ACADEMICS

High-speed rendering capabilities enable creativity for visual design students

14 DEC 2021

8 minute read

Students in the School of Visual Arts (SOVA) are taking their 3D animation skills to new levels thanks to an innovative partnership with Virginia Tech's Advanced Research Computing group. Design by Younhee Erin Chung, a graduate student in SOVA's Creative Technologies program.

When computational scientists and artists collaborate, amazing things can happen very fast.

A new 3D rendering service, developed by the Division of Information Technology's Advanced Research Computing unit (ARC) in collaboration with faculty from the School of Visual Arts (SOVA) and the Institute for Creativity, Arts, and Technology (ICAT), is providing Virginia Tech students with 3D rendering capabilities that rival those of large animation studios.

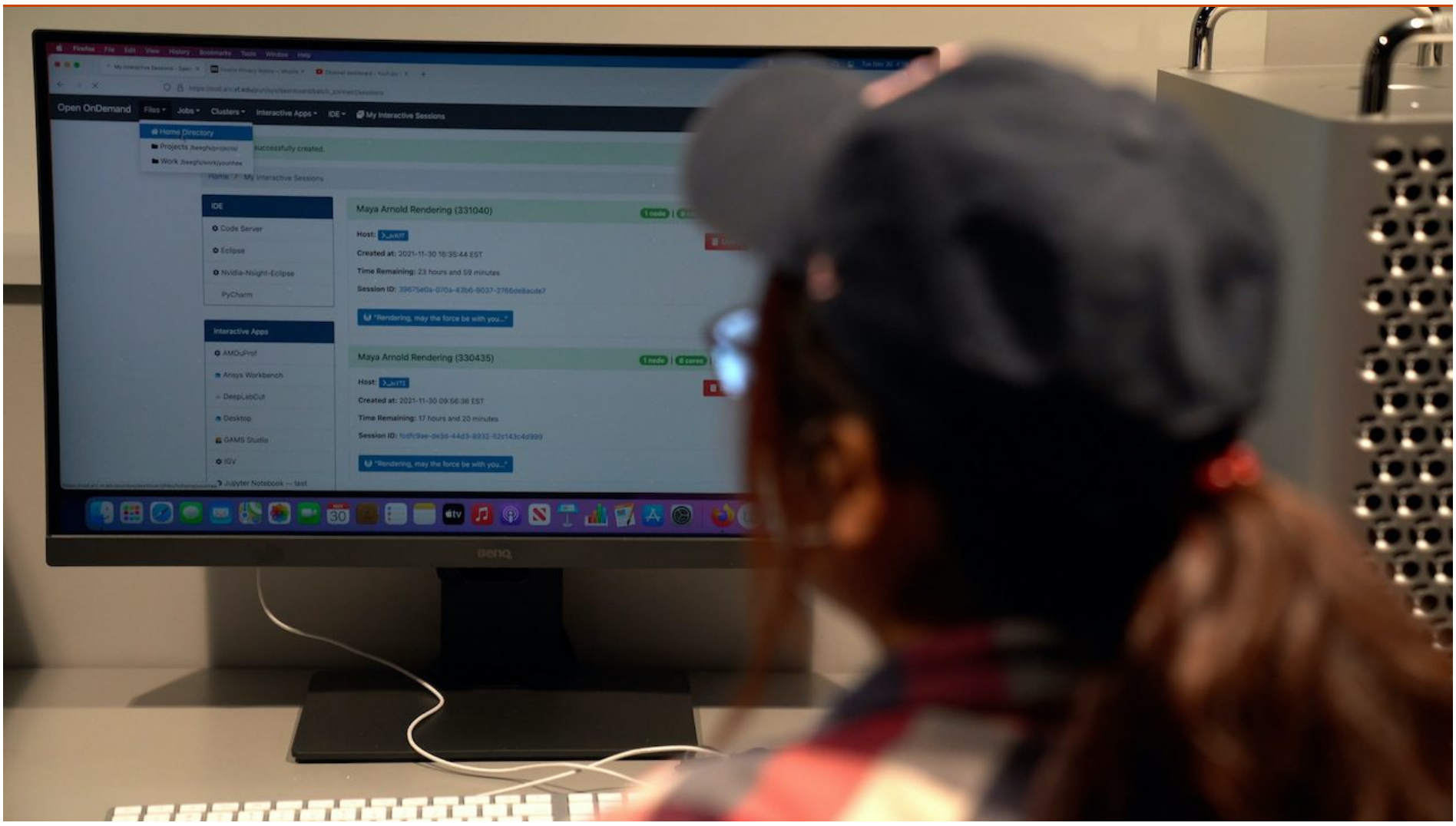
A classroom pilot of the service was launched this fall for students in SOVA's 3D Computer Animation class, led by Meredith Drum, assistant professor of creative technologies.

"This service has already proved to be extremely valuable to my animation students at both graduate and undergraduate levels," Drum said. "It allows them to iterate and see results quickly and thus they are able to take more creative risks and produce more actualized, innovative, and aesthetically and narratively expansive animations. I am very thankful to everyone who worked on this project."

The pilot comes nearly four years after ARC, SOVA, and ICAT first collaborated on a 3D rendering service using ARC's high-performance computing (HPC) clusters. The earlier project proved that large scale 3D rendering could be done on ARC's systems; however, it required students to log onto an HPC terminal and use command-line to run their rendering jobs, which many found cumbersome.

When Drum joined SOVA in 2019, she connected with Thomas Weeks, director of technology futures and community advocacy for the Division of IT, to launch a new student pilot, which would build upon the lessons learned in the first phase of the project. They set out to create a more user-friendly interface, and to find a way to run both SOVA's 3D design software, Maya, and rendering engine, Arnold, on ARC's clusters in a sustainable and cost-effective way.

Over the next year, Weeks, Drum, and other faculty from ARC and SOVA worked together to make these new requirements a reality. Dongsoo Choi, creative technologies and computing manager for SOVA, worked with Weeks to containerize the Maya and Arnold 3D rendering software, which wraps the application into a portable software bundle so that it can run on any system, according to Weeks. This allows the ARC clusters to access and use Maya and Arnold software without having to install it on the highly complex clusters. Containerizing the software also allows Choi and his colleagues to easily update the software over time.



A student in Meredith Drum's 3D Computer Animation class logs into Open OnDemand to access ARC's high-performance computing clusters. Photo by Justin Rocha for Virginia Tech.

Bob Settlage, a computational data scientist for ARC, helped Weeks to connect the containerized 3D rendering engine to use ARC's Open OnDemand, a web-based portal that allows users to access ARC's clusters and manage their rendering files without needing to use the command line interface. With this new rendering system and web interface, "They can just log into Open OnDemand, upload their job, log back in any time to see if the job is done, and download their completed files," Settlage said.

By fall 2021, ARC was ready to pilot this new "point and click" HPC rendering service in a classroom setting.

Saving time allows for greater creativity and confidence

The difference that HPC rendering has made for Drum's students is hard to overstate.

A typical student animation will run at 15 to 24 frames, or individual images, per second, meaning that a video that lasts just a few minutes can consist of thousands of frames – each of which must be rendered.

"At home, it would take 15 to 20 minutes to render one frame," said Rodney Kimbangu, a graduate student in SOVA's Creative Technologies program, who is participating in the pilot. "With HPC, it took less than a minute per frame. Plus it saves my own computer because I am not putting wear and tear on a computer that wasn't designed for these kinds of rendering tasks."

This is one frame from student Rodney Kimbangu's 3D animation project. On his personal computer, Kimbangu estimates that his project would have taken nearly 14 days nonstop to render. Using ARC's clusters, rendering the project took only 10 hours.

Using a computer lab for large render jobs also had its downsides. “Students would end up staying there all night babysitting a computer - or sometimes multiple computers - because if someone else came in and started using that computer, or the task timed out, they'd lose their progress,” Drum said.

The benefits go far beyond time savings. This new approach gives students the freedom to experiment and take creative risks that ultimately make them better designers.

“Students need to be able to make mistakes,” Drum said. “The more often they can experiment, take risks, and rework their projects, the more they can improve their skills and instincts. If they have to wait days and days to see an animation, they may not have time to fix a problem, and they will lose out on an opportunity to learn and grow.”

Kimbangu said that before having access to ARC, he was reluctant to even attempt much in the way of 3D design.

“It was discouraging to know that after spending a long time designing something, it would take up to an hour to render one frame. That hindered my creative process. Now, knowing that I can easily see what I'm working on gives me a boost of confidence,” he said. “With this much computing power, I don’t see any reason not to animate often, you know? It allows me to take risks and see what I can fix because I can do it in such a short amount of time. Having access to the processing power that ARC provides just opens up the opportunities for 3D artists.”

Shiven Saxena, also a creative technologies student, agreed.

“Art is experimenting...you need to be able to try things in different ways to figure out what works best," Saxena said. "So, rendering is something that has to be done intermittently as you’re working on a project, so that you can do that experimentation. Having the ability to do it speedily is a key component of success in this area. It allows me to come up with different ideas and try them out.”

Younhee Erin Chung's animation, 'The Hunt.' Chung's final project includes intricate action scenes, including slow motion sequences that involve up to 300 frames per second, which would have been hard to attempt without access to high-performance computing.

"It's absolutely helpful to have access to the ARC resources," said graduate student Younhee Erin Chung. "It has helped me progress as a 3D artist. Without it, I would have had to skip important steps to finalize my animation, such as putting in sound effects and polishing visual effects, in order to meet the class deadline."

A hands-on experience of a hands-off process

In October, students in Drum's 3D animation class had a unique opportunity to see the HPC systems that are providing the rendering service. Weeks, Settlage, and ARC systems engineer Miles Gentry led the class on a tour of the Steger Hall data center, which houses their flagship computing cluster, TinkerCliffs.

"So often the computing that we engage in as artists is beyond our senses," Drum said. "The students were interested in seeing the actual computers that were doing the rendering work."

She added that "having this experience and exposure to HPC is valuable. The more they understand the relationship between design and computational science, the better prepared they will be working as artists in the field."

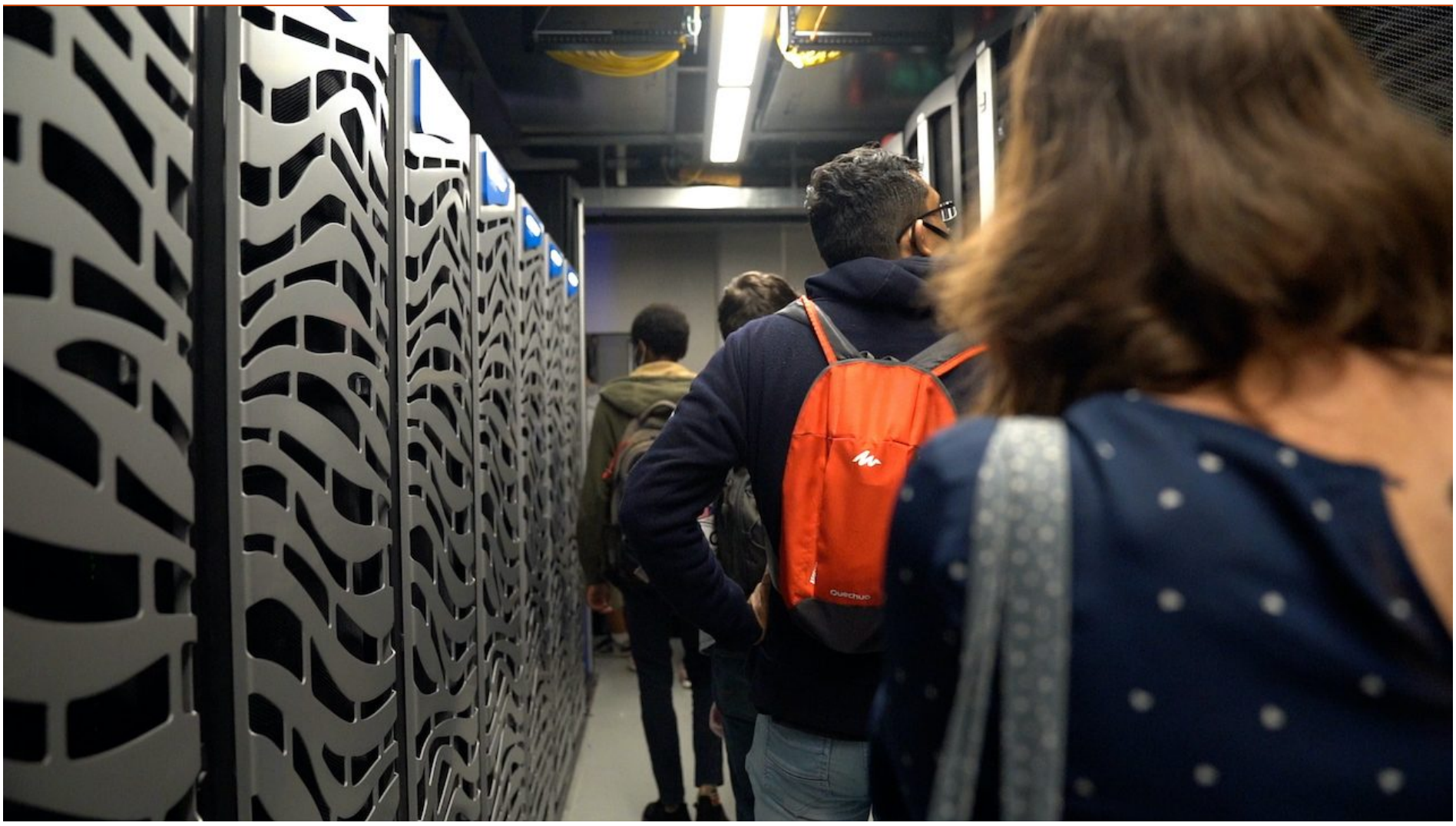
During the tour, Gentry and Settlage provided in-depth information about the physical features of the data center facility, the computer clusters inside, and the computational science work that goes on behind the scenes to enable and support SOVA's new OnDemand rendering app.

Kimbangu found the experience useful.

"It was good for me to get to know what's involved on the technical side of my animation. Now, instead of sending my animations into the ether, I have some kind of a grounded knowledge as to where my rendering happens, and how it happens. It increases my appreciation of the hardware side of this art."

Like many of her students, this was Drum's first visit to a data center.

"It was so loud. I loved seeing the cooling system," Drum remarked. "The physical experience was especially interesting. You can feel in your body the massive amounts of energy running through the system."



Students from Assistant Professor Meredith Drum's fall 2021 3D computer animation class toured the data center that houses the high-performance computing clusters the students are using to render their creations. Photo by Justin Rocha for Virginia Tech.

The success of this pilot demonstrates the impact that high-performance computing can have for students, faculty, and researchers in any discipline.

"Within ARC, our mission is to enable Virginia Tech faculty and students to accomplish and advance their research and education goals. Working with SOVA to provide this rendering service is a perfect example of how we can facilitate this process," said Settlage.

"Bringing HPC to SOVA 3D design students at Virginia Tech has been inspiring, as well as a lot of fun," Weeks said. "They may not realize it right now, but having large scale, Linux-based, HPC rendering on their resume is really going to set them apart as future 3D design professionals. My colleagues in the industry say they are always looking for 3D designers with large HPC cluster experience, but most visual design graduates just don't get exposed to HPC, especially at the undergraduate level. Being able to provide this opportunity through ARC is incredibly rewarding both for the ARC and SOVA faculty as well as for me personally."

Dylan Keegan, whose animation project has been nearly 10 years in the making, expressed the impact that having access to high-performance computing is having on students like him. "This opens up so much speed and so much of what we really need, which is to have more time to share and learn and experience. And really, that's what art is all about."

Related stories

High-performance computing is helping students' creativity flourish (Video)

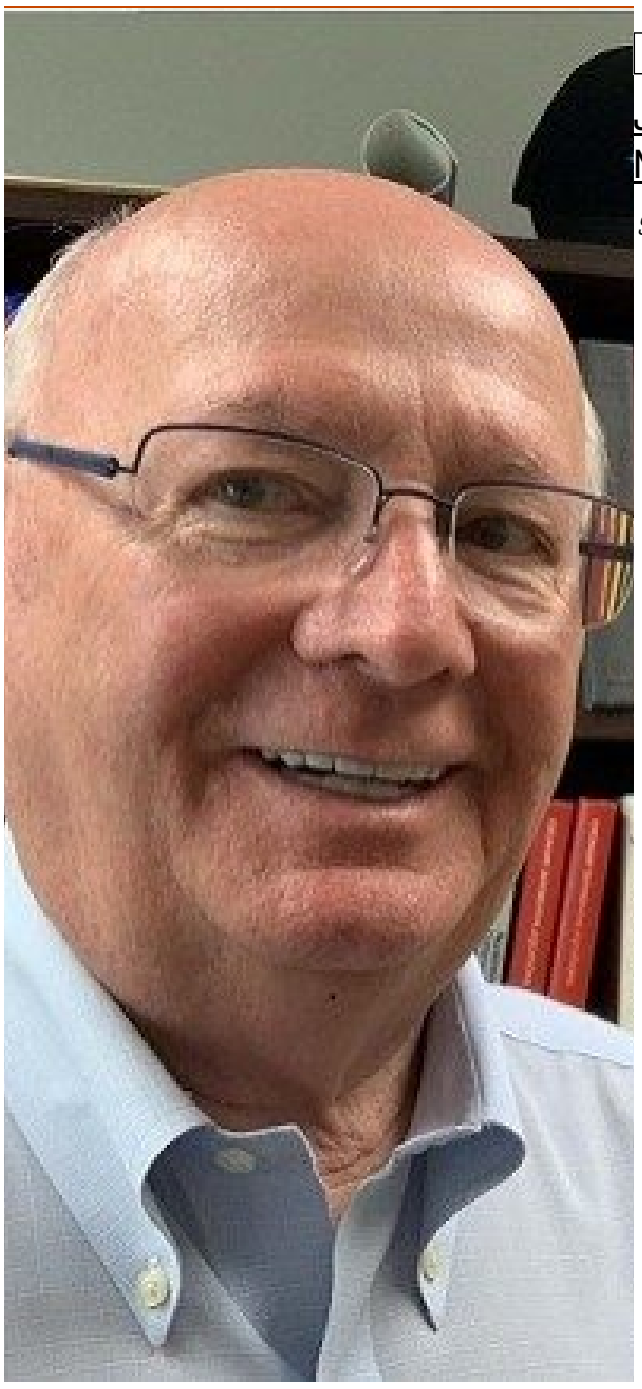
Contacts: Angela I. Correa
540-231-4202

Kit Hayes
540-231-1420

Tags: ACADEMICS | ADVANCED RESEARCH COMPUTING | COLLEGE OF ARCHITECTURE, ARTS, AND DESIGN | CREATIVE TECHNOLOGIES | DIVISION OF INFORMATION TECHNOLOGY | INSTITUTE FOR CREATIVITY, ARTS, AND TECHNOLOGY | SCHOOL OF VISUAL ARTS

SHARE THIS STORY

RELATED CONTENT



RESEARCH

John Burns named interim director of the Interdisciplinary Center for Applied Mathematics

Sep 26, 2022

RESEARCH

Terry Herdman, associate vice president for research computing, retires after 48 years of service

Sep 23, 2022

RESEARCH

Virginia Tech National Security Institute poised for growth, excellence

Nov 08, 2021

ACADEMICS

High-performance computing is helping students' creativity flourish

Feb 17, 2022

RESEARCH

Teaching drone swarms to assist in search and rescue efforts

Oct 19, 2021

ACADEMICS

Introducing PromethION24: the newest machine to join the Genomics Sequencing Center

Nov 09, 2020

ACADEMICS

VIEW ALL

ACADEMICS

Virtual event addresses the importance of women working in data science

Sep 26, 2022

ACADEMICS

Boeing leadership program provides lift for students' career aspirations

Sep 25, 2022

ACADEMICS

Registration open: Integrated Security Seminar Series kicks off on Oct. 3

Sep 23, 2022

ACADEMICS

Virginia Tech's new Holden Hall is anything but boring

Sep 23, 2022

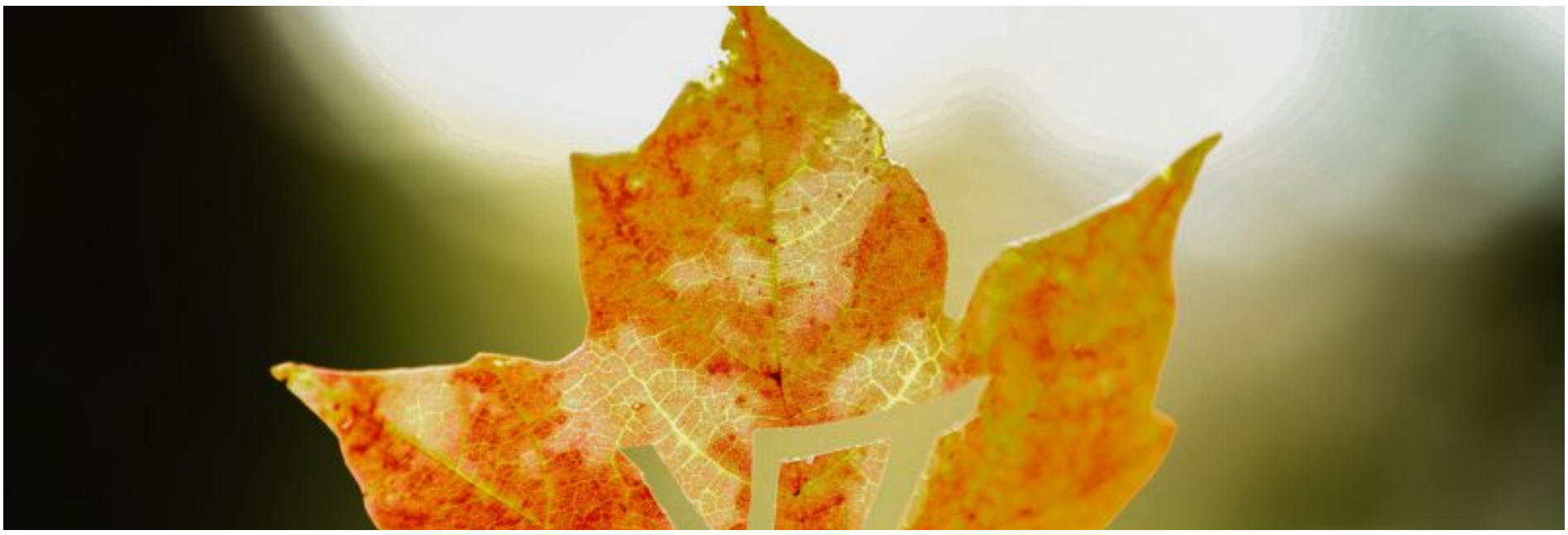
CAMPUS EXPERIENCE

VIEW ALL

CAMPUS EXPERIENCE

TLOS next generation teaching tools showcase - Oct. 14

Sep 27, 2022



CAMPUS EXPERIENCE

Undergraduate Student Senate announces 2022-23 election winners

Sep 27, 2022

CAMPUS EXPERIENCE

Students discover study abroad opportunities at the fall fair

Sep 26, 2022

CAMPUS EXPERIENCE

Sexual Violence Culture and Climate Work Group putting plans into action

Sep 25, 2022

CULTURE

VIEW ALL

CULTURE

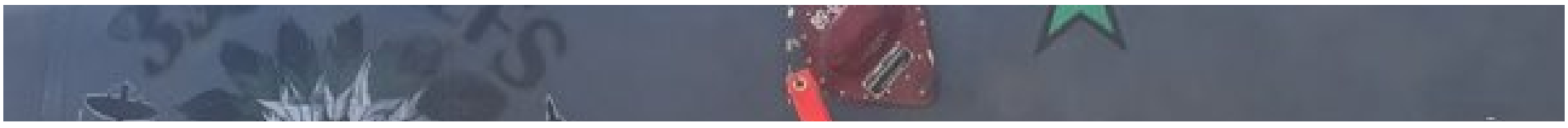
Jump-starting a spouse's job search with the Dual Career Program

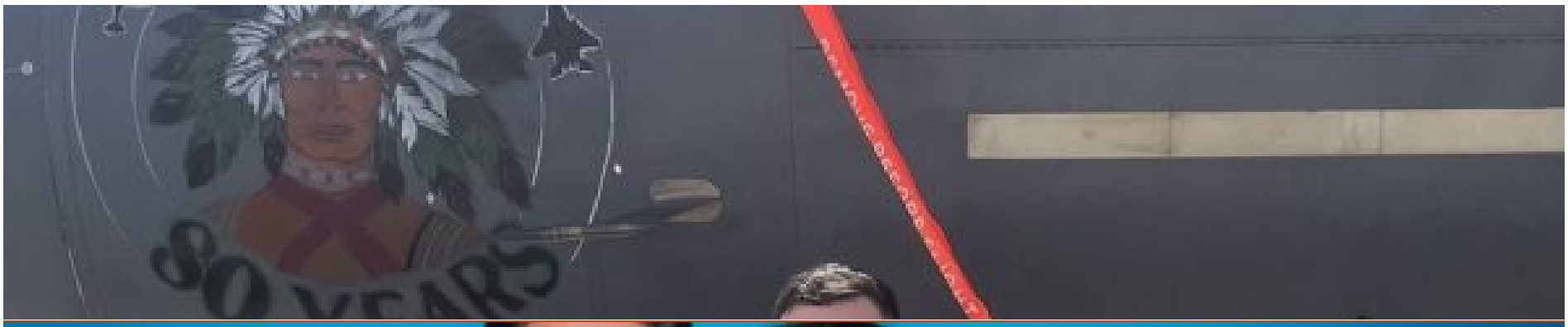
September 2022

CULTURE

College of Science's J. Mark Sowers Distinguished Lecture Series returns with live, in-person event

September 2022





CULTURE

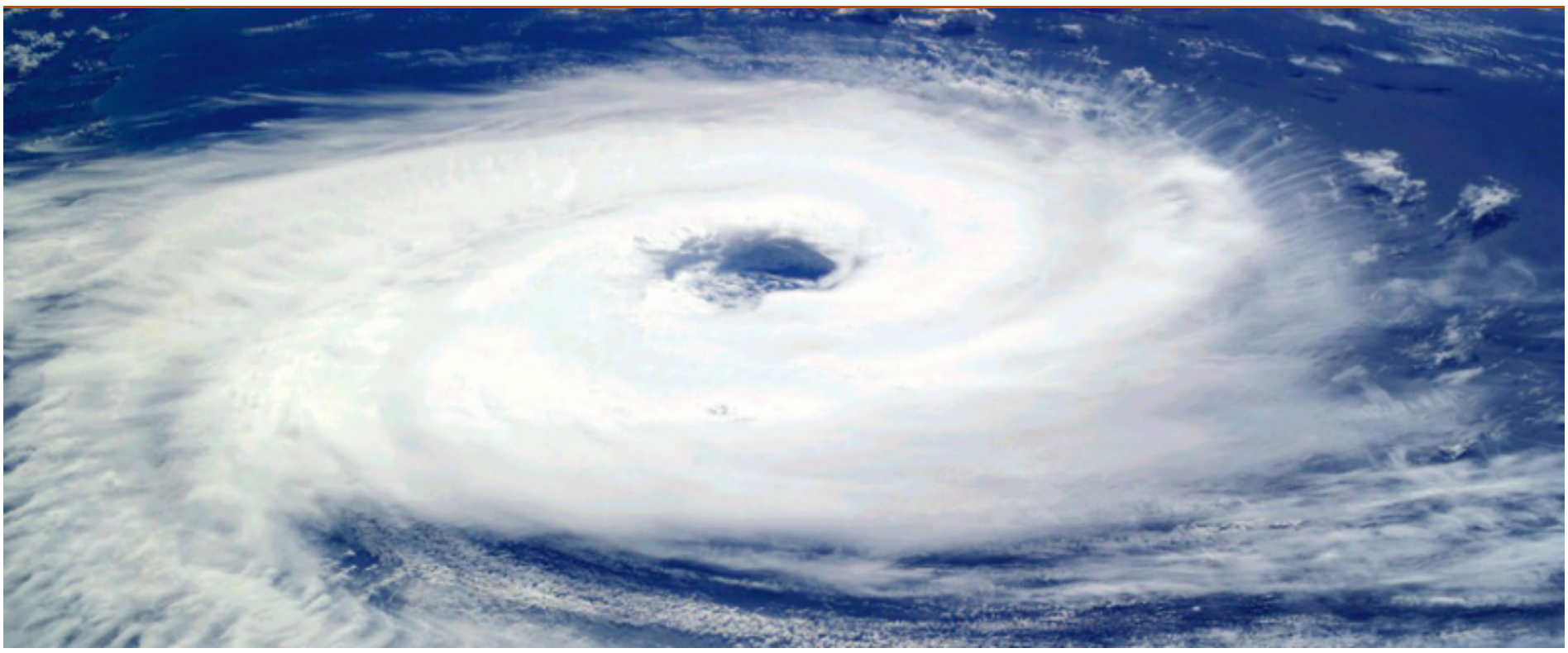
CULTURE

Formidable singer, musician, and storyteller Rhiannon Giddens performs with collaborator Francesco Turrisi

September 2022

IMPACT

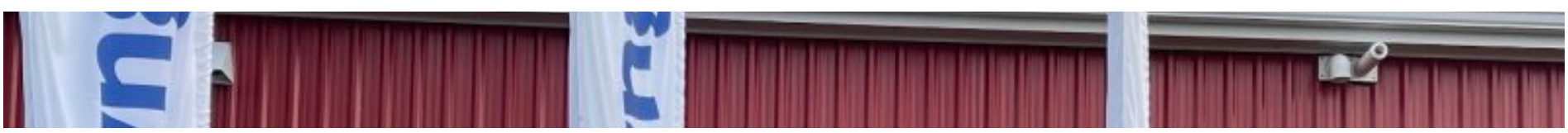
VIEW ALL



IMPACT

Coastal experts available to discuss hurricane emergency preparation, disaster response and recovery

Sep 27, 2022



IMPACT

Students tackle pesky plant problems at summer contests

Sep 26, 2022

IMPACT

U.S. Sen. Mark Warner visits Virginia Tech to discuss CHIPS Act potential

Sep 26, 2022

IMPACT

Virginia Tech alumnus addresses foreign policy challenges at the U.S. Department of State

Sep 25, 2022

RESEARCH

VIEW ALL

RESEARCH

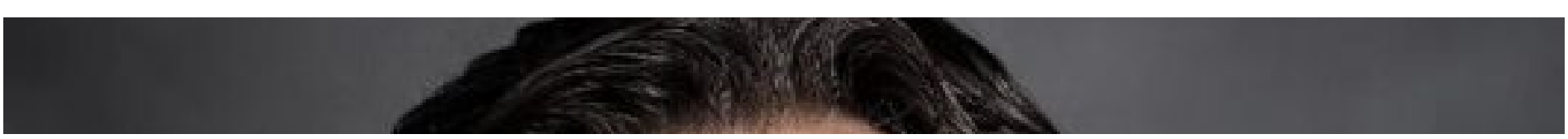
Studying vampire bats to predict the next pandemic

Sep 26, 2022

RESEARCH

Neuroscience doctoral student receives NIH award to study the little-known astrocyte

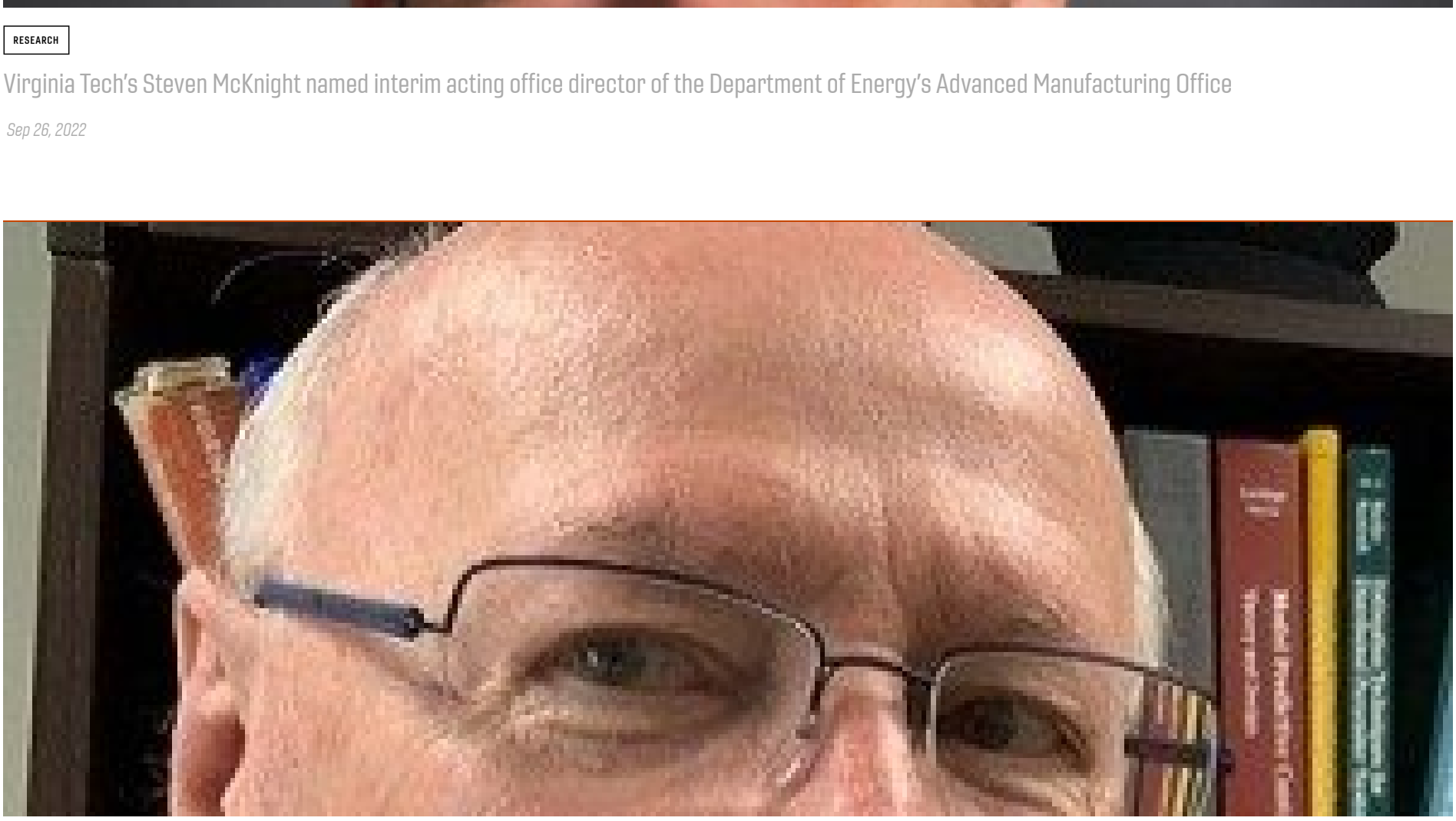
Sep 26, 2022



RESEARCH

Virginia Tech's Steven McKnight named interim acting office director of the Department of Energy's Advanced Manufacturing Office

Sep 26, 2022



RESEARCH

John Burns named interim director of the Interdisciplinary Center for Applied Mathematics

Sep 26, 2022

DAILY DOODLE

VIEW ALL

Know What to Do in an Emergency

Sep 27, 2022

Missed a Doodle? Catch up on past Doodles from the Virginia Tech Daily Email.

DOODLE ARCHIVE

Email Doodle suggestions doodles@vt.edu