Environmental science and engineering have been top priorities at NJIT since the opening of the York Center in the 1980s. Today, the focus encompasses sustainability in building and design, infrastructure and transportation, as well as green chemistry and ecology.

For the second consecutive year, two teams of NJIT interior design students were regional winners in the Annual Interior Design Educators Council (IDEC) Student Competition. Mary O’Haire and Nicole Zampolin (left) designed “Africa’s Playtime” (below) while Peter Fritzky, Tatiana Duarte and Nora Hamadé (right) created “Zulu Cultural Center” (above right) for the African-themed competition. The students used recycled local materials. Faculty advisor is Assistant Professor David Brothers.
**Dr. Louis Lanzerotti** (above right) headed a team of scientists that designed and built the instrument currently in use on the NASA probes, launched in August 2012 (above left) for the Radiation Belt Storm Probes Ion Composition Experiment. The purpose of the investigation is to measure the properties of charged particles that comprise the Earth’s radiation belts and the plasma waves that interact with them, the large-scale electric fields that transport them, and the magnetic field that guides them. The goal is to better understand space weather and how disturbances in the radiation belt may impact Earth’s resources, such as electric grid systems. Lanzerotti recently received the 2012 Basic Science Award from the International Academy of Astronautics.

**Fadi Karaa**, associate professor of civil and environmental engineering (left in photo below left), focuses his research on infrastructure rehabilitation and capital improvement planning. With support from the U.S. Department of Transportation through the City University of New York, he and **Sugata Banerji** (left seated), a doctoral student in computer science, are developing a comprehensive inventory management system for underground fiber optic conduits.

**Collette Santasieri**, (above) and her Strategic Initiatives staff provide technical assistance to governments and nonprofits interested in identifying, assessing, cleaning up and redeveloping brownfield properties. With funding provided by EPA, this Technical Assistance to Brownfields Communities Program (TAB) covers a geographic region consisting of 16 states and 18 tribal nations. Under contract with the New Jersey Department of Transportation, the Strategic Initiatives staff conducted a series of studies for the Liberty Corridor, the congressionally-designated economic and transportation zone that encompasses eight New Jersey counties (above right). Santasieri and her team identified nine brownfield sites within the Liberty Corridor that may have potential for redevelopment, as well as assessed the status of 21 Portfield sites. In addition, Strategic Initiatives inventoried green and environmentally sustainable technologies in use within the Liberty Corridor and researched green technologies in use in other parts of the country that may be applicable for use within the Liberty Corridor.

**Professor Jay Meegoda** of civil and environmental engineering (above left) led a team that developed a computer-based Drainage Information Analysis and Mapping System for the New Jersey Department of Transportation. In collaboration with **Chi Tang** (above center), senior research associate in the Transportation Center, and civil engineering student **Masroor Khan** (above right) and others, he developed a system that will evaluate underground drainage, locating and cataloging infrastructure assets including pipes, storm-water devices, manholes and catch basins, as well as data on inspection, rehabilitation, replacement and repair. Meegoda received the 2011 New Jersey Department of Transportation Research Implementation Award for the project.

**Paul Romano** (above), senior research architect at NJIT’s Center for Building Knowledge is leading a project that will develop and deploy a comprehensive training toolkit offering low-cost strategies for improving energy efficiency and reducing pollution at New Jersey’s supermarkets. The online self-diagnostic and training tool will focus on refrigerant leakage, a major contributor to the greenhouse gas effect, as well as optimization of lighting and HVAC controls. With funding from the U.S. Environmental Protection Agency, the team is working with 35 supermarkets in New Jersey to develop strategies that will help food stores to become more energy efficient.
Lisa Axe (pose of them). Her advisor is Professor
Dr. Lisa Axe, a PhD student in environmental engineering, is developing a model that will predict metal leaching from paints and help the DOT characterize the metals that are generated during bridge rehabilitation. With funding from the University Transportation Research Center, she is developing a model that will predict metal leaching from paints and help the DOT characterize the metals and determine the safest way to dispose of them. Her advisor is Professor Dr. Lisa Axe.

Somenath Mitra (below right), distinguished professor of chemistry and environmental science with his research team, doctoral students Ornthida Sae-Khow (left in photo) and Ken Gethard (not pictured), developed a method to generate pure water and concentrate pharmaceutical waste. The process, carbon nanotube enhanced membrane distillation, vastly increases the efficiency of the distillation process. Mitra also received a patent for a method of purifying carbon nanotubes using a rapid microwave process.

Another of Mitra’s graduate students, Susana Addo Ntim, (right) developed a process for removing arsenic from water using carbon nanotubes. The process uses a metal oxide/multi-walled carbon nanotube (MWCNT) and suggests the potential for using MWCNT hybrids in environmental remediation. She and Mitra have a patent pending on the process.

Zhan Shu, a PhD student in environmental engineering, (above) is developing a model that the New York Department of Transportation will use to evaluate and dispose of paint waste that is generated during bridge rehabilitation. With funding from the University Transportation Research Center, she is developing a model that will predict metal leaching from paints and help the DOT characterize the metals and determine the safest way to dispose of them. Her advisor is Professor Dr. Lisa Axe.

Kamalendu Sirkar, who directs the NSF-funded Membrane Science, Engineering and Technology (MAST) Center (an Industry/University Cooperative Research Center) in partnership with the University of Colorado, Boulder, also applies the membrane techniques to pharmaceutical manufacturing. He received a second patent for a iontophoretic transdermal drug delivery system utilizing a polymer membrane. He is also leading an NSF project in partnership with Bristol-Myers Squibb to develop a continuous, scalable, nanoparticle coating system that enables drug release in a sustained/controlled manner, and improves drug bioavailability.

Zeyuan Qiu, associate professor of chemistry and environmental science (left), studies and evaluates the technical, social, economic and institutional factors that affect protection and preservation of hydrologically sensitive areas. He has authored and submitted a plan to restore the Neshanic River Watershed to the New Jersey Department of Environmental Protection. The Neshanic is one of the most polluted headwater streams in the Raritan River Basin, with many areas suffering from severe bank erosion (above). The plan details the management measures needed to reduce pathogens and attain water quality standards for total phosphorus and total suspended solids. It would assess the potential for restoring the river’s base flow and supporting aquatic life in the river.

Doctoral student in environmental engineering Shuangyi Zhang (right) is investigating what happens when unregulated contaminants found in prescription and over-the-counter drugs, fragrances, and cosmetics seep into our water supply. She and fellow doctoral candidate Stephen Gitungo developed a list of “indicator” compounds that they are evaluating. Their research is collaboration between NJIT and United Water, a subsidiary of Suez Environment. Professor Lisa Axe is their advisor.

Paul Rodriguez, ’12, (below) MS in environmental engineering, says that his work with Engineers without Borders (EWB) drew him to graduate studies and a career in water and wastewater engineering. His EWB group developed a bio-sand and water filter for the town of Milot, Haiti, installing the first 25 filters and teaching local citizens to build additional units. He returned as a team advisor to inspect the operational filters and evaluate future sustainable sanitation measures. He now works for Hatch Mott MacDonald.

Ali Ghadimkhani, (below) a doctoral student in environmental engineering, uses ceramic membranes to create nano-sized air and ozone bubbles that unclog the ceramic membrane water filters used in treatment plants. Ozone commonly lasts only one hour in water, but Ali’s technique allows it to last for more than 100 days, making it feasible to use in water treatment plants. His research took first place in a research contest in Atlantic City sponsored by the American Water Works Association.
Tapping into Emerging Technologies

**Boris Khusid**, professor of chemical engineering, is leading a project that will test electro-hydrodynamic (EHD) technology as a means to intensify and control two-phase heat transfer in microgravity. The project was one of 14 selected by NASA’s Space Technology for development and demonstration on commercial reusable suborbital launch vehicles that fly near the boundaries of space. The team, which includes **Ezinwa Elele** and **Yueyang Shen**, hopes to demonstrate a new solution for thermal management, identified as one of the high-priority technology needs to enable NASA’s current and future missions in exploration, science and space operations. The technology is a promising one for the space environment because it requires no moving parts, offers a simple design with reduced mass and easy adaptability to electronics, and reduces the chance of sparking and electrochemical deterioration of working liquid.

**N. M. Ravindra** (below, right), professor and chair of physics, is leading a research team that is developing models to interpret and improve the performance of multicrystalline silicon solar cells. Single-crystal silicon devices have been more efficient, but are also more expensive than those made from multicrystalline silicon. The project, funded by the National Renewable Energy Laboratory of the U.S. Department of Energy, will investigate material parameters such as dislocation density and surface morphology. Ravindra was also named editor-in-chief of Emerging Materials Research, a new journal dedicated to advancements in materials science and engineering, published by ICE Publishing, a division of the Institute of Civil Engineers (http://www.icevirtuallibrary.com/content/serial/emr).

**Michael Jaffe**, research professor of biomedical engineering, leads the Inter-American Materials Collaboration, a partnership between NJIT and the Universidad Nacional Autonoma de Mexico (UNAM) with NSF support, created to develop new backbone chemistries for very high performance fibers, films and plastics derived from common agricultural crops. The team hopes to produce materials with the density of common plastics but the strength and stiffness usually associated with metals from isosorbide, a substance derived from glucose that can be incorporated into the backbone of polyesters and other common polymers. Jaffe, who was recently elected a fellow of the American Chemical Society, expects to develop materials are that renewable, load bearing, lightweight, environmentally friendly and energy efficient.

**M. Raviendra** (below, right), professor and chair of physics, is leading a research team that is developing models to interpret and improve the performance of multicrystalline silicon solar cells. Single-crystal silicon devices have been more efficient, but are also more expensive than those made from multicrystalline silicon. The project, funded by the National Renewable Energy Laboratory of the U.S. Department of Energy, will investigate material parameters such as dislocation density and surface morphology. Ravindra was also named editor-in-chief of Emerging Materials Research, a new journal dedicated to advancements in materials science and engineering, published by ICE Publishing, a division of the Institute of Civil Engineers (http://www.icevirtuallibrary.com/content/serial/emr).

**Xianqin Wang**, assistant professor of chemical engineering, and director of the Nanomaterials for Energy and Environment Lab, focuses her research on the synthesis and characterizations of the advanced functional nanomaterials for environmental protection, clean energy production, biology, and pharmaceutical engineering. She and **Zafar Iqbal**, research professor of chemistry and environmental engineering, are currently investigating a new approach to oxygen reduction reactions in fuel cells using polymeric nitrogen stabilized supported on carbon nanotubes to replace the expensive platinum-based catalysts. With NSF funding, the team hopes to synthesize polymeric nitrogen stabilized carbon nano-tube sheets and determine properties and stability of the materials. They will fabricate a polymeric nitrogen-based cathode, and compare it to a commercially available platinum-on-carbon cathode.

**Professor Nirwan Ansari** (right), who directs Electrical and Computer Engineering’s Advanced Networking Lab, leads an NSF research project to provide energy-efficient communications by powering wireless access networks with renewable energy. The goal is to integrate power distribution of the micro grid into the design and optimization of the wireless access networks, and to design the operation of the micro grid by considering characteristics of both the power demand of the consumers (wireless access networks) and the distributed energy resources (renewable power generators).
Kritsada Intustitayakul, a doctoral student in environmental engineering, presented the results of his research project to develop a GIS geodatabase for New Jersey’s Passaic River using multitemporal remote sensing data. Working with Professor Sima Bagheri, who has done extensive work with remote sensing, he built a database in which geometrically corrected remote sensing data is used to delineate watersheds and extract physical parameters such as land use/land cover, drainage system, elevation, slope/aspect. Bagheri also launched a new graduate course in geospatial data applications. The new course focuses on geospatial data processing, information extraction and analysis tools for applications in environmental, transportation, infrastructure, public health and homeland security.

Kimberly Russell, research associate in the Spatial Ecology and Conservation Biology Laboratory, studies the most efficient and accurate methods to conserve biodiversity in terrestrial systems. She has been looking into the idea of making use of powerline rights-of-way — where transmission lines must be kept free of tall growing vegetation — as mini-nature reserves. She and biology major Kayla Drobnis compared the impact of periodic mowing to a technique known as Integrated Vegetation Management (IVM) that uses selective herbicides on the native bee communities. They compared the diversity and abundance of the local bee communities in both types of settings as well as pollination patterns.

Biology doctoral student Tanya Lubansky (right) uses quantitative methods to uncover patterns in nature and determine how best to protect species. She studies whale movements in the Gulf of Maine and uses the data to build models that tell her why whales travel where they do. Both through observation, remote sensing and modeling, she is working to more precisely delineate spatial patterns and analyze seasonal movements in the feeding ground of the baleen whale community, off Mount Desert Island, Maine. A deeper understanding of large whale movements helps to determine how best to manage human activities, such as fishing and shipping, to minimize impact on the endangered mammals.