

## EXPANDING RESEARCH AND TECHNOLOGY TRANSFER



The strategic plan's challenge to improve university rankings in research and intellectual property development has been met in a variety of ways:

- Annual research expenditures have increased from \$69 million in 2002 to \$90 million in 2007-2008.
- Nine university faculty members have received prestigious NSF CAREER grants in the last five years, as compared to five in the previous decade.
- NJIT ranks among the top 200 American research universities in an annual study by The Center at the University of Florida.
- The NSF ranks NJIT in the top 50 among public and private colleges without a medical school for research expenditures.
- NJIT ranks 10th among research universities specializing in science, technology, engineering and math based on faculty scholarly productivity in a study by Academic Analytics.
- University researchers were awarded 12 U.S. patents in 2007-2008, bringing the total assigned to NJIT to 95.
- The university has licensed 123 assets for commercialization, almost all licensed in the last five years.

## Moving New Technologies from the Lab to the Marketplace

During each of the past two years, **Judith Sheft** (*right*), associate vice president for technology development, has been awarded funds from the New Jersey Commission on Science and Technology to assist faculty researchers with the most promising patentable inventions with gap funding grants of up to \$50,000 to bridge the chasm between an interesting idea and a commercial product. During the past two years a total of 16 Technology Development Gap Awards have been made to the faculty researchers.

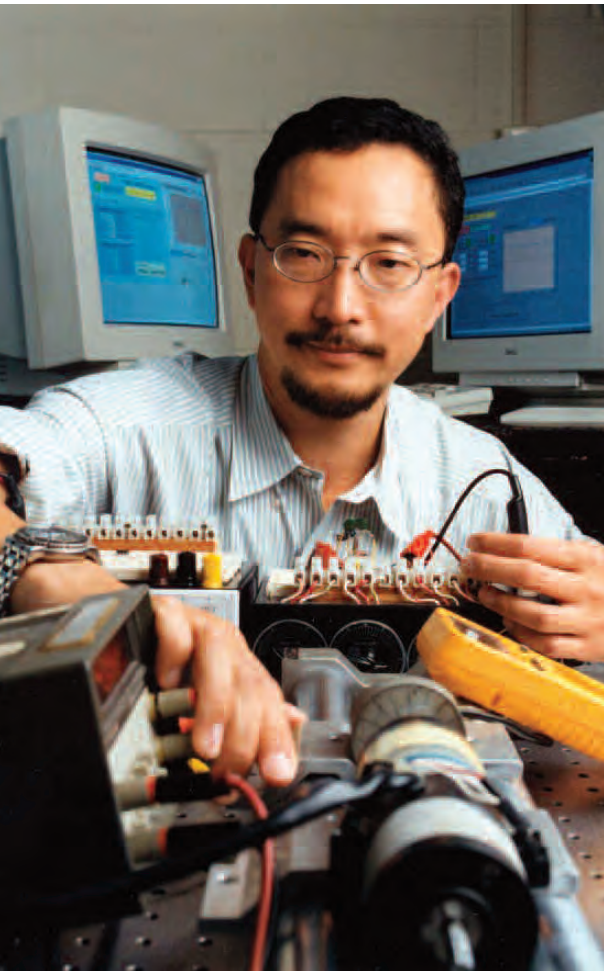
**Timothy Chang**, professor of electrical and computer engineering (*left*), received a gap award in FY07 for his patented nanopositioner, which has 6 degrees of freedom for applications in such fields as semiconductor manufacturing, opto-electronics, life sciences, and material handling. He received two additional awards in FY08 — one for his low transient pulse technique for ultrasound imaging to detect and monitor bone fractures, and another for broadening the application base of the Smart-Pin™, a new liquid dispensing/handling system capable of producing tiny spots/droplets/geometric-features for molecular biology research and analysis.

**Sergiu Gorun**, associate professor of chemistry (*right, second from top*), received an award to develop further his phthalocyanine dyes, which have the unique characteristic of being able to absorb heat, allowing visible light to pass through the polymer thus opening up an array of new civilian and military applications: heat ray shielding laminated glass or film, plasma display grade filters, heat-retaining and heat-accumulating fibers, and liquid crystal display devices.



**Zafar Iqbal**, research professor of chemistry (*above*), received gap support to develop technology that applies the principles and materials of nanotechnology to a novel biofuel cell that converts the body's own glucose to power devices like pacemakers and glucose biosensors for diabetics. The device uses highly conductive nanomaterials — carbon nanotubes and gold quantum dots — to guide the electrons.

**Rajesh Dave**, distinguished professor of chemical engineering, received a gap grant for his dry-particle coating



technique that enables a precise amount of nano-particles to be bonded onto the surface of cohesive powders as small as 5 microns. This nanoscale coating process opens up a host of new applications for pharmaceutical, nutraceutical, food, energetic and electronics materials.

**Somenath Mitra** (*below top*), professor of chemistry, and **Zafar Iqbal**, research professor of chemistry, received awards in FY07 and FY08 to refine their proprietary techniques for producing, purifying and changing the chemical characteristics of carbon nanotubes thus allowing nanomaterials to be combined into nanostructures, manipulated by chemical engineering, or embedded into a matrix of other materials for a wide variety of applications.



**Treana Livingston Arinzeh**, associate professor of biomedical engineering (*below left, center*), and **Michael Jaffe**, research professor of biomedical engineering (*below left, bottom*), received a gap grant to refine and improve their electrospinning technique used to build scaffolds for tissue engineering, which are then combined with adult stem cells to regrow bone tissue.

**Michael Lacker**, professor of biomedical engineering, received an award for his Boundary Method, which generates new output algorithms for measuring skill, movement stability, and energy efficiency of human motion in order to assist individuals with neuromuscular and skeletal injuries with daily activities.

**Kamalesh K. Sirkar**, distinguished professor of chemical engineering (*right top*), received awards in FY07 and FY08 to participate in a NASA-sponsored large-scale demonstration of his hollow fiber membrane device to remove and recover a variety of volatile organic compounds (VOCs) from air and waste-gas streams vented by a variety of industrial processes (water treatment, and chemical, food, petrochemical and pharmaceutical manufacturing) thus reducing the Greenhouse Effect caused by VOCs.

**Gordon Thomas**, professor of physics (*above right, bottom*), received two awards, one to improve and test a new tonometer that enables thru-the-eyelid measurement of intro-ocular pressure to diagnose glaucoma, and a second award to continue work of his team's "smart shunt" for hydrocephalus and brain injury patients.



**Chengjun Liu**, associate professor of computer science, received a gap grant for his patented Face Detection technology to develop new similarity measures required for a robust face detection pilot system. The system, which takes into account such factors as lighting and facial expressions, can be used as a security system with facial identification replacing a physical key or a password. Such a system could also assist law enforcement officials in locating fugitives by means of video cameras strategically placed in public places.



## Partnering for Economic Development

**N**JIT's Enterprise Development Center (EDC), one of the nation's largest high tech incubators with nearly 90 tenant companies, celebrated its 20th anniversary in 2008. The facility was cited in the 2007 report on "Entrepreneurship in America" by the Council on Competitiveness as a benchmark example of a successful technology-based incubator. This year the facility expanded its office space and wet lab capabilities. Current successful tenants include: NeuroTrax, whose computer software program for early diagnosis of Alzheimer's, Parkinson's and other diseases won it "Best in

Show" award in the 2008 NJTC Venture competition; BanDeMar Networks, a developer of advanced video e-learning solutions technology that created the video processing technology for the global microscope installed last summer in the new Liberty Science Center; and CyberExtruder, a company with technology that enables the conversion of 2D facial images to an accurate life-like 3D model of the subject's face or head.

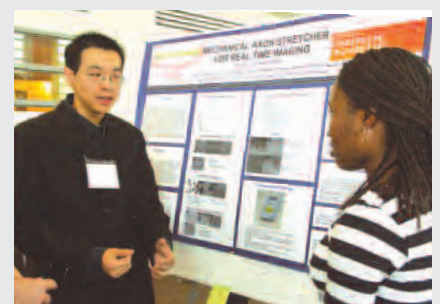
**NJIT** is partner with British and American universities in the White Rose Health Innovative Partnership, a project funded by the UK Higher Education

## Training Tomorrow's Inventors

**N**JIT's increased emphasis on research is also enhancing the educational experience because NJIT encourages undergraduate as well as graduate students to partner with faculty in a wide variety of research projects in cutting-edge technologies such as neural engineering, biogeography, nanotechnology, and engineered particulates. For the past four years, student work has been recognized at NJIT's Annual Provost's Student Research Day. Judges have noted the increasing sophistication of student projects, as demonstrated by the 2008 undergraduate winners:

Biomedical engineering major **Jillian Nguyen** (*right*), earned first place for her study of dysfunctional eye movements to gain better understanding of traumatic brain injury, conducted with **Tara Alvarez**, associate professor of biomedical engineering.

Second-place honors went to math major **Karina Aliaga** (*below left*), and **Temitope Brotherson** (*below right*), a double major in math and biology. The pair worked with **Gareth Russell**, assistant professor of mathematical sciences, to unravel a puzzling absence of bird species on certain islands.



Innovation Fund to accelerate dramatically innovation in technologies, methodologies and practices within the medical and healthcare sector. The consortium's Proof of Concept fund recently funded 32 healthcare projects deemed both innovative and collaborative, including



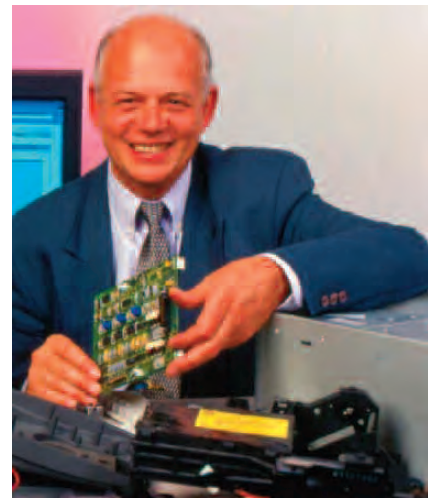
four that partner with NJIT:

■ **William Hunter**, professor of biomedical engineering (*below left*), will collaborate with the University of York on two projects – a device that will allow measurement of brain activity in patients with degenerative disorders such as Parkinson's disease, and a new technique for diagnostic imaging of metabolic processes.

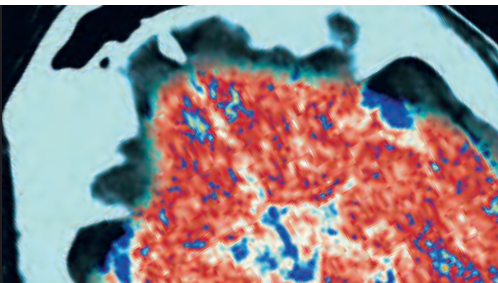
■ **Michael Jaffe**, research professor of biomedical engineering (*left center*), and **Treena Arinzeh**,

associate professor of biomedical engineering, are partnering with a team from the University of Sheffield on the development of an innovative wound dressing.

■ **Gordon Thomas**, professor of physics (*above, third from left*), is working with researchers from the University of Leeds on a new technology for assisting children with developmental coordination disorder (DCD).



**Ernest Geskin**, professor of mechanical engineering (*right top*), and **Paul Ranky**, professor of industrial engineering (*right bottom*), are partnering in a project supported by an Advanced Manufacturing Innovative Partnership grant from the New Jersey Commission on Higher Education. Advanced Manufacturing is identified by the Governor's Office of Economic Growth as an important sector of New Jersey's industry where high quality jobs are available, and which requires a qualified and motivated workforce. The team will be developing several courses in advanced manufacturing at NJIT designed to meet the specific needs of New Jersey companies.



Biomedical engineering majors **Bin Lin** and **Vivian Ozoko** (*left top*), tied for third place for a study with Assistant Professor **Bryan Pfister** of rapid axon stretch growth, a technique for regenerating damaged or diseased nerve cells that is providing clues to repairing traumatic injuries to the spinal cord and other nerve tissue.

Applied physics major **Stephanie Milczarski** (*left bottom*), also took third-place honors for her work with **Gordon Thomas**, professor of physics, as part of an NJIT research team conducting a clinical trial to test a new method that measures compressibility through the eyelid with a device that the patient can easily and painlessly apply to the eyelid.