UNIVERSITY OF DELAWARE

Research

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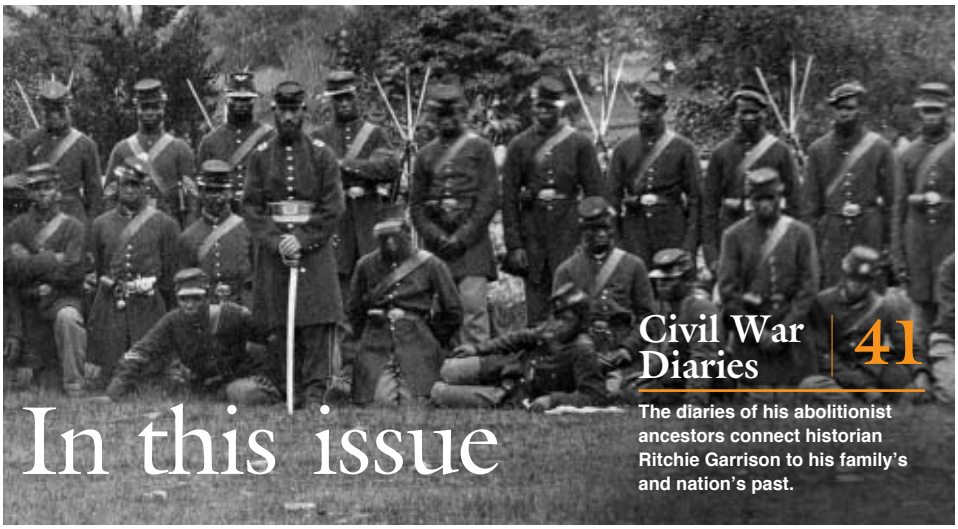


In this issue

From the President

Welcome to the spring 2010 issue of *University of Delaware Research*, a publication celebrating the pioneering research being conducted at UD and its extraordinary potential to improve our health, our lives, our neighborhoods, and our world.

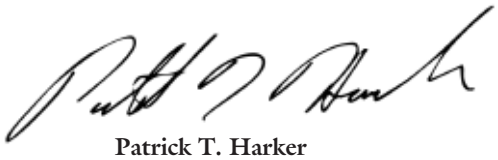
This issue highlights health sciences research, an area in which the University is keenly focused. Last spring, UD joined Thomas Jefferson University, Nemours/Alfred I. duPont Hospital for Children, and Christiana Care Health System to launch the Delaware Health Sciences Alliance. Through the Alliance, the four partners pool institutional resources and expertise to conduct cutting-edge, collaborative health sciences research and expedite its clinical application, so that patients more quickly benefit from laboratory breakthroughs.

But this Alliance isn't just good for Delawareans' physical health. It's good for our economic health as well. With one in six jobs and 15 percent of all economic activity in Greater Philadelphia linked to the life sciences industry, the Milken Institute ranks this Delaware-encompassing region #2 in the U.S. for its ability to sustain and build value in the life sciences.

The Delaware Health Sciences Alliance fortifies the region's noted strengths: a tight research infrastructure involving world-renowned universities and teaching hospitals; a talented and thriving health sciences workforce; and a strong network supporting bioscience entrepreneurs and effective technology transfer. The growing Alliance will place Delaware and its surrounding cities among the nation's top metro areas leading the way through economic recovery and to sustainable growth.

Several components of the Delaware Health Sciences Alliance will have a home on UD's campus, specifically on 272 acres of land the University acquired last fall. The land, formerly occupied by the Chrysler Newark Assembly Plant, will be redeveloped into a major science and technology campus housing advanced University- and partnership-based research, along with proliferative startup and spinoff companies based on lab discoveries.

As the University of Delaware continues its rapid research growth and brokers more partnerships enlarging our R&D capabilities, this science and technology campus will be a center for invention and innovation — an incubator bringing new research ideas from bench to bedside, from lab to marketplace, where they can provide significant benefit to the people of Delaware and position the State for unprecedented prominence and prosperity.



Patrick T. Harker
President, University of Delaware

UNIVERSITY OF DELAWARE

Mark Barteau is the Senior Vice Provost for Research and Strategic Initiatives and the Robert L. Pigford Chair of Chemical Engineering at the University of Delaware.

UD rising

by Mark Barteau

While I hope that "UD Rising" will become a recurring theme, it seems an especially appropriate headline for research at the University of Delaware this year. According to recent information from the National Science Foundation (NSF), UD now ranks among the top 100 institutions in federal funding obligations for science and engineering for the first time in history!

That accomplishment is even more striking when one realizes that UD is among the minority of universities in the top 100 without a medical school, and makes the list without a large portfolio of medical research funded by the National Institutes of Health. That, too, is changing, and this issue of *UD Research* describes the wide range of activities in life and health sciences and their connections to the Delaware Health Sciences Alliance launched last year.

Just over a year ago, Congress passed, and President Obama signed, the American Recovery and Reinvestment Act (ARRA). UD faculty went into high gear to compete for these funds, submitting more than $300 million in proposals. To date, we have been awarded more than $58 million in competitive funding for projects in nearly every college and in fields ranging from early childhood development to cosmic ray physics at the South Pole!

Some of the highlights include the awarding of Energy Frontier Research Center and Advanced Research Projects – Energy (ARPA-E) grants from the Department of Energy. UD is one of only six universities in the country to be leading a multi-million dollar effort in each of these programs.

Other highlights include a new Critical Zone Observatory for environmental studies, one of only six funded across the U.S. by NSF. Most recently, we were informed of a $2.2 million grant for a new high-field NMR spectrometer in the Department of Chemistry & Biochemistry that will make possible new understanding of the structure and role of large proteins in biological systems, among many other applications.

The dramatic narrative would be best served by portraying these achievements as the timely convergence of our strategic plan with the opportunities provided by stimulus legislation. A good story line, indeed, but one that misses the real story. UD's rise as a research power has been in the making for a long time, and nearly every accomplishment you will hear about has been built on much more preparation and hard work of its faculty and students, past and present, than is readily apparent.

The ARRA wins mentioned above provide several cases in point. Our successes in landing major energy initiatives owe much to the strength of UD research centers in areas like catalysis, photovoltaics, and advanced materials spanning nearly 40 years!

Our new environmental programs, including the Delaware Environmental Institute (DENIN), are built on research and education activities that engage every college of the University and reflect the leadership of UD faculty in helping to set the national agenda, as well.

The dramatic growth of life sciences research at UD over the past decade has been catalyzed by the Delaware Biotechnology Institute, founded in 1999. And the faculty team that won the large NMR grant from NSF received a Strategic Initiatives grant from the University of Delaware Research Foundation just last year to foster their collaborative efforts.

That's the real narrative of UD rising in research — working together with dedication, foresight, and creativity toward larger shared goals. You will see that same theme permeating the myriad of activities in health science highlighted in the pages ahead.

The Delaware Health Sciences Alliance is elevated by the complementary strengths of its partners, but also by the years of experience working together that we continue to build upon every day. Its focus on translation and application of research from the lab to the patient is also an excellent reminder of why all of us engaged in creative endeavors do what we do — for the advancement of the human condition.

It's easy to be dazzled by the potential of new science and technology, but to nurture the richness of the human spirit, to understand communities from the local to the global, and to unleash the human imagination, it takes much more. It takes advances in the arts, humanities, and social sciences, and in entrepreneurship, service and partnerships, as well. In short, it takes a University!

Igniting innovation

Stimulus sparks over 60 new research projects at UD

The sparks of innovation are flying at the University of Delaware, where, as of March 2010, researchers have been awarded over $58 million in federal stimulus funds for more than 60 leading-edge science, engineering, and technology projects with the potential to create new ideas and new jobs.

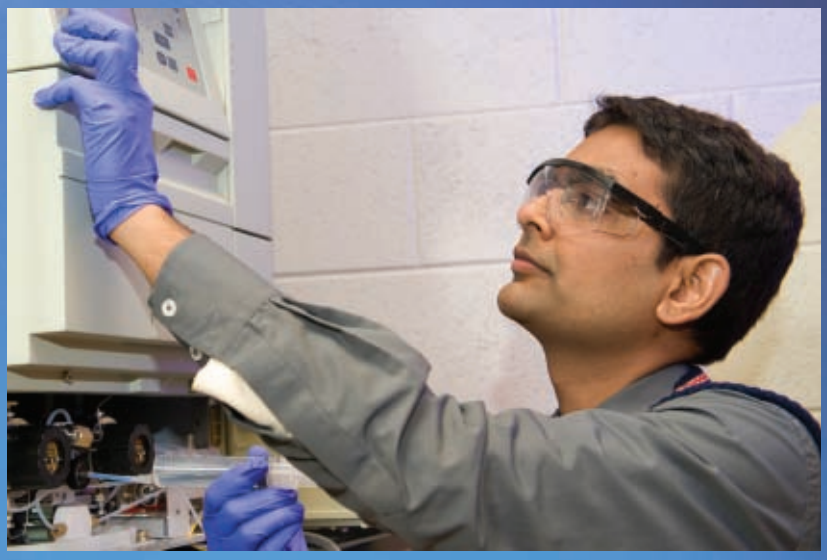
The University has received the funds through competitive grants awarded by federal agencies as part of the American Recovery and Reinvestment Act (ARRA), which was signed into law in February 2009.

"This funding is advancing University of Delaware initiatives in energy, health science, and the environment that are critical to Delaware and to the nation," says Mark Barteau, senior vice provost for research and strategic initiatives. "The innovation in our laboratories will help drive the economy of the future, while also preparing the graduate and undergraduate students who will become our next generation of scientists, engineers, healthcare professionals, and teachers."

According to a preliminary economic analysis by the Center for Applied Business and Economic Research in UD's Alfred Lerner College of Business and Economics, the University's $58 million in research projects will produce a direct stimulus effect on Delaware's economy of close to double that amount ($98 million), and an even larger effect on the U.S. economy of nearly triple that amount ($167 million). On the job front, UD's projects are expected to stimulate the employment of more than 1,300 people nationwide in 2010.

Selected federal stimulus-funded projects are highlighted here. For UD's complete list of ARRA awards, visit this Web site:

www.udel.edu/recovery



Doctoral student Vinit Choudhary works in UD's new Catalysis Center for Energy Innovation, an Energy Frontier Research Center funded by the U.S. Department of Energy.

Pioneers on the Energy Frontier

UD's single largest stimulus award — $17.5 million from the U.S. Department of Energy — is for an Energy Frontier Research Center. The focus of UD's center, the Catalysis Center for Energy Innovation (CCEI), is to develop new technologies for converting grasses and trees into electricity and fuels.

"Switch grass and aspen trees are potential initial biomass targets, but we do a lot of work with model compounds to learn how to run the chemistry and develop suitable catalytic materials," says the center's director, Dion Vlachos, Elizabeth Inez Kelley Professor of Chemical Engineering.

The CCEI is a collaboration involving researchers at UD and nine other institutions, including Brookhaven National Laboratory, the California Institute of Technology, the U.S. Department of Energy's Office of Basic Energy Sciences, Lehigh University, University of Massachusetts, University of Minnesota, North Carolina State University, University of Pennsylvania, and University of Southern California.

Currently, 55 people work at the center; half are at UD. Stimulus funding has enabled the hiring of new full-time staff, postdoctoral researchers, graduate students, and undergrads, as well as supported the creation of infrastructure necessary to grow the center both administratively and technically.

Workforce training for future biorefineries is a key goal. Eight UD graduate students are working on CCEI projects, with more to come. This summer, an annual fellowship program will begin, engaging undergraduates in energy engineering projects.

"With the ability to work with new, cutting-edge equipment, collaborate between institutions, and create new job opportunities, our new Catalysis Center for Energy Innovation is poised to make an impact on the future of energy sustainability," Vlachos says.

Igniting innovation

Stimulus sparks over 60 new research projects at UD

Shedding light on a muddy mystery

Each year, more than a million tons of sediment washes into the Delaware River estuary, which winds 134 miles from Trenton, N.J., to the mouth of Delaware Bay. Where does all the mud go, and what's it matter?

Some of it settles to the river bottom, where it adds stability and helps deter erosion. Some is deposited in neighboring marshes, where it helps maintain the marshes above sea level and provides nutrients that allow plants and animals to survive there, says oceanographer Christopher Sommerfield of UD's College of Earth, Ocean, and Environment.

"In an estuary, when you change the flow of water and sediment in any way, it feeds back into the condition of seafloor, shoreline, and estuarine fringe environments. This has major implications for the living ecosystem," Sommerfield says.

The Delaware Estuary sustains diverse wildlife populations, ranging from the world's largest concentration of horseshoe crabs, to over a hundred species of finfish.The waterway also is the home of the world's largest freshwater port and some of the biggest oil refineries on the East Coast. Recently, the U.S. Army Corps of Engineers began a controversial project to deepen the shipping channel from its current depth of 40 feet to 45 feet.

In research funded by $1.1 million in stimulus grants from the National Science Foundation, Sommerfield and colleague Robert Chant from Rutgers University are working to shed light on the process of sediment transport in the Delaware Estuary and on the system's efficiency in trapping sediment as a function of river discharge, tides, circulation, and wind.

Previously, the researchers developed a "sediment budget" that accounts for sediment that is added to and removed from the estuary. Now they are trying to understand how different processes affect the timing and movement of sediment from sources in the watershed to resting places on the seafloor and tidal marshes.

Christopher Sommerfield is uncovering the mystery of sediment transport in the Delaware Estuary.

From UD's 146-foot research vessel, *Hugh R. Sharp,* the scientists will monitor the estuary's turbidity, salinity, currents, and temperature, as well as the naturally occurring radionuclides Beryllium-7 and Lead-210, which act as sediment tracers. Instrumented moorings also will be installed at sea to gather data for building predictive models of sediment transport.

Roberta Golinkoff (left) is working to find out what three-year-olds know about geometric shapes as a predictor of future mathematics achievement.

Does early knowledge of shapes predict future math success?

Roberta Golinkoff, H. Rodney Sharp Professor in the School of Education, wants to know what preschoolers understand about geometric shapes. There is a link between spatial skills and mathematical abilities for older children, but little research on what younger kids can do.

Golinkoff is exploring these questions in "Shape Up: Preschooler's Knowledge of Spatial Concepts and Future Mathematics Achievement," funded by a $904,828 stimulus grant from the National Institutes of Health.

"Math has a large spatial component. Children who have more knowledge about geometric forms may well have better mathematical abilities than those who don't," Golinkoff says. "We will examine what children know about shapes at three years of age and how this predicts their spatial and mathematical knowledge a year later."

The two-year study will involve about 150 preschool children. They will be asked to point to geometric shapes by name and manipulate them to create structures. A machine called an "eye tracker" will document how children inspect shapes and whether they look first to the center or immediately to the vertices of a shape to draw a conclusion about what it is.

Golinkoff points out that the geometric concepts and materials used in her study are based on national standards of what children should know before entering kindergarten.

"This is important," she notes, "because numerous reports have argued that America is falling behind other countries in the STEM disciplines of science, technology, engineering, and math. To maintain our position in a global economy, we must understand what children know and how to build on their strengths in our instruction.

"But teaching in preschool classrooms about geometric forms can be done in an engaging and motivating way," she notes. "No one is talking about curricula that just make kids sit still and listen."

Golinkoff is passionate about these issues, having recently published *A Mandate for Playful Learning in Preschool* (Oxford), about how children learn best when material is presented in an engaging manner.

Karl Steiner and Cathy Wu (back row) are leading Delaware's effort in the North East Cyberinfrastructure Consortium. Douglas O'Neal (lower left) and Bruce Kingham also are playing key roles in the initiative.

Cyberinfrastructure grant boosts connectivity, collaborations

UD is part of a multi-state team that has been awarded more than $14 million in stimulus funding from the National Science Foundation and the National Institutes of Health to improve networking capabilities among the North East Cyberinfrastructure Consortium, which includes Delaware, Maine, New Hampshire, Rhode Island, and Vermont. Each state has key initiatives through NSF's Experimental Program to Stimulate Competitive Research (EPSCoR) and NIH's Institutional Development Award (IDeA).

Karl Steiner, professor of electrical and computer engineering, and Cathy Wu, the Edward G. Jefferson Chair of Bioinformatics and Computational Biology and professor of computer and information sciences, are leading Delaware's effort, which constitutes about $2 million of the award.

Douglas O'Neal, manager of the Bioinformatics Center at the Delaware Biotechnology Institute (DBI), which serves as one of the two data centers, also will be involved in the effort, along with Bruce Kingham, associate scientist and director of UD's Sequencing and Genotyping Center.

According to Steiner, who is also the senior associate provost for research development at UD, the goals of the project are to improve regional Internet connectivity to national high-speed networks, facilitate biomedical research collaborations, provide training and education for scientists and educators, strengthen inter-institutional partnerships, and enable access to distributed research resources.

Reaching out to older adults with cancer

A team that includes two researchers from UD's School of Nursing — Paula Klemm, professor of nursing, and Veronica Rempusheski, the Jeanne K. Buxbaum Chair of Nursing Science — has been awarded a two-year, $600,000 stimulus grant to conduct research aimed at supporting older adults affected by cancer and their caregivers in Delaware.

The other team members are the Cancer Care Connection (CCC), an agency with a nationwide database of cancer resources, and the Christiana Care Center for Outcomes Research (CCOR).

Awarded as a supplement to UD's ongoing National Institutes of Health IDeA Networks of Biomedical Research Excellence (INBRE) grant, the new funding will support the development of an outreach program to inform the community about resources available to those with cancer, specifically older adults. The goal is to create a model for outreach to older adults in communities all over the United States. Ultimately, access to services through organizations like the CCC may reduce health-care costs.

"Delaware is currently facing the highest population of elderly we've ever had," says Rempusheski. "By the year 2030, 30 percent of our population will be age 60 or older, and one-third of those will be 75 or older, with the 85-plus age group the fastest growing population."

"We will be conducting face-to-face outreach at 68 sites in Delaware to speak directly to the elderly and their caregivers to let them know about the services Cancer Care Connection provides," says Klemm.

The Delaware INBRE grant is a five-year, $17.4 million project, funded by the NIH National Center for Research Resources, to build biomedical research capability in Delaware. It is led by David Weir, director of UD's Office of Economic Innovation and Partnerships.

The Return on Investment

In addition to new discoveries, students educated, and public served, what economic return are taxpayers likely to see from the federal stimulus investment in UD research?

- **Nearly DOUBLE in Delaware**
  UD's $58 million in ARRA funds is expected to produce a **$98 million** stimulus effect on Delaware's economy.
- **Nearly TRIPLE nationally**
  UD's $58 million in ARRA funds is expected to produce a **$167 million** stimulus effect on the U.S. economy.
- **JOB CREATION:**
  Employment for over 1,300 people in 2010.

Source: Preliminary Economic Analysis, UD Center for Applied Business & Economic Research, March 7, 2010.

Magnet research could attract new industry in U.S.

Developing the next generation of high-performance magnets for increasing the energy efficiency of electronics to autos, and for developing hybrid/electric vehicles to wind turbines, is the focus of UD's $4.4 million Advanced Research Projects Agency-Energy (ARPA-E) stimulus grant from the U.S. Department of Energy. The project is one of 37 selected nationwide out of 3,700 proposals.

George Hadjipanayis, the Richard B. Murray Professor of Physics and chairperson of the Department of Physics and Astronomy, is leading the effort, which involves a team of chemists, material scientists, physicists, and engineers from UD (including Profs. Siu-Tat Chui and Karl Unruh), the University of Nebraska, Northeastern University, and Virginia Commonwealth University; the U.S. Department of Energy's Ames Laboratory at Iowa State University; and the Electron Energy Corporation in Landisville, Pa.

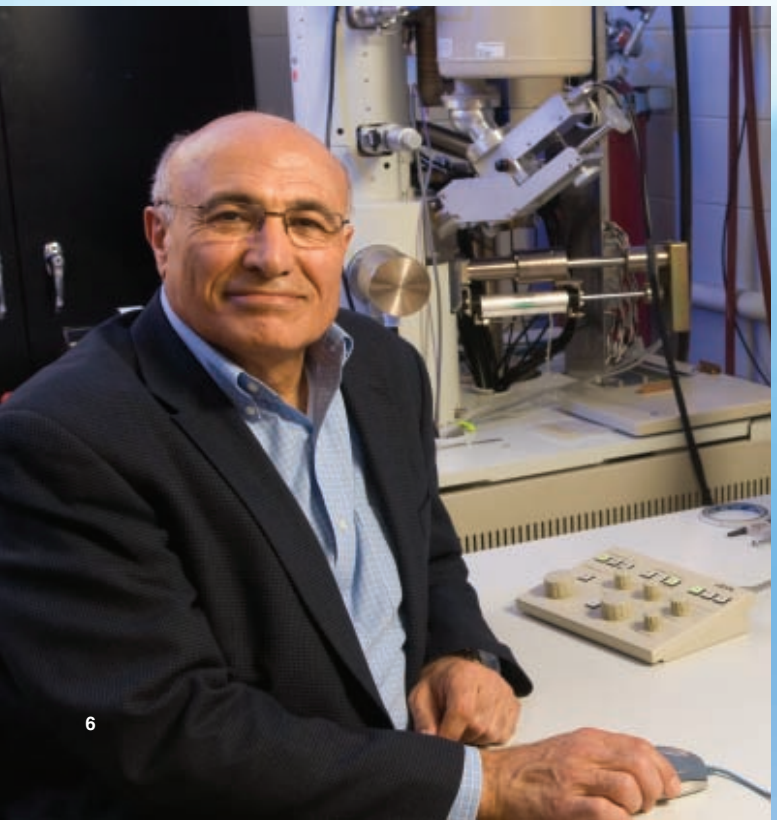
The strongest permanent magnets today are made from an alloy of three elements: neodymium (Nd), iron (Fe), and boron (B). Hadjipanayis was one of the three researchers who discovered the Nd-Fe-B magnets in the early 1980s. He and his team are working to identify materials that will result in magnets twice as strong as those currently in existence.

"This is the first time that such a large concerted effort will be undertaken in the U.S. on the development of high-energy magnets that involves the best expertise available in our country on this type of materials," Hadjipanayis says.

An article in the Sept. 11, 2009, edition of the journal *Science* reported that the demand for Nd-Fe-B magnets is growing at about 15 percent per year, for use in products ranging from magnetic resonance imaging machines, to cell phones, headphones, and even prototype magnetic refrigerators. Yet neodymium (Nd), a rare earth metal, is growing increasingly scarce.

"We hope our efforts will provide the fundamental innovations and breakthroughs which could have a major impact in re-establishing the United States as a leader in the science, technology, and commercialization of this very important class of materials," Hadjipanayis says.

George Hadjipanayis is leading research to develop stronger magnets for use in electric cars, wind turbines, and many other applications.



From left, researchers Louis Kaplan and Anthony Aufdenkampe from Stroud Water Research Center and Kyungsoo Yoo and graduate student Chunmei Chen from UD analyze the water quality of White Clay Creek.

New Critical Zone Observatory focuses on climate change

The University of Delaware, in collaboration with Stroud Water Research Center in Avondale, Pa., has established the Christina River Basin as a Critical Zone Observatory for researching climate change questions. One of only six in the United States, the observatory is funded by a five-year, $4.3 million stimulus grant from the National Science Foundation.

Donald Sparks, S. Hallock du Pont Chair in Soil and Environmental Chemistry and director of UD's Delaware Environmental Institute (DENIN), is leading the multidisciplinary effort. His co-investigators include Kyungsoo Yoo, assistant professor of plant and soil sciences, and James Pizzuto, professor of geological sciences, both at UD; and researchers Anthony Aufdenkampe and Louis Kaplan at Stroud Water Research Center.

Scientists define the "critical zone" as the planet's life-sustaining region, spanning the treetops to the groundwater. Using the 565-square-mile Christina River Basin as their laboratory, the research team is working to determine how, and how rapidly, soil erosion and sediment transport through rivers impact the exchange of carbon between the land and the atmosphere, and affect climate.

"Over the centuries, we humans have been a major geological force, re-contouring entire landscapes through our activities," Sparks notes. "Our new Critical Zone Observatory will work to quantify the impact of these activities on carbon and climate."

The Christina River Basin includes five counties and 60 municipalities in Delaware, Pennsylvania, and Maryland, and encompasses Brandywine Creek, White Clay Creek, Red Clay Creek, and the Christina River and their watersheds. It is an ideal natural laboratory for the research because of its diversity, from more pristine areas, to second-growth forests and agricultural fields, to suburban and highly industrialized and urbanized areas.

Outreach to policy makers and the public is a critical part of the center's mission. Cyberinfrastructure advances that seamlessly merge real-time data with graphics will further establish the Critical Zone Observatory as a community resource for scientific data and public information.

Articles contributed by Elizabeth Boyle, Tracey Bryant, Laura Crozier, Cassandra Kramer, and Diane Kukich.

Smentek wins nation's top dissertation honor

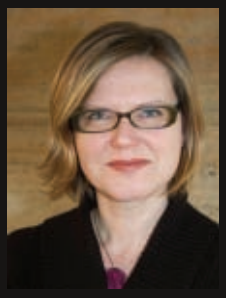
One of 18th-century Europe's foremost art connoisseurs cut apart and reassembled the drawings he acquired. That's just one of the fascinating findings made by Kristel Smentek as she explored the life of Pierre-Jean Mariette (1694–1774), a major figure in the Paris art world, for her doctoral dissertation in art history at UD.

In December 2009 in San Francisco, Smentek received the Council of Graduate Schools/ UMI Distinguished Dissertation Award in the Humanities and Fine Arts, generally acknowledged to be the nation's most prestigious honor for doctoral dissertations.

"I was thrilled to receive the award. It is a great honor and also a reflection of the strength of the University of Delaware and its art history department," Smentek says.

A native of Edmonton, Alberta, Smentek chose to study Mariette because of his importance as a collector, dealer, and publisher of prints and books, including some of the 18th century's most important art books. She is now working on turning her dissertation, "Art, Commerce and Scholarship in the Age of Enlightenment: Pierre-Jean Mariette and the Making of Art History," into a book.

"Mariette was instrumental in shaping how the European elite thought about art and its history," she notes. "His activities as a collector, connoisseur, and scholar of art offered an ideal lens through which to examine the specific institutional, social, and economic conditions in which art history's distinctive forms of analysis took shape."



Kristel Smentek

"It is a great honor and also a reflection of the strength of the University of Delaware and its art history department."

She explains that in 18th-century connoisseurship, drawings were deemed a purer index of an artist's characteristic style than paintings. Thus, any serious taxonomic or historical work on art depended on the study of drawings, and Mariette examined them thoroughly.

"Paradoxical as it may seem to us now, Mariette's careful presentation of his drawings and his interventions — sometimes even splitting single recto-verso sheets [sheets with a drawing on each side] — were necessitated by the desire to conserve drawings for the future, to ensure optimal viewing conditions for them, and to thereby secure them for scholarly work," she notes.

Mariette and his father compiled several "ready-made" print collections for clients all over the continent. Their commission for Prince Eugene of Savoy in Vienna comprised over 300 albums of prints, covering the history of printmaking since its inception to the 18th century, Smentek says.

"As Kristel's master's degree and doctoral adviser, I am extremely proud and not at all surprised about her award," says Nina Athanassoglou-Kallmyer, professor and chairperson of the UD Department of Art History. "From a gifted student, Kristel has now moved to become one of the most promising younger colleagues in our profession."

After receiving her Ph.D. from UD in 2008, Smentek began a tenure-track position as an assistant professor of art history in the Department of Architecture at the Massachusetts Institute of Technology, where she now teaches art history to undergraduates, as well as graduate seminars on ornament, collecting, and the links between Asian and European cultures.

— Sue Moncure and Tracey Bryant

Faculty Honored by the President

Patricia DeLeon

Recipient of the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring

Patricia DeLeon, Trustees Distinguished Professor of Biological Sciences and a member of the University of Delaware Board of Trustees, was honored by President Barack Obama for excellence in science, math, and engineering mentoring during a ceremony at the White House on Jan. 6, 2010.

DeLeon was one of only nine educators selected in 2007 for the prestigious Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. The group was joined at the White House by 13 educators who were selected for the award in 2008. All of the award winners were selected by a panel of leading scientists, mathematicians, and educators after an initial selection process at the state level.

"Whether it's improving our health or harnessing clean energy, protecting our security or succeeding in the global economy, our future depends on reaffirming America's role as the world's engine of scientific discovery and technological innovation," President Obama told the award winners. "And that leadership tomorrow depends on how we educate our students today, especially in math, science, technology, and engineering."

Patricia DeLeon, Trustees Distinguished Professor of Biological Sciences

In addition to an expense-paid trip to Washington, D.C., for the awards ceremony, the award included $10,000 from the National Science Foundation (NSF) and several days of educational and celebratory events, including visits with members of Congress and science agency leaders.

"The events were intellectually stimulating and engaging, and I was fascinated by the individual stories that awardees shared about their mentoring experiences," DeLeon said. "The plenary speakers on Science, Technology, Engineering and Mathematics (STEM) education were dynamic and inspiring. We also had the opportunity to meet with the Secretary of Education Arne Duncan and the members of the President's Council of Advisers on Science and Technology (PCAST) for discussions about the future of science education in the U.S."

DeLeon said the award has underlined the fact that advances in scientific discoveries and technological innovations are buttressed by a foundation of mentoring, an intergenerational transfer process.

"I have changed the yardstick that I use to measure my progress — it now involves more of the process rather than the magnitude of the product," she said. "I came back feeling gratified, exhilarated and inspired. I wish for another 25 years

Patricia DeLeon, Trustees Distinguished Professor of Biological Sciences at UD, is seated second from the right in this photograph taken with President Obama at the White House. Official White House Photo by Samantha Appleton

in which I will continue mentoring, which I consider a powerful natural human relationship with a lasting legacy."

More than 100 trainees, including undergraduates, graduate students, postdoctoral fellows, and visiting scientists from around the world, have been mentored by DeLeon. A large majority of her undergraduate mentees are women, and about one-third are minorities. She also has mentored young faculty in the early stages of their careers.

DeLeon received her doctorate from the University of Western Ontario and did postdoctoral studies at McGill University in Montreal. She has been a visiting scientist at Johns Hopkins University School of Medicine and the University of Pennsylvania School of Medicine, and was an adjunct professor at Penn State University College of Medicine.

She has three patents issued or pending, and her research has been supported by both the National Science Foundation and the National Institutes of Health. She has received many honors and awards, including the NSF Career Advancement Award and the Medical Research Council of Canada Post-doctoral Fellowship.

DeLeon also has served as chairperson of Women in Science and Engineering (WISE) and on the President's Commission on the Status of Women at UD.

A 1992 gubernatorial appointee to the UD Board of Trustees, DeLeon was re-appointed in 2005. She is a member of the Academic Affairs Trustee Committee. — *Martin Mbugua*

Thomas H. Epps, III

Recipient of the Presidential Early Career Award for Scientists and Engineers

Thomas H. Epps, III, assistant professor in the Department of Chemical Engineering at the University of Delaware, was part of an elite group of young scientists and engineers honored by President Barack Obama at the White House on Jan. 13, 2010.

President Obama joins recipients of the Presidential Early Career Awards for Scientists and Engineers (PECASE) for a group photo in the East Room of the White House, Jan. 13, 2010. Official White House Photo by Lawrence Jackson

Epps and 99 others from across the nation received the Presidential Early Career Award for Scientists and Engineers (PECASE), the highest award bestowed by the U.S. government upon scientists and engineers in the early stages of their research careers.

Ken Shipp/DOE

Thomas H. Epps, III, Assistant Professor of Chemical Engineering

"The ceremony and related PECASE events were an exciting moment for me and my family," Epps says. "The opportunity to meet President Obama, tour the White House, interact with other PECASE winners, and meet with officials instrumental in shaping the research direction of the nation was an extremely rewarding experience."

In a letter delivered to the winners during the ceremony, Obama wrote, "You have been selected for this honor not only because of your innovative research, but also for your demonstrated commitment to community service and public outreach. Your achievements as scientists, engineers, and engaged citizens are exemplary, and the value of your work is amplified by the inspiration you provide to others."

Established by President Bill Clinton in 1996, PECASE is coordinated by the Office of Science and Technology Policy within the Executive Office of the President. Awardees are selected on the basis of two criteria: pursuit of innovative research at the frontiers of science and technology, and a commitment to community service as demonstrated through scientific leadership, public education, or community outreach.

Winning scientists and engineers receive up to a five-year research grant to further their study in support of critical government missions. Epps will receive his grant from the Department of Defense, one of nine federal departments and agencies that join to nominate the young researchers for the awards. His research targets materials design and fabrication to create conducting membranes for current and next-generation energy generation and storage devices, such as batteries, fuel cells, and solar cells.

Epps earned bachelor's and master's degrees at the Massachusetts Institute of Technology and a doctorate at the University of Minnesota. He joined the UD faculty in 2007 after completing a National Research Council postdoctoral fellowship in the Polymers Division at the National Institute of Standards and Technology in Gaithersburg, Md.

Epps has won a number of awards, including the National Science Foundation Faculty Early Career Development Award, an Air Force Young Investigator grant, and the Lloyd Ferguson Young Scientist Award from the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers. He is also co-director of an NSF Research Experiences for Undergraduates (REU) program at UD focused on energy and sustainability. — *Diane Kukich*

Building a bright future

The University of Delaware has purchased the former Chrysler Assembly Plant in Newark, Del., for a future campus focusing on advanced science and technology research.

The star, the emblem that workers once installed on new DeSotos to new Durangos at the Chrysler Assembly Plant in Newark, Del., has taken on a bright new light, with the University of Delaware's recent purchase of the auto plant for an advanced science and technology research campus.

The 272-acre site — the largest single property acquisition in the University's history, with a purchase price of $24.25 million — will further efforts to meet the institution's goals as stated in the Path to Prominence™ strategic plan, according to UD President Patrick Harker.

"It's a game-changer for the University of Delaware," said Harker at the semiannual meeting of the University's Board of Trustees on Dec. 8, 2009, held at the former auto assembly plant. "These 272 acres will house several critical partnerships."

At the top of the list, Harker said, is the Delaware Health Sciences Alliance, formed in 2009, and involving UD, Thomas Jefferson University, Christiana Care Health System, and Nemours.

"The alliance will strengthen state and regional capacity in biomedical research, technology, and personnel, and improve health-care delivery, especially in Delaware's rural areas," Harker said. "It will promote Delaware as a health sciences hub, creating health professional jobs and business opportunities, especially in life sciences research and biotechnology. It's absolutely critical to the region's economic development."

A priority for the site, he noted, will be establishing the Thomas Jefferson University Clinical Campus, which will help expand UD's joint degree programs with Jefferson, support new career pathways for medical professionals, and provide a continuous pipeline of health personnel serving Delaware. The clinical campus also would encourage entrepreneurs to create and grow start-up companies that will provide jobs while furthering UD's reputation as a leading research university, Harker said.

"This property awaits big collaborations, not just in the biosciences, but in energy and environmental research, interdisciplinary engineering, and information and communications technologies," Harker noted.

In addition to major health science initiatives, the likely candidates for early inclusion at the site are UD's emerging research partnerships with the Army, as well as several UD research centers and institutes, according to a preliminary analysis by the University.

The proximity of the site will allow University faculty to meet their teaching and basic research responsibilities while simultaneously putting their intellectual property to use for the benefit of Delawareans and the University. Expanding such activities, supported by UD's Office of Economic Innovation and Partnerships (OEIP), will stimulate the state's economy through employee recruitment. Similarly, participation in faculty research and the creation of businesses will promote entrepreneurial undergraduate and graduate student experiences with additional economic potential.

Additional benefits of the acquisition include enhancing public transportation in and around Newark through transit-oriented development, especially given the location of the Amtrak train station adjacent to the property.

Harker said the University plans to work with DelDOT, the city of Newark, the congressional delegation, and others to craft solutions to current parking and

train transportation issues in order to make the new site a pleasant, convenient commuter location.

"Right here and very soon, there will be thousands of creative minds working together, and there is nothing that can match that power," Harker said. "This land is an investment in our people, and in a culture, a culture of creativity, collaboration, and risk, of innovation, entrepreneurship, and excellence."

Harker noted that as the flagship Land Grant university of the state, UD has an obligation to use its considerable strengths and resources to benefit the entire Delaware community.

"We have an obligation to tightly link our academic and extension programs to the community's prevailing needs. We have an obligation to apply our research and to forge the partnerships that will secure its value. Great Universities build — actively build — great communities," Harker said.

"This is an exciting time for the University of Delaware," he added. "We truly are on the cusp of something great." — *Jerry Rhodes*

UD, Army sign research and development agreement

The University of Delaware and the U.S. Army Research, Development and Engineering Command (RDECOM) signed a Cooperative Research and Development Agreement (CRADA) on Jan. 26, 2010, creating a powerful research partnership between UD's Category 1 research capabilities and Aberdeen Proving Ground (APG) in Maryland.

A CRADA is a written agreement between a private entity and a government agency to work together on a project through their laboratories, personnel, facilities, equipment, or other resources to conduct specific research or development efforts that are consistent with the agency's mission.

The CRADA was signed by UD President Patrick Harker and Maj. Gen. Nickolas Justice, commanding general of RDECOM and installation commander of APG, during a ceremony at the University's Newark campus.

Additionally, a Cooperative Statement of Work to be carried out under the new CRADA was signed. The work will focus on antenna technology and composite materials and will involve the Army's Communications-Electronics Research, Development, and Engineering Center (CERDEC), the Army Research Laboratory (ARL), and UD's Center for Composite Materials, which in 1996 was named one of just three Army Research Laboratory Materials Centers of Excellence in the nation. Jack Gillespie, the Donald C. Phillips Professor of Civil and Environmental Engineering, is the center's director.

"It's hard to imagine a partnership with more promise than the one we're establishing with Aberdeen Proving Ground — one whose benefits could affect more people or affect them more critically," Harker said.

UD President Patrick Harker and Maj. Gen. Nickolas Justice, commanding general of the U.S. Army Research, Development and Engineering Command (RDECOM) and installation commander of Aberdeen Proving Ground in Maryland sign a Cooperative Research and Development agreement.

"Strategic collaboration between our two organizations makes sense: Our core research strengths align well, and we have a long and successful history working with one another. Of course, physical proximity also makes this partnership a good fit: UD is the closest Category 1 research university to APG," Harker said.

Justice thanked Harker for his "aggressive leadership" in making the partnership happen. "We know you're dead serious," he said, "because you've showed it by your actions, and in the Army we know that actions speak louder than words."

Justice also lauded the University for its excellence in engineering. "We're hiring engineers with all skill sets," he said, "and many of your strengths align closely with our needs. Your mindset — the way you think as engineers — is what we're looking for.

"The most powerful asset this nation has," Justice added, "is not its technology but the people who find new ways of moving our nation forward. We look forward to the opportunity to take your students and help them put their education to purpose — to bring them the applications that will make their entire education come to life."

Harker said the formalized partnership with APG will be an important influence on the transformation of the former Chrysler site, now owned by UD, into a major center of innovative science, technology, and engineering, and a dynamic incubator of new businesses.

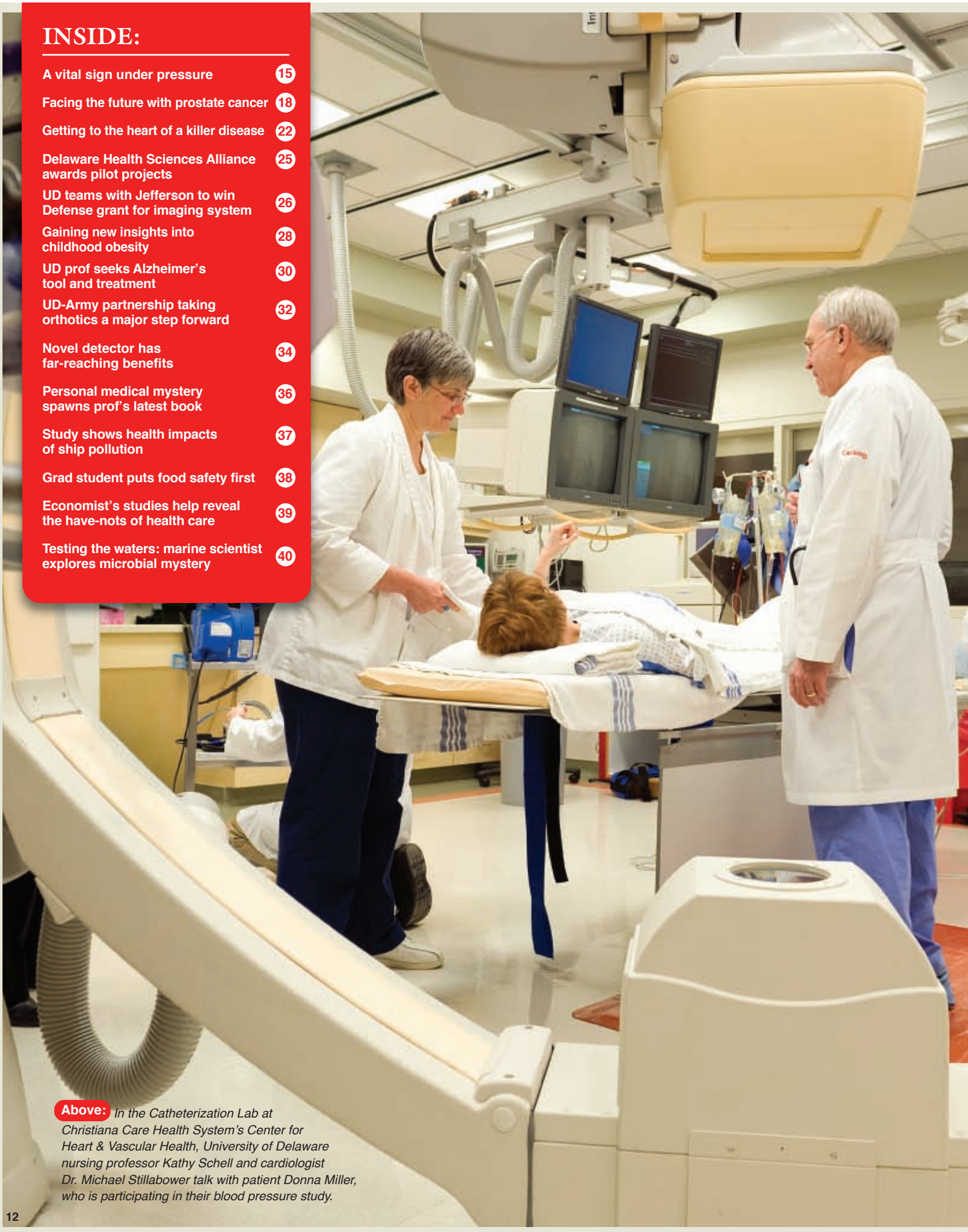
Last year, Delaware Congressman Michael Castle announced that the Base Relocation and Closure program would create 8,000 jobs at APG, with many of those moving from Fort Monmouth, N.J. An additional 16,000 jobs could be created outside to serve the needs of the expanded APG, which will house the Army's Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) complex.

"These jobs are highly scientific," Castle said at the ceremony, "and the University will prove to be very important in this partnership in terms of not only providing graduates to be employed by the Army, but also serving employees who will take advantage of the opportunity to continue their education. This whole geographic area will benefit from the economic surge we're going to see at Aberdeen."

David Weir, director of UD's Office of Economic Innovation and Partnerships (OEIP), said the University has been discussing a variety of partnership opportunities with the Army commands at APG, including recruitment of UD graduates, internships for UD undergraduate students, graduate education, and expanded research collaborations.

— Martin Mbugua and Diane Kukich

INSIDE:



Above: *In the Catheterization Lab at Christiana Care Health System's Center for Heart & Vascular Health, University of Delaware nursing professor Kathy Schell and cardiologist Dr. Michael Stillabower talk with patient Donna Miller, who is participating in their blood pressure study.*

Putting Science into Practice

The health discoveries being made by research powerhouses such as the University of Delaware are more critical than ever, as our nation grapples with health-care reform, an aging Baby Boomer population, and a younger generation that, for the first time in history, may not outlive its parents.

As the wake-up calls to improve our health sweep across the country, the stars are aligning at the University of Delaware to expand health sciences research through dynamic new partnerships and facilities, talented faculty and students, and the leadership and vision to keep moving forward.

UD President Patrick Harker recently appointed Kathleen Matt, dean of the College of Health Sciences, to lead key health initiatives, including the Delaware Health Sciences Alliance (DHSA) — a coalition of Christiana Care Health System, Nemours, Thomas Jefferson University, and UD focused on improving health and health services for all Delawareans.

In the pages ahead, we invite you to meet Dean Matt, named one of "10 Women to Watch in 2010" by *Signature Brandywine* magazine, and learn about the exciting research at UD, and with our partners, across the health sciences spectrum.

For Kathy Matt, dean of the College of Health Sciences at the University of Delaware, it is perhaps no coincidence that UD's newest and largest property acquisition, the former Chrysler Assembly Plant in Newark, Del., will become the future home of the college she is leading and the location of a large health sciences campus.

After all, Matt grew up on Chrysler Avenue in Newark, with a view of the former auto plant, and her strong ties to Delaware only fuel her passion for expanding existing health sciences programs and launching new ones.

"All of this will create better jobs and better health care for the community," she says, "while enabling UD to tap into more research funding from the National Institutes of Health and other agencies, so that we can shorten the pipeline between discovery and delivery."

"We're a university," she adds, "and our main mission is to develop new knowledge. But I think we're obligated not only to contribute to knowledge development, but also to hand-carry it to the medical community."

Kathleen Matt, Ph.D.
Dean, *UD College of Health Sciences*
Executive Director, *Delaware Health Sciences Alliance*

A graduate of UD with bachelor's and master's degrees in biology, Matt holds a Ph.D. in endocrine physiology from the University of Washington. Before joining the UD faculty, she was associate vice president for clinical partnerships and research infrastructure at Arizona State University. She also served as director of clinical partnerships at ASU and at the Mayo Clinic Arizona.

"Hers is exactly the kind of leadership we need at UD, as we expand our health education partnership with Thomas Jefferson University and embark on the expansive and exciting Delaware Health Sciences Alliance with Jefferson Medical College, Christiana Care, and Nemours," said UD President Patrick Harker at the semiannual meeting of the Board of Trustees in December 2009, at the former Chrysler site.

"Those partnerships will be key anchors of this property," Harker continued. "Through them, we will educate future generations of health-care professionals, grow the region's health sciences research and more quickly translate that research into clinical practice, and improve health care delivery throughout Delaware."

The new property is a critical element in Matt's vision.

"One of my major goals for the college," she says, "is to create an environment for synergy, collaboration, and innovation — an outcome that occurs when the various disciplines are located in the same space. In the new buildings, we will form innovative

Continued on page 14

(Continued from page 13)

interdisciplinary and translational research centers and institutes such as the Delaware Rehabilitation Institute and create clinical facilities including an expanded physical therapy clinic, a nurse-managed health-care center, and a clinical research center which will provide the base for strong research and teaching programs."

Building transformational research and educational programs, where doctors, nurses, pharmacists, physical therapists, medical technologists, nutritionists, exercise physiologists, and health behavior experts train and work together is key to Matt's plan, and a major goal of the Delaware Health Sciences Alliance (DHSA), which she now leads.

The DHSA partner institutions already have had over 100 successful projects in areas ranging from medical student and resident education, to cancer and cardiovascular research, nursing and allied health practitioner training, and research infrastructure development and industrial collaboration.

For example, Nemours is the Department of Pediatrics for Jefferson Medical College (JMC); Christiana Care Health System teaches over 100 JMC medical students in clinical rotations each year; through the Delaware Institute for Medical Education and Research and the UD Medical Scholars program, Delaware residents have preferred admission to JMC. Additionally, doctoral students in the new School of Pharmacy at Thomas Jefferson University (TJU) will now spend the first three years of their six-year program at UD; and working together, the institutions have secured over $100 million in research and education infrastructure funds from the National Institutes of Health for Delaware since 2000.

Matt wants to see many more collaborations in cancer, cardiovascular health, neurosciences, rehabilitation sciences, bioinformatics, and outcomes and community research. Several pilot DHSA research grants have been awarded, and more are coming.

"The bright future of health care depends on the education of an innovative set of new health-care professionals," Matt says, "as well as on the further development of evidence-based medicine, which relies on a strong research foundation. We have the opportunity to create that here in Delaware."

Matt also sees real advantages in future health-care professionals being educated at UD, where students in non-medical disciplines can become involved in unique ways. Theatre students at UD have role-played as patients in nursing scenarios, and Matt envisions ways that students in music, art, and writing could participate, from helping hospice patients with journal writing to composing works of art.

"Delaware is a microcosm of the nation," she notes, "and its size lends itself towards everyone working together to get things done. There is an enormous opportunity here for Delaware to have a big presence in the medical community by building a strong platform in interdisciplinary science that can be translated into health practices, therapies, and interventions, resulting in improvements in people's lives — ***now***."

— *Diane Kukich*

Delaware Health Sciences Alliance

CHRISTIANA CARE HEALTH SYSTEM

Nemours

Jefferson

UNIVERSITY OF DELAWARE

A vital sign under pressure

Studies focus on improving accuracy of blood pressure readings

One day, during a clinical teaching session with UD undergrads in a medical surgical unit, Kathy Schell saw a nurse's aide take a patient's blood pressure on the forearm instead of the standard location on the upper arm.

"The nurse's aide changed the location because the patient had an IV in the upper arm," explains Schell, associate professor of nursing in UD's College of Health Sciences. "That really got me wondering about the differences in blood pressure at different locations in the body."

Schell is a member of a team of nurses from UD and Christiana Care Health System who decided to explore blood pressure as a research topic because it is both a common factor and a critical factor that crosses all nursing specialties, from maternity to cardiac care.

Schell has completed studies of blood pressure in pediatric intensive care patients and critically ill adults and now is leading a project to compare blood pressure at the forearm versus the upper arm. The effort includes William Rose, assistant professor of health, nutrition, and exercise sciences at UD; Dr. Michael Stillabower, a cardiologist with Cardiology Consultants; and Dr. James Hopkins, medical director of the Cardiac Catheterization Lab, and Angela DiSabatino, registered nurse and manager of cardiovascular clinical trials, both from the Christiana Care Health System's Center for Heart & Vascular Health in Newark, Del.

"What anatomically determines differences in blood pressure at different sites?" Schell asks. "That's a major question we want to answer. Automatic blood pressure

*See **Vital Sign**, continued on page* 16

In the Cardiac Catheterization Lab at Christiana Care Health System, UD professor William Rose (left) presses a wand-like tonometer against patient Donna Miller's forearm to take an ultrasound of the vessels below. Next to Rose is Kathy Schell, UD professor and leader of the blood pressure research project. At right, from the foreground to left, are registered nurse Catherine Wade, cardiologist Dr. Michael Stillabower, and registered nurse Krista Brazell. Both Wade and Brazell earned nursing degrees at the University of Delaware.

*(**Vital Sign**, continued from page 15)*

machines are pretty common now," she notes. "The standards are based on the blood pressure in the upper arm. But what if these machines are now being used on the lower arm, or perhaps on the ankle of a child who is sleeping so as not to waken him? Maybe there's a way to make a more accurate machine that, with the flip of a switch, accounts for those anatomical differences."

The study results will aid the development of more accurate blood pressure devices with new algorithms for alternative measurement sites such as the forearm.

Preliminary research by Schell and Christiana Care Health System nurses Beth Bradley and Denise Lyons indicated that the differences in blood pressure at various locations can be significant, varying by as much as 20 points or millimeters of mercury.

"But the key point is that these differences varied for the individual, and no blanket formula can be applied to determine differences," Schell says.

In Schell's current study, the researchers are doing comparative studies of upper arm and forearm blood pressures taken by machine and examining the internal anatomy at each location through ultrasound measurements taken on the surface. They also are comparing the readings at both locations against the "gold standard" for blood pressure — inside the body's largest artery, the aorta.

With the consent of patients in the Christiana Care Health System's Cardiac Catheterization Laboratory and the assistance of Drs. Stillabower and Hopkins and the Cath Lab staff, blood pressure readings are taken during catheterization. In this medical procedure, a small plastic tube is inserted in the femoral artery of the thigh and on up to the aorta to check blood flow and how well the heart is pumping.

For the patients participating in the study, it means their visit to the Cath Lab lasts a little longer. In addition to the blood pressure readings, a portable ultrasound of the blood vessels is made with a device called a tonometer, and body mass index (BMI) and skinfold measurements are made to determine fatty tissue content of the arm. Many times blood pressure is measured at the forearm because the cuff is too small for an obese person's upper arm, Schell notes.

"Women have smaller arteries than men. Do things like this play a role in their blood pressure?" Rose asks. "The ultrasound will help us 'see' through the skin to help make these assessments."

These data also will enhance the quantitative model of the human circulatory system that Rose is building with support from the University of Delaware Research Foundation (UDRF), showing arterial blood flow and force at various locations.

The ultimate goal for the data, Schell says, is to contribute to the development of new algorithms for blood pressure devices, to provide accurate measurements for locations in addition to the upper arm.

What's the "big deal" about accurate blood pressure?

Virtually every time you go to the doctor you have your blood pressure checked, and decisions about your health and medical care are based on it. Yet your blood pressure reading — one of the most important measurements in medicine — often is taken inaccurately, according to health experts.

What a blood pressure reading measures is the force of blood flowing through your arteries. "Normal" blood pressure is considered to be under "120 over 80," written as 120/80. The "120" reading is the systolic pressure, the force of the blood flowing through the arteries as the heart beats, while the "80" is the diastolic pressure, the force of the blood flow as the heart relaxes between beats. The measures are in millimeters of mercury.

"It's such a seemingly simple task to take this reading that it's often delegated to someone who is not a nurse, and yet that data is used by everybody," says Schell. "You're assuming that the reading is right. But what if it's not, and you give your patient a beta blocker medication based on it?" she asks.

Schell and her colleagues hope to have their study completed by the end of this year.

Past research by Schell and her nursing colleagues' has led to changes in clinical practice at Christiana Care Health System, where the blood pressure reading is now always taken on both arms upon hospital admission, after which it can be measured on either arm. The hospital units also stock more sizes of blood pressure cuffs, and if forearm blood pressures are used, the cuff site location is documented.

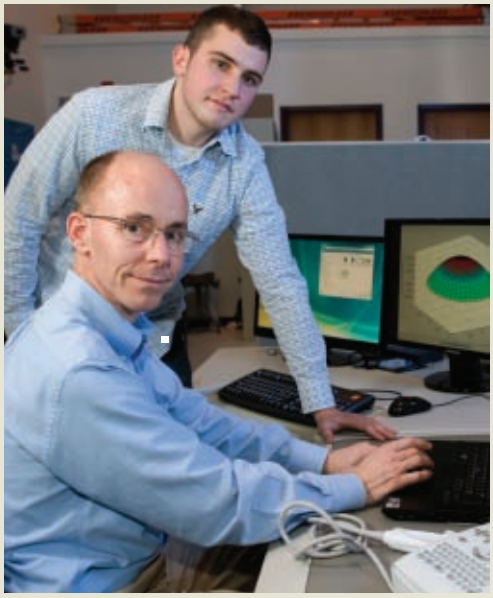
"Blood pressure is a big deal," says Schell, who worked as a cardiovascular and trauma critical care nurse for over 20 years prior to the start of her UD research and teaching career. "Accuracy is really important," she notes. "If we're using the wrong numbers, we could be overtreating and undertreating patients." — *Tracey Bryant*

Building a new model of human circulation: 24 million blood vessels and counting!

Every minute, the steady beating of your heart sends over a gallon of blood coursing through the blood vessels in your body, an amazing network of "tubing" that, if laid end to end, would stretch 100,000 miles!

Also amazing is the model of arterial blood pressure and flow that William Rose is building. It represents over 24 million blood vessels, extending from the largest artery — the aorta — to tiny branching capillaries.

Rose, assistant professor of health, nutrition, and exercise sciences in UD's College of Health Sciences, wants to develop the quantitative model into a non-invasive tool that physicians can use to rapidly assess blood vessel health and identify and manage disease. Properties such as artery stiffness, for example, can signal increased risks of heart attack and stroke.



Prof. William Rose (seated) and undergraduate student Justin Field work on arterial waveforms in UD's Human Performance Lab.

"When you measure blood pressure at different places, you get somewhat different answers," says Rose, who holds a Ph.D. in biomedical engineering from Johns Hopkins University and a bachelor's degree in physics from Harvard. "The reasons have to do with fluid mechanics, stiffness of the vessels, and other features. Based on these differences, can we predict the blood pressure at different places? That's what we want to find out."

Blood pressure measurements are based on the force of blood flowing through the arteries because blood in the arteries has a higher pressure than the blood in the veins. Blood pressure cuffs give just the peak and valley of blood pressure, with the higher systolic reading representing the force of blood when the heart is beating, and the lower diastolic number the force when the heart relaxes. Rose wants to know not only the peak and valley, but all the points in between — the entire shape through the pulse wave.

Rose has mapped the 46 largest blood vessels down the arms and legs. At the end of each blood vessel, he used fractal modeling to create the branching network of capillaries.

To validate the model, he and John Edwards, a recent master's graduate who is now in medical school, recorded blood pressures and flows in the body at numerous locations using a wand-like tonometer, which is pressed against the skin to measure an artery's pulsations.

Rose is garnering valuable data for validating his model, a University of Delaware Research Foundation (UDRF) project, thanks to a complementary project with UD nursing professor Kathy Schell and colleagues at Christiana Care Health System.

"Every time the heart pumps an oomph out, some blood reflects back," Rose says. He compares this wave movement to the snap of a jump rope tied to the back of a chair.

In a younger person, he says the reflected wave gets back after the heart has finished its injection. In an older person, the reflected wave gets back sooner because the vessels are more rigid. Thus, Rose wants to use the model to search for hardened arteries, as well as blockages, and to make predictions of a patient's vascular health over time.

"In a blood vessel, some plaques get large and tear off, causing clots to form and heart attacks to occur. If we could use our model to understand the mechanical properties, we could help cardiologists determine if a plaque requires surgery or if it can be left alone," Rose says. — *Tracey Bryant*

Robert Sikes, associate professor of biological sciences at UD, conducts research on advanced prostate cancer and also directs the Center for Translational Cancer Research.

Facing the future with prostate

Researchers take aim at the basic mechanisms of this deceptive disease

When Tyrone Dixon was diagnosed with prostate cancer, he says he ended up driving his car on I-95 from his doctor's office in Delaware to the Pennsylvania state line and back.

"I didn't know what to do," says Dixon, a native of Wilmington, Del., with over 20 years of experience in the telecommunications industry, doing early-stage construction.

Within a month after the diagnosis, Dixon had his prostate gland removed, a procedure called a radical prostatectomy. Now, a year later, he is preparing to undergo aggressive radiation to kill any remaining cancer cells.

Dixon, 51, is the youngest member of the Prostate Cancer Survivors Group. The support group met recently at UD with Robert Sikes, associate professor of biological sciences and director of the Center for Translational Cancer Research. This "center without walls" brings together researchers from the Helen F. Graham Cancer Center at the Christiana Care Health System, Nemours, and UD. The center's aim, Sikes says, is to create novel methods of treating cancer and then relay that research from "the bench to the bedside," where it can help patients. "Discovery to recovery" is the center's theme.

"The number of men affected by prostate cancer is staggering," Sikes says. "If you're an American man, you have a one in six chance of getting it over your lifetime. That translates into 21 new cases of prostate cancer diagnosed every hour of every day."

The prostate is a gland in the male reproductive system about the size of a walnut and located at the base of the bladder. It produces a fluid, which is part of semen, that both protects sperm and helps them move.

Prostate cancer is complicated, deceptive, a biological masquerader, offering few clues of its presence until it has reached an advanced state.

"That's why it's so important for men to be screened regularly for this disease so that it can be detected early on," Sikes says, noting that there currently is hot debate about what "regularly" means or should include.

Sikes' research focuses on the mechanisms that contribute to advanced prostate cancer development. He wants to find out what happens at each phase of the disease's progression, and why, when prostate cancer metastasizes, or spreads, it goes to the bone. His lab has active programs under way in prostate cancer genetics, as well as therapeutic drug discovery and validation.

"This disease has been evading genetic queries," notes Sikes, who is

working to determine which genes are used in the course of prostate cancer development. "If you look at prostate cancer in 10 different men, you may have 10 different mutations. It's not one thing."

Prostate cancer cells also can mimic bone cells, Sikes says. Patients with advanced prostate cancer do not always appear to have lost bone as compared to healthy people, but their bones are much more fragile than healthy ones. He and his research group are using pieces of protein as biomarkers to see if they can interfere with how cancer cells interact with and remodel bone.

The researchers also are examining the role of blood vessels and nerves in the disease's spread. Before leaving the capsule-like membrane surrounding the prostate gland, cancer cells tell blood vessels to feed them, and also enlist enzymes called proteases to degrade the capsule. Once out of the capsule, the prostate cancer cells set up shop in the spine and other bones where blood cells are made. Another way prostate cancer cells may spread directly to bone without using blood is to spread directly along the nerves, like train tracks, right to the spine, Sikes says.

Currently, Sikes is leading a pilot project, funded by the Delaware Health Sciences Alliance, to pinpoint what happens at the molecular level when advanced prostate cancer becomes insensitive to male steroid hormones, also known as androgens, while in the bone marrow. His collaborators include Prof. Karen Knudsen from the Kimmel Cancer Center at Thomas Jefferson University, Prof. Ayyappan Rajasekaran at Nemours, and Dr. Charles Schneider of Christiana Care Health System's Helen F. Graham Cancer Center.

In a separate but related project, Sikes also is working with John Koh, UD professor of chemistry and biochemistry, to develop novel, potent "androgen receptor antagonists" or modulators that will suppress the hormones' function.

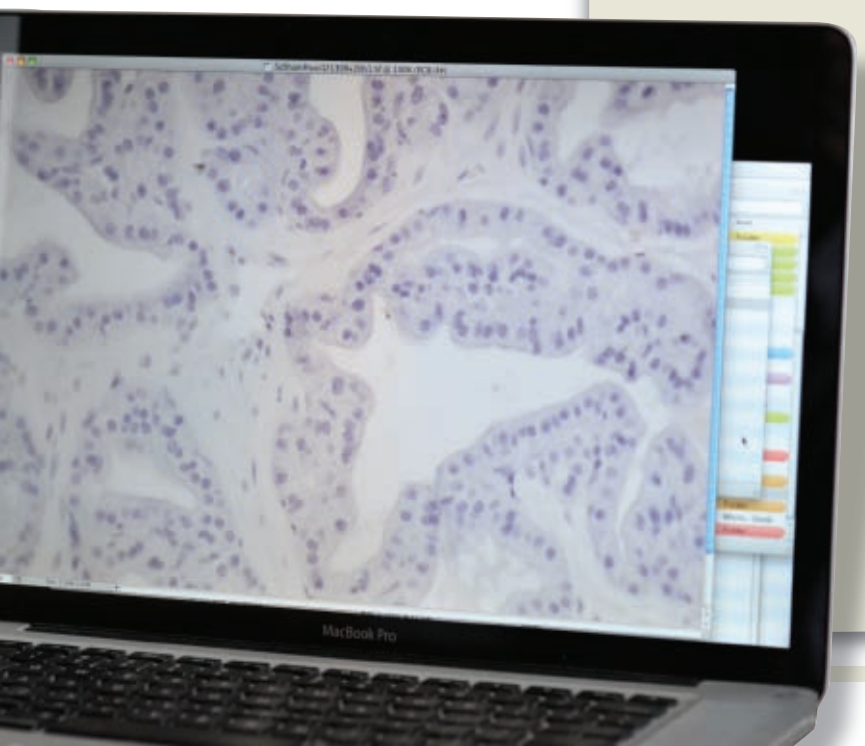
Initially, prostate cancer is sensitive to the levels of androgens, and removing the male hormones surgically or chemically is still "the gold standard" for prostate cancer therapy, Sikes says.

For a time, the prostate cancer responds to the lack of male hormones by regressing. However, invariably, the cancer adapts and continues growing, shifting from an androgen-dependent state to an androgen-insensitive or castrate-resistant one.

*See **Prostate Cancer**, continued on page* 20

cancer

Shown below, on Prof. Sikes' computer screen, are castrate-resistant prostate cancer cells. They look like small dark purple dots in the image.



Center for Translational Cancer Research

Mission: To build teams of clinicians, biologists and engineers, chemists and computer scientists, to attack cancer-related problems; and to forge community partnerships to increase patient participation in clinical trials and cancer genetics with an emphasis on outreach to the minority and underserved population in Delaware.

Partners: A "center without walls," the CTCR encompasses over 30 cancer researchers at UD, including the Delaware Biotechnology Institute; Christiana Care Health System's Helen F. Graham Cancer Center; and Nemours. In addition to these founding partners, the CTCR involves researchers from Lincoln University, Rice University, Delaware State University, and the University of Pennsylvania.

Research Focus: Brain, breast, colon, lung, and prostate cancers

Director: Robert Sikes, associate professor of biological sciences at UD, holds a Ph.D. in biochemistry and molecular biology with an emphasis in reproductive biology from the University of Texas. He did postdoctoral research at the University of Texas Medical School and the M. D. Anderson Cancer Center, a National Cancer Institute (NCI) designated comprehensive cancer center. He formerly was an assistant professor of urology at the University of Virginia Health Science Center.

Sikes has published over 57 scientific articles and book chapters and was a textbook reviewer for the *Biology of Cancer* by Robert Weinberg. His research has been funded by the Department of Defense, Delaware Health Sciences Alliance, National Cancer Institute, UNCF-Merck, and the University of Delaware Research Foundation.

Student Training: The center's goal is to develop a pipeline of multidisciplinary cancer researchers and clinicians by developing a program that starts at the undergraduate level and continues to provide training throughout the graduate and post-graduate levels.

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From left, Roger Singley and Tyrone Dixon of the Prostate Cancer Survivors Group view magnified prostate cancer cells with Prof. Sikes and doctoral student Adam Aguiar.

(**Prostate Cancer**, *continued from page 19)*

"We're hoping that the knowledge gained through this study will increase the survival of prostate cancer patients by allowing us to interfere with colonization of bone or prevent the growth of prostate cancer cells in the bone," Sikes says.

FACT

Prostate cancer is the most common cancer in men.

Source: Centers for Disease Control

Health educator forges community connections

In his lab, microbiologist Carlton Cooper keeps his eyes on the prize of all cancer researchers — that their work will contribute, if only in a small way, to finding a cure someday for the deadly disease.

In the classroom and in the community, however, Cooper is working to have a more direct and more immediate impact on improving health. An assistant professor of biological sciences at UD who also conducts research on prostate cancer through the University's Center for Translational Cancer Research, he focuses his outreach activities on prevention.

"There are many ways to fight disease. Research is important, but so is educating the community," he says. "If there's a cure for cancer, it's probably a long way off. I can't just work with cells in my lab, hoping for the future. I want to do that, but I also want to do something now."

Since 2004, Cooper has been spending much of the time when he isn't in the lab or the classroom speaking to a wide assortment of groups and organizations. His office shelf holds a three-ring binder, at least six inches thick, that is stuffed with agendas and programs of events at which he has delivered his message.

As an African American, Cooper says he concentrates on addressing the racial, ethnic, and gender disparities that exist in health care. Minority groups and women, he notes, have higher incidences and higher death rates from some diseases, and they often are not well-represented in clinical trials of medications and other treatments.

In speeches to both community and professional groups, he says, his emphasis is on straight talk, informal language, and personal responsibility.

"From my very first lecture to an African-American church group, I decided not to be politically correct and not to sugar-coat the message," he says. "We can be so worried about hurting people's feelings that we don't get the information out."

With that in mind, Cooper tells audiences of overweight women that they are so worried about taking care of their children that they fail to eat right and exercise and therefore risk an early death or disability that will seriously harm their family. He tells groups of African-American men that their reluctance to discuss homosexuality has led to higher rates of HIV/AIDS in their own communities.

He tells churchgoers that, just as they shouldn't come to him for spiritual guidance, they shouldn't rely on their pastors for medical advice. And he tells physicians that they must lead healthy life-styles themselves, or their patients won't follow their directions to exercise or lose weight.

Carlton Cooper, assistant professor of biological sciences at UD, is the health disparity coordinator for the Center for Translational Cancer Research.

"I don't say these things to make people feel bad," he says. "But I can't stand for people to suffer, especially when it doesn't have to happen."

In addition to speaking to numerous church and social groups, Cooper has lectured recently at the American Association for Cancer Research, Lincoln University, and the Meharry Medical College School of Graduate Studies and Research, where he delivered the George Howard Memorial Lecture in March. He works with HIV researchers at Johns Hopkins, recruiting African-American men for their clinical studies, and is a member of Delaware Partners to Promote Healthy Eating and Active Living.

Cooper, whose title with the Center for Translational Cancer Research is health disparity coordinator, has what he calls "the community bug," and he wants to inspire that same devotion to public outreach in his students.

"I tell my students: Study and do research, but get involved, too," he says. "Learning all this won't do any good if you keep it to yourself." — *Ann Manser*

As the Prostate Survivors Group tours Sikes' research lab, third-year doctoral student Adam Aguiar displays magnified prostate cancer cells on a computer screen, and in the Center for Translational Cancer Research's bioimaging core, research associate Chu Zhang, who received both her Ph.D. and M.B.A. from UD, presents a 3-D nanoCT view of blood vessels feeding a dog prostate. That work is a joint collaboration between UD Prof. Emeritus Roger Wagner and Denis Van Loo of the Center for X-Ray Tomography of Ghent University, Belgium.

"Any time we have an opportunity to go to something like this, we get more knowledge," says Norwood Johnson of Middletown, Del., an 18-year prostate cancer survivor. "It helps me understand how these cancer cells grow and what kills them. It also helps me understand why I'm a survivor, and some other guys aren't."

African-American men appear to be at higher risk of prostate cancer than other ethnic groups, and a family history of the disease is even more reason for men to be tested early and often, Sikes says.

In Dixon's case, he's African-American, and both his father and grandfather had prostate cancer. His own son is 34.

"I tell him, check your PSA level now. Don't wait. You may look great, but that blood sample can tell a lot about the human body," Dixon notes.

Learning as much as he can about prostate cancer is critical to coping with the disease, Dixon says. UD's research has helped him to understand more about the disease he is facing. The survivors group will provide important support, along with family and church, as his radiation therapy approaches.

"I'm pretty happy," Dixon says. "I'm preparing myself mentally and physically for the next stage."

—Tracey Bryant

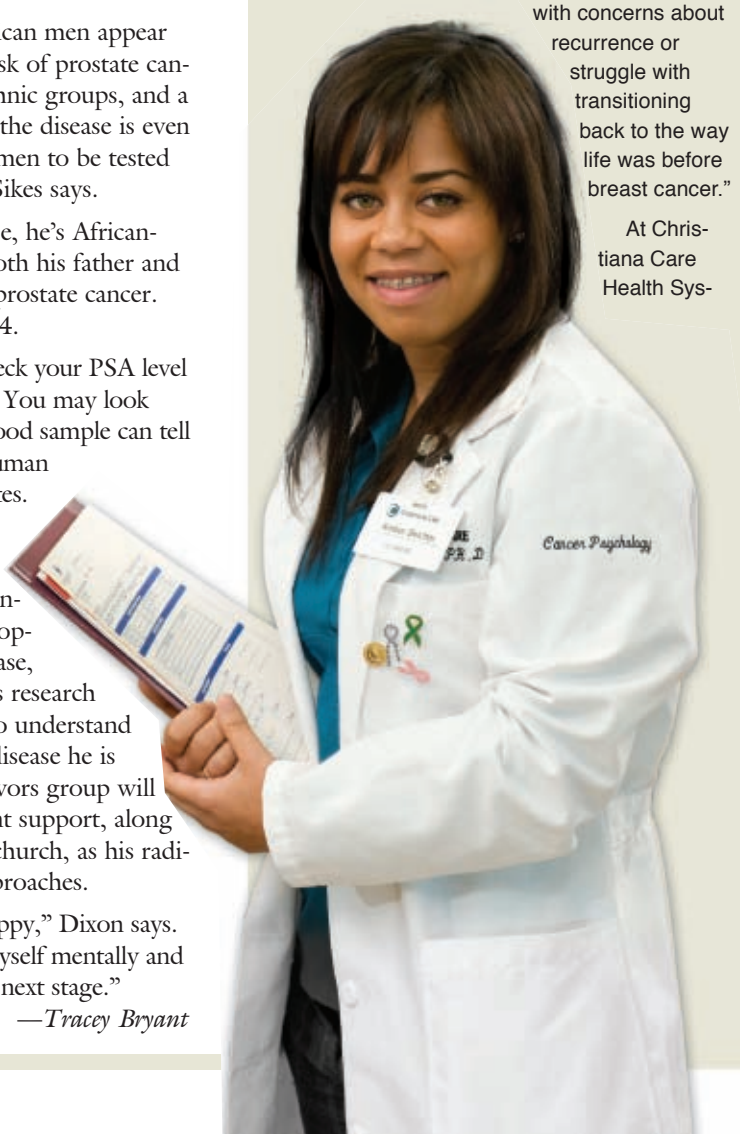
Award-winning student explores how couples cope with breast cancer

Amber J. Belcher, winner of the Ruth L. Kirschstein National Research Service Award from the National Institutes of Health, is using the prestigious fellowship to support her UD doctoral research on how couples cope with breast cancer.

Breast cancer is second only to skin cancer as the most common cancer among women in the United States. According to the American Cancer Society, every year nearly 200,000 women are diagnosed with invasive breast cancer in the U.S. and over 40,000 die from the disease.

Although progress in early detection and treatment has steadily increased breast cancer survival rates, a diagnosis of breast cancer can be emotionally upsetting on many levels.

"Significant stress and adjustment problems often are present in both the patients and spouses as she undergoes treatment, and family roles and daily routines change," Belcher says. "Even after treatment is completed, couples may deal with concerns about recurrence or struggle with transitioning back to the way life was before breast cancer."



At Christiana Care Health System's Helen F. Graham Cancer Center in Newark, Del., Belcher is conducting a diary study in which couples are asked to respond to questions about mood, intimacy, and emotional and practical support provided to and received from one another.

An initial questionnaire is completed shortly after the patient's surgery. Then the couple is asked to complete morning and nightly electronic surveys using personal digital assistants (PDAs) for 14 days, with follow-up six months later.

"This fellowship will allow our team to examine research designs capable of capturing the effects of support transactions as they unfold in daily life," Belcher says. "We hope this will offer new insights into how cancer occurs in a shared, interpersonal context — whereby patients and their non-patient partners can both provide support to and receive support from each other throughout the cancer experience. Understanding daily support between couples has important implications for improving couple-focused therapies."

Belcher's project is an integral part of an ongoing collaboration funded by the National Cancer Institute between UD's Department of Psychology and Christiana Care Health System. The partnership grant not only contributes to the University's health initiatives and the growing Delaware Health Sciences Alliance, but also provides a unique infrastructure to support graduate research and clinical training, according to Jean-Philippe Laurenceau, Belcher's adviser.

Laurenceau, associate professor of psychology, and Larry Cohen, professor of psychology, are co-principal investigators on the grant at UD, working with Scott Siegel, director of cancer psychology at Christiana Care.

"Cancer is a 'we-disease' in that it affects not only patients but also their significant others," Laurenceau notes. "Amber is finding that daily support provided by partners to patients, as well as patients to partners, help both members of the couple maintain connection through this adversity. We are enormously proud of Amber's hard work and accomplishments." *— Tracey Bryant*

Amber Belcher, UD doctoral student in psychology, has won the Ruth L. Kirschstein National Research Service Award from the National Institutes of Health.

Above: *Ulhas Naik, professor of biological sciences at UD, conducts research on blood clotting in his laboratory at the Delaware Biotechnology Institute.*

Getting to the heart of a killer disease

Ulhas Naik, UD professor of biological sciences and director of the new Delaware Cardiovascular Research Center, knows the dangers of heart disease — both scientifically and personally.

Naik has a family history of heart disease. Three of his brothers died instantly from heart attacks in his hometown in India, and his only living brother has had quadruple bypass surgery. Naik himself takes medication to lower his cholesterol and sees his doctor regularly for heart check-ups.

Now, however, Naik may be hot on the trail of the world's number-one killer.

A leading cardiovascular researcher, recently named a fellow of the American Heart Association, Naik has targeted his research over the past two decades on blood clot formation — the direct cause of heart attacks and strokes.

Blood clotting is a complex process involving platelets — the smallest of the blood cells and shaped like a disk, which start clumping together when a blood vessel is wounded; and plasma, the sticky fluid rich in proteins and chemicals that makes up more than 50 percent of our blood.

About 15 years ago, Naik began working on Junction Adhesion Molecule A (JAM-A), a protein present in platelets and the endothelial cells that line the blood vessels. He became the first person to biochemically characterize the protein and clone its gene. He also discovered that, in the absence of JAM-A, platelets clump together more readily. Thus, he believes the JAM-A protein may play a key role in preventing blood clots from forming, and National Institutes of Health (NIH) studies focusing on the protein are ongoing in Naik's laboratory.

Currently, in a pilot project funded by the Delaware Health Sciences Alliance, Naik is examining defects in the JAM-A protein as a potential risk factor for congestive heart failure, also known as dilated cardiomyopathy.

His collaborators on the study include Dr. Takeshi Tsuda, pediatric cardiologist at Nemours/Alfred I. duPont Hospital for Children; Dr. Walter Koch, W. W. Smith Professor of Medicine and director of the Center for Translational Medicine, and Dr. Erhe Gao, research associate professor, both from Thomas Jefferson University; and Dr. William Weintraub, director of the Center for Cardiovascular Outcomes Research at Christiana Care Health System.

Preventing heart failure

According to the American Heart Association, an estimated 5.7 million Americans are living with congestive heart failure, and that number is expected to increase in the future as the baby boomers age. Currently, people 40 years of age and older have a one in five chance of developing congestive heart failure in their lifetime.

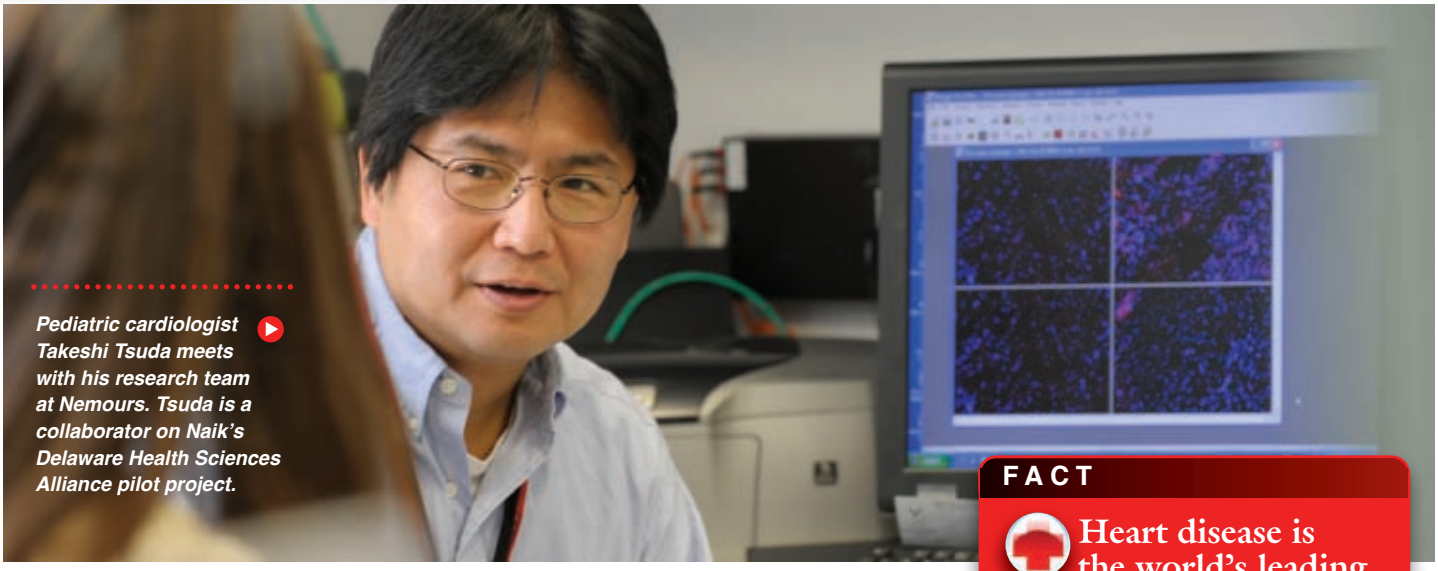
The heart typically pumps over a gallon of blood a minute. In patients with congestive heart failure, the weakened heart grows larger because it has to work harder and harder. Because blood flows more slowly in these patients, blood clots may form in the large vessels, then break off and travel through the bloodstream to elsewhere in the body — to the lungs or kidneys, or to the brain, causing a stroke.

*See **Killer Disease**, continued on page 24*

FACT

While the emotional impact of losing a loved one to heart disease is immeasurable, nationwide the economic cost for health-care services, medications, and lost productivity due to heart disease is estimated to reach $316.4 billion in 2010.

Source: Centers for Disease Control



Pediatric cardiologist Takeshi Tsuda meets with his research team at Nemours. Tsuda is a collaborator on Naik's Delaware Health Sciences Alliance pilot project.

FACT

Heart disease is the world's leading cause of death. Every 38 seconds, someone dies from heart disease in the United States.

Source: American Heart Association

*See **Killer Disease**, continued from page 23*

"As we grow older, the heart often becomes larger because it has to work harder to pump efficiently," Naik says.

The research team, which also includes UD graduate student Chris Schmoyer, is conducting laboratory studies with "knock-out" mice — animals in which the JAM-A gene has been deleted — to determine the impact of not having the protein's hypothesized protection against clot formation.

"Using mice as our model organism, we can accelerate the research and examine mice as they enter old age, which occurs in about a year's time, versus monitoring human subjects for 80 years," Naik notes.

A portion of the project also will focus on screening human patients to see if a correlation can be made between mutations in the JAM-A gene and the risk of developing dilated cardiomyopathy or of having poor survival after a heart attack.

For this phase of the research, patient samples will be obtained from the Center for Cardiovascular Outcomes Research at Christiana Care Health System and from the Center for Translational Medicine at Thomas Jefferson University.

"For patients with coronary artery blockage, some recover from a heart attack and some don't, and physicians don't know why," Naik says. "Is the JAM-A protein defective or missing in these people? If so, it could be an early indicator of high risk, or it could open the door to gene therapy potentially farther down the road. I think we have a ray of light that's important to pursue."

— *Tracey Bryant*

Delaware Cardiovascular Research Center

Location: The center will include laboratories in UD's Wolf Hall, which is home to the Department of Biological Sciences, and at the Delaware Biotechnology Institute.

Mission: To bring together the best cardiac researchers — both medical doctors and scientists — to perform world-class translational research to improve the treatment of cardiovascular patients.

Director: Ulhas Naik, UD professor of biological sciences and researcher at the Delaware Biotechnology Institute, received his doctorate from the University of Bombay in India and did postdoctoral work at Weill Medical College of Cornell University and the SUNY Health Science Center in Brooklyn. Among his most recent honors, he was named a fellow of the American Heart Association in 2009 and received the Mario Toppo Distinguished Scientist Award from the Association of Scientists of Indian Origin in America in 2008.

Among his most significant accomplishments: Naik is the first person to clone and characterize the calcium and integrin binding protein 1 (CIB1) and the junctional adhesion molecule A (JAM-A). CIB1 is critical to the process of platelet clumping and hence blood clot formation. JAM-A protects against platelet clumping and clots. Naik also enjoys teaching and mentoring students and has advised four of UD's Goldwater Scholars and a Marshall Scholar in the past five years alone.

Faculty: Cardiovascular researchers from all of the Delaware Health Sciences Alliance partners, including Christiana Care Health System, Nemours, Thomas Jefferson University, and UD, will be affiliates of the center. About a dozen faculty at UD currently are involved in cardiovascular research, and two additional cardiovascular faculty now are being hired for the center.

Students: The center will offer graduate-level cardiovascular courses to not only advance graduate training in the field, but also to give advanced undergraduates the basic training needed to make informed decisions about their future career paths.

Contact: Prof. Ulhas Naik — Phone: (302) 831-0434; E-mail: unaik@udel.edu

Delaware Health Sciences Alliance awards pilot projects

Jack London, research professor of cancer biology at Thomas Jefferson University, is leading the development of DHSA's bioinformatics framework.

Two new pilot projects funded by the Delaware Health Sciences Alliance (DHSA) will create the bioinformatics framework for facilitating translational research among the coalition's investigators; and advance cutting-edge research to identify new cancer therapies.

The one-year, $75,000 projects include researchers from each DHSA member institution.

Jack London, research professor of cancer biology and director of the Informatics Shared Resource of Kimmel Cancer Center at Thomas Jefferson University, is the principal investigator on the effort to establish a translational research framework for the DHSA, leveraging the medical bioinformatics infrastructure of the partner institutions.

His co-investigators include Cathy Wu, Edward G. Jefferson Professor of Bioinformatics and Computational Biology at UD, Dr. Edward Ewen from Christiana Care Health System, and Prof. Timothy Bunnell from Nemours.

Their goal is to provide DHSA researchers with access to well-annotated information on biospecimens so that experimental results can be linked to clinical observations and procedures for the generation of new hypotheses about gene-disease relationships and the identification of potential diagnoses or therapeutic targets.

"Omics" data — genomic, proteomic, and systems biology data — in the Protein Information Resource at UD will be linked with specimen diagnostic information in caTissue deployments at Thomas Jefferson University, Christiana Care Health System, and Nemours. caTissue is a biorepository management tool for the National Cancer Institute's cancer Biomedical Informatics Grid (caBIG). A data warehouse will be created using the National Institutes of Health's Informatics for Integrating Biology and the Bedside (i2b2) framework; and scientific use cases and a specimen annotation for DHSA researchers will be developed and evaluated.

Zhihao Zhuang, assistant professor of chemistry and biochemistry at UD, is leading a project to discover compounds that inhibit the human protein USP11 for the development of potent, new anti-cancer drugs.

USP11 plays an important role in cellular response to DNA damage and is emerging as a promising target for pharmacological intervention because of its connection to prostate, colon, and breast cancer, and pediatric acute lymphoblastic leukemia, among other diseases.

Zhuang's co-investigators include Dr. Jonathan Brody at Thomas Jefferson University, Dr. Andrew Napper at Nemours Center for Childhood Cancer Research, and Zohra Ali-Khan Catts, director of cancer genetic counseling at Christiana Care Health System's Helen F. Graham Cancer Center.

For more information, visit the Delaware Health Sciences Alliance Web site at www.delawarehsa.org.

Zhihao Zhuang (second from right), UD assistant professor of chemistry and biochemistry, is leading research to identify potent, new anti-cancer drugs.

UD teams with Jefferson to win Defense

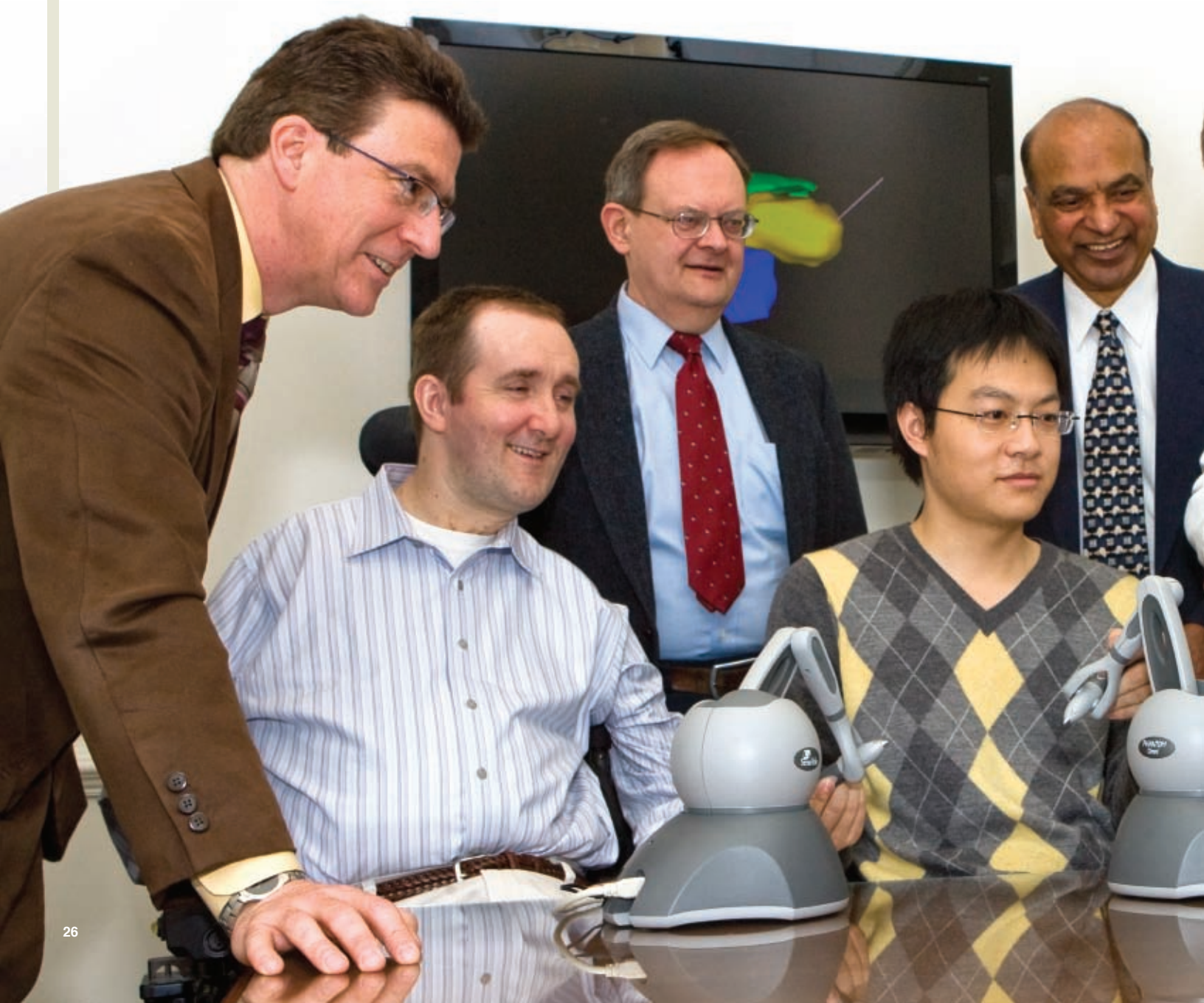
A collaboration of Thomas Jefferson University (TJU) and UD, funded by an $849,000 grant from the U.S. Department of Defense, will take surgery simulation to the next level, enabling surgeons to interact with an organ in 3-D, aiding the planning and preparation for difficult surgeries.

Two faculty members in UD's Department of Electrical and Computer Engineering are part of the team that won the award from the U.S. Army's Telemedicine & Advanced Technology Research Center (TATRC).

The UD team includes Kenneth Barner, professor and chairperson of the Department of Electrical and Computer Engineering; Karl Steiner, professor of electrical and computer engineering and senior associate provost for research development; and Rui Hu, a doctoral candidate in electrical engineering.

Biochemist Eric Wickstrom at TJU is serving as the principal investigator on the project, which also includes TJU team members radiologist Matthew Thakur, surgeon John Kairys, medical educator Martha Ankeny, computer specialist Devakumar Devadhas, synthetic chemist Chang-Po Chen, and biochemistry doctoral candidate Yuan-Yuan Jin.

Under the UD component, Barner and Steiner will build upon their earlier research in 3-D virtual surgery simulation and work with their medical colleagues at TJU to



grant for imaging system

create the next generation of a "touch" or haptics-based virtual surgery simulator.

While radiologic images give surgeons a visual representation of what they may encounter at the time of exploration, current imaging systems do not provide genetic information or tactile information about the tissues that will be encountered during surgery, nor do they allow physical interaction with the image.

"Haptics provides tactile, or touch, feedback to the user via a small robot that is integrated with the visual simulation on the screen," Steiner explains. "As the user moves the robot, a simulated object, such as a scalpel or other surgical instrument, moves within the 3-D environment, which includes simulations of various organs in the human body."

The organ simulations have been generated through a process called segmentation, where data taken from anatomical CT scans and molecular or genetic PET scans are digitally processed slice-by-slice to extract the outlines of individual organs in a patient.

Once the internal structure of the body has been segmented, that data is processed and the organs are integrated with a volumetric simulation that represents the physical properties — for example, healthy tissue or diseased tissue in a lung or pancreas. Next, the biochemical activity inside cancer cells is fused with the anatomical image.

The haptics interface then allows manipulation of the surgical instrument, and, as the instrument touches one of the simulated organs, the deformation of the organ is calculated and visualized.

Members of the TJU-UD research team view a 3-D surgical simulation. From left, UD Profs. Karl Steiner and Kenneth Barner, TJU principal investigator Eric Wickstrom, UD doctoral candidate Rui Hu, and TJU surgeons Mathew Thakur and John Kairys.

Information is provided to the haptic robot that produces the force-feedback touch interaction. Tumor texture will be represented as firmer than normal, healthy pancreas.

"This environment is the basis for our new collaboration with TJU," says Steiner, "where we will now focus on a set of data from CT and PET scans provided by TJU. We will merge these datasets to provide a scene with state-of-the-art information about the disease state of the organ."

The project is yet another link among research groups at UD and TJU. The research benefits from and contributes to the growing collaboration under the Delaware Health Sciences Alliance.

"The unique aspect of this project," Barner says, "is that it enables us to build on our prior results for deformable objects in surgery simulation by partnering with researchers at Jefferson. Our aim is not only to take surgery simulation to the next level, including the realistic interaction of multiple surgical tools and organs, but also to incorporate information from multiple imaging modalities to provide doctors with a comprehensive environment from which surgeries can be practiced and planned.

"The project is also a great opportunity for our graduate students," Barner adds, "as engineers will find it increasingly important to work with professionals from other fields as technology becomes more complex and as its applications broaden." — *Diane Kukich*

Gaining new insights into Childhood Obesity

One of every three children in the United States is now overweight or obese, a startling statistic that is receiving even more national attention with the announcement earlier this year of First Lady Michelle Obama's "Let's Move" campaign to curb childhood obesity.

Obese youth are more likely to have risk factors for heart disease, as well as bone and joint problems, sleep apnea, and poor self-esteem, according to the Centers for Disease Control. They also are more likely to become obese adults with greater risks of heart disease, type 2 diabetes, stroke, cancer, and osteoarthritis.

Preschoolers at UD's Early Learning Center and the first- through eighth-graders in The College School are contributing to the development of new knowledge that may help solve the growing problem of childhood obesity. The youngsters are helping researchers Nancy Getchell and Jaehee Jung shed light on very different aspects of the problem.

Getchell, an associate professor in the Department of Health, Nutrition, and Exercise Sciences, is studying the relationship between motor competency and physical fitness in preschoolers, while Jung is exploring body dissatisfaction and patterns of media use among pre-adolescents.

"There's a general assumption that very young children get all the exercise they need by just running around," Getchell says. "But this turns out not to be true. What we've found is that they do much better with structured physical activity."

Getchell and Sam Logan, who completed a master's degree in exercise science in 2008, administered a motor proficiency test to a group of preschoolers and measured their body composition to determine whether there was a relationship between the two factors.

While they found that the relationship was not statistically significant when the data were analyzed for the entire subject pool, it was significant when the children were broken down into groups.

The researchers discovered that the group with the highest body fat had the lowest level of motor proficiency.

FACTS *Source: Centers for Disease Control*

- Kids need 60 minutes of active play every day to grow up to a healthy weight.
- In the U.S., 8- to 18-year-olds spend an average of 7½ hours a day using entertainment media.
- Only a third of high school students get the recommended levels of physical activity.

Prof. Nancy Getchell (below) and her students conduct research to measure motor competency at UD's Early Learning Center.

Children at UD's College School point out body images they consider attractive to Prof. Jaehee Jung.

"What we're concerned about is the spiraling effect," Getchell says. "Children who don't develop early motor competency tend to become less active over time, resulting in even lower proficiency and an increased risk of obesity. The relationship becomes stronger as kids get older."

Getchell is working with Ilaria Masci, an exchange student from the University of Rome, to develop better ways to measure motor proficiency and energy expenditure in this age group. She also is studying at the University of Otago, New Zealand, this spring to learn more about physical factors and obesity across the lifespan.

Jung's research focuses on the psychological, social, and cultural issues associated with obesity and body image concerns. An associate professor in the Department of Fashion and Apparel Studies, she recently studied a group of 50 boys and girls, ages 8 to 11, to determine their level of satisfaction with their bodies as well as their media consumption and image perception patterns.

The results of the study, carried out in collaboration with Michael Peterson, professor in UD's Department of Health, Nutrition, and Exercise Sciences, were reported in the *Family and Consumer Sciences Research Journal*.

The children's height and weight were measured to determine their body mass index (BMI). They were interviewed about their media consumption behaviors — frequency, content, and preferences for a variety of media including TV, magazines, and video games. The children also were shown two pictorial test instruments and then asked to respond to questions about body size perceptions and preferences for their own sex, and for the opposite sex.

"We found marked differences between boys and girls in their ideal body preferences," Jung says. "The boys chose the larger images as ideals, showing a preference for body types like the figures they see in video games and action toys. On the other hand, the girls wanted to be thinner than their perceived actual body size."

Another interesting finding was in the children's choices of ideals for the opposite sex. "The girls chose images showing very large boys," Jung says, "while the boys picked very skinny girls."

Jung was also struck by the trend among girls to watch programs and read magazines, such as *Cosmo Girl* and *Seventeen*, that are targeted to older teens and young women.

"There is a huge discrepancy between the cultural ideal and the average person," Jung says. "Kids have a hard time understanding that the images they see in the media represent only a very small percentage of people in America. This is a problem because their ideals shape their behavior, and dissatisfaction with their current body size can have a negative impact on their self-esteem. This dissatisfaction grows as they get heavier due to poor diet and lack of activity.

"Media literacy is critical," she adds. "We need to increase children's awareness of the deceptive aspects of media images."

Jung is currently examining body dissatisfaction and disordered eating behaviors with early adolescent boys and girls enrolled in local middle schools and plans to share her findings with school administrators in district offices and individual schools to encourage the implementation of programs that promote healthy eating and exercise behaviors. — *Diane Kukich*

Reducing a Growing Problem in Delaware

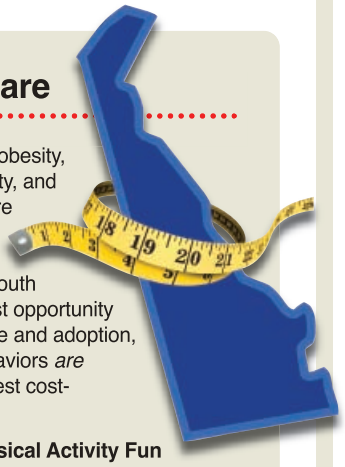
Delaware is far from immune to the nationwide obesity epidemic. Adult obesity in the state has increased 65 percent in the past 12 years.

UD's Institute for Public Administration (IPA) and Department of Health, Nutrition, and Exercise Sciences are partnering with the state's Division of Public Health to address behavioral and environmental factors that contribute to obesity in Delaware.

The IPA's *Healthy Communities: A Resource Guide for Delaware Municipalities,* which can be downloaded at **www.ipa.udel.edu/healthpolicy/healthycommunities**, shows how improving the walkability of a community can lead to environmental, health, and economic benefits. The guide offers strategic tools to develop public policies and plans for a pedestrian-friendly community and showcases examples in Delaware.

Michael Peterson, professor of health, nutrition, and exercise sciences, and director of UD's Graduate Health Promotion Program, is heading up the Division of Public Health's "Get Up and Do Something" campaign.

"Youth rates of obesity, overweight, inactivity, and unhealthy eating are increasing in Delaware," Peterson notes. "However, youth provide the greatest opportunity for behavior change and adoption, and, if healthy behaviors *are* adopted, the greatest cost-savings potential."



How to Make Physical Activity Fun

- Choose an activity that's fun and try to involve the whole family;
- Vary your activities, so you don't get bored;
- Enjoy the relaxing time of doing gardening, yard work, and walking the dog together;
- Use different jogging, walking, or biking paths to vary your routine;
- Explore a new park on foot or bicycle;
- Take a family walk after dinner;
- Build or join a community group to form clubs and organize special events.

Source: www.getupanddosomething.org

UD prof seeks Alzheimer's tool & treatment

Kelvin Lee, Gore Professor of Chemical Engineering at UD and director of the Delaware Biotechnology Institute, is working to find a cure for Alzheimer's disease.

Alzheimer's disease (AD), the most common form of dementia, affects over 5 million Americans. It is progressive, fatal, and incurable. And not only is there no cure for AD; there is no accurate way to diagnose it in a living person. Only an autopsy can confirm that a person had the disease.

Kelvin H. Lee, Gore Professor of Chemical Engineering at UD and director of the Delaware Biotechnology Institute, and his research group hope to contribute to the development of both an accurate diagnostic tool for AD and a strategy that will protect against the ravages of the disease.

Lee came to the University of Delaware in 2007, after spending 10 years on the faculty at Cornell University. He holds a doctorate in chemical engineering, with a minor in biology, from the California Institute of Technology. The minor in biology reflects his interest in the life sciences and his focus on the medical applications of chemical engineering research.

His vision is grand — a tool like the medical "tricorder" in "Star Trek." The handheld device could scan the body, interpret and display data from scans, and record information, helping doctors to diagnose disease. Given the rapid evolution of proteomics, the large-scale study of the structure and functions of proteins, Lee's vision may not be as far-fetched as it seems.

"We're looking for changes in protein expression in cerebrospinal fluid," he explains, "and trying to come up with a 'barcode' that can distinguish between patients who have AD and those who don't, as well as between people with AD and those with similar diseases that can cause dementia."

Doctors can currently diagnose living patients only as "probable AD" because it takes a post-mortem examination of brain tissue to provide definitive evidence of the amyloid plaques that characterize the disease. Lee points out that an estimated 10–20 percent of people with this diagnosis are found to have other conditions that manifest similar symptoms.

"We need a tool that's specific enough to distinguish among neurodegenerative diseases so that the proper treatment can be administered," he says.

As a postdoc at Caltech, Lee worked with a research group focusing on Creutzfeldt-Jakob disease (CJD), a rare and incurable brain disorder that, like AD, can be diagnosed only post-mortem through examination of brain tissue. CJD is classified as a transmissible spongiform encephalopathy, a term used to designate a group of disorders that also includes mad cow disease. Using a special technology to measure

"protein fingerprints" in cerebrospinal fluid, the researchers found that there was a change in one particular protein in people who had CJD.

FACT

Alzheimer's disease is the most common form of dementia. It affects over 5 million Americans.

Source: Alzheimer's Association

The project provided a proof of principle that protein fingerprints could be used as a tool to diagnose neurodegenerative disease, but when Lee accepted a faculty position at Cornell in 1997, he decided to focus on AD. Working with Dr. Norman Relkin, a physician at Cornell Medical Center in New York City who was doing both clinical and laboratory work on the disease, Lee received funding from the National Institutes of Health for a study aimed at finding biomarkers for the disease — in effect, a protein barcode unique to those with AD.

The results of the study yielded a set of validated biomarkers for AD, which was published in the *Annals of Neurology* in late 2006. In the meantime, the research group had turned its attention from diagnosis to treatment.

"There has never been a good treatment for Alzheimer's," Lee says. "Most therapies treat the symptoms to improve quality of life for six months or so. After that period, there is a rapid decline and many patients are not any better off than untreated patients.

"My collaborators began to wonder whether people could be immunized against Alzheimer's," Lee continues. "The disease is characterized by the formation of amyloid plaques in the brain. Would it be possible to get the body to form antibodies to clear the damaging plaques when they're formed?"

Relkin and colleagues at Cornell conducted a Phase I study in which they administered intravenous immunoglobulin (IVIg) to AD patients. The drug was already FDA-approved for treating certain people with compromised immune systems.

He explains that IVIg is basically a cocktail of antibodies taken from a pool of healthy donors. "It turns out that we normally produce antibodies to the protein that is a hallmark of Alzheimer's," Lee says.

The Phase I study design involved six months of treatment with the drug, followed by three months of no treatment, referred to as "drug wash-out."

"Cognitive ability improved during the treatment period and then reverted during drug wash-out, suggesting that cognitive losses were actually reversed by the therapy. This was a very encouraging outcome despite the fact that it was preliminary and involved a very small number of subjects. As a result, all of the subjects were put back on the drug, which resulted in positive effects in patients even after 18 months," he says.

Lee points out that the AD research by his team began in one direction and has changed over time. The initial effort, which has been accomplished, was to identify diagnostic markers for the disease and to determine what happens to the markers as patients are treated.

"We found that there are markers and that they mirror the clinical results," Lee says. "In other words, improvement in patients' cognitive functioning seemed to correlate with a reduction of the markers in their cerebrospinal fluid."

The next steps for the team include conducting additional clinical trials and moving toward obtaining FDA approval to treat Alzheimer's patients with IVIg.

Lee is still collaborating with his Cornell colleagues to collect data that will validate, at the molecular level, the link between the disease-modifying effects of the drug and the observed clinical outcomes. He hopes their work will lead not only to a noninvasive diagnostic tool and an effective treatment, but also an understanding of the mechanisms underlying the development of the disease.

"It would be ideal to have that medical tricorder," he says. "But we're not there yet." — *Diane Kukich*

Delaware Biotechnology Institute

Location: The Delaware Biotechnology Institute (DBI), part of the University of Delaware, is located at 15 Innovation Way in Newark, Del.

Mission: To promote research, education, and technology transfer of biotechnology applications for the benefit of the environment, agriculture, and human health. In the health arena, DBI research and expertise spans systems biology to cancer, cardiovascular, and Alzheimer's disease, to novel plant-based studies with human health applications.

Major Goals:

- Serve as a center for excellence for life sciences research in Delaware.
- Work with state/federal agencies to develop support for continued growth of Delaware's life sciences enterprise.
- Create new business opportunities and jobs by supporting technology transfer and connecting research and education with economic development/workforce preparation.
- Offer educational/technical assistance services to Delaware communities, schools, and organizations that foster understanding of biotechnology and the life sciences.

Collaboration: DBI is a statewide collaboration of the University of Delaware, Delaware State University, Delaware Technical & Community College, Wesley College, Christiana Care Health System, and Nemours/Alfred I. duPont Hospital for Children.

Facilities: In addition to 35 research labs, DBI operates core instrumentation centers for bioimaging, bioinformatics, microarray, protein production and analysis, cellular proteomics, nuclear magnetic resonance, mass spectroscopy, and plant growth chambers.

Director: Kelvin Lee, Gore Professor of Chemical Engineering at UD, received his bachelor's degree from Princeton and master's and doctoral degrees from the California Institute of Technology — all in chemical engineering. In 2010, Lee was honored with a prestigious American Institute for Medical and Biological Engineering fellowship. In 2009, he was selected as the inaugural recipient of the *Biochemical Engineering Journal* Young Investigator Award.

Faculty: DBI has over 20 resident UD faculty research groups and 120 student researchers, in addition to 110 affiliated faculty members at institutions across Delaware.

Contact: Phone: (302) 831-4888; Fax: (302) 831-4841

UD-Army partnership taking orthotics a major step forward

When Steven Stanhope first saw a complex plastic gadget, fashioned with numerous interlocking parts, and was told that it had been manufactured quickly and as a single piece requiring no assembly, it was an "ah-ha" moment of the best kind.

And, he says, it didn't even matter to him what the gizmo was. He knew the process used to create it could be useful in fabricating other items, including devices to help people with injuries or disabilities walk and move more easily.

"I think there are always ideas in the back of your mind," says Stanhope, professor of health, nutrition, and exercise sciences, who holds a joint appointment in mechanical engineering, at UD. "You're thinking, 'Wouldn't it be great if …,' and then you discover something that makes those ideas seem possible.

"You realize that it might be time to seize an opportunity and do something really transformational to change a field. That happened to me four years ago when I learned about rapid prototyping and free-form fabrication technology."

Stanhope, whose research specialty is biomechanics, says those types of technologies can be used to manufacture assistive devices such as leg braces to benefit everyone from children born with cerebral palsy to soldiers wounded on the battlefield to athletes injured in a game.

The high-tech process of free-form fabrication — which Stanhope first saw demonstrated in a military lab at Aberdeen Proving Ground in Maryland, where he is involved in research partnerships — uses a laser and super-thin dustings of plastic powder to "build" a model, layer by layer. Each layer is formed based on a computer-aided design showing cross-sections of the final object.

Currently, Stanhope explains, leg or ankle braces, also known as orthoses, are custom-made manually in a process that takes six to eight weeks and can cost more than $15,000 a pair. And even then, the result is obtained more by trial and error than by the user's precise needs, he says.

"A brace replaces lost muscle function. It should act like a spring but with just the right amount of springiness — and that's the trick," he says. "How do you make the brace right the first time? That's our goal, to have predictive models and produce fully customized braces in 24 hours."

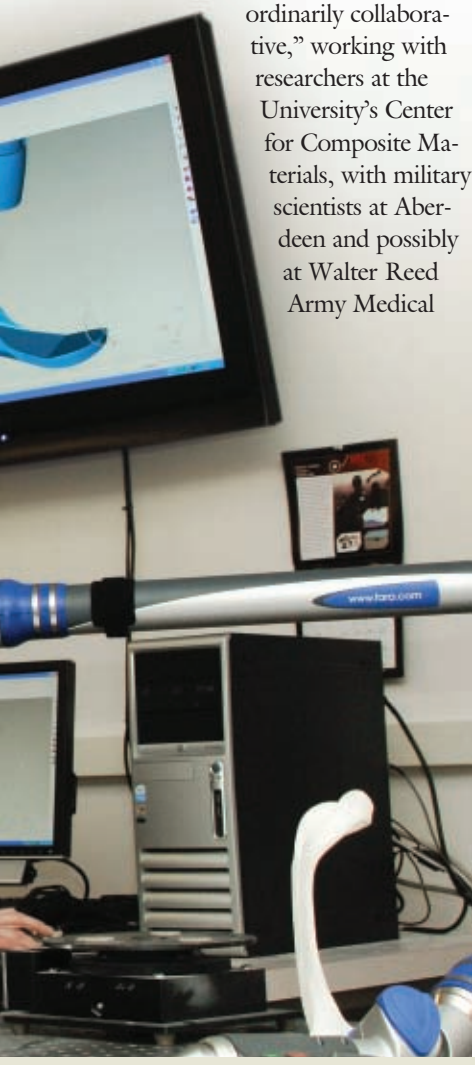
Stanhope's research team has devised a technique using a

At Aberdeen Proving Ground, Md., researchers from UD and the U.S. Army Research, Development and Engineering Command (RDECOM) examine a prototype leg brace made using the Army's free-form fabrication technology. Shown from left are Kevin Wallace, Branch Chief, Technology and Systems Integration-RDECOM, UD professors Steven Stanhope, John Tierney, and Jack Gillespie, and RDECOM engineering technician Rick Moore (seated).

U.S. Army RDECOM
Edgewood Chemical Biological Center
Advanced Design and Manufacturing Division

three-dimensional pointing tool to capture the exact, three-dimensional shape of a person's foot and leg. That information can then be used on a computer to rapidly mold a brace to the person's leg and customize and test its springiness — prior to building it. Since each brace has a unique shape, free-form fabrication is the ideal manufacturing technology, Stanhope says, adding that as the technology improves and the manufacturing process becomes less expensive, "It's going to totally transform the orthotics and prosthetics field."

Stanhope has been focusing on the research aspect of the project, testing braces now in UD's Human Performance Lab to assess how individuals adapt to the custom-made devices and measuring precisely how their gait improves by using them. He is preparing for a clinical component, which he calls "extraordinarily collaborative," working with researchers at the University's Center for Composite Materials, with military scientists at Aberdeen and possibly at Walter Reed Army Medical Center, and with doctors and other cerebral palsy specialists at Nemours/A. I. duPont Hospital for Children.



This prototype leg brace was developed by researchers at UD and the Army's Research, Development and Engineering Command (RDECOM) at Aberdeen Proving Ground, Md.

For now, the research has focused on foot and ankle impairments, but Stanhope says the possible applications are extensive.

"There's a lot of excitement about possibly extending these techniques for use in protective sports equipment, military protective gear, and prosthetics of all types," he says.

Stanhope, who is internationally recognized for his work in clinical movement analysis and rehabilitation research, joined the UD faculty from the National Institutes of Health (NIH) in fall 2007. Between 1985 and 2001, he developed and directed the NIH Biomechanics Laboratory, and in 2001, he began serving as the founding director of the agency's Physical Disabilities Branch.

Stanhope's research focuses primarily on movement disorders related to gait and balance. He has authored over 100 research articles and abstracts and is a founding member of the editorial board of the journal *Gait & Posture*. He also is a founding member of the Gait and Clinical Movement Analysis Society and the Italian Society of Clinical Movement Analysis. — *Ann Manser*

Delaware Rehabilitation Institute being planned

Plans to establish a Delaware Rehabilitation Institute are moving forward. The institute has been proposed as one of the main objectives of the new Delaware Health Sciences Alliance (DHSA), a partnership of Christiana Care, Nemours, Thomas Jefferson University, and UD.

"The University of Delaware has an internationally renowned history of rehabilitation research that encompasses almost every college," says Steven J. Stanhope, professor of health, nutrition, and exercise sciences and of mechanical engineering. "In addition, the state has a remarkable reputation for the extent to which it works with the University."

Stanhope says he came to UD in 2007 from his position as founding director of the National Institutes of Health's Physical Disabilities Branch because of the opportunities in Delaware for partnerships in research that can be translated directly to practical use.

"This is in many ways the ideal setting for translational research, for the opportunity to really make a difference in people's lives," he says.

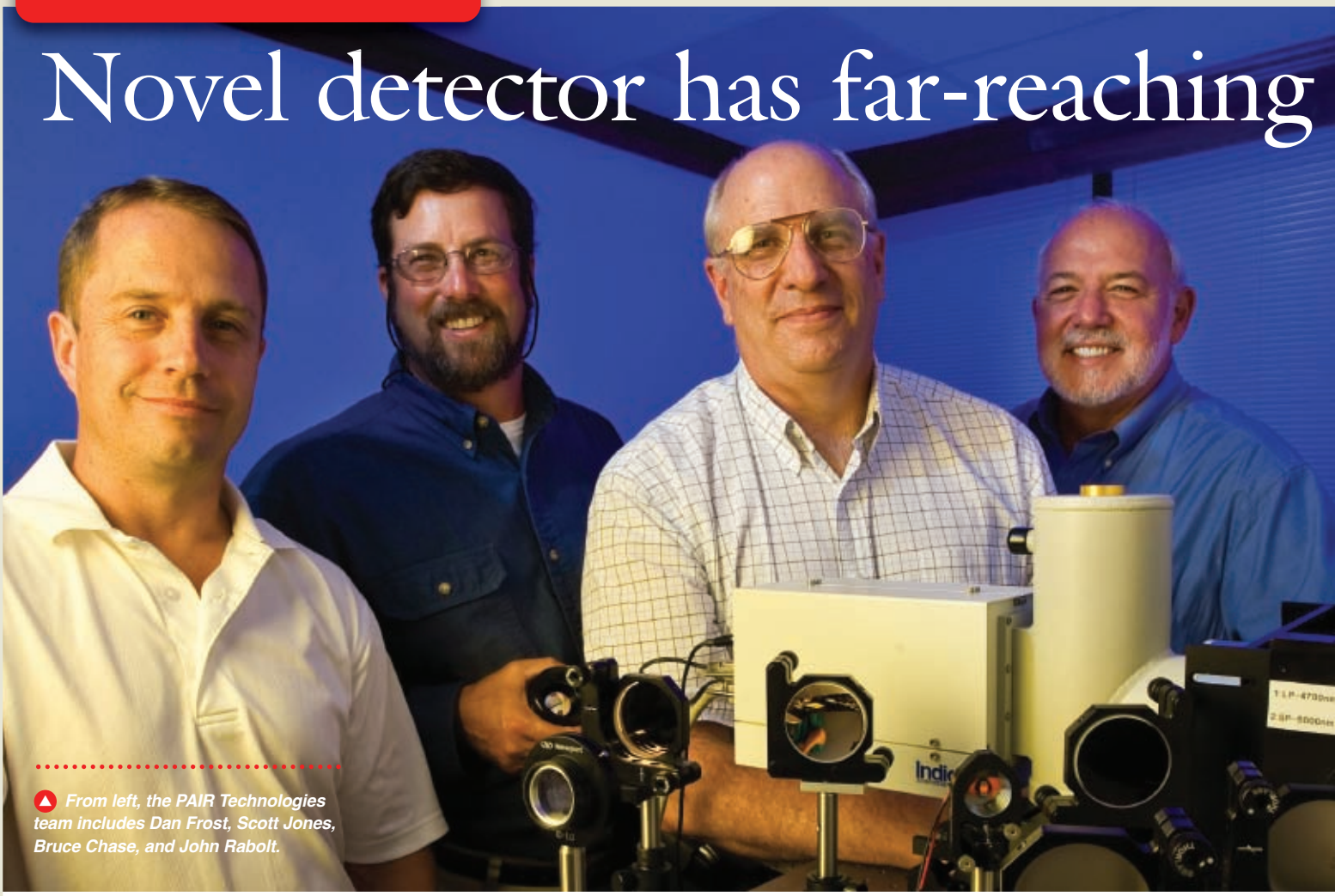
Thomas S. Buchanan, deputy dean in the College of Engineering and professor of mechanical engineering, is spearheading the initial planning for the rehabilitation institute by gathering input from diverse groups on campus and in the community.

"There are already a lot of collaborations going on, but we hope that creating an actual institute will enhance these efforts further by giving them an administrative structure," Stanhope says. He calls the University's recent purchase of the former Chrysler Assembly Plant property "a giant step" toward the goal, since the 272-acre site is envisioned as a varied research and technology campus.

The rehabilitation institute will serve a demonstrated need, Stanhope says. He notes that some 25 million Americans older than 15 have a disability related to walking, with the annual economic cost of chronic disorders estimated at $170 billion. In addition, Delaware is on track by 2030 to rank ninth among states with populations over 65 years of age, a group that more commonly requires physical rehabilitation services.

"Our vision is to conduct world-class rehabilitation research via multidisciplinary research teams spanning the Delaware Health Sciences Alliance, private industry, local, state and federal agencies," Stanhope says. "We also want to translate our rehabilitation research into the best care practices and public health policies to improve the functional levels of Delawareans and reduce the cost of health care." — *Ann Manser*

Novel detector has far-reaching



From left, the PAIR Technologies team includes Dan Frost, Scott Jones, Bruce Chase, and John Rabolt.

PAIR Technologies, a UD startup company, is preparing to commercialize a high-precision detector that can identify low levels of biological and chemical agents in solids, liquids, and gases in the blink of an eye.

The revolutionary technology — a planar array infrared (PAIR) spectrograph — holds promise in the early detection of diseases, chemical weapons, and environmental pollutants. The device also would enhance quality control in a number of manufacturing settings, from ensuring the purity of drugs, to the thickness of paints and polymers.

John Rabolt, the Karl W. and Renate Böer Professor of Materials Science and Engineering at UD, and his students invented and patented the technology in 2001.

Rabolt and Bruce Chase founded the company in 2005. The two collectively have more than 65 years in scientific research, with a significant portion in industry — Chase retired from DuPont as a senior research fellow after a 35-year career, and Rabolt worked for 20 years at IBM before joining the UD faculty in 1996.

Partners in the company include Scott Jones, professor of accounting and director of the Venture Development Center in UD's Lerner College of Business and Economics, and Dan Frost, who received his master of business administration degree from UD in 2008.

The University of Delaware owns the patents for the technology, which are under exclusive license to PAIR Technologies, and has taken a small equity position in the company.

"PAIR Technologies offers an analytical tool with the potential to contribute significant benefits to society through a wide array of medical, military, environmental, and industrial applications," says David Weir, director of UD's Office of Economic Innovation and Partnerships (OEIP).

"The company grew out of UD innovation and is a model for how federal, state, and University partners can work together to advance economic development," Weir notes. "These are the kinds of high-tech economic partnerships the University of Delaware wants to develop, and we will be looking more aggressively at opportunities like this in the future."

The idea for PAIR Technologies actually was spawned in "High-Tech Entrepreneurship," a graduate course that Rabolt and Jones co-teach. Students explore UD patented technologies in the course and then do market analyses to assess their commercialization potential. The planar array infrared technology consistently rose to the top.

"Most technology has about a 30-year cycle. Then something comes along to disrupt it, change it. We think we have that next-generation technology — beyond the current market leader, Fourier Transform Infrared spectroscopy," Rabolt says.

benefits

A molecular fingerprint in less than a second

Spectroscopy is a technique for measuring the concentration or amount of a given material by measuring how well that material absorbs or transmits light.

It's virtually impossible for the current technology, designed over 30 years ago — a Fourier Transform Infrared (FT-IR) spectrograph — to analyze a rapidly reacting system. However, a PAIR instrument can gather data 250 times per second or more. A car's engine undergoes combustion 12,000 times per minute at highway speeds. If a better understanding of combustion can be gained using the PAIR instrument, significant gains may be made, for example, in engine and fuel efficiency.

The PAIR Technologies instrument has no moving parts, further enhancing its portability. It relies on a focal plane array, commonly used in thermal imaging, which consists of a cluster of light-sensing pixels at the focal plane of a lens to receive the optically dispersed infrared light.

"This is a rugged replacement for the existing technology, taking it out of the lab and into the field," Chase says. "Our instrument has no moving parts. It's durable, compact, and portable — we envision someday being able to take it out to your local stream or use it in a doctor's or dentist's office."

New vision for diagnosing eye disease

The detector also may bring new medical applications into focus.

For Rabolt, that became apparent when he visited his ophthalmologist's office and was diagnosed with developing cataracts.

"They've been developing for years, but now they are big enough to scatter light, and that's the only way to diagnose cataracts currently," he says. "If we can 'spectroscopically' detect a small amount of protein in a person's teardrops, we may be able to provide a new diagnostic tool for detecting cataracts early on and potentially many other eye diseases."

For Dan Frost, his three-credit graduate course a few summers ago while a student at UD expanded his horizons rapidly into the business world, where he is now chief operating officer of PAIR Technologies.

"It's very rewarding to be involved in something that's going to really benefit society," Frost says. "Initially, we will do the manufacturing here," he notes of the company's office in Delaware Technology Park. "We plan on doing the assembly locally. That's a win-win for us and for Delaware."

For more information, call Frost at (302) 368-7247 or visit the PAIR Technologies Web site at **www.pairtech.com**.

— Tracey Bryant

Tips for a successful startup

Scott Jones, professor of accounting and director of the Venture Development Center in UD's Alfred Lerner College of Business and Economics, is a partner in the new company PAIR Technologies. He offers the following advice to fellow researchers interested in establishing startup companies.

The University of Delaware has taken a small equity position in PAIR Technologies. David Weir, left, director of UD's Office of Economic Innovation and Partnerships (OEIP), is shown signing the agreement with Scott Jones, representing PAIR Technologies.

It's a partnership — you can't do it alone.

"We've won STTR and SBIR grants from the National Science Foundation. Support from the Delaware Economic Development Office and the state also was very helpful. We've also gotten invaluable help from UD alumni such as Alan Ferguson, Barry Yerger, and Dave Freshman," Jones says.

Know your available resources.

"The Office of Economic Innovation and Partnerships (OEIP), the Small Business Development Center, the High-Tech Entrepreneurship Course at UD, and organizations in the area such as the Delaware Innovation Fund, Early Stage East — a venture capital organization, First State Innovation, and our own Venture Development Center are all good resources," he says. "Right now, the Venture Development Center is focused as a student incubator, but we hope to someday grow it to serve as an incubator for all of UD."

Do your research for the business.

"Don't just rely on your own hunches," Jones urges. "You really need to think through the business proposition. Is it going to add value, increase the size of the customer's business? We researched and networked with experienced alumni; we wrote and revised a business plan over three years. We did the business plan three times — each time we had a better understanding of the markets."

It always takes longer and always costs more than you think it will.

"People always underestimate how long it takes to get a business started and the cost — not just in terms of dollars, but in time and personal resources," he says. "It took time to write the grants and put the whole package together."

Be realistic about your expectations.

"At some point, you need to bring in a network of people, and that involves giving up some control," Jones says. "You have to be realistic about expectations — it's not likely that you'll be CEO forever. The odds are, at some point, someone else will be running your business."

Get good legal and tax advice.

"Be sure you understand the legal requirements," Jones says. "Avoid conflicts by being up front about it, so that it's clear where the lines are drawn. Keep very careful records."

— Tracey Bryant

Personal medical mystery spawns prof's latest book

It was a personal medical mystery that gave McKay Jenkins the idea for his latest book. In it, the Cornelius A. Tilghman Professor of English at the University of Delaware, and author of numerous other nonfiction works, investigates the prevalence of chemicals in common consumer products and the extent to which those substances make their way into our bodies.

Jenkins was hospitalized a few years ago, undergoing tests for what turned out to be a benign tumor. During that time, he says, public health professionals paid a visit to question him about toxins to which he might have been exposed over the years. The list of potentially dangerous substances was frightening and made him want to learn more.

"We're talking about a lifetime of exposure to chemicals in everything from cosmetics to herbicides to plastic water bottles to lead paint," he says. "You're basically surrounded by this stuff day after day, just in the course of your normal activities, and it gets into your body one way or another."

Jenkins started his investigation by reading hundreds of studies to learn about the science involved and to get a clear picture of the general consensus among reputable researchers. He interviewed academic experts — including fellow UD faculty Doug Tallamy, professor and chairperson of the Department of Entomology and Wildlife Ecology and an authority on native plants, and Gerald Kauffman, project director of the Water Resources Agency at UD and an instructor in civil and environmental engineering and in public policy — as well as others knowledgeable about the subject.

"I'm not a chemist, and I'm not writing for chemists or for chemical engineers," Jenkins says. "I'm writing for an intelligent but non-specialist audience. So I do what journalists do. I read the research, I interview scientists, and I look for a compelling way to tell the story."

He decided to focus the book on personal narratives of some of the many people he interviewed. He spent time, for example, meeting with organic farmers, visiting a woman suffering from multiple chemical sensitivity, touring a water treatment plant, turning a toxicologist loose in his own home to point out hazardous substances, and walking the aisles of a big-box store while studying the labels on all types of products. He and Kauffman collected water samples while canoeing on the Brandywine, and Jenkins traveled to New England to meet with people who had been part of a "body burden" study conducted by the Alliance for a Clean and Healthy Maine, in which they were tested for the presence of toxic chemicals in their bodies.

Jenkins' book, which will be published later this year by Random House with a working title of *What We're Made Of*, has been compared to the Rachel Carson classic *Silent Spring*. That book, published in 1962, investigated industrial pollutants and their effect on the environment, while Jenkins' work deals with everyday consumer goods. People tend to feel uneasy about the subject matter, he says, because they aren't sure how dangerous some substances are, or how much individual consumers can do to protect themselves.

McKay Jenkins, the Cornelius A. Tilghman Professor of English at UD

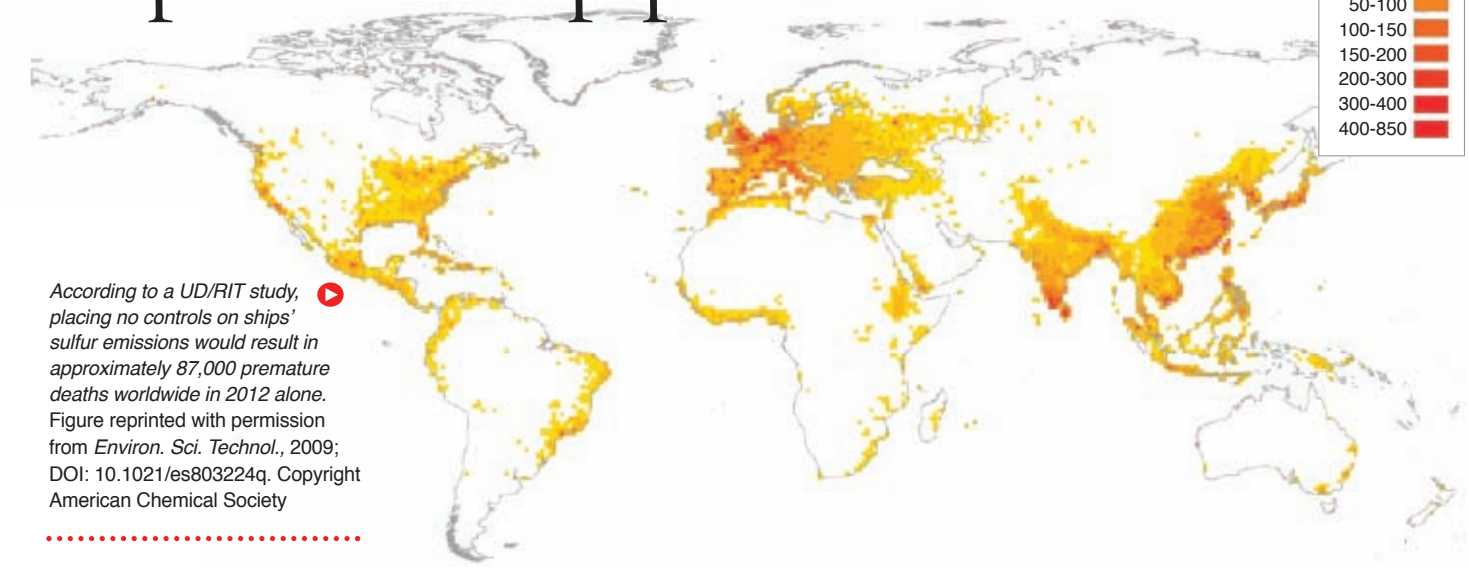
"It's very hard to prove a connection between 'chemical A' and 'disease B,'" he says. "But we should at least be aware that these chemicals are in our consumer products and in our bodies, and there are all kinds of individual decisions and choices we can make."

Those choices might include replacing commercial household cleaners with more natural products, buying organic food and foods without excessive plastic packaging, deciding not to use lawn chemicals, or becoming politically involved in larger issues of regulating and monitoring chemical exposure.

Jenkins also is the author of *The South in Black and White: Race, Sex and Literature in the 1940s; The White Death: Tragedy and Heroism in an Avalanche Zone; The Last Ridge: The Epic Story of the U.S. Army's 10th Mountain Division and the Assault on Hitler's Europe;* and *Bloody Falls of the Coppermine: Madness, Murder, and the Collision of Cultures in the Arctic.*

— Ann Manser

Study shows health impacts of ship pollution



According to a UD/RIT study, placing no controls on ships' sulfur emissions would result in approximately 87,000 premature deaths worldwide in 2012 alone. Figure reprinted with permission from *Environ. Sci. Technol.,* 2009; DOI: 10.1021/es803224q. Copyright American Chemical Society

Most oceangoing ships use high-sulfur fuels, which emit particles into the air that can cause lung and heart disease and harm the environment. International policymakers concerned about the effect of those fuels on human health are seeking solutions. But which approach would be most effective?

A study from the University of Delaware and Rochester Institute of Technology may help answer the question.

The study, published in the July 1, 2009, issue of *Environmental Science & Technology*, found that placing no controls on ships' sulfur emissions would result in approximately 87,000 premature deaths worldwide in 2012 alone. This number is an update on the estimate from a widely reported 2007 ship mortality study by the same research team, which estimated that shipping-related particulate matter emissions are responsible for approximately 60,000 cardiopulmonary and lung cancer deaths annually.

The team's latest study, however, goes a step further. It takes into account the fact that policymakers are considering regulating harmful air emissions from ships in one of two ways: by restricting global sulfur content levels or by designating emission control areas to reduce impacts to sensitive coastal regions and communities.

The researchers found that requiring ships globally to reduce fuel sulfur content to 0.5 percent would reduce premature deaths by about 41,200.

Requiring ships to use marine fuel with 0.5 percent sulfur within 200 nautical miles of coastal areas, they found, would reduce premature deaths by about 33,500. Limit the percent of sulfur to 0.1 percent within 200 nautical miles of the coast, and the number of premature deaths would be reduced by a total of 43,500.

"This study of health-based impacts to coastal populations around the globe shows that real health benefits are associated with cleaner fuels producing lower particle emissions from ships," said James Corbett, professor of marine policy in UD's College of Earth, Ocean, and Environment (CEOE) and one of the study's two lead authors.

James Corbett, Professor of Marine Policy

Current fuel sulfur content averages about 2.4 percent, with upper limits as high as 4.5 percent. The International Maritime Organization (IMO), the United Nations' specialized agency responsible for improving maritime safety and preventing pollution from ships, has agreed to set the global fuel sulfur cap at 3.5 percent in 2012 and 0.5 percent as early as 2020.

More recently, the UD-RIT study has contributed to another significant policy development that will positively impact air quality and human health. On March 26, 2010, the IMO officially accepted the proposal to designate waters off North America as an Emission Control Area (ECA) — a move that will result in cleaner air for millions of Americans and Canadians.

The UD-RIT study analyzed ship emissions' health impacts by integrating global ship inventories, climate models, population models, and health impacts functions. It was supported by the Oak Foundation, the German Helmholtz-Gemeinschaft Deutscher Forschungszentren, and the German Aerospace Center within the Young Investigators Group SeaKLIM. Additional support was provided by the Sustainable Intermodal Freight Transportation Research Program, a multi-university initiative led by Corbett and Winebrake. — *Elizabeth Boyle*

Grad student puts food safety first

Doctoral student Hudaa Neetoo conducts research on high-pressure food processing with her adviser, Prof. Haiqiang Chen.

In many countries, the consumption of seed sprouts has increased in recent decades as consumers have shifted their preferences toward more healthful food options. Since consumers insist on eating their sprouts raw, scientists must find an alternative method to inactivate bacteria that might contaminate them.

Alfalfa sprouts are one of the most common sprouts consumed in the United States due to their wide availability and excellent nutritional value. Unfortunately, there have been recurrent outbreaks in the past decade connecting sprouts and disease-causing bacteria such as *Salmonella* and *E. coli O157*.

Hudaa Neetoo, a doctoral candidate in UD's Department of Animal and Food Sciences, is researching the microbial safety of several varieties of sprouted seeds commonly consumed in sandwiches and salads. Under the direction of Haiqiang Chen, professor of food science, she has been working with high-pressure processing techniques and mild heat treatments to enhance the safety and packaging components of our food supply.

Compared to conventional thermal processing methods such as cooking, non-thermal processing technologies, like high hydrostatic pressure technology, produce a fresher, higher quality product. The other advantage of high-pressure treatment for decontaminating sprouting seeds lies in the fact that it is chemical free and therefore considered to be a "green technology."

Neetoo's findings so far have indicated that it's possible to use high pressure to completely kill pathogenic bacteria such as *E. coli O157:H7* on alfalfa, as well as on other sprouting seeds, including clover, broccoli, and radish sprouts, with minimal negative impact on the seeds.

Using high pressure to treat foods is not a new idea, as many foods available in the grocery store have been prepared using high-pressure processing, including some brands of guacamole, yogurt smoothies, and ready-to-eat lunch meats.

Although it is estimated that the price of pressure-treated products is a bit higher than foods treated in more conventional ways, such products hold great promise.

Before coming to Delaware, Neetoo earned a bachelor's degree in biochemistry from Imperial College in London. Originally, she came to Delaware for a two-month summer internship as part of an exchange program in 2004. It was during her visit that Chen offered her a position in his lab in conjunction with earning her master's degree.

Her master's research project focused on the enhancement of the safety of cold-smoked salmon through the application of antimicrobial packaging. In 2006, Chen offered Neetoo a position in his lab for an additional three years, furthering her studies to the Ph.D. level.

"Hudaa is a highly motivated and ambitious student with a very clear career goal," Chen notes.

So far, Neetoo has authored or co-authored eight publications, given six presentations at professional meetings, and won scholarships and awards from UD, as well as from the Institute of Food Technologists and the International Association for Food Protection.

Currently, while completing her doctorate, Neetoo is enrolled in the Higher Education Teaching Certification Program offered by UD's Center for Teaching Effectiveness in preparation for a career in academia. — *Rachael Dubinsky*

Economist's studies help reveal the have-nots of health care

In 1975, when Charles Link published his first study on the shortage of registered nurses in the United States, the field of health economics was in its infancy.

Since then, Link, who is the Bank of America Professor of Business, as well as a professor of economics, in UD's Lerner College of Business & Economics, has made numerous contributions to this field, which has expanded significantly over the past few decades, as has the nation's health care expenditures.

With the passage of the latest reform bill, the Reconciliation Act of 2010, healthcare now encompasses 17% of the U.S. gross domestic product (GDP), and there is a stronger focus than ever on issues of supply and demand relating to health care professionals and facilities, health care costs and their containment, and equitable health policies, Link notes.

Link's interests in both microeconomics and policy — in understanding investments in human capital from a labor market perspective — led him to undertake his first study of the nursing labor market, which he now has been following for over 30 years. His most recent analysis was completed in 2003.

"Solving the problem is one of the key issues," he says of the continuing shortage of nurses. "We found that, while the wages for RNs is important and has a significant effect on the number of people who enter nursing programs in the U.S., just increasing wages is not going to increase the supply of nurses because, for the most part, the qualified people already are working, and they're working a substantial number of hours."

To address the shortage, Link and co-author Yvana Chiha recommended that federal and state governments consider providing subsidies in the form of loans and scholarships to potential nurses. Enacting higher nursing staff-to-patient ratios at work also could improve both nurse satisfaction and patient outcomes.

Charles Link, Bank of America Professor of Business

"Given the huge costs that cardiovascular disease imposes on the economy — more than $150 billion a year — health policy makers have to address the inequalities in who receives statin drugs."

"Although the short-run supply of RNs appears to be insensitive to wage changes, the supply in the long run as measured by enrollments in nursing programs is responsive to wages," Link says.

In the late 1970s, Link took on a U.S. Department of Health and Human Services study on the equity aspects of Medicaid, which got into issues of race. That experience expanded his horizons, to studies that have revealed disparities in health care for a number of minority populations.

Most recently, in November 2009, Link published, with Simon Condliffe and Bryan Townsend, "Who Receives Statins? Variations in Physician Prescribing Patterns for Patients with Coronary Heart Disease" in *Applied Economics Letters*. Condliffe, a recent UD doctoral graduate, is now a professor at West Chester University, and Townsend received his master's in economics from UD.

The researchers found that whites and patients with private insurance are more likely to be prescribed a statin, a cholesterol-lowering drug, than non-whites and those with public insurance.

"This is a significant finding as death rates associated with cardiovascular disease are higher for African Americans than whites and also because minorities make up a considerable component of Medicaid programs," Link says.

Although the finding is troubling, it's not surprising, Link says, noting that in many aspects of health care, including cardiac care, minorities receive lower quality care compared to whites.

"Given the huge costs that cardiovascular disease imposes on the economy — more than $150 billion a year — health policy makers have to address the inequalities in who receives statin drugs," Link notes.

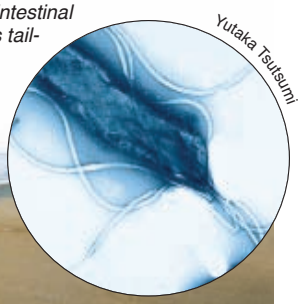
Another recent study Link did revealed that children in the United States from low socioeconomic backgrounds are subject to more health conditions than their wealthier counterparts.

In another study, he and his colleagues are investigating the effects of obesity on labor market outcomes such as wages and labor supply.

Next on Link's research agenda is a study relating to diabetes in collaboration with a team at AstraZeneca, a London-based pharmaceutical company with offices in Wilmington, Del. — *Tracey Bryant*

Testing the waters

Marine scientist explores microbial mystery



Yutaka Tsutsumi

The microscopic organism Helicobacter pylori lives in the stomachs of 50% of the human population. Pathogenic strains can cause diseases of the upper gastrointestinal tract. The microbe's tail-like flagella, which help it move about, are visible in this magnified image.

Barb Campbell became acquainted with potentially pathogenic bacteria such as *Helicobacter pylori*, which can cause stomach ulcers, as a medical technologist years ago, before she went to graduate school. Since then, the assistant professor of marine biosciences at UD has discovered these microbes in some surprising places, including hydrothermal vents deep in the Pacific Ocean. Recently, she began looking for them in waters closer to home. She tells us more about her research, which was funded by Delaware Sea Grant.

Barbara Campbell, Assistant Professor of Marine Biosciences

Question: What was the focus of the study?

Answer: We wanted to look for potentially pathogenic bacteria from a class of bacteria known as the Epsilonproteobacteria, and see if standard water-quality tests picked them up. The geographic focus was the beaches of coastal Delaware and the Inland Bays (Rehoboth, Indian River, Little Assawoman), as well as a few tributaries to the Inland Bays.

Question: What did you find?

Answer: The bacteria we were looking for are distant cousins to those that naturally reside at hydrothermal vents. We found evidence of only one of the two types of pathogenic Epsilonproteobacteria in our samples — *Helicobacter pylori.* The other one we were looking for, *Campylobacter jejuni,* is a natural inhabitant of chicken intestines, so with Delaware's large chicken population, we thought we might find that as well, but we did not.

Question: What can you tell us about *Helicobacter pylori?*

Answer: *Helicobacter pylori* lives in the stomachs of about 50% of the human population. It has been a natural inhabitant of our stomachs for a very long time. In fact, some scientists have used *H. pylori* typing to study human migration patterns, since the strains of the bacterium can be differentiated based on the origin of the humans. Most strains are not pathogenic, in that they do not cause disease. However, there are some that do. In developed countries, transmission is not thought to be waterborne, but it is in developing countries. We wanted to look for these bacteria to see if their presence is correlated with standard water-quality tests.

Question: What concentrations did you find?

Answer: About one-third of the samples we tested were positive for *Helicobacter pylori.* The majority of those were associated with more saline sites (beaches and Inland Bay sites and not tributaries). The fact that they are there is interesting, but why are they there? The most likely source is improperly treated sewage. The source of the sewage could be from treatment plants or leakage of private systems into the bays. There may be other sources as well, such as from marine or other animals.

Question: Did you use any specialized sampling techniques?

Answer: My graduate student, Katrina Twing, and I worked with the Delaware Department of Natural Resources and Environmental Control (DNREC) to develop a sampling plan. Their technicians collected water from their normal places and dropped it off for our research. Ed Whereat, program coordinator, Inland Bays Citizens Monitoring program, ran the usual state test for bacterial water quality (Total Enterococcus) on the samples. We used differential PCR [polymerase chain reaction] techniques to narrow down the samples and tested the positive ones with more pathogen-specific PCR primers.

Question: What intrigues you most about these bacteria?

Answer: We see these bacteria, albeit in low amounts, in marine waters long after other tests of water quality are negative. What is it about them that they can survive either sewage treatment or infrequent water contaminations for so long?

Question: What's happening to the study results?

Answer: The state is aware of our findings and will be sent a report shortly. We will let them know that these bacteria are present, and that tests like those we conducted may be more sensitive for bacteria that can survive outside humans, as well as sewage treatment.

Question: What is the next step in the research?

Answer: There may be other sources of highly related *Helicobacter* in marine waters, potentially even dolphins! I will be working with an REU [Research Experiences for Undergraduates] student on that project this summer.

Civil War Diaries

Prof connects to his past

Ritchie Garrison says the Civil War still seems like a recent memory in his family.

Around the parlor table, a family heirloom, you can almost hear the eloquent, impassioned conversations of his great-great-grandfather — the abolitionist William Lloyd Garrison — with fellow luminaries of the anti-slavery movement in America.

Their words and actions would galvanize public opinion, deepening the divide between those for, and those against slavery, ultimately leading to the deadliest war in American history and the turning point for a nation in how it defined freedom.

"Most of the who's who of the period visited the family home or the printing office of *The Liberator*, both of which were in Boston," says Garrison, professor of history and director of the Winterthur Material Culture Program at the University of Delaware.

Susan B. Anthony (a second cousin), Sojourner Truth, Frederick Douglass, and Harriet Tubman were among the many house guests. Even though there is no record of abolitionist John Brown visiting the home (Garrison, a staunch pacificist, considered Brown to be a fanatic), Brown would never have been turned away, the University professor says, for the Garrison home was a place to discuss both ideas and ideals.

The fact that he grew up in a family of some national interest acquainted Ritchie Garrison early on with old things. The letters, papers, and books, the furniture, clothing, and other objects of daily life have not only connected him to his ancestors on a deeply personal level, but also to the struggles of his country during one of its most tumultuous periods.

Among his most prized possessions is his great-grandfather George T. Garrison's book box, which served as a field desk while he was an officer of the Massachusetts 55th Black Regiment during the Civil War. The regiment was one of the first units of the U.S. Army to be made up entirely of African-American men, with the exception of the officers.

Ritchie Garrison, professor of history and director of the University of Delaware's Winterthur Material Culture Program, with the book box that his abolitionist great-grandfather carried as an officer of the Massachusetts 55th Black Regiment.

See Civil War Diaries, continued on page 42

CIVIL WAR DIARIES

Prof connects to his past

William Lloyd (he was known by "Lloyd") and Helen Garrison did not want their eldest son to go to war. Although a fiery orator, Lloyd Garrison preached nonviolence.

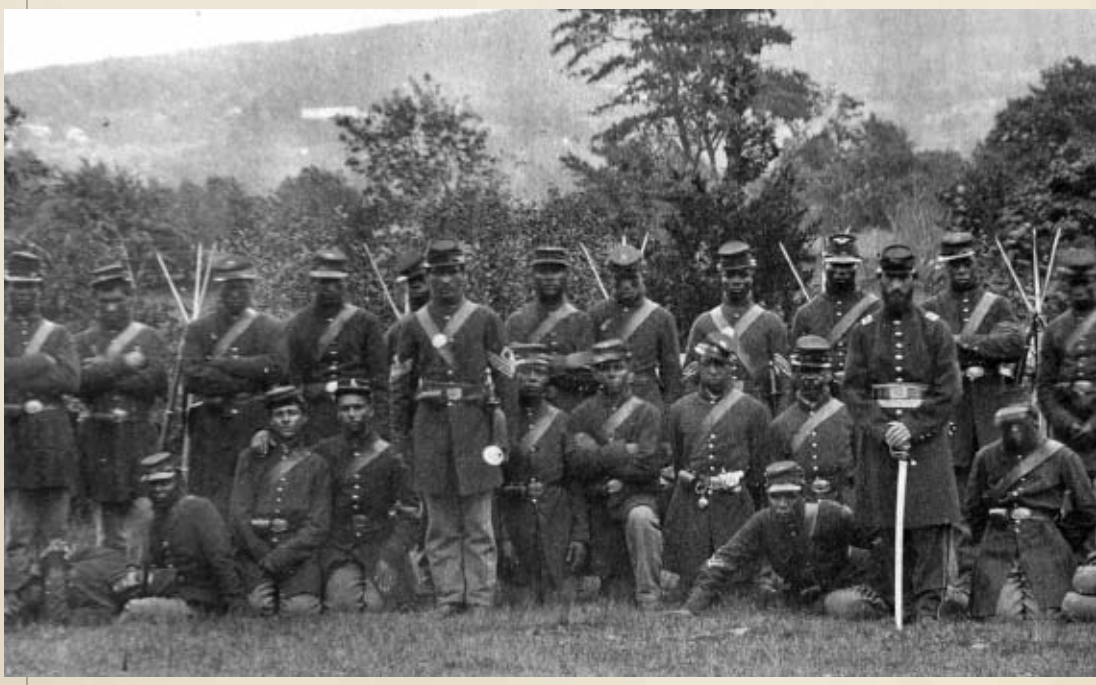
An abolitionist like his father, George T. Garrison was painfully shy, yet eager for adventure. He learned to set type for his father's anti-slavery newspaper, *The Liberator*, early on ("a job he hated," Ritchie Garrison says), but dreamed of prospecting at Pike's Peak. When approached with the opportunity to serve as an officer leading one of the first black regiments, he jumped at the chance.

"The books inside are about military tactics, something George needed to familiarize himself with since he was not a professional soldier," Ritchie Garrison says. "Moreover, senior command often discriminated against the black regiments, usually due to racism, but sometimes out of fear that black soldiers and their officers captured in battle would be summarily executed by enraged Confederates."

Black troops initially received less pay than their white counterparts and a disproportionate share of fatigue duty. George wrote about problems of morale in his diary and letters home.

Courtesy of Ritchie Garrison

Lt. George T. Garrison, Massachusetts 55th Black Regiment



(**Civil War Diaries**, continued from page 41)

"My grandfather who died in 1965 when I was 13 knew many veterans of the Civil War including his father, George Thompson Garrison. After George came home from the war and married my great-grandmother, his book box went into the family's attic, where it remained, with one move, for more than 100 years," Ritchie Garrison says.

In 1973, when it came time to break up the family home, the book box was opened, and inside, Ritchie Garrison says, was "materialized history of a great struggle for human rights," mostly in the form of quartermaster's and officer's reports. There was also George's pistol — still loaded.

"Restless, too impatient to become a scholar like his brother Wendell, he chaffed at the restraints of his family's nonviolent beliefs," Ritchie Garrison notes. "He hated slavery and was prepared to fight for his views."

George's book box, a simple pine chest, served as the Civil War officer's library and filing cabinet while bivouacked. As acting regimental quartermaster, he needed the box when on field maneuvers, and it went with him as part of the regiment's baggage. The box held supplies, a set of traveling brass candlesticks, boxes of pistol cartridges, military forms, books on military tactics and drills, and small items, including one of Ritchie Garrison's favorites, a small box from the Cork Ladies Abolition Society.

On the box's lid is the regiment's name. A stout hasp kept secure the government records and forms George was responsible for maintaining. The lock is still inside the box although the key is missing.

"He recorded with considerable detail his everyday activities, his impressions of the people around him, and his sense of how this wartime experiment in racial justice was going," Ritchie Garrison notes. "He saw men killed in action and had some close calls himself. Such experiences reminded him of the importance of family, and they, in turn, were fascinated by his eyewitness account of the war."

George wrote of the ability of the African-American troops to fight just as valiantly as their white counterparts, and of the men's superior deportment and discipline. He wrote of the important roles that African-Americans played in their emancipation, from able soldiers to scouts and spies.

While stationed at Folly Island, S.C., George told of a visit by Mr. and Mrs. Severance, abolitionist friends. The group went to visit Harriet Tubman, who, unbeknownst to George, had also been on the island for some three months.

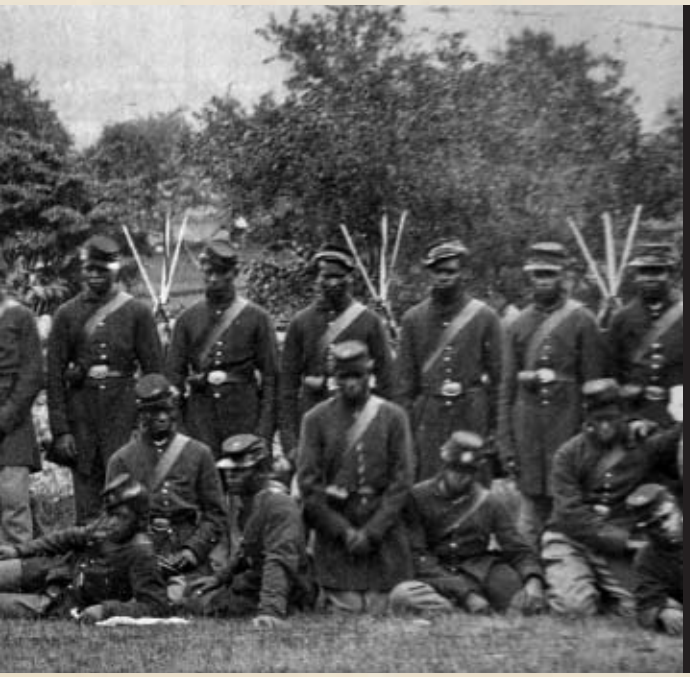
Officer's belt buckle worn by George T. Garrison.

The book box's opened lock.

"When we entered where she was at work ironing some clothes, Mrs. Severance went to introduce me by saying here is George Garrison, she no sooner saw me than she recognized me at once, and instantly threw her arms around me, and gave me quite an affectionate embrace, much to the amusement of those with me. We had such an interesting conversation with her. She is just now cooking and washing clothes at Gen. Terry's quarters, who is now in command of Morris and Folly Islands. She wants to go North, but says Gen. Gilmore will let her go only on condition that she will return back to their department. She has made it her business to see all contrabands escaping from the rebels, and she is able to get more intelligence from them than anybody else."

By February of 1865, resistance in Charleston was collapsing. When the regiment reached Mt. Pleasant, just north of the city, George observed: "The slaves greeted us with great joy all along our route into town. One woman rushed up all out of breath, and shook hands with every man that passed her and exclaimed with great emotion 'Great God.' Another woman kept up crying 'Joy, Joy, Joy.' The sight of seeing a colored Reg't gave them immense pleasure and joy. It seems that our force is the first Union one that has appeared in the village."

On April 14, 1865, at ceremonies at Fort Sumter, George and his father were reunited. They had not seen each other since George and his regiment left Boston in the summer of 1863 although they had corresponded regularly. According to Ritchie Garrison, before leaving the city to visit his son at the 55th's camp, Lloyd Garrison visited the grave of John C. Calhoun, an outspoken proponent of slavery. He stood over the tomb for a moment and then said: "Down into a deeper grave than this slavery has gone, and for it there is no resurrection."



Shortly before departing for the front in 1863, Company K, Massachusetts 55th Black Regiment, posed for this photograph at Readville, Massachusetts. George T. Garrison, center, leans on the sword he acquired from M. D. Ward and Company for $18 on May 30. The regiment marched off to war three days after learning the sobering news that Robert Gould Shaw and half of the Massachusetts 54th Black Regiment died or were wounded trying to capture Battery Wagner in South Carolina. Garrison later was promoted to first lieutenant and became the regiment's acting quartermaster, responsible for distributing supplies and provisions to the troops. ***Photograph courtesy of the Garrison Family***

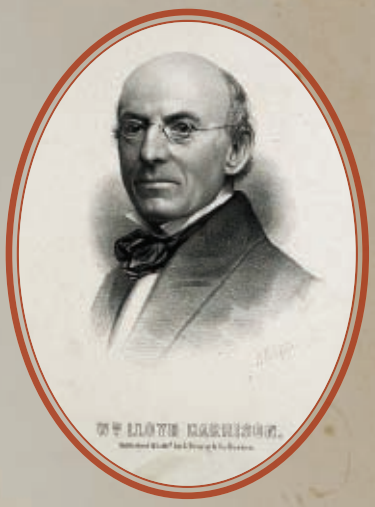
Harriet Tubman, a friend of the Garrison family, played a number of roles for the Union, including nurse, scout, and spy.

Ritchie Garrison is now editing George T. Garrison's Civil War letters and diaries, and the diary of his great uncle, John Ritchie, quartermaster of the Massachusetts 54th Regiment, for an upcoming book.

— *Tracey Bryant*

Editor's Note: *This article is based in part on Ritchie Garrison's lecture "John Brown, Abolition, and George's Trunk: Material Rhetoric/Material Conflicts" for the Jacob Lawrence Exhibition, Paul R. Jones Gallery, Feb. 23, 2009.*

This small box is among the contents of George T. Garrison's book box.



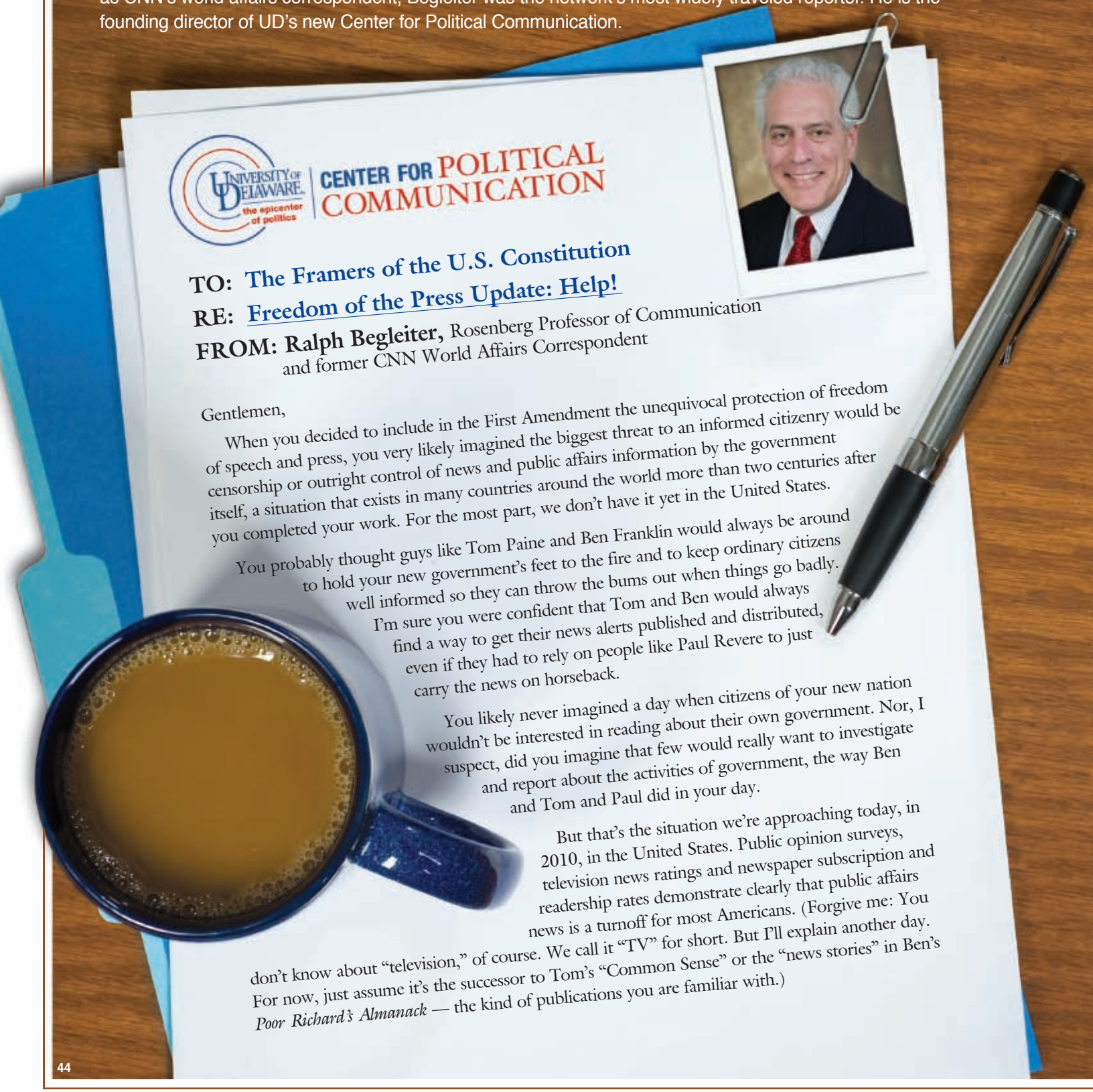
William "Lloyd" Garrison (1805–1879) was one of the most vocal opponents of slavery. He argued for "immediate and complete emancipation of slaves," seeking an end to slavery through non-violent means. Editor and publisher of the weekly anti-slavery newspaper *The Liberator* from 1831 to 1865, Garrison stated in its first issue:

"I am aware that many object to the severity of my language; but is there not cause for severity? I will be as harsh as truth, and as uncompromising as justice. On this subject, I do not wish to think, or to speak, or write, with moderation. No! No! Tell a man whose house is on fire to give a moderate alarm; tell him to moderately rescue his wife from the hands of the ravisher; tell the mother to gradually extricate her babe from the fire into which it has fallen; – but urge me not to use moderation in a cause like the present. I am in earnest – I will not equivocate – I will not excuse – I will not retreat a single inch – AND I WILL BE HEARD. The apathy of the people is enough to make every statue leap from its pedestal, and to hasten the resurrection of the dead."

Engraving courtesy of the Garrison Family

First Person

Ralph Begleiter, Rosenberg Professor of Communication and Distinguished Journalist in Residence, leads off "First Person," written by a UD faculty member who has achieved a "first." During two decades as CNN's world affairs correspondent, Begleiter was the network's most widely traveled reporter. He is the founding director of UD's new Center for Political Communication.



UNIVERSITY OF DELAWARE the epicenter of politics | CENTER FOR POLITICAL COMMUNICATION

TO: The Framers of the U.S. Constitution

RE: Freedom of the Press Update: Help!

FROM: Ralph Begleiter, Rosenberg Professor of Communication and former CNN World Affairs Correspondent

Gentlemen,

When you decided to include in the First Amendment the unequivocal protection of freedom of speech and press, you very likely imagined the biggest threat to an informed citizenry would be censorship or outright control of news and public affairs information by the government itself, a situation that exists in many countries around the world more than two centuries after you completed your work. For the most part, we don't have it yet in the United States.

You probably thought guys like Tom Paine and Ben Franklin would always be around to hold your new government's feet to the fire and to keep ordinary citizens well informed so they can throw the bums out when things go badly. I'm sure you were confident that Tom and Ben would always find a way to get their news alerts published and distributed, even if they had to rely on people like Paul Revere to just carry the news on horseback.

You likely never imagined a day when citizens of your new nation wouldn't be interested in reading about their own government. Nor, I suspect, did you imagine that few would really want to investigate and report about the activities of government, the way Ben and Tom and Paul did in your day.

But that's the situation we're approaching today, in 2010, in the United States. Public opinion surveys, television news ratings and newspaper subscription and readership rates demonstrate clearly that public affairs news is a turnoff for most Americans. (Forgive me: You don't know about "television," of course. We call it "TV" for short. But I'll explain another day. For now, just assume it's the successor to Tom's "Common Sense" or the "news stories" in Ben's *Poor Richard's Almanack* — the kind of publications you are familiar with.)

TV news departments around the country can actually see their viewership decline when news about today's wars in Iraq and Afghanistan comes on their broadcasts. Newspapers — and especially news Web sites — can concretely count the decline in readership of stories related to the wars or to government activities. (Oops. You don't know about the Internet, either. We call it "the Web." I'll have to send you a separate missive on all the changes in news technology since Paul Revere and the lanterns in the steeple.)

Check it out yourself. Take a look at the "most-frequently e-mailed" listings on newspaper Web sites. See what's popular. And observe what's not. You'll be surprised. Or maybe not. Maybe it won't surprise you that many more people read sports and celebrity news than government or global news. When Americans want news, four out of five people say they get it from broadcast sources. Newspapers have been in second place for many years now, but these days, they are in third place, behind the Internet as a source of news. All the major American newspapers — yes, the ones with prize-winning international reputations — have cut their newsroom staffs dramatically.

When viewership and readership decline, advertisers jump ship. That would have made common sense even to Tom Paine. Who wants to advertise in a newspaper where fewer people are seeing those ads? Fewer ads mean less money for editors, writers, reporters, producers, photographers, and other journalists.

So what, you say? Who needs newspapers or TV? Citizens can get their news on that new-fangled Internet. But wait; who's writing that news? Whose reporters are asking the questions of public officials? Whose journalists are demanding access to public records and forcing disclosure of information the public needs to make informed policy decisions? Whose photographers are documenting public life? Whose journalists are keeping track of government's relationship with business? Who's paying those journalists? — Around the country, mostly newspapers, and maybe a couple of very local radio stations. (Radio was a transition technology between Tom Paine and television. Except in big cities, almost nobody depends on it for news anymore. It's mostly become a place to hear the sort of "give-me-liberty-or-give-me-death" political rhetoric you remember Patrick Henry for.)

And few can point to a Web site that's actually paying reporters to investigate and report about state and local government on behalf of its citizens. (Newspapers shovel what they gather for print onto the Web, and in Delaware the *News Journal* even paid an anchor named Patty Petite to spin print into TV news on the paper's Web site for a while.) Even if you can find public affairs journalism about states on the Internet (and there are a few sites with astute analysts writing about state affairs, even if they do so on the basis of rumor or reporting funded by others), how many Americans are reading those sites?

You, the Constitution's framers, probably would be shocked to know that 50 million Americans watch "American Idol," a weekly televised musical talent show, while fewer than 2 million watch even the most popular all-news cable TV channels on any given day. And if the framers were gathered in a tavern in Elsmere after a hard day's Bill of Rights drafting and discovered that only about 110,000 of Delaware's 870,000 citizens read the *News Journal*, they might decide to skip worrying about "freedom of the press" altogether. They might conclude that Americans just aren't interested in public affairs. The small handful of corporations (you can count them on the fingers of one hand) which own almost all news media in the United States today have come to the same conclusion.

The last time a U.S. president was impeached, in 1998, one of the most prestigious television networks with a renowned news division broadcast a football game between the New York Jets and the Buffalo Bills instead. And when presidential election-year nominating conventions were held 10 years later, the big networks mostly left the job of covering them to those small TV news channels I mentioned earlier. In 2009 and 2010, the national networks dropped hundreds of journalists and news photographers from their staffs.

Of course, Americans do tune in, sometimes, to the news, and even pick up the newspaper. When Anna Nicole Smith died, or when Michael Jackson failed to awaken from his drug-induced sleep, or when a football player went on trial accused of murdering his wife, Americans tuned in, in droves.

So I'm writing to see if you have any ideas for us. In your day, you simply assumed that somebody would care enough to write about government affairs. You took for granted that someone would print and distribute that news. And if television had been around in your day, you surely would have assumed it would pay reporters to serve as watchdogs to protect the public.

Thanks to you, we still have freedom of the press. Any ideas about how to ensure we'll continue to have news media dedicated to keeping an eye on our government?

BLOGOSPHERE

Check out the fascinating topics our
UD researchers and students are blogging about!

A group of UD art history students traveled to China's Tsinghua University to present at an international conference on architectural history as part of a growing partnership. The students also went on research fieldtrips to view China's stunning architectural treasures, such as the Temple of Heaven, shown above, in Beijing. The program was led by Vimalin Rujivacharakul, assistant professor of art history, and supported by UD's Institute for Global Studies.

Andrew Bowden (left) standing with elder Uncle Moogy is painted with traditional aboriginal ceremonial designs.

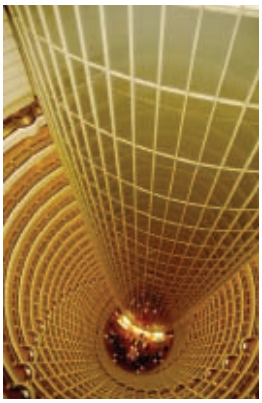
UD-Tsinghua University Partnership

"Shanghai Sunday"

by Julia Szczecinski and Antonia Marie Tetreault

Dec. 20, 2009 — We begin our third day of field research outside Tsinghua.... We proceeded from Shanghai modern to the uber-contemporary of Shanghai, as our red bus took us to visit the land of skyscrapers in the Pudong area.

The first one we visited was Jin Mao Tower, completed in the 1990s and designed by SOM [Skidmore, Owings & Merrill]. We traveled up to the auspicious 88th floor to see the cityscape of Shanghai and went down to the ground floor again before taking another elevator to go up to the 54th floor, which was the Grand Hyatt Hotel's main lobby. Our professor let us walk around to take photographs of the hotel's luxurious interiors before leading us out to the next site, the Shanghai World Financial Center. This second building was even taller and more futuristic. We found ourselves underneath its cantilever, staring down at Jin Mao Tower from the 94th floor, before taking another elevator up to that cantilever and walking along its long span (called the "Skywalk").



Student Christopher Kaiper took this photo of the atrium of the Jin Mao Tower from the 88th floor. The bottom is the Grand Hyatt Hotel's lobby on the 56th floor.

As the day is ending, we have come to realize how close we are to the imminent future as we gazed at the never-ending horizon of the city of Shanghai looking forward, wondering what the Shanghai World Exposition of 2010 would hold for the architectural possibilities this world is capable of....

Read more at international.udel.edu/projects/

South Pole Station

"Deep in the Heart of South Pole Station!"

by James Roth, Senior Electronics Instrument Specialist, Bartol Research Institute

Dec. 15, 2009 — As we spend our days in the relatively cushy comforts of the new elevated station here at South Pole, we sometimes forget that we are on the harshest continent on Earth. Today, I had the rare opportunity of taking a tour deep in the heart of South Pole Station (SPS). The power generators here at SPS are truly like a heart. They not only give us power, but provide us with heat and life-sustaining water.

If you think fuel costs are high in the States, imagine the $30 per gallon it costs for fuel here by the time it is flown to the bottom of the Earth! For this reason, conservation is very important. SPS does its part to be "green" by using as much energy from the fuel as possible. The heat generated by the 750 kilowatt generators is run through heat exchangers to strip off all of the heat possible to be used in the station. Some of the heat is used to heat the entire station, and some is used to melt our water for drinking and showering. I think you can understand now why we are only allowed two, 2-minute showers a week.

In January 2010, Jacob Bowman, professor of entomology and wildlife ecology in UD's College of Agriculture & Natural Resources, and Jon Cox, instructor in the Art Department, led a two-week study-abroad trip to the Australian outback focusing on wildlife conservation and nature/wildlife photography. At left, student Jasmine Macies is shown taking sunrise shots along the rocky coast in the Croajingolong wilderness area.

Australian Outback 2010

"Travels in Tasmania"

Jan. 25, 2010 — Our departure from Gumleaves began with a high-speed chase between the Tasmanian Native-hen and our tour bus. Only moments later, panic erupted when a huntsman spider was spotted on the ceiling of the bus. No worries, though. After a quick evacuation, the spider was released into the wild allowing us to continue our journey to the Tamar Islands.

As we walked along the boardwalk, we spotted Australian Shelducks, Welcome Swallows, and Black-fronted Dotterels in their natural habitat. In the evening, we camped at Narawntapu National Park. At sunset, we crept along open fields and photographed common wombats, red-necked wallabies, Tasmanian pademelons, and eastern gray kangaroos coming out of their daily hiding places to forage in the last rays of daylight.

Read more at ats.udel.edu/blogs/australia-outback-2010/

So what d'ya know about wombats?

Danielle Migliore holds a wombat in Trowunna Wildlife Park.

- They inhabit the grasslands and forests of Australia's east coast.
- There are three species: Common, Tasmanian, and Southern Hairy-Nosed. All are threatened or endangered. The Common is the largest, from 2–4 feet long, and 32–80 lbs.
- A wombat is a marsupial, a mammal with a pouch for carrying its young. A baby wombat, or joey, is about the size of a jellybean at birth and is carried in the mother's pouch, which faces backwards to keep out dirt as she digs.
- These "bulldozers of the bush" have powerful short legs with strong claws for digging extensive burrows.
- They have long incisors for eating grass, shrubs, bark, and roots.
- A group of wombats is called a mob or colony.

James Roth at the South Pole

If the generators are the heart of the station, the pipes and wells are the arteries and veins. Deep under SPS are cold, dark, snow tunnels that house the pipes that carry fresh water from the Rodriguez Well into the station and also carry the waste out to the outfall. The unsupported tunnels are 30 to 60 feet deep and run as far as half a mile away from the station. The temperature in the tunnels is a constant -60°F.

In the early '60s, Army engineer Raul Rodriguez developed a method for creating a well in the ice in Greenland. A pump is placed deep in the ice. As hot water is circulated into the hole, the walls melt to create a pool of water that looks like an upside-down light bulb. Once established, the Rodwell can last seven years.

Our current Rodwell is nearing the end of its life and contains as much as 3 million gallons of water. The melted water is so pure that it has no minerals and can harm pipes (and humans) if not treated. The water flows through limestone beds in the treatment plant, which makes it safe to drink.

James Roth is part of the UD research team working to build "IceTop," the surface array of detectors on top of the IceCube neutrino telescope at the South Pole.

Read more at www.expeditions.udel.edu/antarctica/

Test your knowledge

Dazzling, but DANGEROUS

Can you identify these tiny troublemakers? Check your answers at the bottom of the page.

1

Prof. Diane Herson & Megan Kautz

It is the most frequently reported cause of foodborne illness.

2

Prof. Ulhas Naik

Although it helps stop a cut from bleeding, it also is a key player in heart attacks and strokes.

3

Prof. Kirk Czymmek

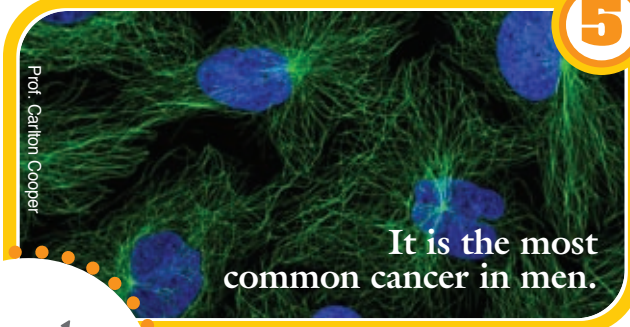
Widely found in soil, this resistant fungus can infect patients who are already sick.

4

Prof. Mary Ann McLane

If you use a tanning bed, you have a higher risk of getting this.

5



Prof. Carlton Cooper

It is the most common cancer in men.

Check out the answers below!

1. Salmonella – Salmonella bacteria have been known to cause illness for over 100 years. They were discovered in 1885 and are named for Dr. Daniel E. Salmon, an American veterinary pathologist.

2. A platelet – The smallest of the blood cells, platelets start clumping together when a blood vessel is wounded. Blood clots are a direct cause of heart attacks and strokes.

3. Fusarium — One of the most resistant fungi to antifungal agents, fusarium is widely distributed in soil and can infect people with compromised immune systems, such as cancer, organ transplant, and AIDS patients, often causing death.

4. Melanoma — It is the most serious form of skin cancer, more often affecting people with fair skin. These cells have actually been treated with snake venom in UD research.

5. Prostate cancer — It starts in the prostate gland, the walnut-sized organ that is part of the male reproductive system.

Take the challenge!

Special thanks to UD faculty and the Bio-Imaging Center at the Delaware Biotechnology Institute for the images!

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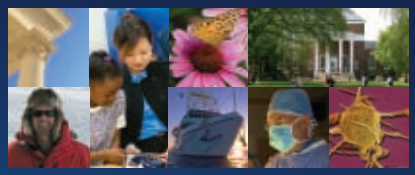

Colleges

- College of Agriculture and Natural Resources
- College of Arts and Sciences
- Alfred Lerner College of Business and Economics
- College of Earth, Ocean, and Environment
- College of Education and Public Policy
- College of Engineering
- College of Health Sciences

Research Centers & Institutes

Agricultural Experimental Station
Applied Science & Engineering Laboratories
Art Conservation Laboratories at Winterthur
Avian Biosciences Center
Bartol Research Institute
Elbert N. and Ann V. Carvel Research & Education Center
Catalysis Center for Energy Innovation
Center for Applied Coastal Research
Center for Applied Demography & Survey Research
Center for Archaeological Research
Center for Bioinformatics & Computational Biology
Center for Biomedical Engineering Research
Center for Carbon-free Power Integration
Center for Catalytic Science & Technology
Center for Climate and Land-Surface Change
Center for Climatic Research
Center for Community Research & Service
Center for Composite Materials
Center for Critical Zone Research
Center for Disabilities Studies
Center for Drug & Alcohol Studies
Center for Economic Education & Entrepreneurship
Center for Energy & Environmental Policy
Center for Environmental Genomics
Center for Fuel Cell Research
Center for Historic Architecture & Design
Center for Information & Communications Sciences
Center for Innovative Bridge Engineering
Center for Managed Ecosystems
Center for Material Culture Studies
Center for Molecular & Engineering Thermodynamics
Center for Neutron Science
Center for Public Horticulture
Center for Remote Sensing
Center for Research Development
Center for Spintronics and Biodetection
Center for the Study of Metals in the Environment
Center for Translational Cancer Research
Computer Architecture & Parallel Systems Lab
Delaware Asteroseismic Research Center
Delaware Biotechnology Institute
Delaware Center for Transportation
Delaware Education Research & Development Center
Delaware Environmental Institute
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Delaware Sea Grant College Program
Delaware Space Grant Program
Delaware Water Resources Center
Disaster Research Center
Early Learning Center & Laboratory Preschool
Exelon Trading Center
Halophyte Biotechnology Center
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