

11-2018

Illuminator, Volume 2, Issue 3

Batten College of Engineering & Technology, Old Dominion University

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Recommended Citation

Batten College of Engineering & Technology, Old Dominion University, "Illuminator, Volume 2, Issue 3" (2018). *College of Engineering & Technology Newsletter*. 6.

https://digitalcommons.odu.edu/engineering_newsletter/6

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illuminator

a monthly publication of the batten college of engineering and technology

volume 2, issue 3

Improving night vision technology for the United States Army

CERDEC Night Vision and Electronic Sensors Directorate senior design partnership continues

by Keith Pierce

Student researchers in the Department of Electrical and Computer Engineering (ECE) at Old Dominion University (ODU) are benefiting from continued funding from the U.S. Department of Defense (DoD) related to the U.S. Army Night Vision and Electronic Sensors Directorate (NVESD). Since 2017, NVESD's INNOVATIVE DISCOVERY SCIENCE PLATFORM (iDISPLA) initiative, has partnered with universities to advance innovations in multiple emerging technologies, specifically within the United States Army's Communications-Electronics Research, Development and Engineering Center, (CERDEC).

ODU continues to offer senior capstone design projects on topics of interest to the Army, specifically those related to night vision and electronic sensors. This is the third consecutive year ODU has received funding from CERDEC to support ECE senior design projects. NVESD researches and develops sensor and sensor suite technologies for air and ground intelligence, surveillance, reconnaissance and target acquisition under adverse battlefield conditions in day and night-time environments. Khan Iftekharuddin, Ph.D., professor and associate dean for research and graduate programs for the BCET and director of the ODU Vision Lab, worked with Nibir K. Dhar, Ph.D., CERDEC's chief scientist, to establish the partnership.

"The inception of this program was a result of the efforts of Dr. Khan Iftekharuddin," said Hani Elsayed-Ali, Ph.D., Batten endowed professor and eminent scholar and senior design course instructor for ECE. "Its success is



Night vision photo taken using technology built into the Intelligent Ground Operating Robot (IGOR), at the Intelligent Ground Vehicle Competition (IGVC), held at Oakland University in Rochester, Michigan last June where the ODU team competed against 25 other universities from across the U.S. Left to right: Jonathan Ziegler, Lee Belfore, Ph.D., (advisor and associate professor of ECE), Caroline Kuzio, Richard Kazmer, Adam Seay and Gordon Rarick

due to the collective effort of the ECE faculty supervising the various projects."

The Army-related design projects create a unique opportunity for students and faculty to interact with military researchers and gain practical experience, while guiding educational and research efforts in areas of interest to CERDEC. Bonnie Lee Miley, a second-career undergraduate student, serves as team captain of the ECE 486 Senior Design project entitled: **"Intelligent Ground Vehicle Plus Night Vision,"** a robotic vehicle designed to autonomously navigate an obstacle course. The current vehicle is built atop a wheelchair chassis and has a custom weather-proof case and an integrated commercial infrared camera.

"As a non-traditional ECE student, I am excited not only to be able to apply my work history, but also my current

degree program on our ECE 486 Senior Design project," said Miley. "Crucial to any project, is funding. Thankfully, CERDEC is fully vested in not only the senior projects at ODU, but in the continued development of ECE students as well. Once the software design and implementation is deemed successful, I believe ODU will have a great opportunity to branch out to new vehicle designs as the competition allows for up to three designs per school."

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ODU

**Batten College of
Engineering & Technology**

ALUMNI SPOTLIGHT: JOHNNY GARCIA

Modeling & simulation expert kicks off engineering diversity lecture series

story and video by Keith Pierce

Modeling and simulation engineering expert and ODU MSVE Ph.D. graduate, Johnny Garcia, kicked off the Engineering Diversity Lecture series for the Batten College of Engineering and Technology. Founder & CEO of SimIS, Inc., a modeling and simulation company in Portsmouth, Virginia, Garcia is a regular supporter of Old Dominion University and works regularly with faculty and students in the Department of Modeling and Simulation Engineering, as well as in the Virginia Modeling, Analysis & Simulation Center (VMASC).

Addressing the nearly 50 students, faculty and staff in attendance, Garcia shared his personal challenges growing up a migrant worker in Texas with little

idea of what he wanted to do with his life.

"The odds were stacked up against me," he said. "My first job was working in the cotton fields back in the early 80s with my family in a row of 35 Hispanics. I knew then that I needed to get out of this."

Garcia offered students hope as he shared his path to success from being the first in his family to graduate from high school and go on to college, to joining the Navy, where he discovered his knack and passion for modeling and simulation.

Focusing on overcoming the obstacles and challenges that come with issues of diversity, Garcia also encouraged students to stick to it, regardless of the fact the engineering is one of the hardest degrees to pursue, assuring them that the reward is worth the

struggle. He explained how after a successful career at General Dynamics, he was able to launch his own simulation firm, SimIS, Inc. in 2007.

Hear more in this brief video:



Holly Handley, Ph.D.

Source: HFES.org

Holly Handley, Ph.D., associate professor, Engineering Management and Systems Engineering at Old Dominion University, has been named one of three 2018–2019 Science Policy Fellows for the Human Factors and Ergonomics Society (HFES).

Together with the Government Relations Committee and Lewis-Burke Associates, HFES's government relations firm, the

EMSE professor one of three named a Science Policy Fellow

Science Policy Fellows, (who also include Caroline Cao from Wright State University and Carisa Harris-Adamson from the University of California, San Francisco), will develop policy statements and perform outreach to government decision makers on Capitol Hill and within government agencies.

According to Mica Endsley, chair of the Government Relations Committee, "The Science Policy Fellowship program is a key mechanism for HFES to grow a cadre of members with expertise in working effectively with government agencies and Congress to improve the inclusion of human factors and ergonomics in government programs."

The Fellows met with representatives of Lewis-Burke in Philadelphia to gain more understanding of public affairs, advocacy

and the issues of importance to HFES.

"The training was a great refresher on how the budgeting cycles for the U.S. government work, and how we can be involved to influence lawmakers by providing them with factual information to support science-based initiatives," said Handley.

The Science Policy Fellowship is a three-year program. Fellows will participate in the Government Affairs Committee, help write policy statements, and travel once a year to Capitol Hill to meet with legislators and regulators.

The Human Factors and Ergonomics Society, founded in 1957, is the world's largest scientific association for human factors/ergonomics professionals.

Army partnership, *cont'*

Thomas Batchelder, a graduate student whose project, **"Vision Guided Mobile Robot for Automated Near Real-Time Surveillance in Noisy Environment,"** builds on an ongoing NVESD-supported project where ODU students developed automated facial recognition and tracking using a Multi-function Agile Remote-Controlled Robot, (MARCBot) connected to a remote computer via digital-analog converter. A system was



ODU Vision Lab team with MARCBot and NAO robot. Seated left to right: Thomas Batchelder, Alex Glandon, Patrick Cox and Zeina Aman. Standing left to right: Linmin Pei, Carrie Kuzio, Lasitha Vidyaratne, Khan M. Iftekharuddin, Ph.D., (associate dean for research and graduate program for the BCET and director, Vision Lab), Mahbulul Alam and Megan Witherow.

developed for identifying persons in a scene and tracking those individuals through remote control of the robot.

"The funding given to our design group from the Army has allowed us to upgrade the MARCBot's camera feed, which has made tracking and classification of individuals more efficient," Batchelder said.

Other funded projects include:

Capacitive Wireless Charger for Electronic Sensors. For this project, students constructed a 2.5-Watt, 5-Vdc, 50-MHz near-field capacitive wireless charger based on advanced power electronics technology for the remote charging of low-power electronics devices such as electronic sensors and mobiles.

Smart watch – situational awareness of warfighters. This wearable computing device (smart watch) designed by students, monitors the health and other states of the wearer. The technology could be used to monitor soldiers during training or aid in obtaining valuable warfighting information on the battlefield.

Development of ultra-capacitor for energy sources.

Students developed ultra-capacitors to store energy generated by power sources including perovskite solar cells. These cells can be used for efficient energy storage and rapid power delivery in a small space, unlike larger high-powered batteries.

ZnO nanostructure gas sensor with 3-D AZO coating by ALD for enhanced sensitivity. In this project, students constructed Metal Oxide Semiconductor (MOS) gas sensors, a proven material for the detection of volatile and toxic gases. ZnO nanorod/nanotube structures for

sensors are also being fabricated at ODU.

A thermal evaporator for controlled fabrication of nanoparticle sensors.

Students working on this project constructed an evaporator to fabricate metal NPs for applications in chemical

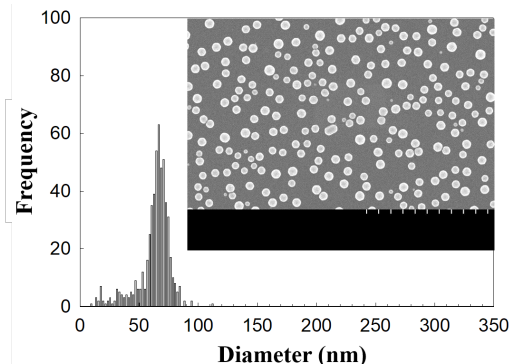


Figure 1.

and biological. Focused on design upgrades of the instrument, students used the instrument they upgraded to fabricate silver nanoparticles by self-assembly on a substrate and observed the nanoparticles by scanning electron microscopy (Fig. 1) and atomic force microscopy.

"These projects introduce students to technology of significant interest to national security, while also preparing them to enter the workforce in government labs and in industry," said Oscar Gonzalez, Ph.D., professor and interim chair, ECE. "It also helps the military recruit well-trained U.S. students to guide their research in areas of interest, such as night vision technology."

Inaugural Anne Carney Lecture on SUSTAINABLE CLEAN WATER November 13, 2018, 7:00 PM

Mills Godwin Building (MGB), Room 101~ Old Dominion University

Featuring: Dr. David Sedlak, Plato Malozemoff Professor at the University of California, Berkeley Editor-in-chief, Environmental Science & Technology and ES&T Letters Co-Director, Berkeley Water Center at UC Berkeley
Member, National Academy of Engineering
2014 Recipient of the Athalie Richardson Irvine Clarke Prize for Excellence in Water Research

For more information, please contact: Gary Schafran (gschafra@odu.edu)



Open for business

New BCET business services center offers one-stop financial, travel, human resources and more

by Mary Addison

The Batten College of Engineering and Technology (BCET) began Fiscal Year 2019 with a newly created Business Services Center (BSC). Focused on supporting the BCET community, the BSC will develop and maintain the College's financial and internal control structure in alignment with University policies and facilitate opportunities to align with the ODU strategic planning effort slated for calendar year, 2019.

The BSC is a strategic concept of Stephanie Adams, Ph.D., dean of the Batten College of Engineering and Technology, who last year invested in making that concept a reality by hiring, Nina Gonser as director of finance and operations to envision the BSC, oversee operations and support and mentor the BSC staff. Over the course of Fiscal Year 2018, Ben Stuart, Ph.D., senior associate dean, along with the college's leadership team and members of the center, helped design and build the center model, purpose, functions and location. BSC is responsible for supporting the needs of the six academic departments within the college, along with supporting the dean's office operations.

On July 1, 2018, BSC members, including fiscal operations specialists, Jennifer Broderick, Vonda Norman, Keisha Riddick and Romina Samson, moved into their



Business Services Center Team. Seated: Nina Gonser (left) and Jennifer Broderick. Standing left to right: Vonda Norman, Romina Samson and Keisha Riddick

new home in Kaufman Hall, Suite 242 and began transitioning the financial duties they previously managed within their respective departments. Additional services include human resources support. On a BSC "roadshow," the team began visiting each department to introduce and train faculty and staff on the services provided by the new center.

"The Business Services Center is ready and eager to serve the BCET community," said Gonser, "The team enjoyed meeting with staff and faculty during our roadshows and looks forward to working with each department to essentially

make their lives easier."

An internal resource intranet, built by instructional designer/trainer, Mary Addison, was launched in mid-October. As the BSC continues to enhance the quality of services provided, additional enhancements will be added to the site to process approval workflows and policies to guarantee efficient use of BCET resources.

The BSC is one of many strategic initiatives the BCET has embarked on to position students, faculty, and staff for continued success.

Tailgate talk

photos and video by Keith Pierce



Sarah Martin Lampert, BCET development officer, chats with ODU engineering technology alum, Tom Swenor, '92, featured in video

Batten College of Engineering and Technology alumni paused during the

Old Dominion University Alumni tailgate celebration at Homecoming 2018, to share their perceptions of the college and offer advice for current engineering students. Hear their thoughts in this brief video:



www.ODU.edu/eng

The **illuminator** is a publication of the Batten College of Engineering & Technology

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