# ABSTRACTS



## **VAN ALLEN REVELATIONS** AND NJIT RECOGNITION

NASA's two Van Allen Probes, carrying NJIT's Radiation Belt Storm Probes Ion Composition Experiment (RBSPICE), are shedding new light on a hazardous, little-understood region of Earth's magnetosphere. The instrumentation has revealed, for example, hitherto undetected zones of high-energy helium ions within the Van Allen radiation belts that surround our planet, as well as the surprising revelation of bands of electrons that resemble what some investigators have called "zebra stripes." In March, NJIT and its partners received word from NASA that the Van Allen Probes had met all of the scientific criteria to be designated a "Mission Success." None of the resulting discoveries would have been possible, however, if the instruments in orbit aboard the twin spacecraft had failed to function properly following their 2012 launch. Such operational success is no small achievement.

So it was with considerable satisfaction that the NJIT-led RBSPICE team also received a Group Achievement Award last year from NASA citing the mission's outstanding cost and schedule performance, as well as its groundbreaking science. More recently, NJIT team members, along with colleagues from the Advanced Physics Laboratory at Johns Hopkins University and Foundational Technologies, LLC, received individual certificates for their roles in conceiving, designing and building the RBSPICE.

"The mission has been highly successful both in the operation of the spacecraft and in the operation of the instruments," notes Louis Lanzerotti, distinguished research professor of physics and principal investigator for the mission. "Almost anything you can imagine can go wrong with a space mission. The most serious, of course, is a launch failure, and then an instrument failure."

"This is NJIT's first spacecraftbased mission and we are ecstatic with the world-class instrument the team designed, which is producing cuttingedge science and advancing our understanding of the radiation belts," says Professor of Physics Andrew Gerrard, director of NJIT's Center for Solar Terrestrial Research and RBSPICE science-team member. "We have not had this level of coverage of the radiation belts since the 1980s."

The Van Allen Probe mission, managed by Goddard Space Flight Center as part of NASA's Living With A Star program, is tasked with investigating changes in solar-driven space weather that can disable satellites, cause communication and power-grid failures, and disrupt GPS services on Earth. ■

http://physics.njit.edu http://solar.njit.edu Drones could be used to deliver packages, conduct various types of surveys, and monitor environmental conditions. They also could help police and firefighters enhance public safety.

#### LAUNCHING AN UNMANNED FUTURE

The Federal Aviation Administration (FAA) recently chose six teams from across the nation to determine if unmanned aircraft - frequently called drones - can safely share the sky with aircraft that have humans on the flight deck, and to recommend standards to regulate operation of the aerial newcomers. These autonomous craft could be used to deliver packages, conduct various types of surveys, and monitor environmental conditions. They also could help police and firefighters enhance public safety.

NJIT is part of a site team that will evaluate the flying robots at locations such as the Warren Grove Air National Guard Range in Burlington County and the FAA's William J. Hughes Technical Center in Atlantic County. The team, which grew out of a collaboration between New Jersey and Virginia, includes members from Virginia Tech and American Aerospace Advisers, a company partnering with NJIT. "As the state's science and technology university, NJIT is ideally suited to help the FAA test these unmanned aircraft," says Research Professor Michael Chumer, Department of Information Systems. Chumer, who coordinates unmanned aircraft systems research at NJIT, is a member of the test-site team's Policy and Strategy Committee.

NJIT houses the New Jersey Homeland Security Technology Systems Center, which is also conducting research related to unmanned aircraft systems. William Marshall, an NJIT assistant vice president who directs the center, says unmanned aircraft can play a vital role in homeland security and national emergencies.

First, however, NJIT and its partners must develop safety requirements that the FAA can recommend to Congress. Once Congress approves the recommended measures, expected in 2015, groups that want to use unmanned aircraft can apply for permission to launch them into the nation's airspace. ■

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Architectural rendering of Qatar's Umm Salal Stadium

### SENSING STRUCTURAL WEAKNESS

NJIT has joined an international team working on an innovative system to detect dangerous weaknesses in bridges and other large structures. With a grant of just over \$1 million from the Qatar National Research Fund, the team is developing a wireless sensor network to monitor vibration, sagging and other factors that affect structural integrity and safety. The new system would not only warn of serious problems after they occur and possible impending deterioration, but also signal the need for periodic preventive maintenance.

"Our part of this project is to determine where to place the sensors, what types of data to collect, how to interpret it, and then how to make decisions about the extent of intervention needed," says Assistant Professor Mohamed Mahgoub, director of NJIT's Concrete Industry Management (CIM), program and one of the project's principal investigators. "While the network can be installed on existing structures, the aim is to embed it in steel components before concrete is even poured." In addition to Mahgoub, the team's principal investigators are Mohamed Hossam Ahmed, associate professor, Faculty of Engineering and Applied Science at Memorial University in Canada, and Assistant Professor Tarek M. Elfouly, Department of Computer Science and Engineering at Qatar University.

While significant for infrastructure protection worldwide, implementation of these safety measures is important for Qatar as the country prepares to host the 2022 FIFA World Cup soccer competition. Qatar is planning extensive infrastructure development in advance of the event, including construction of the Umm Salal Stadium to accommodate more than 45,000 people. ■

http://engineeringtech.njit.edu/academics/cim



NJIT's School of Art + Design, part of the College of Architecture and Design, was represented at the Greater Newark Mini Maker Faire with four exhibit stations in the garden of the Newark Museum.

#### **FAIRE CREATIVITY**

Children, parents, teachers, artisans and others visited the Newark Museum on a Saturday in early April for the first Greater Newark Mini Maker Faire, billed as a "celebration of creativity and ingenuity in the New Jersey community" at the state's largest museum.

The Faire featured demonstrations of craft and design making, hands-on workshops, and lectures by artists, designers and others pushing the limits of art, science and technology. Maker Faires (a registered trademark of Maker Media, Inc.) are held throughout the United States, attracting thousands of creative individuals who use a wide array of skills, techniques and materials to fashion their works.

The NJIT School of Art + Design was well represented at the Faire with four exhibit stations housed in a large tent in the Newark Museum's garden. Six faculty members (José Alcala, Martina Decker, Glenn Goldman, Taro Narahara, Augustus Wendell and Andrzej Zarzycki), accompanied by twenty students from the industrial and digital design programs, spent the day at the Faire.

NJIT students demonstrated digital and analog/traditional media games they had designed, printed bracelets for children on a 3D printer, displayed a series of household products created by industrial design students, and provided face-mold masks for children to decorate. Laser-cut parts NJIT students had designed were creatively assembled by children and adults into small animals or creatures, called "nijits," imprinted with "NJIT" to take home.

Inside the museum, Decker and Zarzycki hosted a wellattended workshop, "Design Smart and Kinetic Objects." Alcala, university lecturer and coordinator of the industrial More than 300 students, faculty, staff, alumni and friends contributed approximately 1,000 "person days" of volunteer work.

#### A PRESIDENTIAL HONOR



For the fifth year, NJIT has been named to The President's Higher Education Community Service Honor Roll, one of the highest federal recognitions a college or university can receive for its commitment to volunteering, service-learning and civic engagement. Honorees are selected based on factors that

include scope and innovation of service projects, percentage of student participation, incentives for service, and the extent to which the school offers academic service-learning courses.

NJIT students and staff have a long history of community service and engagement. During NJIT's Alternative Spring Break, held from March 15 through March 22, more than 300 students, faculty, staff, alumni and friends contributed approximately 1,000 "person days" of volunteer work from Newark to the Jersey Shore, cleaning up devastated areas and helping towns rebuild resiliently.

Students cleaned debris from beaches and parks, removed and replaced floors and wallboard, painted and did carpentry, stocked and distributed food and clothing, compiled information on areas affected by Hurricane Sandy, and performed other tasks to help communities recover and rebuild. With a generous grant from the Provident Bank Foundation and support from the NJIT University Senate, Campus Center, Career Development Services, College of Architecture and Design and the Center for Resilient Design, NJIT coordinated work with some dozen organizations and provided transportation, food, and opportunities for lodging for the week.

design program, gave one of the keynote addresses, "The Making of a Maker," an account of the "crooked path taken towards personal and professional fulfillment through the act of design-making."

Don Menke, model shop coordinator at the College of Architecture and Design, provided offsite logistic support and assistance in the preparation of materials. Kim Robledo-Diga, director for innovation and learning at the Newark Museum, coordinated the efforts of the host institution. ■

http://art.njit.edu

Among the noteworthy projects to win prizes at TechQuest were a cutting-edge method for detecting and monitoring glaucoma, a skin graft technology, and a medical imaging device.



THE QUEST FOR INNOVATION

NJIT's second annual TechQuest and Innovation Day in April showcased the wide range of innovative talent and entrepreneurial skills possessed by students across disciplines, from engineering and the life sciences to business and finance. Among the noteworthy projects to win prizes at the event were a cutting-edge method for detecting and monitoring glaucoma, a skin graft technology, and a medical imaging device.

The TechQuest undergraduate invention competition rewards innovation among NJIT undergraduates by encouraging small interdisciplinary teams to work together to develop research ideas. The competition is sponsored by the James Stevenson Foundation, which this year gave out a total of \$14,000 in awards shared among the three topplacing teams. Three-quarters of the funds go toward summer stipends that enable team members to continue their research.

Hassan Muhammad, a senior biomedical engineering major, and Roa al-Abdalla, a senior biology major, won first place in the TechQuest competition for their innovative non-invasive method and device for detecting and measuring glaucoma. Working with their advisor, Professor of Physics Gordon Thomas, the pair developed a technology that allows patients themselves to continually monitor fluid pressure within the eye, a symptom of glaucoma, through the eyelid.

The second place winner, Quik Graft, proposes creating antibiotic-resistant, ready-toapply skin grafts within hours using a modified compact 3D From left to right: First place TechQuest winners Hassan Muhammad and Roa al-Abdalla\* for Transpalpebral Self-Tonometer; second place for Quik Graft, Ilesha Sevak (also on the team, but not present were Matthew Armanious\*, Sayali Kulkarni\*, Ashas Pathan\* and Evan Tyerman\*); and Pitambar Dayal\*, third place for CAS-Imaging.

printer. The third place award went to CAS-Imaging, a device that would be incorporated into functional magnetic resonance imaging (fMRI) to detect 3D (lateral, axial and rotational) head movement and analyze it in real time.

Winners of the Big Data Visualization Challenge, a contest sponsored by S&P Capital IQ, a business unit of McGraw Hill Financial, Inc., were also announced at the event. The competition was designed to immerse undergraduates in the high-stakes world of mergers and acquisitions by challenging them to pitch hypothetical acquisition targets to technology company executives using cutting-edge research, analytics, and data-visualization tools available on S&P Capital IQ's desktop platform.

Members of the winning team were Geoffrey Ching\*, a junior majoring in business and finance, James Barr, a senior majoring in finance and accounting, Orest Bidnyk, a senior majoring in accounting, Pedro Santos\*, a senior majoring in civil engineering, Rodolfo Marquez\*, a junior majoring in accounting and finance, and Grant Barr, a senior majoring in mathematics and finance. The winners received iPad Air tablets, and all participating students were evaluated for the opportunity to become an S&P Capital IQ intern.

Lou Eccleston, the president of S&P Capital IQ and keynote speaker at the event, emphasized the importance of what he called a critical combination – "learning how to learn," communications skills, and discipline – in maintaining the "sustained competitive innovation" necessary to prevail in today's technologyrich global marketplace.

More than 40 students presented their research, inventions and business concepts as part of Innovation Day. They represented the Ronald E. McNair Postbaccalaureate Achievement Program, the Undergraduate Research and Innovation program, the Student Innovation Acceleration Club, the Undergraduate Biophysics Program, and the Interdisciplinary Design Studio.

\*Dorman honors scholars

A customizable device would monitor responsiveness, assess cognition and adapt future learning sessions. It could take the form of a familiar toy, such as a stuffed animal or robot.

# TO HELP CHILDREN WITH AUTISM

NJIT and WebTeam Corporation recently signed an agreement to collaboratively produce a learning device to help children with autism spectrum disorder master skill-building lessons via sensors and software embedded in the device. An NJIT team, including students, will work with New Jersey-based WebTeam to design and develop the tactile-friendly device, which will interface with the company's iLearnNEarn2 program, part of the ColorsKit package for autism management.



The customizable device would prompt a child through the lessons, monitor responsiveness, assess cognition and adapt future learning sessions accordingly. The device could take the form of a familiar toy, such as a stuffed animal or robot. The educational sessions will be based on a curriculum developed by Eden Autism Services, a non-profit organization that provides education and training for people with autism, as well as for their families, teachers and caregivers.

WebTeam chose to partner with NJIT because the university is "a technology leader with the best engineers in the region," says Nish Parikh, WebTeam's chief A learning device created by NJIT students to help autistic children will be developed as an educational aid with a greater range of capabilities through the university's partnership with WebTeam Corporation and Eden Autism Services.

executive officer. "We want to provide an educational tool that parents with little teaching experience can use, bringing them together on the same platform with teachers and therapists," he adds. "The ultimate goal is to improve the quality of life for individuals on the autism spectrum and to reduce stress on them and their families. We want to make learning both smart and fun."

"WebTeam has developed the program and we will optimize

#### THE GAME IS ON

NJIT has been named one of the top 25 schools on The Princeton Review's recently published list saluting those with the best undergraduate programs in video game design. The schools were selected after a survey of 150 programs at institutions offering game design coursework and/or degrees in the United States, Canada, and a number of other countries.

"We are honored that The Princeton Review has chosen NJIT as one of the top 25 universities for game design in 2014," says Marc Sequeira, university lecturer and coordinator of game development for the Information Technology Program in NJIT's College of Computing Sciences. "NJIT's gaming programs engage a vibrant community of designers and developers, artists and programmers, scientists and industry partners. Our course offerings reflect an emphasis on strong, individual skill sets as well as interdisciplinary, team-based projects. And our students graduate with strong practical skills, developed in hands-on laboratory and studio environments."

NJIT offers two degree programs in game design: The Bachelor of Science in Information Technology and the Bachelor of Arts in Digital Design. ■



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its interface, as well as assessment, feedback and response capabilities," says Atam Dhawan, distinguished professor of electrical and computer engineering, who will lead the NJIT team. As part of the intellectual property agreement, NJIT is jointly filing a patent supplemental to the patent WebTeam filed on its educational software.

NJIT students have been working on a learning device for children with autism since 2011, when Honors College students from the university's Interdisciplinary Design Studio (IDS) created an educational toy for engaging children who might lose focus or interest staring at a computer screen and for assessing their cognitive abilities. Parikh, a member of the IDS External Advisory Board, was one of the sponsors whose support enabled the team to pursue research and development on the NJIT campus.

Dhawan says that the new project will build on the IDS team's technology, which could respond in simple ways to the children's choices, such as telling them whether they had correctly picked the color the program prompted. The next stage of the project will incorporate more sophisticated responses, including the intelligence to recognize whether a task is taking a child too long and the ability to respond by moving on to the next task, so the child does not become frustrated. ■ NJIT athletes are as academically accomplished as they are physically fit.

# BY www.njithighlanders.com POINT

#### END NOTES

Michel Boufadel, professor in the Department of Civil and Environmental Engineering and director of the Center for Natural Resources Development and Protection, has been elected a Fellow of the American Society of Civil Engineers (ASCE). Membership as a Fellow recognizes exceptional professional accomplishments and is an honor accorded less than four percent of ASCE members.

Atam Dhawan, distinguished professor of electrical and computer engineering, has been elected a Fellow of the American Institute of Medical and Biological Engineering for his significant contributions in the field of medical imaging. Dhawan, who serves as executive director of undergraduate research and innovation at NJIT, is also a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).

**Bernadette Longo**, associate professor in the Department of Humanities, is the 2014 recipient of the IEEE Professional Communication Society's Emily K. Schlesinger Award for outstanding service to the society. Longo also recently co-wrote a chapter in *Solving Problems in Technical Communication*, which won the 2014 Best Original Collection of Essays in Technical Communication Award from the National Council of Teachers of English.

Horacio G. Rotstein, associate professor in the Department of Mathematical Sciences, along with Tasso Kaper and Mark Kramer of Boston University, recently served as guest editors of a special journal issue focused on rhythms in neurological disease. "Rhythms and Dynamic Transitions in Neurological Disease Modeling, Computation and Experiment," which appeared in Chaos: An Interdisciplinary Journal of Nonlinear Science, provided diverse perspectives assessing rhythmic neural activity in healthy and diseased brains, research central to understanding and treating disorders such as epilepsy, Parkinson's disease and migraine.

Laurent Simon, associate professor of chemical engineering, has received a Distinguished Teaching Award from the American Society for Engineering Education. At NJIT, he has been recognized with an Excellence in Teaching Award (2007), Master Teacher Award (2009), and the Saul K. Fenster Innovation in Engineering Education Award.

# ACADEMICALLY OUTSTANDING

NJIT athletes are as academically accomplished as they are physically fit. Recently, the Men's Swimming and Diving Team received the Team Scholar All-America Award from the College Swimming Coaches Association of America. The award is given to teams that have collectively achieved a GPA of 3.0 or higher.



In addition, eight NJIT scholarathletes received Coastal Collegiate Swimming Association All-Conference Academic Awards, which set a university record. To receive that award, a swimmer must have achieved a GPA of 3.5 or higher and competed at the 2014 Coastal Collegiate Swimming Association Championships.

The Highlanders receiving the award include freshman Anthony Czar (mathematical sciences)\*, freshman Joe Pedo (computer engineering)\*, freshman Michael Sungurov (business/ finance), sophomore Matthew Temple (chemical engineering)\*, sophomore David Schmidt (web and information systems), junior Gene Tutzauer (electrical engineering), senior Christian Barnard (business/ marketing), and senior Victor Razuk (chemical engineering)\*.

"NJIT is a nationally-ranked university with demanding majors and really smart students," says Leonard Kaplan, director of athletics. "The Men's Swimming and Diving Team is a perfect example. They had a great season, winning conference awards and being named Team Scholar All-Americans. That's quite an achievement."■

\*Dorman honors scholars