ADVANCING economic development

University of Delaware President Patrick Harker believes the goal of economic advancement is "to make people's lives better, to unleash human potential, and to create opportunity for all."

Since UD's Office of Economic Innovation & Partnerships (OEIP) opened its doors in July 2008, it has risen to President Harker's challenge to strengthen the University's participation as a partner in economic development that enhances economic prosperity and quality of life.

Led by David Weir, founding director of the Delaware Biotechnology Institute, the office is facilitating exciting new partnerships in areas as diverse as agriculture, energy, biomedicine, and the environment.

Of special importance is a research and education partnership with the U.S. Army's Research, Development and Engineering Command (RDECOM), as the nearby Aberdeen Proving Ground in Maryland expands to house high-technology programs.

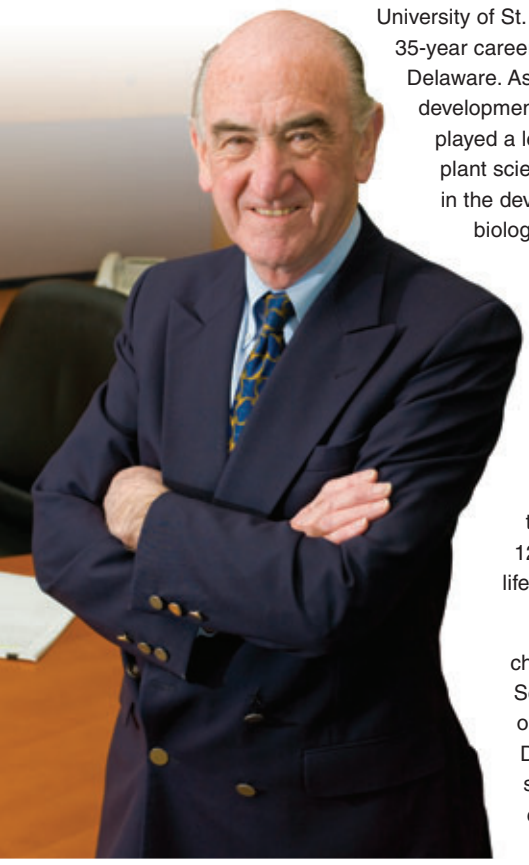
OEIP's chief roles include the following:

- To function as a communication gateway, providing external entities access to UD's knowledge-based assets, and UD personnel access to research and development opportunities outside the University;
- To foster invention, innovation, and entrepreneurial activities campuswide, from the arts to the physical sciences;
- To develop, leverage, and market UD's invention portfolio through the Intellectual Property Center;
- To provide UD entrepreneurs with business, marketing, financial, and legal expertise to enable commercialization of University inventions;
- To provide guidance (business, marketing, financial, legal) to small businesses, start-up companies, and entrepreneurs through the Small Business Development Center;
- To develop state, regional, national, and international partnerships encompassing research, business, and education; and
- To provide leadership to the state of Delaware for science and technology-based economic development.

Business Week **named Newark the best city for business start-ups in Delaware in part because of proximity to the knowledge-based resources of the University of Delaware.**

An 'aye' for innovation

With a keen eye for innovation and years of experience forging collaborations and advancing new products to the marketplace, David Weir is a natural to lead the University of Delaware's Office of Economic Innovation & Partnerships.



David Weir, *Director, University of Delaware Office of Economic Innovation & Partnerships*

Weir holds a Ph.D. in chemical physics and taught at the University of St. Andrews, Scotland, before embarking on a 35-year career at the DuPont Company in Wilmington, Delaware. As vice president for global research and development in DuPont's agricultural business, he played a lead role in building DuPont's capability in plant science, meeting with industry and political leaders in the developing world to explore the role of modern biology in agriculture and sustainable development.

After retiring from DuPont, Weir was lured to UD by the opportunity to direct a new center for life sciences research: the Delaware Biotechnology Institute, a partnership involving state government, academic and medical institutions, and the private sector that launched in 2001. The institute, with its interdisciplinary research teams, has led to the creation of an estimated 12,000 new primary and secondary jobs in the life sciences.

Today, in addition to leading OEIP, Weir chairs the executive committee of the Delaware Science & Technology Council, a statewide organization that is working to improve Delaware's competitive position so that the state is recognized broadly as a center of excellence in science and technology. In 2009, he received the Delaware Bio Award for outstanding service to the bioscience industry.

Q: What goals have you set since you took the helm in July 2008?

A: We've set four goals to establish the University of Delaware as a recognized center for innovation and entrepreneurship, benefiting the community, the state, and region:

(1) Create an environment that nourishes invention, innovation, and entrepreneurship and has the capability to convert it into valuable businesses, creating high-quality jobs;

(2) Develop a strong portfolio of intellectual property;

(3) Establish OEIP as the communications gateway to enable those outside the University to access UD's knowledge-based assets and vice versa; and

(4) Develop a network of partnerships for UD, the state, and the region.

Q: How does the current economic downturn affect your plans?

A: There are, of course, serious issues, but there is a bright side. It actually provides increased opportunities for us. The way back to a healthy economy is small businesses, and that ties right in with what we're trying to do here.

Q: What advantages and disadvantages does UD have compared to other universities in this arena?

A: One disadvantage — I think the capabilities and competencies of this University have been underappreciated and

Soon, UD students may leave campus not only with a freshly minted degree, but also a small business in tow.

That's one of the goals of the Office of Economic Innovation & Partnerships (OEIP), which has established the Entrepreneur in Residence program to connect students and faculty with business leaders.

William G. Mavity, UD's first Entrepreneur in Residence, offered his insights on topics ranging from international business assignments to raising venture capital during his inaugural lecture in December.

A 1972 UD graduate in mechanical engineering administration, Mavity is president, chief executive officer, and director of Paracor Medical, Inc. The Sunnydale, Calif., company develops innovative ways to treat heart failure using mechanical devices that don't require patients to undergo open-chest surgery.

Among Mavity's advice for UD students:

- If you ever have the opportunity to work overseas, take it.
- Raising money is not for the faint of heart. Venture capitalists look for three things in identifying projects to support: a good balance between opportunity and risk, the right kind of management team, and a protectable idea.
- Pay attention in your classes — even the ones that don't interest you.
- And follow your passions.

"Try to find a company and pursue your idea," Mavity said. "You have tremendous resources today to do your research using the Internet. What took me weeks in the library 20 years ago, you can do in just a few hours now."

During his presentation this past April, UD alumnus Michael Bass, executive vice president and chief operating officer of La Dove, Inc., told students that no amount of academic education beats being prepared for the unexpected.

Miami-based La Dove is a leading full-service research facility, formulator, and manufacturer of personal care products for

underutilized. A major advantage is that we have an integrated team that is flexible and nimble. When you put this together with our ability to interact with the private sector and the governor and legislature — a hallmark of a small state like Delaware — we have very real opportunities to differentiate ourselves and to promote economic development.

Q: How can UD better leverage its intellectual property and transfer it to beneficial use?

A: First off, we're working to streamline the process. When researchers call this office and say they have an invention, we immediately file a new invention disclosure, and we put a business team (legal, business, marketing expertise) together with the inventor. Then we begin to answer the question of whether it is a new business opportunity, or one for licensing for equity or royalties, etc.

Q: What opportunities lie ahead for UD?

A: One of my beliefs is that as the world shrinks and economies become more knowledge-based, universities are going to become a very critical component of innovation and entrepreneurship, especially as the private sector outsources more of their basic research. That's a big shift. Additionally, UD researchers have developed proposals competing for several hundred million dollars in federal stimulus funding. We also are working closely with the U.S. Army through the Department of Defense Base Closure and Realignment Commission (BRAC) to develop graduate courses and programs and to foster research collaborations and student internships at the expanding Army base at nearby Aberdeen Proving Ground in Maryland.

Q: What is your biggest challenge?

A: Being able to get the financial wherewithal to support all the good ideas we've got. It's how to manage them and remain financially sound and fund all of these opportunities.

Q: What is your guiding philosophy?

A: My career has always been involved in the creation of new opportunities — at DuPont, I was involved in Lycra, Nomex, Tyvek, Kevlar. I like starting with a blank sheet of paper and creating something new that has value. I get a lot of satisfaction from that, I really do. And I like to see the people that I work with grow themselves. So if I can create new value and grow an organization where people thrive in their careers, that's very satisfying for me.

both the professional and retail markets, including hair care, skin care, and body care products for some of the world's leading cosmetic brands.

◀ William G. Mavity (center), UD's first Entrepreneur in Residence, meets with students in the Venture Development Center in Purnell Hall. Mavity, the president of Paracor Medical, Inc., earned his bachelor's degree in mechanical engineering administration from UD in 1972.

Bass recounted his experiences early in his career at another company when he worked with difficult accounts and bad clients. He encouraged the students to take on challenges and learn from them.

"The way you learn is to go to the clients that don't work, go into the bowels of companies that don't work. That's how you learn," Bass said.

OEIP Contacts

David Weir

David Weir, *Director.* He is former vice president for global research and development at DuPont and the Delaware Biotechnology Institute's founding director.

Denise Bierlein

Denise Bierlein, *Administrative Coordinator.* She assists with the filing of patent applications and related activities associated with the Intellectual Property Center.

Shelley Cook

Shelley Cook, *Business Development Analyst.* She is coordinating research and education activities relating to the Army Base Realignment and Closure (BRAC).

Amalea Maidanos

Amalea Maidanos, *Administrative Assistant.* She assists with external relations and is often the first point of contact for callers and visitors to OEIP.

Cyndi McLaughlin

Cyndi McLaughlin, *Manager.* She coordinates the office's communications and external relations activities, with an emphasis on programs enabling innovation.

Bruce Morrissey

Bruce Morrissey, *Director of Technology Development, Intellectual Property Center.* He oversees legal issues relating to inventions, patents, copyright, and trademarks.

Clinton Tymes

Clinton Tymes, *State Director, Delaware Small Business Development Center Network.* He is responsible for the network's long-range planning and development.

Bradley Yops

Bradley Yops, *Assistant Director, Intellectual Property Center.* Yops assists UD researchers with legal issues relating to inventions, patents, copyrights, and trademarks.

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HOT TECHNOLOGIES

UD inventions designed to

"Mouth mouse" aids people with spinal injuries

The "mouth mouse" designed by Kurt Manal, research assistant professor of mechanical engineering, is a novel assistive technology that can give people with disabilities, particularly individuals with severe spinal cord injuries, the ability to operate a computer and other electronic systems.

The device, consisting of a dental retainer embedded with sensors, detects the magnitude and location of the force applied by the user's tongue, moving the cursor on a computer screen accordingly.

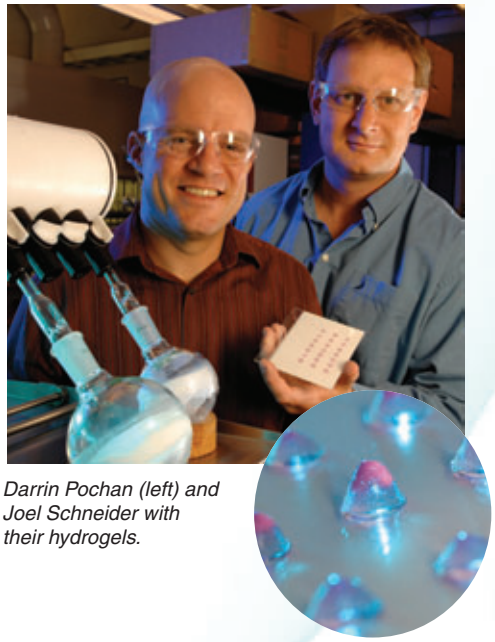
The mouth mouse can be used to drive motorized wheelchairs, control environmental conditions in a home or office by switching lights on or off and regulating thermostats, as a call-switch to sound a bell when personal care or assistance is needed, and as a possible "third hand" for surgeons or for military use by pilots, among other applications.

High hopes for healing hydrogels

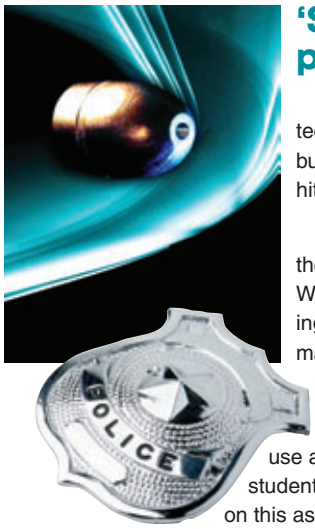
What's a hydrogel? Think of a soft contact lens. However, UD researchers Darrin Pochan, professor of materials science and engineering, and Joel Schneider, professor of chemistry and biochemistry, are now moving hydrogels into exciting new applications once deemed the domain of science fiction.

They've invented a new kind of hydrogel based on "smart peptides" that transform from a solution into a gel once injected in the human body, capable of delivering a targeted, timed-release payload of cells and antibiotics for repairing wounds or diseased organs.

Providing wounded soldiers in battle with pain-killing, infection-fighting treatment, regenerating healthy tissue in a cancer-ridden organ, healing a biopsy site, providing a dermal filler for cosmetic reconstruction, and aiding with numerous dental applications, from periodontal therapy to dental implants, are among the myriad uses the scientists foresee for the new technology.



Darrin Pochan (left) and Joel Schneider with their hydrogels.



'Superman' technology to protect troops, police officers

Scientists from UD and the U.S. Army recently invented a leading-edge technology that sounds a lot like Superman — It's able to stop a speeding bullet. It's called "shear thickening fluid." It flows like a liquid until something hits it. Then it hardens on impact.

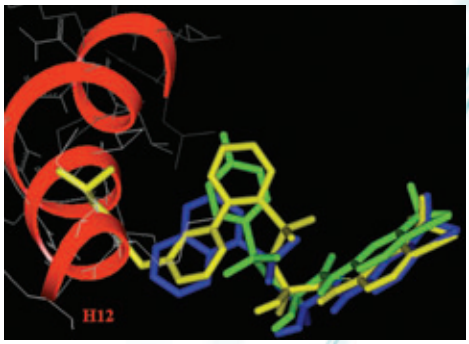
Norman Wagner, the Alvin B. and Julia O. Stiles Professor and chair of the UD Department of Chemical Engineering, and his students and Eric Weitzel, a scientist at the U.S. Army Research Laboratory, have been working to develop "liquid body armor" — a bulletproof, lightweight, and flexible material to help protect soldiers in battle.

Besides safeguarding soldiers and law enforcement officers, the novel material is being examined at UD's Center for Composite Materials for use as a "hip guard" to protect elderly patients from fractures. Wagner and his students are working with UD health and exercise scientist Charles Buz Swanik on this aspect of the research.

Breakthrough technology for treating prostate cancer

Prostate cancer is the second leading cause of cancer death in men in the United States, after lung cancer. The National Cancer Institute predicts 192,280 new U.S. cases of prostate cancer in 2009 and 27,360 deaths from the disease.

John Koh, professor of bioorganic chemistry, and Paula McGinley, recent UD doctoral graduate, have developed a breakthrough technology for enhancing prostate cancer treatment based on the unique therapeutic agent PLM1. The scientists have designed PLM1 to target androgen receptor mutations, which are known to impart resistance to anti-androgens, the chemotherapy agents that block the production of male hormones to stop the prostate cancer cells from growing. PLM1 and its analogs could serve as a critical second line of defense in anti-androgen therapy when mutations to the androgen receptor give rise to anti-androgen withdrawal.



A new class of anti-androgen molecules have been designed to disrupt critical portions of the androgen receptor associated with prostate cancer progression.

improve lives

A simple way to clean water

One-sixth of the world's population — over a billion people — lack access to clean drinking water. While potable water is readily available in the United States, there is increasing concern about the high levels of chlorine used in water disinfection and treatment.

Yan Jin, professor of plant and soil sciences, and Pei Chiu, associate professor of civil and environmental engineering, have developed an inexpensive technology that uses iron to remove microorganisms from water — not only bacteria such as *E. coli,* but also viruses.

The technology is less expensive than existing disinfection methods. It doesn't require power, use toxic chemicals, or generate harmful byproducts. In fact, it can remove chlorine, arsenic, chromium, lead, and other contaminants. And it can be incorporated into existing water treatment systems.

NASA Tech Briefs, the top-circulation engineering magazine in the United States, named the technology one of the top seven innovations of 2007.

Yan Jin (right) and Pei Chiu developed an inexpensive technology for removing bacteria and viruses from drinking water.

Find out what else is perking at UD's gateway to innovation

From powered leg aids to help stroke patients regain the ability to walk, to telecommunications devices based on new-age spintronics, UD has dozens of technologies available for licensing.

To learn more, contact the Office of Economic Innovation & Partnerships at **oeip-info@udel.edu** or (302) 831-7140.

Way to go, baby!

Using joysticks, infants with special needs can gain precious mobility in a controlled, safe environment with the aid of this robot designed by Sunil Agrawal, professor of mechanical engineering, and Cole Galloway, associate professor of physical therapy.

The device may be manually driven by the infant or remotely by a caregiver. In addition, using in-house developed intelligent software, it can be autonomously or semi-autonomously driven safely, avoiding obstacles.

Further developments include a force-field joystick to train an infant to navigate within a cluttered environment, and a "virtual leash" to allow the robot to autonomously follow a parent within a selected leash radius while navigating in an indoor or outdoor environment.

The technology is ready for widespread clinical testing with children.

From left, researchers Sunil Agrawal and James (Cole) Galloway and doctoral candidate Ji-Chul Ryu with their happy young driver.

UD and DuPont partnership yields disease-resistant corn

Through a successful collaboration of the University of Delaware and DuPont, the DuPont seed business Pioneer Hi-Bred is now marketing Pioneer® brand hybrid 34F26 — the first corn hybrid in North America to carry the trait that provides enhanced resistance to anthracnose stalk rot (ASR). This corn disease annually causes an estimated $1 billion in yield losses in North America alone.

The commercial agreement between UD and DuPont regarding their multi-year, corn disease research collaboration was announced February 11, 2009.

"We're thrilled to see the discoveries of University of Delaware scientists being put to work for farmers through our collaboration with DuPont," said UD President Patrick Harker.

James A. Hawk, professor of plant and soil sciences in UD's College of Agriculture and Natural Resources, became familiar in the 1980s with a gene in corn known to provide resistance to *Colletotrichum graminicola,* the fungus that causes ASR. At the time, the gene was found only in a "tropical" corn line from Mississippi, which could not be used commercially.

Corn without resistance to the fungus Colletotrichum graminicola can be attacked by anthracnose stalk rot, a devastating disease.

Hawk worked for more than 20 years to demonstrate that the gene could be bred into commercial germplasm and developed "near-isogenic lines" that facilitated the genetic characterization of ASR resistance. He and his associates then teamed up with DuPont scientists, and cutting-edge technology was used to "fine map" the gene and develop molecular markers under a collaborative research agreement.

DuPont scientists are using the markers in high-throughput genetic technology to move the gene into a wide variety of elite commercial germplasm.

"Bringing additional disease resistance to our customers is part of our overall strategy to increase their productivity," said Paul E. Schickler, president of Pioneer and vice president and general manager at DuPont.

Jim Hawk, UD professor of plant and soil sciences (right), and scientist Teclemariam Weldekidan examine a diseased corn stalk.

Anthracnose stalk rot typically rots corn stalks from the bottom, causing the stalks to break over or ears to fall off completely, making harvest much more difficult. The disease also can kill the plant from the top down, a trait called top dieback, which results in premature plant death and reduced yields.

The increased incidence of anthracnose stalk rot is thought to be associated with increased use of no-till agricultural practices to reduce soil erosion and fuel costs. Higher risk of the disease also is associated with corn planted in fields that had corn the previous year because the pathogen over-winters in corn residue.

The technology developed by UD and DuPont adds to the arsenal of tools farmers can use to combat ASR and protect corn yields. A portion of the royalties to the University from sales of the ASR-resistant hybrid will be reinvested in support of continuing research at UD.

Proteins could detect cancer's spread

The University of Delaware signed a partnership agreement with Strategic Diagnostics, Inc. (SDI), in November to develop biomarkers that detect the spread, or metastasis, of prostate cancer.

SDI is a major developer and producer of antibodies and immunoreagents for a broad range of applications. The biotechnology company is based in Newark, Del.

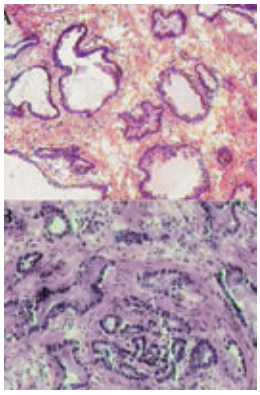
The Helen F. Graham Cancer Center also is a collaborator in the effort under an existing agreement between UD and Christiana Care Health System, based in Wilmington, Del.

Scientific findings suggest that when cancer cells implant in normal body tissue, they cause damage to surrounding proteins upon breaking away from the primary tumor, leaving behind fragments of protein molecules. These fragments are indicators that the cancer has metastasized.

SDI will work to develop antibodies to detect these protein fragments left by the invading cancer cells. The results of tests that employ such antibodies would help determine the stage and severity of the cancer and allow medical professionals to develop effective treatment options for patients with metastatic disease.

"We are extremely excited about this collaboration with the University of Delaware and the Helen F. Graham Cancer Center," said Francis M. DiNuzzo, president and chief executive officer of SDI. "The applications of SDI's Genomic Antibody Technology™ in fields such as cancer biomarker discovery represent an important opportunity for us to further demonstrate the efficacy of our technology platform. We look forward to contributing to this critical scientific research with the University and the center."

"It is a perfect triple play," noted David Weir, director of UD's Office of Economic Innovation & Partnerships, which facilitated the agreement. "It benefits SDI and is another important step in building a biomedical research and business capability in the state. This partnership is clear evidence of the importance of deploying the University's knowledge-based assets for economic and community benefit, with SDI's technology being a strong value driver."



Healthy prostate (top) vs. prostate cancer (bottom). Note the irregular glands and clumps of cells in the bottom histograph.

Dr. Nicholas Petrelli, medical director of the Helen F. Graham Cancer Center, called the collaboration "an example of the successful establishment of the Center for Translational Cancer Research, which will not only succeed in helping in the care of patients, but also in establishing new jobs in the state."

The Center for Translational Cancer Research is a collaborative initiative of the state of Delaware, the University, the Delaware Biotechnology Institute, and the Helen F. Graham Cancer Center.