NEW YORK SPACE GRANT NEWS

Newsletter of the NASA/New York Space Grant Consortium

Supporting education and research in space-related fields through fellowships, internships, outreach, and corporate partnerships

Lead Institution:

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Affiliates:

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Binghamton University
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Ursa Space Systems, Inc.
York College, CUNY

Greetings:

Fall 2017

This August, citizen scientists across the nation saw a total eclipse of the sun. Those of us in New York saw about a 70% eclipse. Many traveled long hours to be in the path of totality, and some simply watched online. Virtual presence is unlike the real thing, of course. But either way, I was heartened to see that millions of Americans were so compelled by this spectacular example of astronomy's presence in our everyday lives.

The solar eclipse put science front and center in the news, if only for a short while. But for many of us, the discoveries and invention of space technology and science didn't stop when the sun emerged from behind the moon. We in the NASA New York Space Grant community engage with such spectacles daily. In fact, New York pioneered aerospace in the decades that followed the Wright brothers' famous 1903 flight in Kitty Hawk, North Carolina. In the century since, New York has continued to innovate for the benefit of the nation's space science and technology priorities—whether that's planetary science, heliophysics, earth science, or astrophysics, or the technologies of space optics, remote sensing, autonomous air vehicles, and space mechanisms. And those are only a few of our consortium's extraordinary capabilities.

Considering the boost that technology and science give to our nation's economy, the inspiration that these ideas provide our young people that help keep them on track for bright futures, and the sheer spectacle of daily discovery, I find it particularly difficult to understand why some in the White House and in Congress are trying to eliminate NASA's modest office of Education, where Space Grant resides. In fact, despite a more-or-less healthy NASA budget this year, NASA Education saw deep cuts. Boxing in STEM, scaling back our future, is simply not the way to go. For now, the Space Grant program remains in place, but its future is uncertain.

My son brought home a pinhole camera from school the week before the eclipse. We set it up in the driveway and watched. Soon we decided to step it up: I got an old refrigerator box from the garage, and we made a walk-in pinhole camera. Still not satisfied, my son opened up the box, enlarged the pinhole (now the size of a twelve-year-old fist) and arranged it on the roof of the garage for a building-sized device. As we tracked the continuing eclipse on the driveway, I noticed that the leaves on the trees all around us cast dappled shadows, each a crescent shape of its own. Thousands of gaps in the tree canopy transformed our neighborhood into an array of pinhole cameras. As we walked around the block enjoying the unexpected sight, my son commented that you don't need to keep science in a box. I couldn't agree more.

Mason Peck Mason Peck, Director

Students' Summer Research in Biomedical Engineering

above: *Tala Azar, Samuel Stephen, and Michelle Gelbs in the Orthopaedic Research Labs at CCNY.*

This summer several biomedical engineering students were supported by NYSG research fellowships at The City College of New York (CCNY). Tala Azar and Samuel Stephen, two rising seniors in the undergraduate biomedical engineering program, and Michelle Gelbs, a biomedical engineering master's student, participated in research projects to better understand the response of bone to mechanical loading.

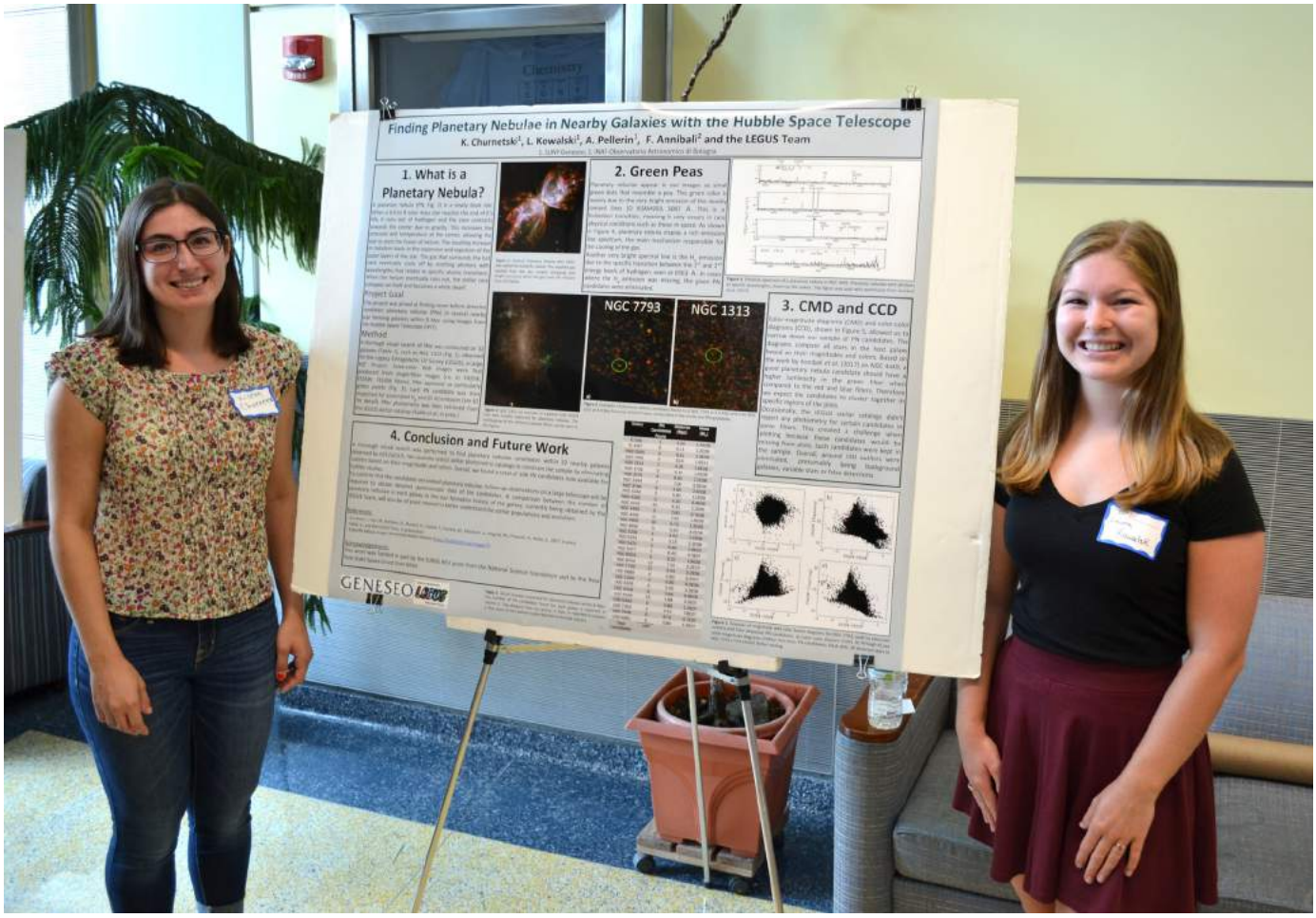
Michelle and Tala worked on a project supervised by Prof. Susannah Fritton and Prof. Luis Cardoso that is investigating how bone adapts to reduced mechanical input. Decreased physical activity can cause bone loss in many situations, including weightlessness, long-term bed rest, and paralysis. The overall goal of the research project is to investigate whether reduced mechanical loading causes bone cells to alter bone porosities such that the bone's ability to detect mechanical loading is diminished. Michelle and Tala assessed structural alterations from bone cells taken from tissue that withstood reduced mechanical loading. They learned many techniques related to processing and analyzing bone tissue, including sample preparation, staining protocols, micro-computed tomography scanning, light microscopy, confocal microscopy, and image analysis using several software programs. Findings from this research can help create more effective countermeasures to bone loss during long-term spaceflight.

Samuel's summer research project, in the lab of Prof. Mitch Schaffler, involved the creation and evaluation of a new four-point bending device designed for more accurate mechanical testing of mouse long bone. It is a difficult mechanical test to perform because of the non-uniform topography of mouse bone. This confounds any derived results since a critical stipulation of four-point bending is for all contact points of a device to constantly touch the specimen tested. Thus, the bending device designed and constructed by Samuel featured a rotating upper platform and locking mechanism to ensure complete contact point interface. The device can be used in future studies to characterize the structural mechanics of mouse long bones that undergo reduced mechanical loading to simulate spaceflight.

Over the summer, Samuel was also a mentor in a STEM summer program at CCNY, where he trained a group of high school students in the basics of biomechanics. He also taught other critical tools needed for data acquisition, analysis, and presentation in the field of biomedical engineering, including basic programming, statistics, surgical dissection, and performing four-point bending tests. Michelle was also a mentor as part of her summer activities; she supervised a student from the High School for Math, Science and Engineering, who also worked on the disuse project.

In the upcoming year, both Tala and Samuel plan to apply to graduate school to continue their studies in the field of biomechanics. Michelle will be working on her master's thesis this academic year. She also has a strong interest in robotics and has been mentoring robotics teams at a Manhattan all-girls independent school. *—Susannah Fritton*

Search for Extragalactic Planetary Nebulae with Hubble



above: *Kristen Churnetski and Laura Kowalski with their work at the SUNY Geneseo REU/SURGE poster session.*

At SUNY Geneseo, Space Grant supported Kristen Churnetski, an undergraduate summer student, to work for 10 weeks on the analysis of images from the Hubble Space Telescope. The images were collected for the Legacy ExtraGalactic UV Survey (LEGUS) collaboration and other various archival projects. Together with another summer student participating in Research Experiences for Undergraduates (REU), Laura Kowalski, the pair searched for planetary nebulae, looking for point sources with an unusual green color. The search was quite systematic and tedious, but it didn't discourage them from creating a long list of over 300 candidates scattered in 32 galaxies located between 3 and 8 Mpc. Photometric measurements for planetary nebula (PN) candidates were then retrieved from the LEGUS Stellar Catalog and used to construct color-magnitude and color-color diagrams. Those diagrams allowed the students to identify and reject outliers from the list of PN candidates, such as background galaxies and other emission-line sources. Overall, 166 point sources made it to the final list of PN candidates.

Kristen and Laura proudly presented their work at the REU/SURGE poster session at SUNY Geneseo in July. The project was conducted under the supervision of Dr. Anne Pellerin (SUNY Geneseo), in collaboration with Dr. Francesca Annibali (INAF-Observatorio Astronomico di Bologna) and the LEGUS Team. *—Anne Pellerin*

Diversity and Collaboration Open Doors for Students

above: *Tawhid Pranto, Yvon Achim Pierre-Noel, & Adrian Chamorro at NASA KSC, 2017 Robotics Mining Competition.*

CUNY York College is very proud to announce the successful Ph.D defense of Dr. Ryan Abrahams in Dec 2016. Dr. Abrahams was supported by Space Grant for the majority of his graduate studies. His thesis project, entitled "Diffuse Gamma-ray Emission from Nearby Molecular Clouds as a Probe of Cosmic Ray Density Variations," was overseen by his advisor and NYSG affiliate director, Tim Paglione. Ryan now works for Advanced Technology Applications in McLean, VA, putting his skills to use in "big data" analytics.

Robotics teams were also supported at York College, namely participants in the NASA Robotic Mining Competition and the NASA Swarmathon Competition. The positive institutional impacts of the York Astrobotics programs started in 2014; by teaming up with faculty sponsors, students within the Astrobotics programs have competed yearly in these two NASA competitions. These hands-on learning activities apply classroom scholarship in ways that specific discipline learning cannot. By combining interdisciplinary collaboration, off-site robotic competition practice, and year-round engagement with faculty, the Astrobotics program has exceeded expectations by engaging the student body across every ancillary field of robotics. We are especially proud of Juanpablo Rodriguez, who gained sufficient experience to earn a very competitive summer internship with Honeybee Robotics through the Brooklyn Navy Yard in the summer of 2017.

Interdisciplinary teamwork between students and faculty has become the cornerstone of Astrobotics at York College. Because of the complex nature of robotics, students in the fields of computer science, communications technology, physics, and engineering work together to compete in NASA-sponsored research. This collaboration exposes a wide variety of students to new areas of study. For example, physics majors are working with computer science cohorts and faculty to incorporate programming methods into their Robotic Mining Competition entry. Inversely, computer science majors are working with biology and communications technology faculty to incorporate biological algorithms into the programming of swarm robotics in the NASA Swarmathon Competition. It's through these events that student-to-student and student-to-faculty bonds are strengthened and contribute to improving on previous designs and software methods. These close relationships have led to the retention and recruitment of some of the best minds York College has to offer. By "buying in" to the Astrobotics Program, students and faculty alike come to rely on one another throughout, and beyond, the academic school year.

above: *The Astrobiotics Team's robot.*

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The York College Astrobotics teams also include a diverse, multicultural pool of students from information and systems management, English, and journalism. In addition to competition, this interdisciplinary group has also been promoting robotics and STEM through various initiatives, workshops, and technology demonstrations. For example, they participated in the NASA Minority University Research and Education Program (MUREP) Aerospace Academy, which has engaged over 16,000 K-12 students from southeastern Queens in NASA activities on Saturdays and in the summer. Not only has a younger generation been introduced to STEM through the program, but the Astrobotics participants have reinforced their research and academics in a way that keeps them invested in the college and their subsequent STEM majors. *—Timothy Paglione and Daniel Phelps*

Space Grant Internships at NASA & NY Industry: Summer 2017

This summer, NYSG supported research at Cornell University and affiliate institutions, plus awarded funds to eight NY students who interned at NASA. Seven additional students were funded as Space Grant interns at aerospace companies within NY State. See more details in the table below. Internship reports are available online: http://astro.cornell.edu/spacegrant//internshipreports.html

LOCATION	NO. OF STUDENTS	STUDENTS' HOME INSTITUTIONS
 Center for Computational Astrophysics | Flatiron Institute	1	CUNY Lehman College
 Lockheed Martin (Owego, NY)	3	Binghamton University, Barnard College, and Cornell University
 Moog Inc. (East Aurora, NY)	3	Alfred State University, Case Western Reserve University, and Clarkson University
 NASA Goddard Institute for Space Studies (GISS)	2	Columbia University and Stony Brook University
 NASA Ames Research Center	1	Stony Brook University
 NASA Goddard Space Flight Center	2	Colgate University and Rensselaer Polytechnic Institute
 NASA Marshall Space Flight Center	2	Cornell University and Stony Brook University
 NASA Wallops Flight Facility	1	Cornell University

RIT Students Work on Diverse Research Projects

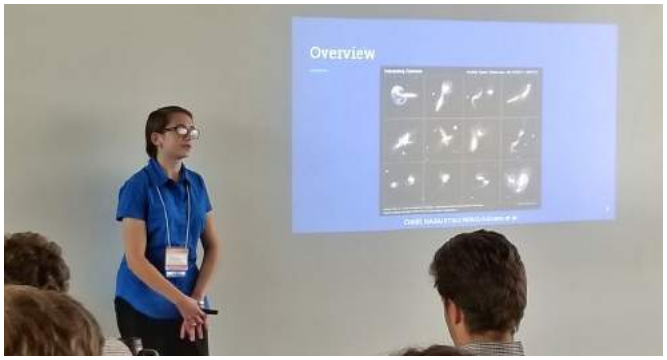
At Rochester Institute of Technology, the New York Space Grant award helps to fund two merit-based graduate student fellowships annually in the Astrophysical Sciences and Technology (AST) Program, as well as summer research experiences for undergraduate students in our SURF program. Below, the 2016-17 Space Grant Fellows describe their research and outreach activities. *—Michael Zemcov*

JACOB LANGE

Ph.D Candidate, RIT Astrophysical Sciences & Technology

Mr. Lange's research involves estimating the parameters of binary black hole (BBH) systems via gravitational wave (GW) radiation observed by the LIGO and now Virgo observatories, building on the recent first detection of GWs emitted from massive BBH pairs. In the 2016 academic year, he completed a methods paper (currently under review) on a new technique to interpret LIGO measurements; used this new analysis method to corroborate parameter inferences in the LIGO discovery paper on GW170104; and helped coordinate a project to perform detailed numerical relativity follow up simulations of binary black hole mergers. With only a few simulations available, it can be important to quickly fill gaps in the current set, both to validate and to refine the LIGO team's interpolation in between existing simulations. Mr. Lange continues to analyze observations conducted in LIGO's second survey observations, using standard techniques as well as our method.

Mr. Lange has given many updates on the development and analysis using ILE on internal LIGO teleconferences. He has also given oral presentations at many conferences including the 2016 Midwest Gravity Meeting, the 2017 APS April Meeting, and the 2017 Eastern Gravity Meeting. Mr. Lange has been involved in multiple outreach events with people of all ages. Every year at RIT, the AST Program contributes to a campus-wide, festival-like event called ImagineRIT in which he was an important participant. Mr. Lange also visited Victor, NY to introduce high school students to astronomy and the detection of gravitational waves.



above: *Christina Magagnoli at RIT's Undergraduate Student Research Symposium in August.*

CHRISTINA MAGAGNOLI, *Undergraduate*

Ms. Magagnoli spent the summer studying the morphological properties of luminous infrared galaxies with active galactic nucleus (AGN) activity at high redshift. She looked at images from the Hubble Space Telescope to determine if they were disks, spheroids, or had any evidence for merger activity. She also used results from surface brightness profile fitting to determine which objects were more 'disk-like' in a quantitative way. The ultimate goal is to be able to quantify how often these objects exhibit merging activity and how much the merger enhances a galaxy's star formation rate and AGN activity.

DALE MERCADO, *Undergraduate*

Mr. Mercado spent the summer trying to quantify the contribution an AGN has to a galaxy's total infrared luminosity, and, thus, its inferred star formation rate. The ultimate goal is to be able to correct the star formation rates measured when a dominant AGN is present. Mr. Mercado's work involved using RIT's computer cluster to fit models to a variety of different AGN spectral energy distributions (SED) in order to determine when the AGN model was needed in the infrared.

above: *Benjamin Stewart and Ambar deSantiago discuss data interfaces for CSTARS in the laboratory at RIT.*

UPDATES ON RIT'S CSTARS

Students at the RIT are building an attitude control system for suborbital rockets that works at the temperature of liquid nitrogen. Cryogenic Star Tracking Attitude Regulation System (CSTARS) will use optical detectors to identify and track stars during a 10-minute sub-orbital rocket flight. This project is endorsed by Space Grant and funded by NASA's Undergraduate Student Instrument Program. "We're helping to push the boundaries of deep space electronics, which is hard not to get excited about," says Benjamin Stewart, the project's current team leader. During fall 2016, the team integrated the instrument's cryostat, telescope, electronics, and control software, which required the joint efforts of then-team leader Kevin Kruse, elec. engineers Stewart and Keegan Evans, mech. engineer James Parkus, software engineers Poppy Immel and Ambar deSantiago, system engineer Jeffrey Maggio, as well as those of graduate student mentor Chi Nguyen, faculty mentor Dr. Dorin Patru, and principal investigator Dr. Michael Zemcov. In spring 2017, the team readied it for flight. The first flight attempt was scheduled for May 2017; several members of the team went into the field to support the flight effort. Unfortunately, several technical problems caused delays, and CSTARS will be launched as part of a later flight opportunity. The second version of CSTARS will fly as part of a science payload in mid-2018. "I am very proud of the students and particularly the mature way they have worked as a team to build and field the instrument," says Dr. Zemcov. "USIP has given dozens of students opportunities to work on a real instrument that they would not otherwise have had. We are eagerly looking towards flights in the next year."

BRITTANY N. VANDERHOOF

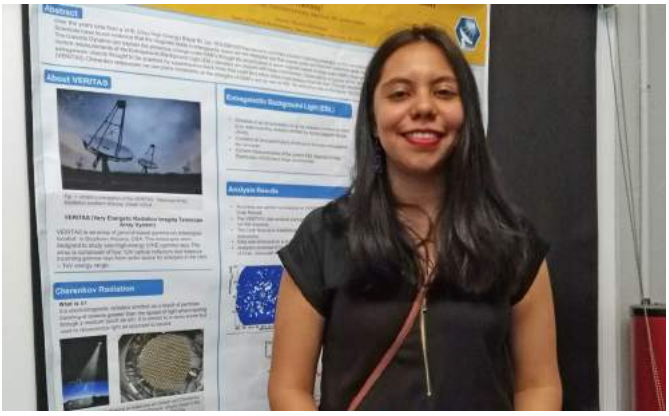
Ph.D Student, RIT Astrophysical Sciences and Technology

Ms. Vanderhoof is currently investigating the kinematics of luminous starburst galaxies at high redshift to determine the role of mergers in galaxy evolution. A fraction of galaxies called starbursts exhibit significantly high star formation rates given their stellar mass, indicative of a powerful star formation mode. One process that may be responsible for the increased star formation is the merger of galaxies. Mergers of gas-rich galaxies can drastically change morphology and are typically followed by bursts in star formation. Ms. Vanderhoof is using data from a variety of ground- and space-based instruments to further understand star formation in these type of systems.

In addition to her research, Ms. Vanderhoof has a passion for scientific communication and helping to empower and mentor underrepresented groups in STEM. She put this passion to work this past year by participating in multiple outreach events on the RIT campus such as the Girls Soaring in STEM Fair, where she designed our exhibit theme and an interactive demo. Ms. Vanderhoof also helped design and build another interactive demo communicating the science behind the 2017 solar eclipse for ImagineRIT, our campus-wide outreach event that saw 30,000 attendees. Finally, she is currently helping to plan and organize the Regional APS Conference for Undergraduate Women in Physics that RIT will be hosting in January 2018.

Students Engage in X-ray and High-Energy Gamma-Ray Research

above: *Anna Coerver at the Summer Research Institute Poster Session in Diana Center at Barnard College, July 2017.*



above: *Miriam Ramirez at the Summer Research Institute Poster Session in Diana Center at Barnard College, July 2017.*

ANNA COERVER

Undergraduate

Anna Coerver, first-year student at Barnard College, worked at Columbia University analyzing NuSTAR data on X-ray sources. NuSTAR is a space-based X-ray observatory that views the universe in the 3-79 keV spectral band. Following the exciting discovery of the very-high-energy gamma-ray source 2HWC J1928+178 in the galactic plane by the Water Cherenkov TeV Observatory (HAWC), NuSTAR carried out observations of the region in an effort to resolve the nature of the TeV source. NuSTAR is an ideal X-ray telescope to carry out this probe, given its sub-arcminute angular resolution and broad energy range. Anna worked with the NuSTAR Team at Columbia (Dr. Chuck Hailey and Dr. Kaya Mori) and carried out analysis of the data taken with NuSTAR. Anna presented her work in a poster entitled "DA 495: An Aging Pulsar Wind Nebula with Possible Gamma-Ray Counterpart" at the annual Barnard College Summer Research Institute Poster Session in July. Anna's research was also presented in a poster at the American Astronomical Society's HEAD meeting in Sun Valley, ID in August. This was Anna's first experience in astrophysics research, and she continues to be interested in viewing the Universe with high-energy glasses. She will continue her research in Dr. Hailey's group during this academic year.

MIRIAM RAMIREZ

Undergraduate

Miriam Ramirez, a rising senior at Barnard College, worked with Prof. Mukherjee's group on high energy studies with the VERITAS (Very Energetic Radiation Imaging Telescope Array System) Observatory. This was carried out at Nevis Labs in upstate New York. Miriam worked on analyzing data from distant active galactic nuclei (AGN) in an effort to learn about the extragalactic background light bathing our Universe and about the primordial intergalactic magnetic fields. Miriam spent ten weeks learning how to analyze VERITAS data, focusing on the study of AGN. VERITAS is a ground-based gamma-ray telescope located in southern Arizona, viewing the universe at the highest energy gamma rays. Miriam also participated at Barnard's summer research poster session, and presented a poster entitled "Placing Constraints on the IGMF and EBL through the Observation of 1ES 0229+200."

In September 2017, both Anna and Miriam presented their research at Columbia University's annual Astrofest. —Reshmi Mukherjee

PRE-COLLEGE

Sciencenter Continues to Illuminate the Night Sky

above: *Karen Perez, Cornell University student and Sciencenter volunteer, leads an activity demonstrating how the force of gravity influences planets.*

The Sciencenter, an interactive science museum in Ithaca, uses NY Space Grant funds to engage rural, upstate New York families and children in hands-on earth and space science activities. In the last year, 549 elementary-aged students and 124 parents attended Sciencenter-led science nights where they built and launched rockets, created scale-model solar systems, and explored the night sky in a portable planetarium. New this year, the Sciencenter brought stars and planets to Robert H. Treman State Park, where we engaged park visitors with a special program around the portable planetarium. This outreach opportunity augmented our school-year offerings and helped us reach locals and tourists alike.

The Sciencenter also engages scientists and university students in science outreach by providing training and opportunities to practice and hone communication skills at these family-friendly science events. *—Michelle Kortenaar and Alli Sribarra*

RENSSELAER POLYTECHNIC INSTITUTE

Giving Back to the Community

above: *Jake Weiss preparing for the eclipse. Photo by John Craig, WNYT News Channel 13.*

This year we feature Jake Weiss, who was a Space Grant fellowship winner in 2015. His fellowship allowed him to do preliminary research that led to an NSF grant entitled "The Milky Way Halo and Disk: Substructure and Interaction" that is currently funding his PhD research. Last year, he won the Paul S. Ho award, given to an outstanding graduate student in Rensselaer's Physics Department. Although he won this award primarily for his excellence in research, his passion for public outreach was also a factor. This year he spearheaded a public outreach event for the eclipse on August 21, 2017. He enlisted the help of the Rensselaer Astrophysical Society, for which he is the student advisor, and other helpers that included two past and current Space Grant fellowship winners, assorted physics graduate students, and the Rensselaer NYSG affiliate director and her family. More than 1500 people came out to see the eclipse. Visitors were able to view the eclipse through solar telescopes, various pinhole cameras and projected images, and live video feed of images from across the country. One of the pinhole cameras created a projection of the Sun about one foot across, and others demonstrated the how blankets or hats create an array of images of the Sun. Jake's efforts were featured in high profile interviews on WAMC Northeast Public Radio, Channel 6 (CBS) TV News, and WNYT News Channel 13.

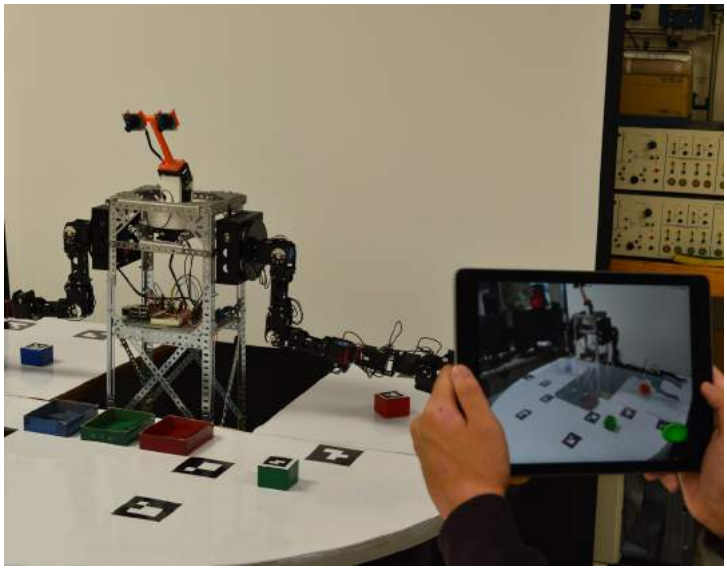
—Heidi Newberg

Augmenting Reality with Mobile Devices

This year, NY Space Grant Consortium funding supported diverse research, education, outreach, and mentoring activities at the Mechatronics, Controls, and Robotics Lab (MCRL). These activities have focused on advanced control technology, mechatronics- and robotics-related experimental efforts, and K-12 STEM education, outreach, and mentoring programs.

As mobile devices become increasingly powerful and popular among learners and instructors alike, research involving their comprehensive integration into educational laboratory activities is attracting attention. In a recent study, we integrated vision-based measurement and control, augmented reality, and multi-touch interaction on mobile devices to render Mixed-Reality Learning Environments (MRLE) that enhance interactions with laboratory test-beds for science and engineering education. A learner points her mobile device at a laboratory test-bed fitted with visual markers while a mobile application supplies a live view of the experiment augmented with interactive media that aid in the visualization of concepts and promote learner engagement. As the learner manipulates the augmented media, her gestures are mapped to commands that alter the behavior of the test-bed on the fly. Sensing, storage, computation, and communication capabilities of mobile devices are leveraged in this study to relieve the need for laboratory-grade equipment, improving the cost-effectiveness and portability of platforms to conduct hands-on activities. For details of the work, see: J.A. Frank and V. Kapila, "Mixed-reality Learning Environments: Integrating Mobile Interfaces with Laboratory Test-beds," *Computers & Education*, Vol. 110, pp. 88—104, 2017.

Although user interfaces with gesture-based input and augmented graphics have promoted intuitive human-robot interactions (HRI), they are often implemented in remote applications on research-grade platforms requiring significant training and limiting operator mobility. In another recent study, we proposed a mobile mixed-reality interface approach to enhance HRI in shared spaces. As a user points a mobile device at the robot's workspace, a mixed-reality environment is rendered providing a common frame of reference and spatial information for the user and robot to effectively perform object manipulation tasks. An evaluation with participants was conducted to examine task performance and user experience. Results indicate that, despite the suitability of conventional approaches in remote applications, the proposed interface provides comparable task performance and user experiences in shared spaces without the need to install operator stations or vision systems on or around the robot. Moreover, this approach provides users the flexibility to direct robots from their own visual perspective (at the expense of some physical workload) and leverages the sensing capabilities of the tablet to expand the robot's perceptual range. For details, see: J.A. Frank, M. Moorhead, and V. Kapila, "Mobile Mixed-Reality Interfaces that Enhance Human-Robot Interaction in Shared Spaces," *Frontiers in AI and Robotics*, Vol. 4, Article 20, 2017.



above: *Human-robot interaction study.*

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In summer 2017, MCRL hosted synergistic K-12 STEM education projects, several undergraduate students, and several high school students. For example, Max Rudolph and Dominique Watt (New York State residents from undergraduate engineering programs outside New York) participated in MCRL research and education activities for eight weeks. They helped review, test, and revise the instructional curriculum for a four weeks long summer robotics program for high school teachers and students. Seven additional undergraduate engineering students from overseas institutions and NYU Tandon participated in MCRL summer research and mentoring activities for four to eight weeks, along with five high school students. The undergraduate and high school students collaborated with MCRL graduate students to design, develop, prototype, and assess a variety of mechatronics and robotics systems, e.g.: i) a hand rehabilitation device for stroke patients; ii) a device to assist stroke patients in practicing finger extension/flexion movements; iii) an instrumented wearable jacket to sense the range of motion of a person's arms to aid in the recovery of stroke patients; iv) integration of vision, augmented reality, robot operating system (ROS), and mobile devices for low-cost, efficient identification and localization of agents in a robotic swarm; v) an instrumented smart syringe for precise drug-delivery at specific locations exhibiting increased muscle stiffness; and vi) an expressive humanoid robot. These students learned about mechatronics and robotics by engaging in authentic engineering research projects. Through these activities, students gained and applied numerous new skills, e.g., mechanical and electronic prototyping using OnShape, EagleCAD, and 3D printing; sensing, instrumentation, filtering, and calibration with sensors (inertial measurement, force, displacement, etc.); programming and algorithms for embedded computing; and computer vision, motion analysis, graphical user interface design, mobile app design, etc. *—Vikram Kapila*
http://engineering.nyu.edu/mechatronics/

STONY BROOK UNIVERSITY

Awards and Grants Enhance Research and Curriculum

The 2016-2017 academic year and the summer of 2017 were a productive time for NY Space Grant at Stony Brook University. Jessica Flores, a former Space Grant research award recipient, graduated and moved on to an international REU at the University of Bordeaux. Her plan is to complete a European masters degree in France and then pursue a doctoral degree at a university in Sweden.

This summer, we made three significant research awards to students in the Louis Stokes Alliance for Minority Participation (LSAMP) program. Each student spent an excess of 350 hours in a laboratory working on a space-related research project. The students and their projects are:

CHE LEWIS-BULLEN *An Approach to Constructing Energy Harvesting Treadmills for Outer Space Exploration*. Che was mentored by Dr. Haili Liu and Dr. Ya Wang from the Department of Mechanical Engineering.

ROBERTO SERRANO *Modeling the 3-D Motion of a Kicked Black Hole.* Roberto was mentored by Dr. Nathan Leigh from the Department of Physics and Astronomy.

BRANDON YALIN *Ultrathin Si Solar Cells Sensitized by Energy Transfer from Semicondutor Nanocrystals: A Simulation Survey of Device Performance Enhancement*. Brandon was mentored by Dr. Andreas Liparis, Dr. Dmytro Nykypanchuk and Dr. Chang-Yong Nam from the Center for Functional Nanomaterials at Brookhaven National Laboratory and Dr. Matthew Eisaman from the Department of Electrical Engineering.

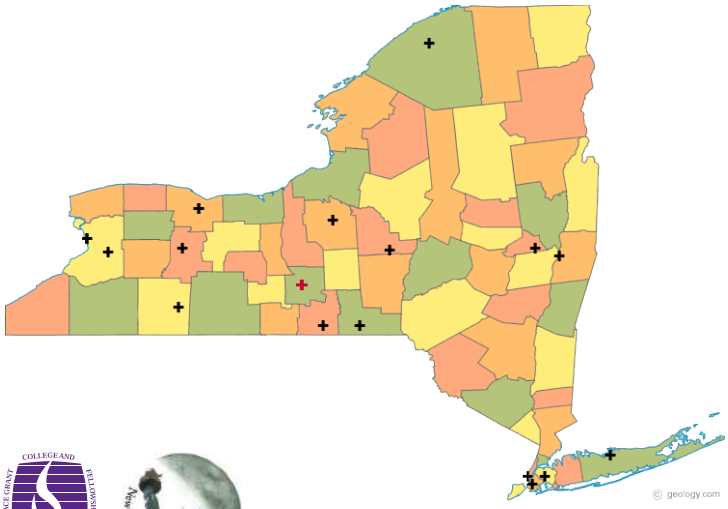
Last fall we applied for, and received, an NYSG Curriculum Development grant. Dr. Thomas Woodson from the Department of Technology and Society (DTS) is the **(CONT'D)**

principal investigator (PI) and Paul Siegel, the NYSG affiliate director also from DTS, is the co-PI. The goal of the project is to design three courses about the history and promise of space exploration. The first course will cover aviation history from Icarus to the present-day and the project management, design, and goals of the Mercury, Gemini, Apollo, and early Shuttle programs. We have finished the design of the first course, and it will be presented to the university's curriculum committee in October.

The second course will address the privatization and commercialization of outer space exploration and is in the development phase, along with the third course which will be a series of seminars given by university faculty who are currently recipients of NASA funding. We expect to present the first course in the spring of 2018. We believe that we have generated enough interest in the topic to begin preliminary exploration of creating a minor in space studies within Stony Brook's Department of Technology and Society. *—Paul Siegel*

NY Space Grant Affiliate Directors and Institution Locations

Prof. Mason Peck (Director), **CORNELL UNIVERSITY**
Prof. David Toot, **ALFRED UNIVERSITY**
Prof. Reshmi Mukherjee, **BARNARD COLLEGE**
Prof. Changhong Ke, **BINGHAMTON UNIVERSITY**
Prof. Susannah Fritton, **CITY COLLEGE OF NY, CUNY**



Prof. Daniel Valentine, **CLARKSON UNIVERSITY**
Prof. Thomas Balonek, **COLGATE UNIVERSITY**
Prof. Marcel Agüeros, **COLUMBIA UNIVERSITY**
Ms. Ellen Silbermann, **INTREPID SEA, AIR & SPACE MUSEUM**
Mr. Ron Crawford, **LOCKHEED MARTIN**
Prof. Shermane Austin, **MEDGAR EVERS COLLEGE, CUNY**
Ms. Jennifer Brady, **MOOG INC.**
Prof. Vikram Kapila, **NEW YORK UNIVERSITY**
Prof. Heidi Newberg, **RENSSELAER POLYTECHNIC INSTITUTE**
Prof. Andrew Robinson, **ROCHESTER INST. OF TECHNOLOGY**
Mr. Dean Briere, **SCIENCENTER**
Mr. Paul Siegel, **STONY BROOK UNIVERSITY**
Prof. Aaron Steinhauer, **SUNY AT GENESEO**
Prof. Peter Plumley, **SYRACUSE UNIVERSITY**
Prof. Rebecca Koopmann, **UNION COLLEGE**
Prof. Jennifer Zirnheld, **UNIVERSITY AT BUFFALO**
Prof. Judith Pipher, **UNIVERSITY OF ROCHESTER**
Mr. Derek Edinger, **URSA SPACE SYSTEMS, INC.**
Prof. Timothy Paglione, **YORK COLLEGE, CUNY**