But can this explain the huge increase in autism cases over the past two decades? Because an autism diagnosis is made on the basis of behavior rather than biology — simply put, the very complex and subtle behaviors of young children — studies that try to look back at the infant behavior of older children, before the disease was well-known, simply aren't a sharp enough tool to unearth, once and for all, whether autism was as common in the past as it is now.

Newschaffer doubts that a definitive answer will be found soon.

"We haven't developed a conclusive body of evidence to either fully support or fully refute the notion that there has been some real increase in autism risk over the past two decades," he says.

In a 2005 study, Newschaffer and his colleagues concluded that shifting diagnostic categories alone can't account for the increase in autism cases. But genetic causes also can't account for sudden jumps in a disease's prevalence, he notes, and that suggests a role for some environmental risk factor.

"Autism is a very complex disease," says Newschaffer. "Even though we know that autism can run in families and probably has a significant genetic component, we've had a very hard time finding a pattern of autism in families or identifying specific autism genes."

Newschaffer believes that even without a full understanding of why autism has become more common, it makes sense to start studying possible environmental causes. More and more, he is coming to understand that complex conditions are caused by both genetics and environment.

"It's exciting to start asking questions about the interaction between genes and environment. There's really a very rich array of potential exposure variables that can and should be explored," Newschaffer says. "We really do need to begin considering environmental risk factors."

He notes that several federally funded epidemiological studies are underway that hope to pinpoint possible environmental triggers for autism, including an initiative by the CDC. Newschaffer serves as a co-principal investigator of this CDC study, called the SEED study, which is expected to review 2,700 children during the next five years.

Beginning in spring 2008, Newschaffer will be leading a major new study, called the EARLI Network, with collaborators at Drexel's College of Medicine, other Philadelphia area institutions, and sites around the country, to recruit and follow mothers of autistic children who are now pregnant again.

Because the rate of occurrence of autism in the sibling of an affected child is much higher than the rate in the general population, these babies will form a "high-risk cohort." This cohort will provide unparalleled opportunities to study environmental exposures and the genes that may make certain mothers or babies susceptible to them.

"For one thing," Newschaffer notes, "autism probably isn't just one disease. It's likely a spectrum of disorders."

"The 'window' that we should be looking into to identify exposures that affect autism risk most likely happens during fetal development," he says.

The EARLI Network will be enrolling 1,200 mothers at its four sites over a six-year period. The study will gather very detailed data from families about diet, the home and work environments, personal care products, illness episodes, and prescription and nonprescription medication. In addition, the study will look at novel samples for potentially meaningful biomarkers.

"The genes that are expressed on the mother's placenta may tell a very important story about the fetal environment," Newschaffer commented. "We're hoping that the meconium [the babies' first stool] will also be very valuable because we think it can be used to measure certain chemicals the baby was exposed to from the second trimester until birth," he continued.

Epidemiologic studies like SEED and EARLI seek to provide new clues about autism's complex causes. During the better part of the first year of the project, efforts will be focused on outreach to the autism community and building a strategy to successfully recruit families.

"We're not rushing into data collection," he notes. "We realize that if we don't have the backing of the organizations that serve and support families with autism, we won't be able to get the message out, and keep the message circulating, about this study."

"An epidemic means simply that we observe more cases of a disease than we would expect," he says.

Newschaffer cites the example of smallpox, an affliction for which a single confirmed case would qualify as an epidemic, because the disease has been eliminated in humans. On the other hand, when everybody you know has a cold in the winter, that's to be expected, and therefore not an epidemic.

"Saying that it's an epidemic is a powerful word," Newschaffer reminds us — it means more public attention and increased research funding.

While Newschaffer's research is not focused on testing different treatment approaches, it still has the potential to reduce the burden of autism. If researchers can isolate one or more contributing causes of autism, they're "adding to the body of knowledge and hopefully revealing ways to prevent future cases."

"It's also quite possible," Newschaffer says, "that understanding the multiple causes will guide the development of multiple future treatments. The business of public health is to improve quality of life through *multiple* approaches."

Professor and chairman of the department of epidemiology and biostatistics at the Drexel University School of Public Health, Craig Newschaffer, Ph.D., was recently at the department of epidemiology at the Johns Hopkins Bloomberg School of Public Health, where he founded and directed the Center for Autism and Developmental Disabilities Epidemiology, one of five federally funded centers of excellence in autism epidemiology. Major initiatives included the development of methods for monitoring autism spectrum disorders prevalence and participation in the largest population-based epidemiologic study of autism risk factors to date — the Study to Explore Early Development (the SEED study). Newschaffer is also engaged in other projects focusing on how particular genes might interact with environment exposures to increase autism risk. He will begin his Early Autism Longitudinal Investigation (EARLI) Network research in Spring 2008. Newschaffer is an Associate Editor of the American Journal of Epidemiology and a member of the editorial board of the journal Developmental Epidemiology.

http://publichealth.drexel.edu/Academics/Faculty_Staff/Craig_J_Newschaffer_PhD/282/

SAVING COLONIAL PHILADELPHIA: IN 3-D GRAPHICS

GLEN MUSCHIO | ANTOINETTE WESTPHAL COLLEGE OF MEDIA ARTS AND DESIGN

Tourists visit Philadelphia to see America's birthplace, but much of the architecture they see has been reconstructed, rebuilt, or destroyed by urban progress. The students in the Digital Media Program at the Antoinette Westphal College of Media Arts and Design and Glen Muschio, the director of the program, are preserving America's heritage with cutting-edge electronic toys in computer graphics and animation.

The students working at Independence National Historical Park with Muschio are also getting a perhaps unexpected crash course in old-fashioned American history. Drexel University researchers are beginning to uncover what 18th century Philadelphia was really like — through the creation of an interactive computer model of the city that anyone can explore and that other cities could use to create models of their past.

Muschio, Chris Redmann, assistant professor of digital media, and their students have been recreating historically correct 3-D models of colonial and federalist period structures. The project brings together faculty and students from Westphal College, the computer science department in the College of Engineering, the College of Information Science and Technology, the School of Education, and the Pennoni Honors College.

The collaborative 3-D Colonial Philadelphia will serve as a research and production center for models, animations, and interactive media — a repository for "virtual artifacts" of colonial life, in searchable databases for researchers and scholars.

"We want this to be a resource for research, production, use, and evaluation of digital assets for studying U.S. history," says Muschio.

The project is part Second Life, part social history, part SimCity, part computer science, and part teaching tool.

"What we hope to do is create a 3-D environment for teaching and learning about colonial American history in schools, at historic sites, and on the Web," he adds.

One of the first homes recreated in their virtual 18th century Philadelphia is a two-story brick house located in the vicinity of Fifth and Arch Streets occupied by James Oronoko Dexter, a free African-American, active in Philadelphia's nascent free black community. Dexter's house is believed to have been used for meetings organized by Absalom Jones in the formation of an independent black church known as The African Episcopal Church of St. Thomas. The original house was demolished in the 19th century, but recent archeological digs brought to light information about the house and site.

Muschio, Redmann, and their students working with Independence National Historical Park archeologists and their advisors produced a 3-D digital model of the Dexter house exterior. The model is based on the partial house foundation excavated by Park archaeologists, and a historic insurance document that describes the house. The team is planning to use a 3-D scanner to virtually reconstruct artifacts recovered from the Dexter excavation and place them in the context of the virtual house.

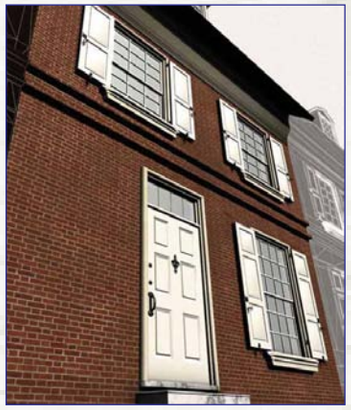
Another site virtually reconstructed is the Whitall House, home of a wealthy Quaker family that occupied the home circa 1748 to 1830. The house still stands in Woodbury, N.J., across the Delaware River from Philadelphia International Airport. The 3-D model will be made available through a podcast website that will deliver information for self-guided tours of the house. A Drexel University Synergy Grant and a grant from the New Jersey Historical Commission are funding the work.

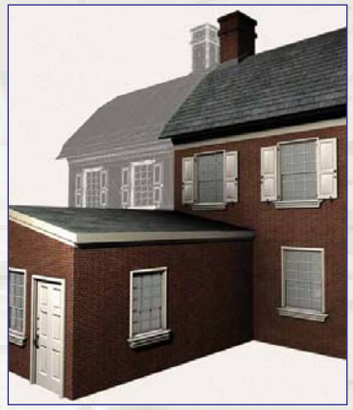
The future of the project includes regional sites and events that were historically significant to the development of Philadelphia's culture and economics.

"3-D Colonial Philadelphia will evolve as technology advances and as we too develop cutting-edge technology to move the field forward," says Muschio.

He wants to recreate the 18th century city and its economic ecosystem, eventually populating its buildings with digitized characters, or avatars, which will show visitors the objects found there and describe the significance of the sites — like virtual tour guides.

"As AI [artificial intelligence] capabilities develop, we hope that the interaction will get to the state where we can really do this on a big scale and people can get involved in role-playing games. That's where we're headed. Right now, we're building the spaces in a photo-realistic way."





Working with the computer science department, the team is planning to create algorithms that will allow the National Park Service to virtually reconstruct the Dexter artifacts based on the remnants that were uncovered.

"We're also working with information-science technology to create databases of information about the house because we hope to make this information available to other researchers in other cities who might need data on window types, brick faces, construction details like that," said Muschio.

Redmann, an architect and 3-D animator with an interest in historic preservation, is directing the construction of the 3-D virtual environments. He's teaching his undergraduate and graduate students to use the Historic American Building Survey (HABS) and the Historic American Engineering Record (HAER) as guides for reconstructing 3-D models of historic buildings. These digital assets will be used to construct virtual period buildings that are known to have stood on specific plots, but are undocumented in terms of detailed descriptions. The faculty and students will also research insurance, tax, and deed records noting physical descriptions and positioning of structures.

The resulting database of colonial Philadelphia doors, windows, and other common construction features, like blocks in a child's building toy, could be dropped into a scene or a row of houses quickly. Whole streets, which might have sketchy historical records at best, could then be recreated with some measure of authenticity.

Working from 2-D HABS drawings, undergraduate student Brian Gadomski has already begun to produce 3-D models that will eventually form an archive of 18th century house doors and windows.

To create the database, "I'm tracing them in the computer and building, based on the original drawing, a geometric object that matches exactly with those," he says. "It's a process that's relatively simple but will allow us to create a database of doors and windows that can be used eventually in the complete Colonial Philadelphia."

"3-D Colonial Philadelphia will evolve as technology advances and as we too develop cutting-edge technology to move the field forward," says Muschio.

Chester Cunanan, a graduate student in digital media, said he began this work because he was fascinated with the technology of 3-D modeling, but that he has learned more than he expected.

"You have to study the story of the buildings to build the model properly, and that's when the history catches you," he says. "So when it starts, maybe you weren't totally into the history, but when it ends, you're not only looking at the doors and windows, but the history of the place, too. The history pushes you on — that's what keeps you going after the fun of playing with a new toy wears off."

Glen Muschio, Ph.D., professor and director of the Digital Media Program at Drexel University, worked for more than 20 years in corporate communications, legal, community, and educational media production.

http://www.drexel.edu/news/innovations/virtual-history-lessons.aspx

ELIMINATING THE BLIND SPOT

A NEW CURVED MIRROR CREATES SAFER ROADS

ANDY HICKS | SCHOOL OF ARTS & SCIENCES

Every driver knows — or should know — about the "blind spot;" that part of the road that you just can't see in any of your car's rear-view mirrors; the spot that all too often hides a semi-tractor trailer full of hazardous wastes passing you at 70 miles per hour on a crowded turnpike.

R. Andrew Hicks, an associate professor of mathematics at Drexel University, has a better solution than a quick turn of the head and a yelp of surprise. He has created an elegant, slightly curved mirror that provides drivers with a 45 degree field of view on the driver's side. A flat mirror provides fewer than 20 degrees.

The difference is dramatic.

Flat mirrors do not provide a wide enough field of view. Trucks and buses make use of spherical mirrors, which broaden the field, but increase the distortion of the image. The passenger-side mirror on a car, the one with the worrisome note that, "objects in the mirror may be closer than they appear," also trades a wider field for a distorted view.

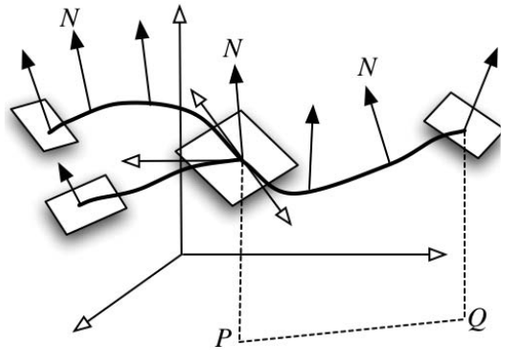
Hicks has been working on creating very wide fields of view, in the new field of "omnidirectional vision," sometimes also called "panoramic vision," which has been developed to help robots "see." A mobile robot might use a camera with an extremely wide-angle fish-eye lens or with curved mirrors mounted in front of a standard lens. Omnidirectional vision is different because it provides a very large field of view.

Curved mirrors can provide the same kind of panoramic views — such as often seen in closed-circuit television security cameras. Hicks designed such mirrors for robots as a postdoctoral fellow at the General Robotics, Automation, Sensing, and Perception Laboratory at the University of Pennsylvania, where he received a doctorate in mathematics in 1995.

Hicks also learned a lot about the problems of building them. The theoretical design of a curved mirror that has a wide and undistorted view is a "problem of classical optics," he says. That elegantly drawn curve, however, was until recently impossible to translate into a physical mirror.

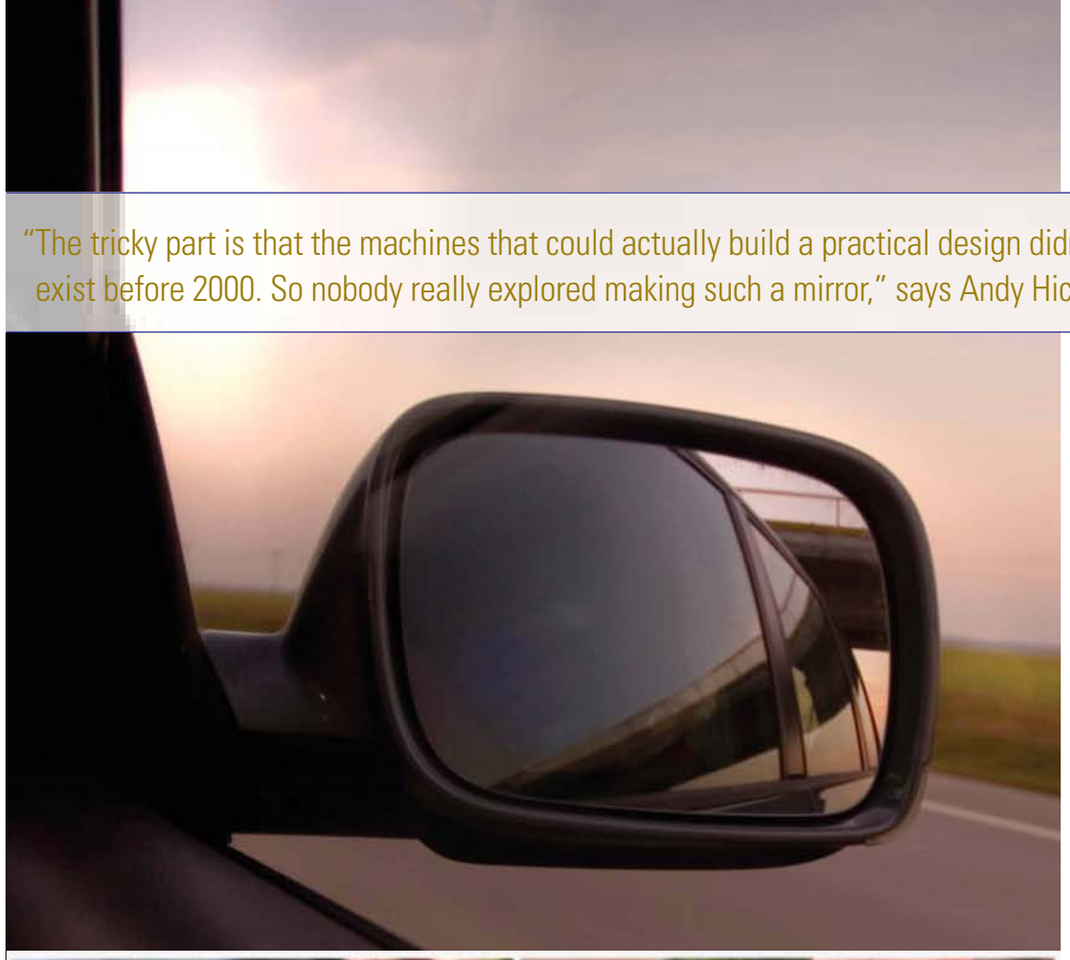
"The tricky part is that the machines that could actually build a practical design didn't exist before 2000. So nobody really explored making such a mirror."

Hicks can now make and demonstrate such a mirror, but he can't sell it: U.S. law prohibits a curved mirror on the driver's side. It is allowed in Europe and Japan and as an add-on in the U.S. Until that can be changed, he still advocates for, as your driver-education teacher did, an occasional quick glance over the shoulder.



An associate professor of mathematics at Drexel University, R. Andrew Hicks, Ph.D., graduated from Queens College, City University of New York, with a B.A. degree in mathematics. He received his Ph.D. in mathematics from the University of Pennsylvania, where he was also a postdoctoral fellow at the General Robotics, Automation, Sensing, and Perception Laboratory, working on panoramic vision systems for the control of mobile robots.

"The tricky part is that the machines that could actually build a practical design didn't exist before 2000. So nobody really explored making such a mirror," says Andy Hicks.



http://www.math.drexel.edu/~ahicks/

NO SMALL MIRACLE

ENABLING A LIFETIME OF PARTICPATION OF CHILDREN WITH CEREBRAL PALSY

ROBERT PALISANO | COLLEGE OF NURSING AND HEALTH PROFESSIONS

Children with chronic diseases such as cerebral palsy are living longer lives. Survival sometimes seems miracle enough, but Robert Palisano, a professor of physical therapy and rehabilitation sciences at the College of Nursing and Health Professions, and his colleagues Lisa Chiarello and Margo Orlin, are developing programs and support services that enable these young people to participate fully in home, school, and community life.

Palisano leads a multi-center study of activity and participation of children with cerebral palsy funded by Shriners Hospitals for Children. He is also co-investigator of prospective longitudinal study of changes in functional mobility and self-care in adolescents with cerebral palsy funded by the Canadian Institute for Health Research.

Cerebral palsy is a blanket description for several neurological disorders that appear in infancy or early childhood and permanently affect body movement and muscle coordination. Because it typically doesn't get worse over time, long-term efforts to improve participation in life are important, says Palisano.

Cerebral palsy can't be cured, but does not have to restrict quality of life. Participation is the key.

"Our research team believes that interventions to optimize mobility and self-care should actively involve children and families and provide opportunities for participation in school and community activities such as a sports team or youth group," Palisano says.

In general, the earlier children with cerebral palsy begin to actively manage their condition and the more opportunities for participation they are afforded, the more they will be prepared to negotiate the transition to adulthood.

Cerebral palsy doesn't always cause profound disabilities. While one child with severe cerebral palsy might be unable to walk and need extensive, lifelong care, another with mild impairment might be only slightly affected and require little to no special assistance. Supportive treatments, medications, and surgery can help many individuals improve their motor skills and ability to communicate with the world.

What goals are realistic for children with cerebral palsy and their parents? Palisano's project aims to study a large group of children and youth with the disease to identify the combination of child, family, and service factors that optimize activity and participation.

In general, the earlier children with cerebral palsy begin to actively manage their condition and the more opportunities for participation they are afforded, the more they will be prepared to negotiate the transition to adulthood.

Palisano says he wants to, "identify key environmental and personal factors that positively or negatively influence activity and participation and explore relationships between mobility, self-care, participation, and quality of life from the perspective of children and youth with cerebral palsy."

Participation, Palisano says, turns out to be a complex issue. He uses the example of walking: if you ask a child how much she walks, you may get a straightforward answer like, "Once a day." But you need to understand the environment, Palisano says. If the patient lives in a high-rise apartment, "Once a day." may mean a different level of participation than if she has a one-story detached home with a yard.

"If we can improve delivery of family-centered services," Palisano says, "we may help people with cerebral palsy negotiate lifelong challenges to education, employment, and independent living."

Not the stuff of pulse-pounding medical drama perhaps, but a miraculous outcome all the same.

Robert Palisano, PT, ScD, is a professor of physical therapy and rehabilitation sciences at the College of Nursing and Health Professions. He is a member of the Scientific Staff at Shriners Hospitals for Children, Philadelphia and principal investigator of a national study of activity and participation of children with cerebral palsy funded by the Shriners Research Foundation. He recently completed a longitudinal study of gross motor development of children with cerebral palsy funded by the National Center for Medical Rehabilitation Research and National Institutes of Health (NIH). He is co-investigator of an international study on determinants of gross motor function and playfulness of children with cerebral palsy funded by the National Institute of Disability Rehabilitation Research. His research at CanChild involving quality of life and changes in mobility and self-care in adolescents with cerebral palsy is funded by the Canadian Institutes of Health Research. He has served as an advisor or committee member of thesis and dissertation research for more than 30 students. Palisano co-edits the journal Physical & Occupational Therapy in Pediatrics and was associate editor of the textbook "Physical Therapy for Children." Palisano received a Drexel University Research/Scholarship Award that honors outstanding faculty for seminal accomplishments in research, scholarship, and creative works. This award recognizes faculty members for specific work that has impacted a field in a way that significantly augmented thinking, understanding, or trends among other practitioners and scholars.

http://www.drexel.edu/CNHP/faculty/palisano.asp

MINING THE VEINS OF MEDICAL KNOWLEDGE

TEXT MINING, WEB MINING, AND BIOMEDICAL INFORMATICS ARE CHANGING THE WAY MEDICAL PROFESSIONALS WORK

TONY HU | COLLEGE OF INFORMATION SCIENCES AND TECHNOLOGY

A Web search for even the simplest human ailment, say, "chicken pox," will provide more facts than you can fathom. Imagine how a medical professional feels when searching for new information about a rare disease. "Information overload" is a serious problem in medicine, but who would want less data? Tony Hu helps physicians make sense of the mountains of data they have instantaneous access to every day.

"Data mining" is what it's called–sorting through large amounts of data and picking out relevant information. Business intelligence organizations and financial analysts were data mining pioneers, but scientists are now extracting information from the enormous data sets generated by modern experimental medical research. Like panning for gold, it's the science of extracting nuggets of useful information from large data sets. The potential for medical professionals is enormous, according to Hu.

Hu directs the Data Mining and Bioinformatics Lab at the The College of Information, Science & Technology at Drexel. Biomedical informatics resolves the practical problems of refining the masses of biological data that mining turns up into useful and actionable information.

At the intersection between bioinformatics and data mining, Hu's lab works to facilitate collaboration between data mining researchers and bioinformaticians by developing cutting edge algorithms, methodologies, and software systems in data preprocessing, data transformation, data management, data mining, data visualization, data simulation, and modeling for the life sciences.

Hu arrived at the The College of Information, Science & Technology at Drexel in 2002, with years of research and development experience in the private sector and several degrees, and found the cooperative intellectual environment at the College of Information Science and Technology ideally receptive to his wide-ranging research.

"The thing that makes our research unique is we really treat these three, independent components as one whole system," Tony Hu says.

Since then he has published more than 140 peer reviewed papers, received the 2005 National Science Foundation (NSF) Career Award, and founded the International Journal of Data Mining and Bioinformatics and the Data Mining and Bioinformatics Laboratory. He teaches database administration to undergraduates, mentors the research dissertations of doctoral students, and continues to conduct the groundbreaking research that has defined his career.

Medicine is the current focus of his work. The booming health care industry generates masses of data on widely varied subjects, and bioinformatics is the key to making sure the important information is where it should be.

One of Hu's several biomedical informatics projects is a joint venture with faculty at the College of Medicine and the School of Biomedical Engineering, Science, & Health Systems intended to develop an integrated computational model of breast cancer progression. They hope that one of the outcomes of their research will help physicians accurately diagnose the disease at an early stage. Hu's data mining tools remove the irrelevant information, leaving only the biomarker data that might be related to the genomic instability that indicates breast cancer.

In a related text mining project funded by NSF, Hu is taking a step back to look at how health care data management as a whole can be made more efficient. By examining the entire process of retrieving, extracting, and analyzing data, he is making each aspect more efficient.

"The thing that makes our research unique is we really treat these three, independent components as one whole system," he says.

NSF is also supporting Hu's continued work with rough set theory, the mathematics that supports data mining. Hu was a pioneer of rough set theory, which helps analyze incomplete or imprecise data and makes it a perfect tool for building Internet search engines. Google and other keyword searches produce results based only on how closely they match the entered term. Hu's new smart Web mining engine generates returns based on remembered search histories, prior returns actually used, and other context-sensitive information. For example, a physician conducting a smart search for "cancer signs" would never have to dig through astrological predictions again.

Hu recognizes that, like anybody searching for information on the Web, he too needs to have a clear object in mind and the wisdom to recognize what is useful when he finds it.

"To do research you need to have the vision to see what problems are important," Hu says. "You need to consider the broader impact."

A searcher and researcher whose work affects everyday life and health, Hu is making discoveries today that will lead the way to better health care techniques tomorrow.

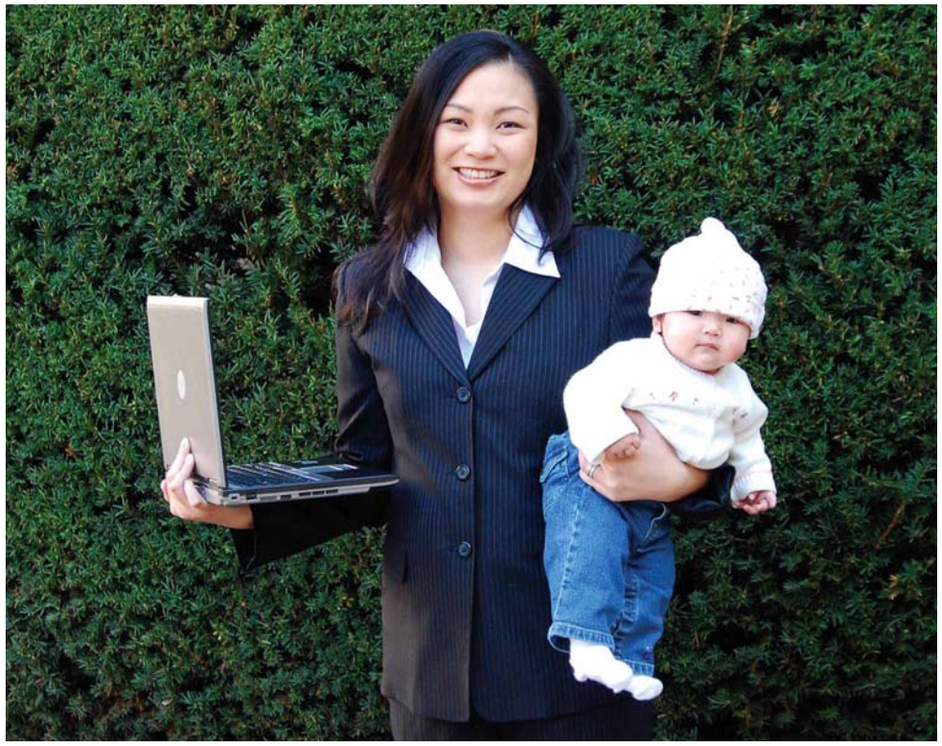
Born and raised in the Hunan province in China, where his parents were teachers, Tony Hu, Ph.D., earned degrees from Wuhan University and the Institute of Computing Technology at the Chinese Academy of Science before moving to Canada. There he received a degree from Simon Fraser University and a Ph.D. from the University of Regina. In the private sector, he worked on real-time data management systems for Nortel, then moved to the data mining research group at GTE (now Verizon) Laboratories. There his work on the CHAMP (CHurn Analysis, Modeling and Prediction) project won him the nomination for GTE's highest technical achievement award in 1997. The program, which is still in use, analyzes contract applications to identify "churners" — customers who take serial advantage of introductory offers. After helping start-ups Knowledge-Stream Partners and Blue Martini Software create systems like a real-time fraud detection program for Chase Manhattan Bank, he founded his own company, Data Mining Warehouse.

http://www.cis.drexel.edu/faculty/thu/

BALANCE WORK & FAMILY

CHALLENGING THE CONVENTIONAL WISDOM SHOWS INTERDEPENDENT FORCES IN BALANCER

JEFF GREENHAUS | LEBOW COLLEGE OF BUSINESS



Upon receiving the 2007 Everett Cherrington Hughes Award for Career Scholarship from the Careers Division of the Academy of Management (AOM), the leading professional association for scholars of management and organizations, Jeffrey Greenhaus was called, "the foremost scholar in the world on the topic of the relationship between work and family."

Greenhaus, the William A. Mackie Chaired Professor of Management at Drexel University's LeBow College of Business, says that his "earliest research dealt with work-family conflict," with a distinct stress on that final word, and goes on to say, "It has been an evolution to work-family balance."

A prolific scholar, Greenhaus and G. N. Powell, a colleague from the University of Connecticut, published an important article, "When Work and Family are Allies: A Theory of Work-Family Enrichment," in the *Academy of Management Review* in 2006.

In the not-too-distant past, he used different language. Greenhaus' seminal 1985 article, "Sources of Conflict between Work and Family Roles," published in the *Academy of Management Review,* was cited, at last count, in more than 400 papers.

A scholar needs to be willing to reconsider the "conventional wisdom" in his field. Greenhaus had conducted research on the negative side of the work-family interface — what he calls work-family conflict — for many years. He doesn't claim now that his latest research exposed the great secret that work and family aren't natural enemies.

"After many years of domination by a conflict or interference perspective, work-family researchers had begun to recognize the positive effects that work and family roles can have on one another," he notes today.

But there was a missing element: "There was no broad theoretical framework to explain these positive interdependencies. Our article filled this gap by providing a theoretical model that integrated the emerging findings and suggested areas for future research."

> "Individuals should appreciate the positive connections between their work and family pursuits"

Greenhaus' research draws a theory from the data.

"Our primary contribution has been synthesizing and integrating existing findings within a theoretical framework. We didn't discover the positive interdependencies between work and family roles, but rather provided a conceptual model of these interdependencies to guide future research."

The theoretical model that Greenhaus offered should prove useful to both workers and employers. Employees' work experiences have the capacity to strengthen their family lives just as their experiences in the family domain have the potential to strengthen their work lives. An individual's experience in one role, either work or family, enhances performance and positive emotions in the other role.

"We proposed that resources, such as interpersonal and leadership skills, or overall self-confidence, acquired in a role can be applied directly to the other role to promote high performance and positive emotions in the latter role," says Greenhaus.

This is what the researchers call the "instrumental path" of transfer: if you do well at home, you will do well at work.

There is also an "affective path," that has more to do with how you feel at home or work. Feeling good at home or work can produce positive emotions, which can be transferred to the other role to enhance performance and positive emotions there.

This research has implications for everyone.

"Individuals should appreciate the positive connections between their work and family pursuits and learn how to leverage their participation in each role for the betterment of the other role," Greenhaus says.

The fact is that most of us have more options than we might think.

"An individual's decisions in everyday life affect the relationship between their work and family roles," Greenhaus has concluded from the data. "You just need to make that balance a priority."

"A surprising number of people don't try to negotiate a solution," he reports. "I like to think of it as a work-family decision-making process. The more important your work and family lives are to you, the more you're going to need a new way of looking at work-family dynamics."

Greenhaus says that the decisions needn't be dramatic. "Seeking the support of someone is a decision."

The research methods that Greenhaus uses aren't dramatic, either. He uses mostly questionnaires with statistical techniques.

"I ask straightforward questions: 'How supportive is your spouse of your work life?' I also offer vignettes, and ask for responses. Such as, 'Your child's dance recital conflicts with a project at work: What do you do?' I ask people to think about a time when work and home were in conflict."

"As a researcher," Greenhaus says, "you want to study these things before you reach a conclusion."

Good advice for a worker, too.

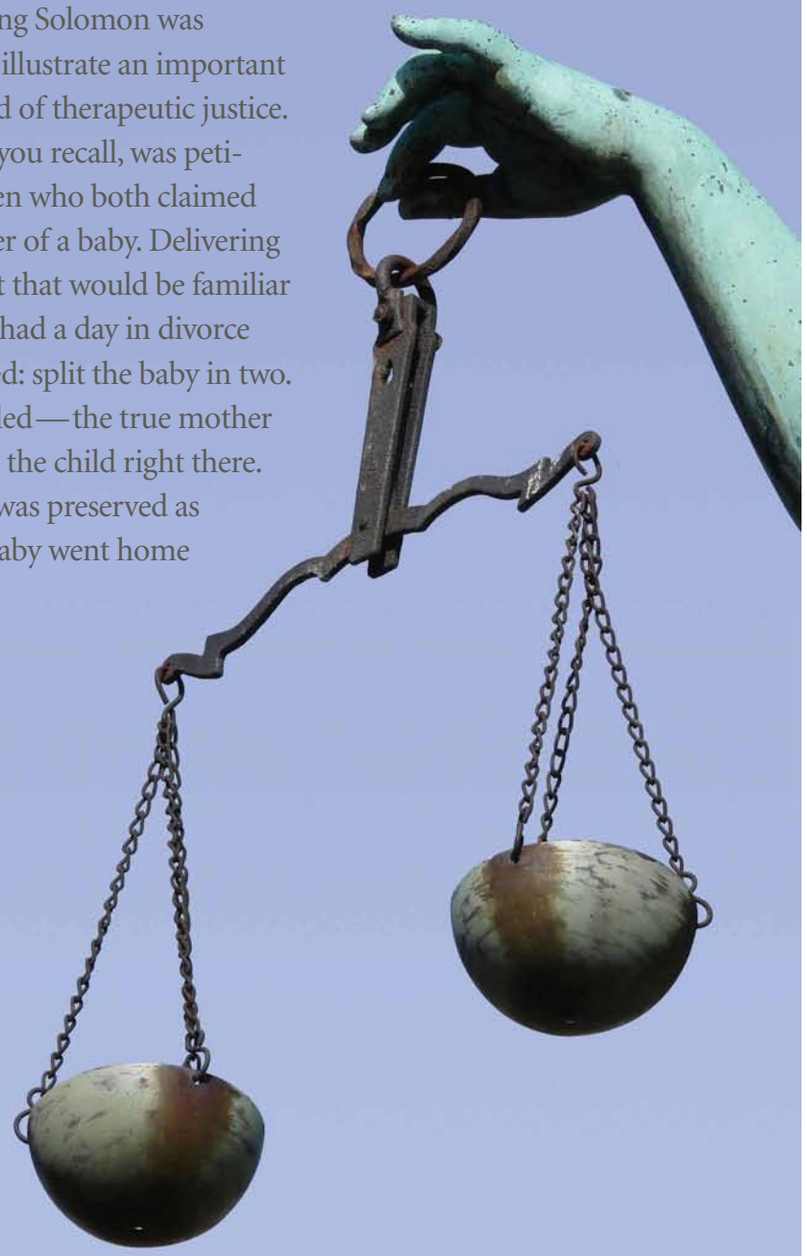
The William A. Mackie Chaired Professor of Management at Drexel University's LeBow College of Business, Jeffrey H. Greenhaus, Ph.D., began his career in 1971 and joined Drexel University in 1981. He has written four books, presented at 39 conferences and published more than 66 journal articles. His research is credited for enhancing knowledge of the balance among career, social and family commitments. Greenhaus has written the seminal text, "Career Management," a fundamental resource on career management education and career research. He organized and edited The Encyclopedia of Career Development, which provides an outstanding history of career research. At LeBow College, Greenhaus serves as a mentor for Ph.D. candidates and has served as chair on numerous dissertation committees. In 2005, Greenhaus was elected fellow of the Association for Psychological Science and the Society for Industrial and Organizational Psychology. He also received the Sage Scholarship Award for Excellence in 2004, in research on gender and diversity sponsored by the Gender and Diversity in Organizations Division of the Academy of Management. He received a Ph.D. degree in industrial-organizational psychology from New York University in 1970, and a Bachelor of Arts from Hofstra University in 1965.

http://faculty.lebow.drexel.edu/GreenhausJ/

THE FAMILY-FRIENDLY COURTROOM

SUSAN BROOKS | COLLEGE OF LAW

The judgment of King Solomon was extreme, but it does illustrate an important argument in the field of therapeutic justice. The wise old judge, you recall, was petitioned by two women who both claimed to be the true mother of a baby. Delivering a legalistic judgment that would be familiar to anyone who ever had a day in divorce court, Solomon ruled: split the baby in two. The truth was revealed — the true mother was ready to give up the child right there. Solomon's wisdom was preserved as a proverb, and the baby went home happy and whole.



Sending everyone home healthy from the courtroom is, according to Susan Brooks, what therapeutic jurisprudence is about. A professor of law and Associate Dean of Experiential Learning at the Drexel University College of Law, Brooks concentrates on the law's impact on emotional life and psychological well-being. It is a perspective that regards the law — the rules of law, legal procedures, and roles of legal actors — itself as a social force that sometimes has therapeutic consequences, but is sometimes deeply anti-therapeutic. People often suffer because of the law's judgments.

Brooks would be the last to suggest that therapeutic concerns are more important than other consequences or factors, but she does believe the law's role as a potential therapeutic agent should be recognized and systematically studied.

When the term "therapeutic jurisprudence" was first used in 1987, the focus was on the ramifications of certain decisions, such as competency to stand trial and the insanity defense. It soon developed into a new perspective, the study of the extent to which substantive rules, legal procedures, and the role of legal actors, such as lawyers and judges, affect the lives of individuals involved in the legal process.

The approach soon spread beyond mental health law to include work in criminal law, family and juvenile law, health law, tort law, contracts and commercial law, trusts and estates law, disability law, constitutional law, and evidence law. In short, Brooks notes, therapeutic jurisprudence became a mental health approach to law generally.

Around the time that therapeutic jurisprudence was being developed, Brooks, an undergraduate at the University of Chicago, took a course in cultural anthropology that, she says with a smile, "changed my life." The instructors were John and Jean Comaroff, two noted anthropological researchers who worked in the complex system of law in post-colonial Africa.

Brooks, who had always wanted to be a lawyer, recalls now, "I had a negative image of social work, but I learned that law always has a cultural component."

She spent three years in the trenches as a social worker before attending law school. After a period in private practice, she was moved to teach law.

"From the outset of my career as a clinical law teacher, I have naturally relied on the body of knowledge I learned as a social worker."

Among the key insights that she brought to budding lawyers: client self-determination and cultural competence matter. This client-centered approach has now become fundamental to clinical legal education.

"Social work principles also include an important theoretical approach — known as an 'ecological' or 'systems' orientation — that is unfamiliar to most clinicians and lawyers," she says.

As she wrote in an early piece on the topic:

Our legal system purports to care about children. Indeed, genuine concern for children motivates courts and advocates. Yet, in our efforts to help children, we often condemn their parents. Perhaps we derive a sense of security by treating

"I learned that law always has a cultural component," Susan Brooks recalls now.

these 'bad' individuals differently from ourselves. Perhaps we want retribution, which we achieve by depriving these parents of the thing they cherish most: their children.

What we fail to recognize is that by these same actions, we deprive children of something they also cherish and need — their families. If we truly care about children, we must begin by respecting their family systems.

Family systems theory, Brooks says, maintains that in order to intervene effectively to help children, you have to "treat" the whole family. The best way to protect children is to preserve as much of their families as possible. Law, as it developed in the U.S., maintained the legal fiction that the family was a collection of separate legal entities rather than an organic part of the body politic.

As the associate dean of experiential learning at Drexel Law, the person responsible for cooperative education in the school, Brooks has applied therapeutic jurisprudence in an effort to reframe the role of the lawyer.

According to her, Drexel can turn out "lawyers who practice with an ethic of care and heightened interpersonal skills, who value the psychological well being of their clients as well as their legal rights and interests, and who actively seek to prevent legal problems through creative drafting and problem-solving approaches."

Susan Brooks, J.D., is an associate professor of law and also serves as the Associate Dean of Experiential Learning at the Drexel University Law School. Prior to coming to Drexel Law, Brooks was a Clinical Professor of Law at Vanderbilt University School of Law. She attended law school at New York University School of Law and served on the editorial board of the New York University Law Review. After law school, she clerked for Judge Bernard Friedman on the United States District Court for the Eastern District of Michigan. She subsequently worked as an associate in the Chicago office of Sonnenschein Nath & Rosenthal. She also has an M.A. degree in social work from the University of Chicago.

http://www.drexel.edu/law/susan-brooks.asp

HEALING SPINAL CORD INJURY

HOW DREXEL IS CHANGING THE WAY PARALYSIS CHANGES LIVES

JOHN HOULE | COLLEGE OF MEDICINE

Drexel University has one of the world's premier research groups dedicated to developing a treatment for spinal cord injury that will result in the restoration of lost functions — and vastly improve the quality of patients' lives.

Back in 1981, when John Houle, now the director of the pioneering Drexel University Spinal Cord Research Center, received his Ph.D., a spinal cord injury meant permanent paralysis with no hope for recovery. Today this premier research center is improving the prognosis for such injuries by employing new scientific discoveries to develop promising therapies.

That year, researchers were able to demonstrate for the first time that adult nerve cells (neurons) could regenerate after injury. This feat — long thought impossible — changed the principal theory that propelled the sense of hopelessness in repairing spinal cord injuries. But Houle, a professor of neurobiology at the Drexel University College of Medicine, says that "breakthrough" was only the first step on a long road in translating scientific findings to treatments that improve the quality of life of patients.

It's a long and exciting journey that is leading investigators at the Spinal Cord Research Center to use a combinatorial treatment including nerve regeneration, cell transplantation, and rehabilitation strategies with the aim of bridging the discovery phase and clinical application. This effort is facilitated by close collaboration with members of the neuroengineering group that provide computational resources for modeling and analysis of locomotion as well as biomaterials for producing multi-functional scaffolds.

"It is important to appreciate the complexity of spinal cord injury and understand that it is a progressive injury and an evolving condition," Houle says.

For weeks, if not months, after the life-threatening injury has been stabilized by neurosurgeons, the spinal cord and the neural tissue connected to the brain continue to change at the cellular and molecular level. An effective repair therapy has to take these changes into account.

Houle cites the example of the effect of spinal cord injury on distant neurons in the brain that normally transfer information to the periphery through nerve pathways. When these connections are damaged, neurons in the brain may atrophy or die, while the damaged nerve retracts leading to additional damage termed "secondary injury."

"Unfortunately the body's defense mechanism is paradoxically working against the possibility of repair," he says.

The biological response to injury is to create barriers in the form of scar tissue attempting to protect the adjacent, undamaged spinal cord and in the process inhibits nerve regeneration.

"We now have good ways of making nerves overcome the inhibitory environment of the injury and regenerate in a manner that can potentially lead to recovery of function," Houle says.

Indeed, one of the most exciting research findings published last year by Houle and colleagues in the Journal of Neuroscience demonstrated that scar tissue could be modified with a specific enzyme treatment to promote functional regeneration.

Another important strategy in achieving functional repair is neurotransplantation. Cell transplants can provide a substratum that will support the re-growth of injured nerves, and when using stem cells can also provide a source of precursor cells to replace cells damaged or lost after spinal cord injury. With these neuronal seeds "planted," the next step is to enhance the transplantation process by treatment with drugs, growth factors, and scaffolds that reduce inflammation and promote cell survival and growth. In addition, glial scar tissue has to be removed to reduce the structural and chemical barriers to regeneration. Together, this sequence of treatments can target the specific steps of the injury process providing protection and supporting regeneration.

In recent years, Houle's group has learned that exercise of injured limbs can not only maintain joint fluidity and muscle strength, but can also re-train regions of the spinal cord that are no longer getting input from the brain to function more effectively.

"There is strong evidence of activity-dependent plasticity within the brain and spinal cord after exercise," Houle says, and adds that the research of his colleagues at the Center suggests that the spinal cord has a "central pattern generator" that generates the rhythmicity essential for locomotion.

"It is important to appreciate the complexity of spinal cord injury and understand that it is a progressive injury and an evolving condition," John Houle says.

This concept of a "learning spinal cord" that works with sensory input has allowed researchers at the Center to train cats with spinal cord injuries to walk on a treadmill and to develop computational models that provide the theoretical framework for the function of the intact and injured spinal cord.

The Spinal Cord Research Center is now leading the way in developing specific physical therapy and rehabilitation protocols that will enhance spinal cord plasticity which translates into greater recovery of function.

The diverse techniques that Houle and his team use in the laboratory are supported by core facilities funded with a NIH Program Project grant.

"It's a personal tragedy and a significant financial burden to society to have so many people with spinal cord injuries living with serious physical limitations and chronic pain," says Houle, noting that more than 10,000 Americans, mostly young men between 16 and 30 years old, are injured yearly. Most remain paralyzed for the rest of their lives, require continuous medical treatment, and are highly dependent on others.

"Many have a normal life expectancy today, but they have a chronic and devastating condition, and our hope is to help provide them with a better quality of life."

Houle emphasizes that one of the priorities is the restoration of bodily dignity.

"People with spinal cord injuries want to be able to control their bowels and bladder, to function sexually, to reduce chronic pain, and to walk. We're not looking for a magic bullet, but for an array of therapies that we can fit together to improve the quality of their lives."

John Houle received a Ph.D. from Purdue University and completed postdoctoral fellowships at University of Saskatchewan and University of Florida. He later served on the faculty of the Department of Neurobiology and Developmental Sciences at the University of Arkansas for Medical Sciences, before coming to the Department of Neurobiology and Anatomy at Drexel University College of Medicine in 2005.

http://neurobio.drexel.edu/Research/SCRC

BACK IN FASHION: 200 YEARS OF COUTURE ONLINE

MAKING THE DREXEL COLLECTION OF FASHION ACCESSIBLE TO ALL ON THE WORLD WIDE WEB

KATHI MARTIN | ANTOINETTE WESTPHAL COLLEGE OF MEDIA ARTS AND DESIGN

Kathi Martin is standing in the Drexel Historic Costume Collection on the fourth floor of the Antoinette Westphal College of Media Arts and Design on Market Street, holding a flapper dress from the 1920s. "What you lose is the tactile experience," she says. What you gain is visual access to the oldest, deepest, and most extraordinary collection of clothing and accessories that was ever mothballed.

"You miss the play of different lights on the fabric, the scent," she says while smiling. "My students think I'm nuts when I pick up a garment and give it a sniff."

It's a hidden treasure of the City of Philadelphia, one that few tourists will ever see — but one that Martin, a professor of fashion, and Xia Lin, a colleague from the College of Information Science & Technology, are making available to all online — just without the scents and textures.

The Drexel Historic Costume Collection had its beginning in the 1890s when members of the Drexel family began assembling a collection of notable garments, accessories, and textiles. The collection represents 200 years of historic costume and textile design. Among the items are eight gowns by noted 19th century designer Charles Worth. One gown, complete with kneeling pillow, was worn by Minnie Drexel Fell Cassatt during her presentation to the Austrian Court.

In addition to famous individual items, the various collections are impressive, including an extensive assortment of lace. Shoes, millinery, parasols, gloves, and other accessories in the collection present an opportunity to study an entire period ensemble. Most significant fashion designers of the 20th century are represented, including Madam Grès, Fortuny, Poiret, Vionnet, Givenchy, Chanel, Norell, St. Laurent, and Charles James.

The Drexel Digital Museum Project: Historic Costume Collection is a joint initiative between the College of Information Science & Technology and the College of Media Arts and Design. It represents the first of several planned projects that will be combined to form the Drexel Digital Museum.

The impetus for the project, Martin says, "has been the need to provide access to Drexel University's rich collections of art, textiles, clothing, ceramics, and artifacts from around the world."

The Drexel Digital Museum Project: Historic Costume Collection, uses current technology, traditional design skills, and historical perspective to create access to and manage the objects which are in the collections of the Drexel museums, including 7,000 objects in the Historic Costume Collection that richly illustrate society life from the late 1800s to the present time. Some are used for classes in the Antoinette Westphal College of Media Arts and Design.

The image standards of the Museums and the Online Archive of California initiative and the metadata harvesting protocols of the Open Archive Initiative are being implemented in the project to insure sustainability, extensibility, and portability of the Collection's digital archive.

"My students think I'm nuts when I pick up a piece and give it a sniff."

Martin says the project's goals are to provide access to the collections of the Drexel Museum in an online, searchable database; to represent them with high-quality graphics, from multiple views and via multiple search criteria; to conserve the existing physical collections; and to develop a process to incorporate the technical protocols and standards being developed and promoted by the Open Archives Initiative (OAI).

"Standards for metadata harvesting and image capture are being created," she says, "to facilitate the use of the Internet beyond its use as a tool for resource discovery, to a tool for distributed custodianship. Participating in this initiative expands the knowledge pool accessible to a local collection."

The work of fashion designers, educators, archivists, and scholars in the digital age includes the production of visual images, the creation and management of databases, and the ability to use advanced network and information technologies to improve access to digital images and information.

The Dublin Core Metadata Element Set and XML developments, as well as recommendations from other collections involved in information sharing between databases, are being incorporated into the information system of the Drexel Digital Museum Project to interpolate information between the database of a small historic costume collection and the database of a multi-community OAI repository.

Since the Drexel Digital Museum Project requires the conversion of collection data from 3" by 5" paper file cards to a relational database that includes images, all aspects of standardized data structure from naming conventions, data structure, and image capture are considered. The database is designed particularly for Historic Costume incorporating Fashion Design, within the framework of the greater museum community's accepted data structure, and populated via an online data entry form.

Her next task, Martin says, is to catalog everything in the Drexel collection for the Web.

"We have a lot of wedding gowns," she says, "of nearly every kind, because people save them. The real trick is to index all these!"

Continued development of the project is supported by generous funding from the Barra Foundation, the William B. Dietrich Foundation, the Friends of the College of Media Arts & Design, and Lois Lunin.

Kathi Martin received her Bachelor of Fine Arts in printmaking from the University of the Arts. Before joining Drexel, she had her own fashion design company, Bobolocon, selling hand silk screened designer sportswear to Henri Bendel, Barney's, Neiman Marcus, Harvey Nichols, and other fine specialty stores in England and the United States. Her design work has been published in British Vogue, Harpers, Queen, Architectural Digest, The New York Times Sunday Magazine, Women's Wear Daily, Tobe Report, and The Hamptons Magazine. In addition to directing the Drexel Digital Museum Project: Historic Costume Collection, Martin is the director of graduate studies in fashion design. She teaches fashion design, CAD for fashion, textile design, and drawing for the industry. She is currently doing graduate studies in graphic interface and database design for Websites in the College of Information Science and Technology at Drexel.

http://digimuse.cis.drexel.edu/

MAJOR RESEARCH INITIATIVES

NEUROENGINEERING

Over the past decade, Drexel has experienced significant growth in our research enterprises. We have built our research base by performing use-inspired, solutions-based, and translational research as well as generating new knowledge through basic research programs. This approach has also led to an increase in commercialization of Drexel technologies that has resulted in their transfer into the public sector to the benefit of society and economic development in Greater Philadelphia.

The Neuroengineering: Brain-Machine Interface Initiative is developing the knowledge and tools required to restore sensory and motor function to victims of spinal cord injury specifically related to the lower limbs. This interdisciplinary team is utilizing their expertise in motor and sensory systems, spinal cord injury, materials science and rehabilitation sciences to achieve this goal.

This program aims to develop a closed-loop brain-machine interface that can restore motor and sensory function after spinal cord injury. While ongoing research is working to repair the spinal cord after traumatic injury using biological methods, there are likely to be many instances when repair is not feasible and for which by-passing the injury with a brain-machine interface (BMI) will be the best clinical option.

Drexel is in a unique position to be a leader in this field because it is one of the few universities with expertise in motor systems, sensory systems, spinal cord injury and development of microelectrode devices to both record from and stimulate neural tissue. Furthermore, Drexel, unlike most other universities, is also pursuing the development of portable, non-invasive brain scanning devices that can augment or even supplant the need for invasive devices.

The approach that the neuroengineering faculty has taken to address the development of a BMI includes breaking down the challenge into its constituent elements and optimizing solutions for each component in order to ultimately produce a complete solution.

These constitutive elements for a clinically applicable BMI device include:

- Extracting motor commands regarding the intention to remove a limb from the brain;
- Transmitting motor commands from the brain to output devices to restore movement;
- Extracting sensory information from nerve stimulation in the limbs; and
- Restoring sensory information to the brain.

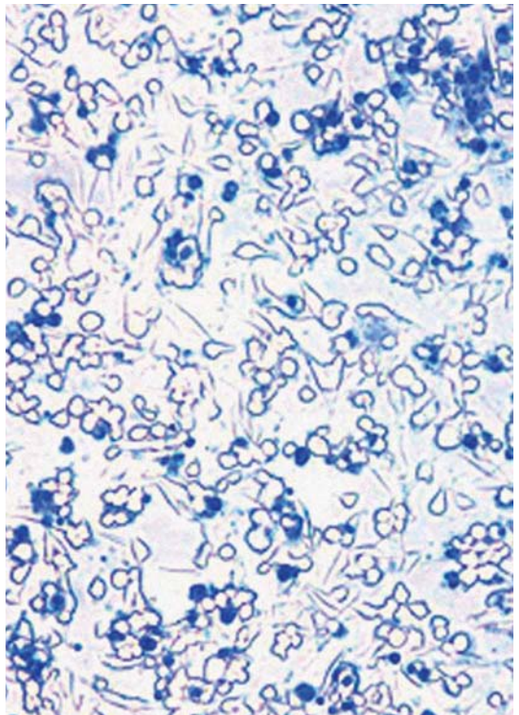
Implementation of each of these components provides a complete closed-loop solution to restoring motor and sensory function.

Drexel researchers have many skills that will be important in developing this BMI. Drexel is the only university to have a patent on a microelectrode device to record single neuron activity that can be used to extract information related to motor commands generated in the brain. Neurorobotic researchers are developing mathematical algorithms that will convert brain motor signals into limb movements which will enhance functional recovery after spinal cord injury. Drexel researchers are leaders in studying how sensory information is transmitted to the brain for processing.

The academic units involved in this program are the College of Medicine, the School of Biomedical Engineering, the College of Arts & Sciences, the College of Nursing and Health Professions and the LeBow College of Business.

PLASMA MEDICINE

The Plasma Medicine and Biology Initiative at Drexel is exploring novel research and applications of electron plasma science and engineering for medical purposes. These include rapid and safe blood coagulation that can be used for casualties in emergency situations, prevention of infection in wounds such as diabetic ulcers or burns and treatment of skin cancers such as melanoma by inducing the death of cancer cells that otherwise grow unchecked. Researchers have also applied the use of plasma to decontaminate and sterilize air, water and non-living surfaces for safety and environmental purposes.



Recent breakthrough inventions at Drexel in electron plasma have resulted in the opportunity for novel research and application of non-thermal plasma interactions with living organisms from viruses and bacteria to human tissue. Led by Drexel researchers, new exciting and promising research areas of plasma biology and medicine have been created recently on the border of medical and engineering sciences that will continue Drexel's international leadership in this area of research. The goal is to examine the use of non-thermal plasmas in areas of clinical practice where plasma can be a more effective medical tool than existing procedures or in cases where no treatment presently exists.

Further research will include:

- Development of non-thermal plasma discharges to provide clinically important treatments
- Identification of major electron plasma components (e.g., charged particles, free radicals, ozone) that are responsible for the desired clinical effects of treatments
- The effect of plasma on various pathogenic microbes and cancer cells
- The use of plasma discharges in surgical procedures

The academic units involved in this research program include the College of Engineering, the College of Medicine, the School of Biomedical Engineering, and the College of Arts & Sciences.

Photo courtesy of Edwynn Houk Gallery, New York

For more than nine years, Andrea Modica, an associate professor of photography at the Antoinette Westphal College of Media Arts and Design at Drexel University, has been documenting the extraordinary lives of the Baker children, heirs to a family-run slaughterhouse in the plains of central Colorado. Modica, long renowned for her virtuosity in printing 8 x 10 platinum/palladium prints, recently exhibited her large-scale works from her latest series, "Fountain, Colorado," at the Edwynn Houk Gallery in New York.

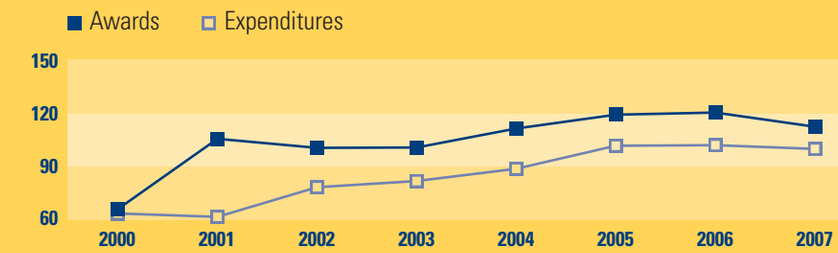
"Like her earlier "Treadwell" series, the photographs Modica titles "Fountain, Colorado" fall somewhere between documents and dreams. Her subjects are the young members of a family that runs a slaughterhouse, so death is always just offstage, but fantasy is ever present. With Modica's encouragement, both children and teen-agers slip into reveries, nestling together on a bare mattress, curling up under a coverlet in the bare back yard, or reaching out to one another in bed. The intensity of this tenderness can nudge the work into a kind of down-home surrealism — a mix of Manuel Alvarez Bravo and Sally Mann — but these fictions never ring false, only wonderfully, irresistibly strange."

— from The New Yorker (February 4, 2008)

A Guggenheim fellow, Modica has exhibited her work in the United States and Europe. Her photographs are featured in the permanent collections of the San Francisco Museum of Modern Art, the Metropolitan Museum of Art, the Museum of Modern Art New York, the Whitney Museum of American Art, and the Bibliothèque Nationale in Paris.

http://www.houkgallery.com/

TOTAL RESEARCH AWARDS AND EXPENDITURES 2000–2007 (IN MILLIONS OF DOLLARS)



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