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Rajesh Dave (above standing) oversees doctoral student Lauren Beach, who is studying the flow properties of pharmaceutical powders to optimize manufacturing of solid dosage forms, such as pills and tablets. Using the dry particle coating technique developed at NJIT, she attaches nanoparticles to the surface of larger host particles to improve flow and handling properties, critical factors in both manufacturing and formulation of pharmaceuticals.
FOSTERING NATIONAL RECOGNITION IN BIOMEDICINE

As the fastest growing concentration in the university, biomedicine is rapidly becoming an intrinsic part of education and research at NJIT. Encompassing health care, life sciences, and pharmaceuticals, the university’s biomedical focus draws from every department and discipline with an array of educational programs ranging from bioelectronics to health care systems management. Research projects investigate such areas as tissue engineering, engineered particulates for pharmaceutical coatings, rehabilitation medicine, and data mining.

Helping stroke patients regain use of their hands and arms through innovative robotic and virtual reality-based video game therapies is the goal of Sergei Adamovich, associate professor of biomedical engineering. With funding from the National Institutes of Health (NIH), he leads a team in the design of optimal, personalized, and dynamic strategies for rehabilitation of hand and arm function in patients with such disorders as cerebral palsy and stroke. The team utilizes brain imaging to evaluate the effects of sensory manipulation on brain activation patterns and to learn more about the changes that take place in the brain during rehabilitation.

Adamovich and graduate student Qinyan Qiu work with the VR Piano Trainer, developed to play the appropriate notes as they are pressed by the virtual fingers. The position and orientation of both hands, as well as the flexion and abduction of each finger are recorded in real time using a Data-Glove and translated into movement in their three dimensional counterparts. This activity was designed to train the patient’s ability to move the hand through space accurately and flex each finger independently.

Nanoscale particulates designed to produce better medicines and improve the ways in which drugs are manufactured are the work of the NSF-supported Engineering Research Center for Structured Organic Composites, a collaboration among NJIT, Rutgers University, Purdue University and the University of Puerto Rico, Mayaguez. Rajesh Dave, distinguished professor of chemical engineering, lead investigator at NJIT, heads a team developing tailored particulate materials with unique properties. The team is developing pharmaceuticals with higher drug loadings and improved quality, as well as nano-sized drugs that are more water soluble, and can be administered as edible films.

Dave oversees doctoral student Lauren Beach, who is studying the flow properties of pharmaceutical powders to optimize manufacturing of solid dosage forms, such as pills and tablets. Using the dry particle coating technique developed at NJIT, she attaches nanoparticles to the surface of larger host particles to improve flow and handling properties, critical factors in both manufacturing and formulation of pharmaceuticals. Techniques such as near-infrared spectroscopy and positron emission particle tracking are used to measure results and to evaluate different methods used during the coating process.

Tissue engineering is a major research focus in NJIT’s Department of Biomedical Engineering. Associate Professor Treena Livingston Arinzeh uses adult stem cells in combination with scaffolds of calcium phosphates to repair and regrow bone. Cheul Cho, (right) assistant professor of biomedical engineering, received a Coulter Foundation Translational Award to develop a device that uses liver cells derived from stem cells for the treatment of liver failure.
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Donald H. Sebastian, (above) senior vice president for research and development, is principal investigator on a grant of more than $23 million from the American Recovery and Reinvestment Act of 2009 to achieve widespread meaningful use of health IT and facilitate use of an electronic health record for every person by the year 2014.
With NSF support, **Marino Xanthos**, professor of chemical engineering, is leading a project to develop a drug manufacturing technology based on Hot-Melt Extrusion (HME). The goal is to help commercialize numerous drugs that never progressed to the marketplace due to poor bioavailability.

**Somenath Mitra**, professor of chemistry, is collaborating with Frank Witzmann, professor of cellular and integrative physiology at the Indiana University School of Medicine, in an NIH-sponsored study to assess the potential biological and toxicological impacts of carbon nanotubes. The NJIT team will synthesize and characterize reproducible nanotubes in order to generate protein biomarker candidates of the biological and toxicological effects on the digestive system.

**Cheul Cho**, assistant professor of biomedical engineering, also received a Coulter Foundation Translational Award to develop a device that uses liver cells derived from stem cells for the treatment of liver failure. His invention provides for a rapid, direct differentiation method that yields a homogeneous population of endoderm-like cells, which can then be further differentiated into hepatocyte-like cells with hepatic morphology, functionality, and gene and protein expression.

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With NSF support, **Marino Xanthos**, professor of chemical engineering, is leading a project to develop a drug manufacturing technology based on Hot-Melt Extrusion (HME), a process widely used in the plastics industry that holds the potential of improving the bioavailability of poorly soluble drugs. The goal is to help to commercialize numerous drugs that never progressed to the marketplace due to their solubility-caused poor bioavailability, and change the delivery route of some drugs from injection to oral.

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SHAPING THE AGE OF “DIGITAL EVERYWARE”

“Digital Everyware” is NJIT’s name for the ubiquitous computing that has changed the way we work, the way we learn, the way we play, and even the way in which we interact with others. Computer chips are adding functionality to just about everything, from musical greeting cards to cars and appliances to “smart” homes. Wireless technology adds mobility and flexibility, and voice, data, video and Internet are available everywhere, from tinier and tinier devices. Social networking is part of the fabric of daily life, as are concerns about online security. NJIT researchers are working to create the tools to help the digital world function and to evaluate the impact of new technologies on society.

**Somenath Mitra**, professor of chemistry, is collaborating with Frank Witzmann, professor of cellular and integrative physiology at the Indiana University School of Medicine, in an NIH-sponsored study to assess the potential biological and toxicological impacts of carbon nanotubes. The NJIT team will synthesize and characterize reproducible nanotubes in order to generate protein biomarker candidates of the biological and toxicological effects on the digestive system.

**OSvaldo Simeone**, assistant professor of electrical and computer engineering, is leading a team developing enabling technologies, and transmission models and protocols, and for cognitive radio. In this wireless technology, either network or wireless node itself changes particular transmission or reception parameters to execute its