

**Knowledge acquired and applied by scientists and engineers provides the tools and systems that characterize modern culture and the raw materials for economic growth and well-being. The knowledge density of modern economies has steadily increased, and the ability of a society to produce, select, adapt, and commercialize knowledge is critical for sustained economic growth and improved quality of life.**

*—Rising Above the Gathering Storm, report by the National Academies Committee on Prospering in the Global Economy of the 21st Century*

# AN EDGE ON

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**JIT'S LEADERSHIP** in preparing students for personal achievement and future contributions to the nation's economy grew stronger this summer. Through the Provost's Summer Undergraduate Research Awards program, undergraduates had a significant new opportunity to experience hands-on research, traditionally a defining aspect of graduate work.

Immersed in the essence of scientific and commercial innovation, undergraduates in this and other NJIT programs benefit from mentoring relationships with faculty, graduate students and their peers, relationships that promise the improved retention and graduation rates vital for national prosperity in the 21st century.

## **HOT SUMMER RESEARCH**

This year, eleven NJIT undergraduates spent the summer working on cutting-edge research projects ranging from space weather to cloud computing as the first recipients of the awards for summer undergraduate research initiated by NJIT Provost and Senior Vice President for Academic Affairs Ian Gatley. The program gives students an in-depth research experience that encompasses formulating topics for investigation and presenting a cogent case for what they hope to achieve.

“We have lots of programs that allow undergraduate students to work on faculty research projects,” Gatley says. “In this program, students get to work on their own research ideas.”

*[continued]*

# SUCCESS



ILLUSTRATION: SERGE BLOCH

“THE STUDENTS ESSENTIALLY BECOME FULL-TIME RESEARCHERS FOR TEN WEEKS. THE RESEARCH IS THEIR PRIMARY FOCUS, WITH A MINIMUM OF OTHER DISTRACTIONS.”

—Ian Gatley, NJIT Provost and Senior Vice President for Academic Affairs



PHOTO: IED MEDINA

#### IN THE CLOUDS

Julian Raymar\* (left), a computer science major, is studying data security and privacy in cloud computing, with Assistant Professor Reza Curtmola advising. One of eleven recipients of the Provost’s Summer Undergraduate Research Award, Raymar works with a security protocol called Provable Data Possession (PDP), a means of verifying the ownership of user data stored remotely on a web server.

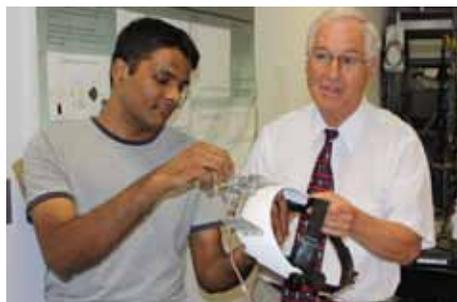


PHOTO: MOSTAFA ABOU-EL-FETOUH

#### LOOKING AT GLAUCOMA

Electrical engineering major Pradyumna Dingari is working to improve a device that can detect glaucoma by measuring internal eye pressure through a closed eyelid, as opposed to direct contact with the cornea. The technology was developed by a team led by Professor of Physics Gordon Thomas (in the photo) and Robert Fechtner, MD, director of the glaucoma division at the University of Medicine and Dentistry of New Jersey. Dingari, a Provost’s Summer Undergraduate Research awardee, is looking at the statistical accuracy of the device and testing ways to improve it.



PHOTO: SOPHIA SOBERS

#### FOR CLEANER AIR

Chemical engineering major Elaine Gomez is a Provost’s Summer Undergraduate Research Award recipient, Albert Dorman Honors Scholar and Gates Millennium Scholar. She is developing a system for using ammonia scrubbing to remove carbon dioxide from combustion or process exhaust gas. Robert Barat, professor of chemical engineering, is her advisor.

Students who compete for the Provost’s Summer Undergraduate Research Awards must design their own project and write a proposal explaining why the research is important, who will benefit from the findings, and what they could realistically accomplish during the 10-week summer program. Awardees, who are housed on campus, receive a \$2800 stipend. They are not permitted to have any other job – on or off campus – or to take any courses for the duration of the program.

“The students essentially become full-time researchers for ten weeks,” Gatley says. “The research is their primary focus, with a minimum of other distractions.”

In addition to NJIT’s Office of the Provost, program sponsors include Newark College of Engineering, the New Jersey Space Grant Consortium, and the Sky Meditation Center (through the Department of Physics). In addition, five of the students were supported by funds raised through Albert Dorman Honors College.

Electrical and Computer Engineering Professor John Carpinelli, who chaired the selection committee, says that the faculty reviewers were very impressed with the quality of the proposals they received. “We originally planned to give only five awards, but the applications were so good that the provost was able to use them to raise additional funding and expand the program from five students to eleven.”

#### DESIGNING INNOVATION

In spring 2011, Albert Dorman Honors College students were offered the opportunity to participate in another unique research experience – the Interdisciplinary Design Studio (IDS). Six multi-disciplinary teams of four freshman students each identified problems that they would seek to solve over the ensuing three years of their education. The teams will individually pursue solutions of high societal impact with a focus on future commercial success in areas that include

point-of-care health technologies, medical devices, sustainable infrastructure, green energy systems and smart homes.

Through a four-year undergraduate interdisciplinary curriculum students will learn and apply skills in research, design, innovation and entrepreneurship with the goal of developing leaders who will create technologies with significant positive impact on society. The teams are led by Distinguished Professor of Electrical and Computer Engineering Atam Dhawan, Honors College associate dean, and are mentored by faculty and industry representatives.

“We anticipate starting a new IDS cohort each year, building to a steady state of twenty-four teams involving a total of ninety-six high-achieving honors students. Significantly in the course of the program, the student projects will be evaluated for commercial development,” says Joel Bloom, dean of the Honors College.

“SIGNIFICANTLY IN THE COURSE OF THE PROGRAM, THE STUDENT PROJECTS WILL BE EVALUATED FOR COMMERCIAL DEVELOPMENT.”

—Joel Bloom, Dean of Albert Dorman Honors College



PHOTO: DOUG PLUMMER

### COMBATING CANCER

Through the Undergraduate Biology and Mathematics Training Program, Sandyha Ventakaraman,\* a biology major with minors in applied mathematics and chemistry, completed rotations in several labs, including a summer in the biophysics lab. She continues to work in the biophysics lab with Associate Professor of Physics Camelia Prodan, whose research explores how the chemotherapy drug Taxol alters the physical properties of proteins involved in cell division.

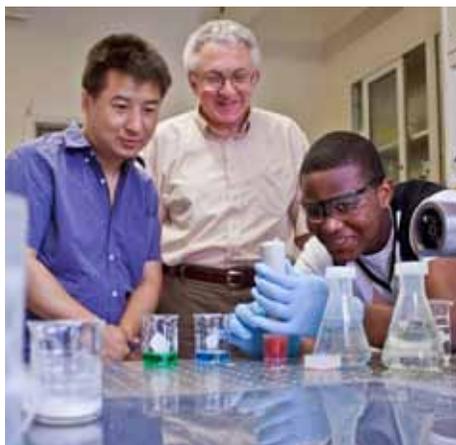


PHOTO: JED MEDINA

### MAGNETS AND SALT

Seth Bortey (right), a chemical engineering major, is working on determining the effects of magnetism on a precipitated salt solution of calcium carbonate and calcium sulfate with Research Professor Yueyang Shen and Professor Boris Khusid, both in the Otto H. York Department of Chemical, Biological and Pharmaceutical Engineering.

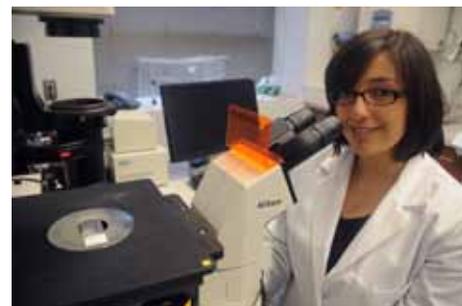


PHOTO: SOPHIA SOBERS

### AT THE STEM CELL FRONTIER

It was through the Ronald E. McNair Program that Gloria Portocarrero, now a second-year PhD student in biomedical engineering, was teamed with Biomedical Engineering Professor Treena Arinzeh, a prominent stem cell expert. A Gates Millennium Scholar, Portocarrero was enrolled in Albert Dorman Honors College and the Educational Opportunity Program as an undergraduate. During her junior year at NJIT, Portocarrero started doing research under Arinzeh’s direction. She is now Arinzeh’s full-time research assistant and co-author of a paper based on their work.

### DOCTORAL DIVERSITY

Research is the traditional focus of graduate study, especially for those pursuing PhD degrees. The talented students participating in the Ronald E. McNair Postbaccalaureate Achievement Program prepare for research at the graduate level and for academic careers in a special way.

Funded by the U.S. Department of Education since 1999, the McNair program is named after the distinguished African-American physicist and astronaut who lost his life on the space shuttle Challenger in 1986. The primary goal of the program is to increase the diversity of individuals entering academia as faculty who have received PhDs in science, technology, engineering and math. Open to various groups that historically have not had a strong presence in these fields, the McNair program at NJIT enrolls students studying full-time in Newark College of

Engineering, the College of Science and Liberal Arts, College of Computing Sciences and Albert Dorman Honors College.

McNair Scholars engage in research and other scholarly pursuits with faculty mentors from their academic departments. Results of their research are presented at professional meetings and conferences, and submitted for publication in appropriate journals. In addition, McNair Scholars are given the opportunity to participate in a wide array of workshops and activities to help prepare them for doctoral study.

“In their junior year, McNair Scholars participate in summer research – either at NJIT or another academic institution,” says Professor of Chemical Engineering Angelo Perna and director of the McNair Program at NJIT. “They also have the opportunity in their senior year to apply to national undergraduate research programs.”

Upon receiving their bachelor’s degrees from NJIT, all those who have been successful in the McNair program receive assistance in applying to graduate school. As McNair Fellows, they may pursue their postbaccalaureate study at any institution of higher education in the United States. “The program is also responsible for tracking the academic and career accomplishments of all Fellows after they graduate from NJIT,” says Perna. “The record of success we’ve seen is a source of pride for the program and our university.” ■

Author: Christina Crovetto is assistant editor of NJIT Magazine.

[njit.edu/provost/events/undergrad\\_research.php](http://njit.edu/provost/events/undergrad_research.php)

<http://honors.njit.edu>

<http://mcnair.njit.edu/programs/index.php>

\*Dorman honors scholars