

illuminator

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Season's Greetings

from the
Batten College
of Engineering
and Technology



This time of year, we are reminded of how grateful we are for the potential we hold to change the world through unparalleled research and innovative teaching and learning, all thanks to your support.

May this holiday season bring joy, hope, peace and prosperity to you and your family.

Stephanie G. Adams, Ph.D.
Dean, Batten College of Engineering and Technology



Batten College of Engineering
and Technology

Cold plasma technology meets mechanobiology

Working across departments to find medical breakthroughs

By Keith Pierce

In the world of biomedical research, collaboration is key. When that research is combined with educating the next generation of scientists and engineers, such collaboration is even more important. That's why when Electrical & Computer Engineering professor, Mounir Laroussi, Ph.D., known worldwide for his cold plasma research, needed a better understanding of how plasma affects cell migration, such as during metastasis, he turned to cell mechanics expert, Venkat Maruthamuthu, Ph.D., an assistant professor in Mechanical and Aerospace Engineering. Together, they are discovering new possibilities in the fight against cancer.

According to Maruthamuthu, the two initially met over lunch and began discussing their work. Before they knew it, they discovered a synergy

between Laroussi's plasma research and Maruthamuthu's study of cell movement.

"Cell movement is basically a mechanical process," said Maruthamuthu. "I study multiple aspects of cells, including how they move, stick to their surroundings and proliferate or multiply."

For Laroussi, the conversation generated immediate excitement about the possibilities.

"Before I started working with Venkat, all of our cancer-related work was focused on killing cancer cells. What was missing, however, was how plasma might affect the proliferation and migration of normal cells," said Laroussi. "Venkat is an expert on how cells attach to each other and to surfaces, so that made him the perfect collaborator to help answer that question."



Mounir Laroussi



Venkat Maruthamuthu

There was one other motivating factor for Laroussi. Venkat and his team possessed a high-resolution fluorescence microscope, which uses fluorescence to generate images of cells labeled with fluorescent tags or expressing fluorescent proteins, in addition to phase imaging of unlabeled cells. The semi-automated microscope allowed the team to study cell movement over extended periods of time – days at a time – and record time-lapse images of cell behavior at various time intervals.

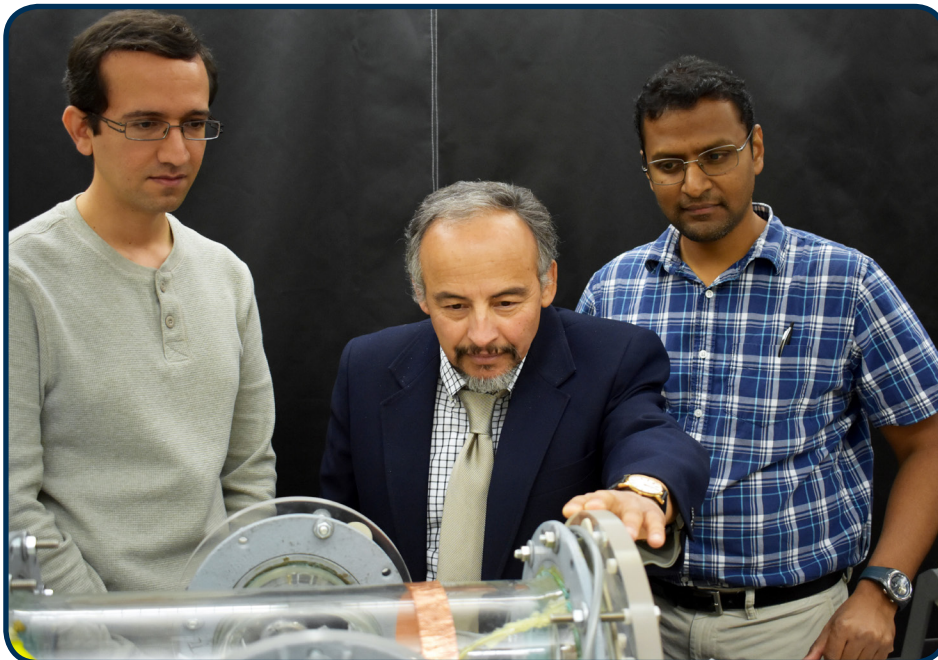
"It's not the primary cancers that cause most cancer deaths, it's when cancer cells metastasize or break off and move to another part of the body," Venkat explained. "If we can slow down or even stop the movement of these deadly cells, we may be able to offer a new hope for extending the life of people with cancer."

Laroussi and his team have known for some time that plasma exposure could kill cancer cells without damaging healthy cells, but they needed assurance about how these cells would behave after plasma exposure.

"Our prior work showed that below a certain plasma dose, healthy cells were able to withstand up to four minutes of exposure and remain alive while the same dose killed the cancer cells quite efficiently," Laroussi explained. "If plasma is to play a role in cancer therapy, its effects on normal cells have to be clarified."

The findings so far are encouraging. The pair found that plasma radiation does, in fact, impact the proliferation of cells and also limits their migration.

"These results are important because it means we may be able to find a window of plasma exposure that can kill cancer cells while healthy cells survive," said Venkat.



Graduate student and research assistant, Hamid Razavi, (left), Electrical & Computer Engineering professor, Mounir Laroussi, Ph.D., (center) and Mechanical and Aerospace Engineering professor, Venkat Maruthamuthu, gather around the Pyrex chamber, where the plasma pencil ignites a large volume of plasma.

"These are important findings as they give us information that was missing in our prior work," said Laroussi.

Collaborations such as this, particularly in medicine, physics, engineering and biology, are not uncommon. In fact, according to Sebastian Bawab, Ph.D., professor and department chair, Mechanical and Aerospace Engineering, cross-disciplinary work has become an expectation for drawing more attention — and support — from government and private funding agencies.

"I'm not surprised at all by this collaboration," said Bawab. "There was a time when research faculty would stay in their lab and work in a silo, but that's changed. Not only are the organizations that fund important research expecting to see collaboration towards a common cause, but the success of much of this research relies on the integration of ideas, technology, resources and innovation."

Learn more:

- [Moderate plasma activated media suppresses proliferation and migration of MDCK epithelial cells](#)
- [Perspective: The physics, diagnostics, and applications of atmospheric pressure low temperature plasma sources used in plasma medicine](#)

Hear from Laroussi and Venkat in this brief video:



Prof. W. Steven Gray of the Dept of Electrical & Computer Engineering, and his team, won the "best paper" award at the 21st Int'l Conference on System Theory, Control and Computing, held in Romania. The annual conference draws scientists and engineers from academia and industry to discuss new trends in systems and control theory. *Get the full story here.*

Stephanie Primeaux, Navy veteran and mechanical engineering student, wins SoldierStrong scholarship

By Keith Pierce

Being a busy mom, a full time student and a part time NASA intern, has not stopped Navy veteran, Stephanie Primeaux, from pursuing her dream to work on a Mars project. The recent recipient of a SoldierStrong Scholarship, awarded to a female veteran at Old Dominion University in a STEM discipline, the mechanical engineering student may be well on her way. The \$2,500 scholarship is renewable for up to \$5,000 per academic year.

Primeaux understands the importance of discipline and service. She grew up a close-knit, military family, in California and Rhode Island. From very early on, her parents taught valuable lessons about putting family first, serving your country and persevering even when things get tough. She, along with her father, brother and husband, chose to serve in the U.S. Navy.

"Though I knew I wanted to join the Navy, I wanted to go to college first, but finances were an issue," said Primeaux. "The Navy not only help better prepare me for college, both financially and

academically, but it helped connect me to a great advisor who recognized my hard work and made me aware of opportunities like the SoldierStrong scholarship. I feel beyond honored to have been selected. It has given me the confidence and means to continue my education."

Primeaux spent six years in the military where she served as a nuclear electrician, one of the most demanding jobs in the Navy. As a mother, student and NASA intern, when her workload gets hard, Primeaux is comforted and motivated by the support she receives from her close family.

"Sometimes I feel like I have a lot on my plate and I get really overwhelmed," she says. "But whenever I have a hard day at school, my mom always says, 'hang in here, it's all going to be worth it one day,' and my dad says, 'tough it up! You went through one of the hardest schools in the Navy, this should be a cakewalk.' My husband is really supportive as well. It takes a village." In addition to her family, Primeaux credits her advisor, Tony Dean, a Navy

veteran and assistant dean for research in the Batten College of Engineering and Technology, for giving her the encouragement she needs to stay the course, despite her demanding schedule.

"I have a really good advisor in Dr. Dean," Primeaux says. "He's been very supportive and encouraged me to apply for internships. Whenever I would see him, he would ask me about my applications, so it motivated me to keep trying. That's how I ended up with a NASA internship."

Primeaux is minoring in aerospace engineering and hopes to continue her work with NASA after graduating in 2019.

See and hear more in this brief video:



Addressing innate bias is key to advancing diversity and inclusion

American anthropologist, Dr. Johnnetta B. Cole, delivers powerful message to Old Dominion University audience

By Keith Pierce

Appearing relaxed in a comfortable chair as she addressed the audience of faculty, students, community leaders and guests, American anthropologist and former director of the Smithsonian National Museum of African Art, Johnnetta B. Cole, Ph.D., combined inspiration, passion and humor while delivering a message of diversity and inclusion at Old Dominion University.

After a formal reception in Broderick Dining Commons, rather than a standard speech, Cole sat with Stephanie Adams, dean of the Batten College of Engineering and Technology, for a casual, "Oprah-style" conversation. Among several key points, Cole stressed the importance of understanding the role bias plays in impeding the growth and success of women and people of color – particularly in math and science fields.

"When we understand that bias, mitigate against it and begin to bring increasing numbers of women and people of color into engineering, we are doing one of the most important things that can be done to contribute to greater diversity," Cole said.

Earlier that day, following a meeting with the Batten College of Engineering and Technology leadership team, Cole met with ODU provost and vice president for academic affairs, Austin Agho, who shared an unexpected connection with the legendary educator.

Johnnetta Cole



"When most people ask me, 'where are you from' and I tell them Africa or Nigeria, the conversation normally ends there," Agho said while introducing Cole. "But she [Cole] asked me where I was from 'in' Nigeria. I said Benin City. Come to find out, my high school friend is someone she has worked with over the years. Truly a small world."

After the onstage conversation with Dean Adams, the audience had the opportunity to ask questions. ReNee Dunman, assistant vice president for the Office of Institutional Equity and Diversity at ODU, who served as emcee, presented Cole with ODU's first John R. Broderick Diversity Champion Award on behalf of the University.

Held in the Batten Arts and Letters building, Cole's visit was the first in a new lecture series introduced by Adams.

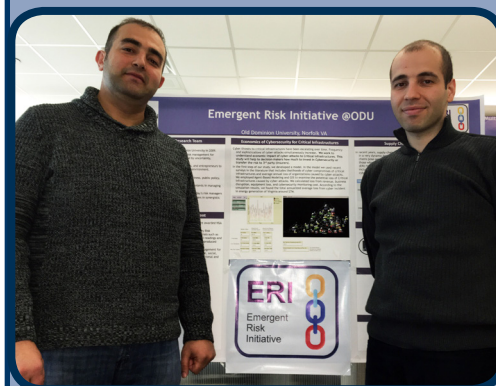
Hear more in this video recap:



Left to right: ReNee Dunman, Johnnetta Cole, Stephanie Adams

EMSE PhD students win merit award

Research addresses cyber-risk on VA power grid



Omer Poyraz (left) and Omer Keskin, in the EMSE-ERI Lab

Congratulations to Engineering Management and Systems Engineering (EMSE) students, Omer Keskin and Omer Poyraz, who recently won the 2017 Society for Risk Analysis (SRA) Student Merit Award for Economics and Benefits Analysis for their research titled "Annualized Loss of Revenue Caused by Cyber-attacks on Power Generation in Virginia Using Agent-Based Modeling." Their research is one of several in the area of cyber risk being conducted in EMSE with guidance from Ariel Pinto, Ph.D. and Adrian Gheorghe, Ph.D., including risk of phishing, distributed denial-of-service (DDoS) and cloud ecosystem, as well as the future of blockchain technology. The award ceremony will take place at the SRA annual meeting in Arlington this month.

The *illuminator* is a publication of the Batten College of Engineering & Technology at Old Dominion University.

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