New alliance advancing health research, services

Discussing the Delaware Health Sciences Alliance are, from left, Tom Ferry of Nemours, UD President Patrick Harker, Robert Laskowski of Christiana Care, and Robert Barchi of Thomas Jefferson University at the "Stronger Health-Based Partnerships" conference held in March at UD.

Delaware Health Sciences Alliance

A coalition of leading education, healthcare, and medical research institutions has formed to nurture research and the development of advanced technology in the First State.

The new Delaware Health Sciences Alliance, announced during the "Stronger Health-Based Partnerships" conference held at UD in March, will combine the strengths and assets of its members — Christiana Care Health System, Nemours, Thomas Jefferson University, and UD — to provide leadership in the improvement of health and health services to all Delawareans and to serve as a key element in the state's economic future.

In addition, said UD President Patrick Harker, the Delaware Health Sciences Alliance will further the University's goals of becoming a premier research and graduate institution and achieving excellence in professional education.

"This alliance, critical on its own merits, is also a critical vehicle for advancing UD's strategic priorities and fulfilling the mission to which we obligated ourselves one year ago," Harker said at the announcement. "Neither goal will be advanced without close and dynamic partnership with the researchers and clinicians who deal in pressing healthcare challenges daily."

Harker noted that the four alliance partners have a long, shared history of cooperation. For example, the Partnership in Health Education, announced last fall, formalized the collaboration between UD and Thomas Jefferson University, enabling articulated degree pathways and joint research proposals.

"Before the partnership, we hadn't really pursued collaboration with a defined framework," Harker said. "That partnership and this alliance give us that framework."

He said the alliance also represents a way for the partners to articulate common priorities, including world-class healthcare education, interdisciplinary research, and better healthcare quality and delivery, and a structure for combining expertise and resources to meet those priorities.

A key component of healthcare education represented by the alliance will be the development of a Campus for Healthcare Education in Delaware. The campus will include classrooms, study halls, and a new residential facility for up to 150 medical, pharmacy, nursing, and occupational and physical therapy students.

The alliance also has these initiatives under way:

- The Delaware Valley Institute for Clinical and Translational Science (DVICTS), which seeks to acquire new grants that could collectively fund greater research discoveries and ensure the rapid movement of these findings from the lab to clinical settings to the patient, referred to as "bench to bedside" research;
- The Delaware Center for Cancer Biology, which will build on the unique research capabilities of the Kimmel Cancer Center at Jefferson, the Helen F. Graham Cancer Center at Christiana Care, the Nemours Center for Childhood Cancer Research, and the Delaware Center for Translational Cancer Research, which includes researchers at UD, Christiana Care, Nemours, and the Delaware Biotechnology Institute; and
- The Delaware Rehabilitation Institute, which will leverage partner strengths to become the premier research and training center in physical rehabilitation in the nation.

Other major centers are being considered in the areas of cardiovascular disease, women's and children's health, the neurosciences, and health policy.

In addition to announcing the alliance's formation, the conference included keynote addresses by Delaware Gov. Jack Markell and Newt Gingrich, former speaker of the U.S. House of Representatives and founder of the Center for Health Transformation.

For more about the Delaware Health Sciences Alliance, visit www.delawarehsa.org.

As part of her doctoral research in psychology, Amber Belcher works as a psychotherapy extern at Christiana Care's Helen F. Graham Cancer Center, helping patients and their spouses cope with breast cancer. Such collaborations are expected to expand through the new Delaware Health Sciences Alliance.

Center to build 'smart'

Thomas Beebe, Jr., is directing UD's new center for biomaterials research.

From contact lenses to hip implants, biomaterials are not new. But a research center focusng on them is at UD. And its aim is to develop "smart" new biomaterials, from vocal cords to pharmaceutical drug carriers, that operate by mimicking natural processes in the human body.

The National Institutes of Health's National Center for Research Resources (NIH-NCRR) awarded UD a five-year, $10.5 million grant for a multidisciplinary research program on molecular design of advanced biomaterials in October.

◀ *UD's advanced biomaterials research team includes (from left) Xinqiao Jia, Darrin Pochan, Thomas Epps, Kristi Kiick, Sandeep Patel, Zhihao Zhuang, and Millicent Sullivan.*

$17.4-million NIH grant boosts biomedical research

Delaware took another major step toward expanding human health research when, in April, a partnership of six of the state's academic and clinical institutions, led by UD's Delaware Biotechnology Institute, won a five-year, $17.4-million grant from the National Center for Research Resources at the National Institutes of Health to develop the state's biomedical capacity in the target areas of cancer, cardiovascular, and neurosciences research.

The program — the Delaware IDeA Networks of Biomedical Research Excellence (INBRE) — involves Christiana Care Health System, Delaware State University, Delaware Technical & Community College, Nemours/A. I. duPont Hospital for Children, the University of Delaware, and Wesley College.

"The University of Delaware's INBRE program has been, and continues to be, at the forefront in developing a cyberinfrastructure network to address bioinformatics needs and applications to advance biomedical sciences," said Barbara M. Alving, M.D., director, National Center for Research Resources. "This award will help advance research to combat diseases including cancer, heart, and neurological disease — research that may lead to improved health within the state and far beyond its borders."

Ulhas Naik, professor of biological sciences, is directing a new cardiovascular research program, and will lead a cardiovascular research center to be developed at UD, through a new NIH INBRE grant.

DBI, a major research center for the life sciences at UD, drove the development of the successful proposal. The institute also managed the first INBRE program grant, awarded by NIH in 2002, which, among its accomplishments, catalyzed formation of the Delaware Center for Translational Cancer Research, a collaboration of UD, Christiana Care's Helen F. Graham Cancer Center, and the Nemours Center for Childhood Cancer Research, and the hiring of 50 new life sciences faculty across the state's academic and medical institutions.

"Our new INBRE grant will help build a new generation of health researchers for the 21st-century workforce, to improve the health of the citizens of Delaware and expand health-based economic development in the state," said David Weir, founding director of DBI and leader of the INBRE effort. Weir was appointed director of UD's Office of Economic Innovation & Partnerships last year.

The new effort will encompass cancer, cardiovascular, and neurosciences research programs; four new research centers — in bioinformatics, clinical outcomes research, cardiovascular research, and neurosciences; and four new Ph.D. programs — in neurosciences, biomolecular science and engineering, bioinformatics and computational systems biology, and cardiovascular research. The program also will provide funding for 80 graduate students and 150 undergraduate researchers throughout the state.

biomaterials

The program, involving researchers in chemistry and biochemistry, biological sciences, chemical engineering, and materials science and engineering, is directed by Thomas P. Beebe Jr., professor in the Department of Chemistry and Biochemistry and director of the Surface Analysis Facility.

Beebe has pioneered new classes of nanomaterials and biomaterials, including materials designed to stimulate and guide nerve cells, and hopes to eventually invent a cure for paralysis caused by spinal cord injuries.

The grant is part of NIH's Centers of Biomedical Research Excellence (COBRE) program, which funds projects to strengthen the research infrastructure and further the research careers of junior faculty in this field.

"For many years, the biomedical industry has focused on making anything that goes into the body as strong, unreactive, and inert as possible," Beebe says. Commonly used materials have included titanium, ceramics, and stainless steel.

"Rather than trying to fool the body into thinking that there is no object present," Beebe explains, "our researchers will use their understanding of chemistry, biology, and physics to design and make new biomaterials by determining what the component molecules would need to be and how they would need to be connected to each other in order to give the final material its desired properties. This can be done by taking advantage of the body's natural processes, by mimicking the body's properties in that location, by releasing additional drugs when and where they are needed, or by contracting, expanding, flexing, solidifying, flowing, adhering, or vibrating as needed," he says.

"It may not be tomorrow, it may not even be by the end of the five-year grant," Beebe says, "but we fully expect the results of this program to be translated into clinical applications that will have an impact on patients."

UD has two other COBRE programs, one on the prevention and treatment of osteoarthritis and the other on membrane protein production and characterization.

Cancer Research

The cancer research program will focus on cancer cell mobility and the role of specific proteins in metastasis, DNA repair, computer-based tools for simulation and early diagnosis of cancer, and biomaterials for use in cancer treatments.

Dr. Nicholas Petrelli, Bank of America Endowed Medical Director of Christiana Care's Helen F. Graham Cancer Center, will serve as program director. A key partner will be the Delaware Center for Translational Cancer Research, directed by Robert Sikes, UD professor of biological sciences.

Cardiovascular Research

Ulhas Naik, UD professor of biological sciences, is leading the cardiovascular research program, which will focus on the effect of kidney function on cardiovascular events, extracellular matrix remodeling in heart failure, and biomaterials for cardiac tissue engineering. He also will direct a new cardiovascular research center to be developed at UD.

Neurosciences Research

The neurosciences research program will address molecular mechanisms of learning and memory, spinal muscular atrophy, and cardiovascular autonomic nerve function in diabetes. A key goal will be to establish a new center for brain disease and translational neurosciences. It is directed by Melissa Harrington, associate professor of biology and director of biomedical research at Delaware State University.

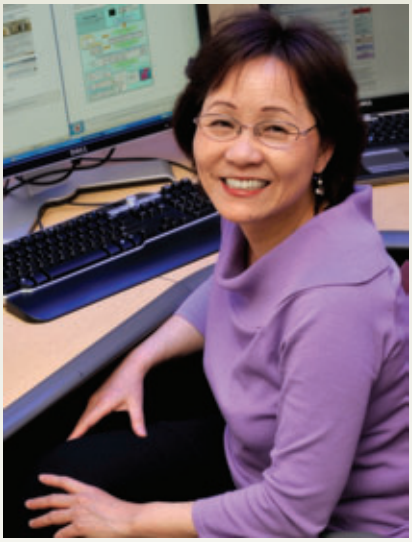
Bioinformatics critical to future of medicine, research pioneer says

Cathy Wu sees the integration of genetics and the environment as key to the practice of medicine in the future, with a focus on personalized medicine, where care is tailored to the individual based on his or her genetic profile.

"The driving force of 21st-century biology is integration," says Wu, UD's recently appointed Edward G. Jefferson Chair of Bioinformatics and Computational Biology.

The new faculty chair honors the late former chairman and chief executive officer of the DuPont Co. who was a University trustee and benefactor.

Wu is a pioneer in the emerging field of bioinformatics, which uses computer science, mathematics, and information theory to model and analyze biological systems.



Cathy Wu, UD's Edward G. Jefferson Chair of Bioinformatics and Computational Biology

She says she is looking forward to collaborating with researchers in engineering, computer science, math, and biological sciences across campus. A major aim is to create the Center for Bioinformatics and Computational Biology at UD.

"The new center will become a focal point for a lot of synergistic activities," she says.

New graduate programs will be established through the center, and Wu plans to have a master's course of study in place for the 2010–2011 academic year, with a Ph.D. program to follow.

Before joining UD, Wu was a professor at Georgetown University Medical Center, where she will retain adjunct status.

Since 2001, Wu has led the Protein Information Resource (PIR), a major bioinformatics tool supporting genomics, proteomics, and systems biology research. The PIR Web sites, accessible by researchers worldwide, receive more than 4 million hits per month. PIR will now have two branches: one at Georgetown and one at UD.

Under the watchful eye of Lynn Snyder-Mackler, Alumni Distinguished Professor of Physical Therapy, at UD's Physical Therapy Clinic, T. Fraser Russell does a quadriceps strengthening exercise as part of his recovery from total knee placement surgery.

Getting a new knee?

It may be uncomfortable at first, but doing exercises to strengthen your quadriceps after you've had knee replacement surgery due to osteoarthritis is critical to recovery. In fact, it can boost the function of your new knee to nearly that of a healthy adult your age.

That's the finding of a University of Delaware study published in the February issue of *Arthritis Care & Research.* It was written by Lynn Snyder-Mackler, Alumni Distinguished Professor of Physical Therapy at UD, Stephanie Petterson, clinical faculty at Columbia University, Ryan Mizner, assistant professor at Eastern Washington University, Jennifer Stevens, assistant professor at the University of Colorado at Denver, and Drs. Leo Raisis, Alex Bodenstab, and William Newcomb of First State Orthopaedics in Newark, Del.

Petterson, Mizner, and Stevens all received their doctorates in UD's nationally ranked Biomechanics and Movement Science (BIOMS) program.

"It sounds logical that exercises to strengthen your knee should be a component of your postoperative physical therapy after a total knee replacement, but it's not the convention at all," Snyder-Mackler says.

"There are all of these old wives' tales that strength training is a detriment to the patient and that the new knee should be treated delicately," she notes. "Our study demonstrates that intensive strength exercise as outpatient therapy is critical to begin three to four weeks after surgery."

Nearly a half-million knee replacements, also known as total knee arthroplasties (TKAs), are performed every year in the United States to treat severe knee osteoarthritis, the loss of the cushiony cartilage padding the knee. The joint disease leaves its sufferers with persistent pain and limited function, resulting in an overall diminished quality of life.

A step forward for stroke patients

Sometimes called a "brain attack," a stroke occurs when the blood supply to the brain is blocked or when a blood vessel in or around the brain bursts, damaging a part of the brain. It's the third leading cause of death in the United States and a leading cause of adult disability.

A team of UD engineers and physical therapists is developing new technology — in the form of a robotic exoskeleton worn over the leg — in the quest to help stroke patients fully regain the ability to walk.

"About 700,000 people suffer strokes each year in the United States, and as many as 3 million survivors are living with the after-effects," says Sunil Agrawal, professor of mechanical engineering and director of UD's Mechanical Systems Laboratory, who is the project's leader.

The team includes Stuart Binder-MacLeod, Edward L. Ratledge Professor and chair of the Department of Physical Therapy; John Scholtz, professor of physical therapy; and Jill Higginson, assistant professor of mechanical engineering and director of UD's Center for Biomedical Engineering Research.

The research is funded by a new five-year, $3-million grant from the National Institutes of Health's Bioengineering Research Partnerships (BRP) program. An initial BRP grant, awarded in 2002 and led by mechanical engineering professor Thomas Buchanan, enabled the researchers to develop robotic prototypes and demonstrate the feasibility of the treatment approach through limited testing with human subjects. Significant progress also was made in developing biomechanical models to predict muscle deficiencies during normal and abnormal gait.

The competitively renewed grant focuses on embedding two robotic exoskeletons developed during the initial research with a variety of position and force sensors. The first of these is a U.S. patented, non-motorized device, known as a gravity-balancing orthosis, which increases

Exercise after surgery is critical

While knee replacement alleviates the pain of osteoarthritis and improves function, patients exhibit impaired quadriceps strength and function for such activities as walking and climbing stairs, and the levels remain below those of healthy people the same age.

In a randomized controlled trial at UD's Physical Therapy Clinic conducted between 2000 and 2005, 200 patients who had undergone knee replacements were given six weeks of progressive strength training two or three times a week starting four weeks after surgery. Half of the group also received neuromuscular electrical stimulation.

Their function was compared to that of 41 patients who received conventional rehabilitation and home physical therapy. Quadriceps strength, knee range of motion, and gait were measured in such tests as timed up-and-go, stair climbing, and a six-minute walk.

The group in the progressive strength-training program showed significant improvement in quadriceps strength and functional performance. They also demonstrated substantially greater quadriceps strength and functional performance after 12 months than the group having conventional rehabilitation.

"This study clearly demonstrates the importance of surgeons encouraging their patients to be compliant with progressive quadriceps strengthening during their rehabilitation to enhance their clinical improvement and function post-total knee replacement," notes Dr. Leo Raisis, a total joint surgeon at First State Orthopaedics and adjunct associate professor at UD.

Raisis, one of the lead total joint surgeons on the study, has been in practice for over 20 years and currently serves as chairman of the Center for Advanced Joint Replacement of the Christiana Care Health System.

"Why undergo a $25,000 elective surgery and then not do as much as you can to get the most out of it and improve your quality of life?" Snyder-Mackler says. "Older people are incredibly motivated — they hurt after the surgery and they want to be better. They need to do this."

A variety of media reported the study, including *The New York Times.* The research is one component of a multi-investigator $11 million program on osteoarthritis, funded by the National Institutes of Health in 2007.

UD AROUND THE World

Research on aging goes international

Individuals 60 and older are projected to comprise 30 percent of Delaware's population by 2030, and 41.5 percent over age 65 likely will have a disability, according to Veronica Rempusheski, UD's Jeanne K. Buxbaum Chair of Nursing Science.

The University of Delaware and the Azienda Unità Sanitaria Locale 11 di Empoli (AUSL11), a local health authority in the Tuscan region of Italy, signed an agreement in January fostering mutual cooperation in research, teaching, and faculty/student exchanges focusing on aging. AUSL11 is one of 12 local health authorities in Tuscany — which has a population of nearly 3.7 million, 22 percent of whom are 65 or older — in an area of 383 square miles.

The agreement was facilitated by Steven Stanhope, professor in the College of Health Sciences; Francesco Benvenuti, director of the Department of Rehabilitation and Frailties, AUSL11, and Velio Macellari, direttore Dipartimento Tecnologie e Salute, Istituto Superiore di Sanità (the Italian equivalent to the National Institutes of Health).

"The Rehabilitation and Frailties Department of AUSL11 has a unique, innovative model care system for persons with chronic motor disabilities. They have implemented a community-based Adaptive Physical Activity (APA) program for addressing the disabling functional decline in persons with chronic health conditions — the only program of its kind in the world," Rempusheski said.

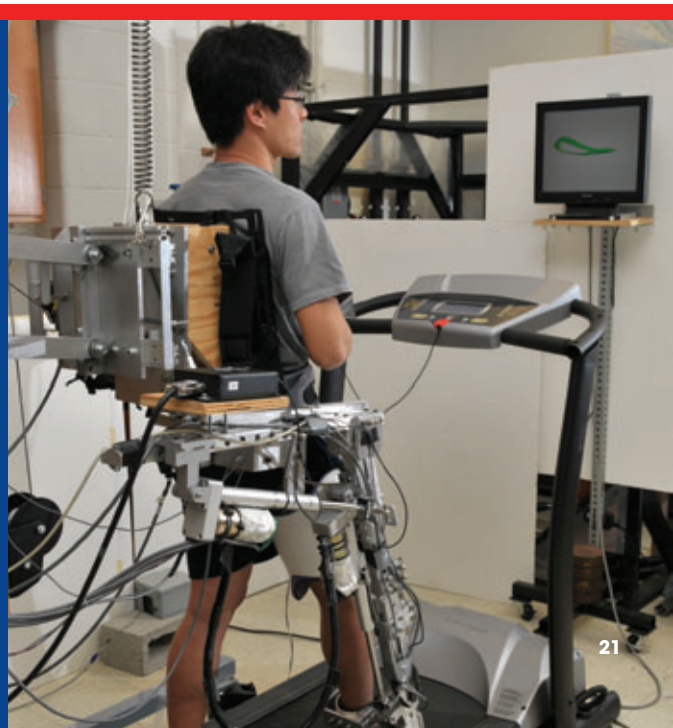
The APA program has evaluated 10,000 citizens in the past four years and currently includes 4,500 regular attendees. The program provides a rich resource and ideal clinical environment for answering research questions of interest to clinicians. UD and Italian researchers already are setting in motion studies to build on the Italian experience and replicate the APA program in the United States.

range of motion in impaired individuals by removing gravity from their joints.

The second is an Active Leg Exoskeleton, or ALEX, which fits over the leg and contains sensors as well as motors. While walking on a treadmill, ALEX users receive visual feedback from a video monitor on how well their gait matches a desired pattern. In addition, motors on the device help users maintain their leg motion within a designated range by guiding the foot back when it moves outside that range.

ALEX not only improves motion but also maximizes learning, or retraining of the brain, Agrawal says, adding that research has found that survivors can benefit from using the device even years after their stroke.

Stroke is a leading cause of adult disability. About 700,000 people suffer strokes each year in the U.S.



Postdoctoral researcher Seok Hun Kim demonstrates the robotic exoskeleton that helps correct a patient's gait while walking on a treadmill.