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Undergraduate Opportunities

Vol. 4 • No. 1 • Spring 2021

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- Provides an understanding of research methodology

At MTSU, undergraduates get research opportunities often available only to graduate students at many other large universities.

Undergraduate research pays off at MTSU with \$135,000 invested annually in grants and activities.



TRUE DISCOVERY • mtsu.edu/ureca

UNDERGRADUATE OPPORTUNITIES



Undergraduate research marks a new frontier in the university world, where research historically was the domain of only faculty and advanced graduate students. At MTSU, we believe that the benefits accrued from conducting research—knowledge, confidence, the ability to learn from a mentor, failure, success, teamwork, systematic thinking, and more—should not be contained and constrained in the hands of a few. Extending this opportunity to every MTSU undergraduate student produces many wins for all: the undergraduate student; faculty and graduate student mentors; the project itself; the University by way of higher-quality graduates; and future employers of these undergraduate researchers.

The world is intensely competitive, and to compete well, a person needs a unique set of skills that matches the need of an employer, society, or organization. Undertaking undergraduate research allows MTSU students not only to grow, but also to stand out when applying for jobs or to graduate and professional schools. And this opportunity is open to all students from all backgrounds with different academic journeys—not just the highest achievers or STEM majors. As the articles in this issue attest, sometimes an undergraduate research opportunity is the pivotal moment to help galvanize a student's success. Some bring their own ideas, and others form a professor-student collaboration, or projects may develop from a team framework.

I invite you to read these stories of some outstanding undergraduate researchers, their mentors, and their projects in these pages—and realize the remarkable experiences that undergraduate research at MTSU affords students. Anyone who seeks out this opportunity helps further the future for themselves and others. They just simply need to raise their hands.

True Blue!

A handwritten signature in black ink that reads "David Butler". The signature is written in a cursive, flowing style.

David Butler

Vice Provost for Research and
Dean, College of Graduate Studies

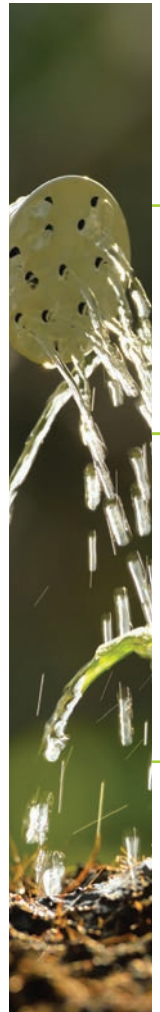
MTSU

UNDERGRADUATE OPPORTUNITIES

Vol. 4 • No. 1 • Spring 2021

Office of Research and Sponsored Programs

RESEARCH



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MIDDLE TENNESSEE STATE UNIVERSITY

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All articles by Allison Gorman



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SEED TO FRUITION

MTSU students may apply for tiered levels of URECA grants.

KEY



Applicant



Gold



Assistant



Platinum



Silver

TRANSFORMING EXPERIENCES

URECA GRANTS LET UNDERGRADUATES DEVELOP SKILLS AND TAKE LIFE-CHANGING STEPS FOR THE FUTURE

SUCH GRANTS HAVE ALLOWED STUDENTS TO TRAVEL ABROAD, ATTEND NATIONAL CONFERENCES, OR SIMPLY HAVE FINANCIAL FLEXIBILITY.

Opportunities offered by MTSU's Undergraduate Research Center (URC) can enhance the undergraduate experience and make students more competitive when they apply for jobs or to graduate or professional schools.

The URC's flagship initiative is the Undergraduate Research Experience and Creative Activity (URECA) program, which annually awards \$135,000 in grants to fund student projects from across the academic spectrum.

Such grants have allowed students to travel abroad, attend national conferences, or simply have the financial flexibility to spend extra time in the lab, field, or studio.

Depending on the level and type of grant, it lasts one or two semesters, represents 50–350 hours of work, and pays \$500 to \$3,500 plus expenses such as travel and materials.

Recipients must present their finished work and can showcase it at the Undergraduate Research and Creative Activity Open House or at the Research and Creative Activity Exposition during Scholars Week.

"It's a way of evolving as an undergraduate researcher towards a more advanced researcher through multiple applications, not unlike what a faculty member or graduate student has to do—submitting a grant, getting that grant successfully, executing it, getting your result, publishing on it, and then reapplying, using your track record of success as an indicator of the next step," said David Butler, Vice Provost for Research and Dean, College of Graduate Studies.

URECA grants have gotten more competitive with a recent surge in applications, but roughly half are chosen, says Jamie Burriss, who oversees the URC. A sampling of success stories here shows how MTSU undergraduate scholars thrive in this nurturing environment, taking the germ of an idea into full fruition of a real research project. [MTSU](#)





Applicant, Spring 2021

A MILITARY MESSENGER

ROTC STUDENT PLANS TO PRODUCE GRANT-BACKED FILM PROJECT TO SUPPORT VETERANS CENTER

It's entertainment,
but in the background
there's always a purpose.



Javier Hernandez is using undergraduate research to mix Business Administration with pleasure and to give back to an MTSU community he loves.

The sophomore from La Vergne has been making amateur videos for years, so when he enrolled at MTSU, he toyed with the idea of minoring in Video and Film Production. But as a first-generation college student who needed to take the straightest path to career success, he decided it wouldn't be wise to take on the extra semester of coursework. Instead, Hernandez plans to feed his creative appetite—and improve his skills—with the help of an Undergraduate Research Experience and Creative Activity (URECA) grant. He intends to use the funds to make a video promoting MTSU's Charlie and Hazel Daniels Veterans and Military Family Center.

MTSU has more than 1,000 veteran and active military students, and the Daniels Center, which opened in Keathley University Center in 2015, ranks among the largest, most comprehensive campus veterans centers in the nation.

Hernandez, an Army ROTC student, said he feels many people aren't aware of the center's existence or what it offers, including some students and families who could use its services.

"It's something unique, because it's not just about helping people out with their paperwork," he said. "They want to help students graduate and be successful personally and professionally as well as academically."

Beyond providing services such as financial aid assistance and academic advising, the Daniels Center offers space where students who share a military connection can meet and study as a community.

Photos by
J. Intintoli



HERNANDEZ WANTS HIS WORK TO CONVEY A MESSAGE ABOUT DUTY AND CAMARADERIE.

Hernandez is part of the military community too, having found his own place there through MTSU's ROTC program. "After the first semester, I loved it so much that I knew this was exactly what I wanted to do," he said.

Between a Business Administration degree and the Military Science minor he'll earn through ROTC, Hernandez has his post-college future mapped out. But just in case he wants to make an excursion into the world of video production, he's hoping his URECA experience can help him get there.

A GOOD CAUSE

Hernandez loves making videos so much that one of his favorite pastimes is "watching videos on how to create better videos."

Another favorite pastime is watching movies, specifically superhero movies such as *X-Men* and *The Avengers*. Like most fans of that genre, he enjoys the action. But it's the overarching themes that really capture his imagination.

"Yeah, it's entertainment, but in the background there's always a purpose," he said. "Something like Captain America—having loyalty, those high ethics and values. I think it would be great to display a message like that through video."

His Daniels Center project would give him that opportunity. While its purpose will be to showcase the many ways the center supports military-connected students and their families, Hernandez wants his work to convey a message about duty and camaraderie, the qualities that drew him to ROTC.

"It's the environment, the culture—it's just the values," he said. "It's like a big brotherhood. . . . In a military environment, regardless of your position, you try to give it your best."

Hernandez discussed the parameters of the project with faculty mentor Hilary Miller, director of the Daniels Center, and spent last fall brainstorming as

he drove back and forth to campus. Soon he was “planning out the simple things like background music, the transitions, the theme, and whether the video will be long or short, two minutes or five minutes.”

THERE’S A LOT THAT I DON’T KNOW IN VIDEO AND FILM, SO I WANT TO LEARN FROM MY ERRORS NOW AND THEN IMPLEMENT THAT WHEN MY NEXT SEMESTER COMES.

He also wanted to get better at the craft before he started filming. “There’s a lot that I don’t know in video and film, so I want to learn from my errors now and then implement that when my next semester comes,” he said.

His aim was to have all the details ironed out before applying for a grant, so he could hit the ground running if he won it. Fortunately, he has experience with grant writing; this is his second URECA proposal for a video project.

As a freshman, he was awarded a URECA grant for the Spring 2020 semester, to create a documentary on what student research looks like at MTSU, including the URECA program and MTSU’s Student Organization for the Advancement of Research (SOAR), a new organization he joined his freshman year. He was going to use the grant to fund a trip with SOAR to the National Conference on Undergraduate Research, in Bozeman, Montana. Unfortunately, like so many events in 2020, the conference was canceled due to the COVID-19 pandemic and, thus, the grant project was scuttled.



With this project, he'll be closer to home. But he's also closer to the subject matter. His enthusiasm for the project makes up for whatever it lacks in glamour.

"I don't have much professional equipment. I have a basic camera and a microphone, and the majority of the [software]," he said. "But if I can get paid to do this for a good cause, raising awareness for the veterans center, why not give it a shot?"

CREATIVE OPPORTUNITIES

When the project is finished, the Daniels Center can share the video on its web page and social media, and Hernandez can put it on his résumé—along with any other URECA projects he pursues and receives his junior and senior years.

His immediate career path runs through the U.S. Army. Hernandez plans to graduate as a commissioned officer and put in a few years of active-duty service before moving to the civilian workforce. Judging from his ROTC training, he said, being a military officer is good preparation for a career in business.

"I think you could say it's like being a manager," he said. "You're just managing to make sure that everyone else in your organization, your small unit, is doing everything right."

Wherever his business career takes him, Hernandez will be looking for opportunities to apply what he learned through his URECA experiences.

WHEN THE PROJECT IS FINISHED, THE DANIELS CENTER CAN SHARE THE VIDEO ON ITS WEB PAGE AND SOCIAL MEDIA.

"I think maybe with a business degree I can go into something like video and film even if I don't have those specific credits or courses," he said. "These creative projects might support that background." [MTSU](#)



Javier Hernandez

Class: Sophomore

Major: Business Administration
(ROTC minor)

Faculty mentor: Hilary Miller

Project: Film promoting MTSU's
Charlie and Hazel Daniels
Veterans and Military
Family Center



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**May 1 deadline
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Assistant, Spring 2020

SHEDDING HER SKIN

VISUAL ARTIST CHANGES NARRATIVE ABOUT WOMEN'S POWER THROUGH CULTURAL PROJECT

In the visual arts, research is reflected in both content and process.



When Katrina Scott spent a semester studying abroad in Fall 2019, she had a mission beyond immersing herself in a foreign culture and picking up French as a second major.

As a Visual Arts major and Honors College student at MTSU, Scott needed a topic for her Honors thesis project. She was hoping to find inspiration while studying at the Université de Caen Normandie, located in a small port city in northern France.

The idea came to her when she teamed up on a project with a campus group that advocates for women's rights—and then, with that experience fresh in mind, she took a whirlwind tour of art museums in Italy. She was struck by the ubiquity of a certain theme.

"I saw so many pieces like *The Rape of the Sabine Women*, all these representations of women being persecuted and oppressed throughout history," she said. "I wanted to change that narrative and talk about women's power."

Artists were our storytellers long before writers were, and visual narratives are often far more elaborate than any arrangement of words. The four works Scott was inspired to create for her Honors project are no exception.

"I wanted these pieces to be a little obscure, to invite the viewer to ask questions," she said. "I really want it to open up a conversation and let people have a takeaway of confronting their own values and beliefs about women and women's role in society—and what that looks like."

Each piece was produced as a series of layers: a 16-by-20-inch hard board canvas painted with an oil wash; then covered in paper collage, including bits of pictures and text from vintage books; and followed by oil paint mixed with various media, including a cold wax medium, which produces heavily textured brush strokes.

Photos by
J. Intintoli

The focus of each is a single animal—hare, alligator, wolf, snake—set against a backdrop of evocative plant imagery and found art. Together, the pieces change the story about what’s possible for women: subjugation, but then awareness, anger, renewal.

FREEDOM THROUGH ART

Scott said she understands that cycle because she’s been through it.

Although she was always a high-achieving student, she says her self-worth was undermined for years by teachings at an extremely conservative religious school she attended in Knoxville. When she came to MTSU, Scott had every reason to be confident—she had received a Buchanan Fellowship, the

I CHOSE THE SNAKE INSTEAD OF THE BUTTERFLY BECAUSE . . . IT’S STILL THE SAME PERSON AT THE CORE.

University’s top academic award for incoming freshmen—but she also was carrying some heavy baggage.

“I was taught some really messed-up things about what it meant to be a woman and what my duties were as a woman, and how it was my responsibility to keep men in check, and my freshman year I experienced a series of harmful situations with men that I blamed myself for,” Scott said.

Ultimately she recognized that she was both damaging and limiting herself by accepting



what she'd been taught. "I just felt so angry that I missed out on so much because of that narrative," she said.

Scott's minor coursework in Psychology may have helped her tease apart the threads of experience and emotion, cause and effect. She knows it helped her recast the feminine story, which she conveys through her series of mixed-media paintings.

And so the fearful hare in the first painting gives way to the watchful alligator, which represents "the decision point in a situation where you're trying to scope out the best course of action," Scott said. The wolf—her favorite piece, done in chunky strokes of teal and pink—is lashing out in self-defense or perhaps maternal rage. Then there's the final piece, in cool blues and greens: a snake shedding its skin.

"I was interested in challenging people's perceptions," she said. "A wolf is traditionally seen as a powerful symbol, and I wanted to reinterpret that as female power. And people sometimes see snakes as negative, deceptive, but there's evidence in history of snakes being guardians and positive symbols. The shedding of the skin specifically—there was a period in my life when I was dealing with a lot of trauma, and I remember feeling like I wanted to shed my skin and become a different person that hadn't had those experiences. I chose the snake instead of the butterfly because it shows that it's still the same person at the core."



VISUAL TESTIMONY

In a sense, Scott had been exploring the psychology behind this series for years. Still, she worried that it wouldn't qualify as a research project when she applied for a Spring 2020 Undergraduate Research Experience and Creative Activity (URECA) grant, which pays a stipend plus materials costs. Her Honors thesis advisor and URECA faculty mentor, Erin Anfinson, explained to her that in the visual arts, research is reflected in both content and process.

“There’s some heavy symbolism in there, but the whole thing was a learning experience,” Scott said. “I learned how to use different materials. I learned how to propose a project. And I learned to be adaptable. I came into a lot of difficulties throughout the process, and I had to address those and adjust expectations as needed.”

Those difficulties included losing access to the campus studio when much of the campus shut down last spring due to the COVID-19 crisis. Scott requested a deadline extension and spent the summer hauling her works-in-progress back and forth between her cramped apartment in Murfreesboro and her family’s home in Knoxville, where there was room to paint.

I LEARNED HOW TO USE DIFFERENT MATERIALS. I LEARNED HOW TO PROPOSE A PROJECT. AND I LEARNED TO BE ADAPTABLE.

Like many college students in 2020, Scott also battled pandemic burnout. She says Anfinson helped her keep momentum and perspective when she was essentially in survival mode.

“Her advice a lot of the time was just to step back from it and let myself remember why I started doing this in the first place,” Scott said. “You get so caught up in the process—the painting layers and trying to get it to look right—it’s easy to forget the content and the meaning of it.”

She finished her paintings last August, and they will be displayed in Todd Hall for her thesis exhibition Feb. 27–March 9, 2021. Then she’ll hang them on her apartment wall, reminders of all she went through to create them—and testaments to her resilience. [MTSU](#)



Katrina Scott

Class: Senior

Majors: Visual Art and French

Faculty mentor: Erin Anfinson

Project: Mixed-media collage paintings on the role of women’s anger and complex human emotions

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Assistant, Spring 2020



Assistant, Spring 2020

GROWING SCHOLARS

ARMY VETERANS TAKE RESEARCH AS JUST ANOTHER CHALLENGE IN CULTIVATING A SECOND CAREER

For many graduate students, research is a requirement. But for undergraduates, it's generally extracurricular, an additional time commitment on top of coursework, paid work, and sometimes even family life.

When Robert Conner and Christopher Hall enrolled as undergraduates at MTSU, they were already husbands, fathers, and military veterans. They'd gone the extra mile for their country, and they were ready to go the extra mile for their educations, too.

Undergraduate research makes you competitive so you can get your master's paid for or get a research gig.



CHECKING BOXES

A lot of Conner's extra miles were logged over the Fall 2020 semester. He spent every week bouncing around between three Tennessee cities: Clarksville, where he lives with his wife and two young sons; Murfreesboro, where he had in-person classes Mondays and Tuesdays (plus tomato plants to tend in a campus greenhouse); and McMinnville, where he worked Wednesdays and Fridays at Tennessee State University's Otis Floyd Nursery Research Center. On Thursdays, he Zoomed from home.

Conner acknowledges that the schedule wasn't sustainable long term. As much as he enjoyed his Floyd Center internship, he was glad to see it wind down at the end of the year. But the extra work he took on that semester—the research, the internship—checked off boxes that got him closer to his goal of being a soil scientist.

He wasn't quite sure what those boxes were until he took freshman-level biology. That's where he learned about MTSU's Undergraduate Research Experience and Creative Activity (URECA) program, which offers undergraduates grant funding for their research work.

Photos by
Andy Heidt

*Pictured left: (top) Christopher Hall
and (bottom) Robert Conner*

“They really stressed that undergraduate research makes you competitive so you can get your master’s paid for or get a research gig,” Conner said. “I like checklists. That’s why I joined the Army.”

AS SOON AS HE LEARNED ABOUT URECA GRANTS, HE BEGAN SCOURING THE LITERATURE.

Maybe he likes checklists *because* he joined the Army. Before serving, when he was right out of high school, he had tried college twice: “I went to the University of Tampa and I had a lot of fun. And then I went to the University of South Florida and I

had a lot of fun there, too. Then when I was 21, I joined the National Guard and went active duty.”

Suffice it to say that when Conner arrived at MTSU, he was a different guy: a 30-year-old veteran with a wife and two kids and a newfound fascination with horticulture—specifically soil, which he considers a vital but largely untapped resource.

“The effort to find ways to bring more efficiency out of our soil is critical to the human race’s future,” he said.

Conner enrolled as a Plant and Soil Science major, minoring in Biology. As soon as he learned about URECA grants, he began scouring the literature, looking for research to expand on. He needed a project. He already had a partner.



AN UNCOMMON BOND

What are the odds of two strangers discovering that they share a military background and a passion for soil? It's hard to say for sure, but those odds certainly improve at MTSU, which has a long tradition of welcoming veterans and active-duty soldiers.

And for good reason. Military-connected students tend to be focused and highly pragmatic. For them, college is about succeeding, not socializing. Yet the camaraderie forged between soldiers doesn't end with military service, so when they meet in college, as Conner and Hall did, they tend to connect there, too.

THEN THERE'S SOIL

Like Conner, Hall speaks about it like a man on a mission.

"Soil fascinates me, and having healthy soil is essential to continued life on Earth," he said. "We live in a technological world, where society thinks they will find the answers to solve every problem; however, we must learn how to use the available technology to understand how to properly feed the soil in order to set future generations up for success."

Also like Conner, Hall is medically retired from the military. Fifteen years as an Army Airborne combat engineer—"I jumped out of airplanes and blew stuff up for a living"—gave his back all the punishment it could take.

Maybe it's his three tours of duty (two in Afghanistan, one in Iraq) or his three surgeries. Maybe it's simply his upbringing in an almost all-female family. But when asked about the challenge of balancing college, work, and family life, which includes four girls ages 7 to 13, Hall replied, "Being a retired senior noncommissioned officer in the military, time management has always been a big part of what I had to do. I'm pretty good with managing my own time and creating



SOIL FASCINATES ME, AND HAVING HEALTHY SOIL IS ESSENTIAL TO CONTINUED LIFE ON EARTH.

my own schedules. But yeah, it does get a little challenging between four girls, school, work, all that good stuff.”

So when Conner floated the idea of doing a research project together, Hall was all in.

Conner’s thought was to expand on a Chinese study he had found comparing the outcomes of various air irrigation techniques on tomato plants. He wanted to compare the effects of fertilization and water with and without aeration, as well as test the thermal and physical properties of the soil.

Hall says he loved the idea, but “honestly we had no idea what we were doing” until they attended the Fall Undergraduate Research and Creative Activity Open House showcasing recent URECA grant winners and their projects. “That’s when we got our intel to figure out how we should go about doing this,” he said.

THEY WENT TO WORK BUILDING A CUSTOM FERTIGATION SYSTEM.

They met with Jamie Burriss, who facilitates the URECA program; found a mentor, Samuel Haruna, assistant professor in the School of Agriculture; and with input from both, applied for and won Spring 2020 URECA grants, which paid stipends and covered costs of materials. Then they went to work building a custom fertigation system.

The original system had clear pipes so observers could see the venturi injectors mix air into the water. But the pipes sprang too many leaks, so Conner and Hall had to rebuild with PVC. Then the pandemic hit and they couldn’t get into the horticulture greenhouse. Undeterred, they got their grants extended and soldiered on through the fall. They’re now completing analysis of the results.

Research, like life, is a series of challenges. These two Army vets are up for it, enthusiastically. [MTSU](#)



Robert Conner and Christopher Hall

Class: Nontraditional students
(Army veterans)

Major: Plant and Soil Science

Faculty mentor: Samuel Haruna

Project: Research on
fertilization and water
with and without aeration

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Assistant, Spring 2020

DIGGING INTO THE PAST

WITH *VANDERBILT*, STUDENT SCREENWRITER REVISES HISTORICAL ACCOUNT ABOUT AMERICAN ARISTOCRACY

Like many millions of other Americans, Emily McTyre spent part of the last decade glued to the British historical drama *Downton Abbey*.

The critically acclaimed TV series was wrapping up when McTyre, who was then in high school, took her first trip to Asheville, North Carolina, to visit the Biltmore Estate. She didn't just see splendor in the Vanderbilts' ancestral mansion; she saw a screenplay, too.

Inspired, she returned home to Maryville and began working on a distinctly American tale of aristocracy, romance, and grandeur, with parallel narratives of the haves and have-nots.

"At the beginning it was just a passion project," McTyre said. "I thought, 'You know, one day it would be great to finish this.' "

As a Video and Film Production major at MTSU, she completed the project—twice. First, she turned it into a pilot episode for a screenwriting class taught by longtime industry pro Leland Gregory. Then with Gregory as her Honors thesis advisor, she overhauled and greatly expanded the script.

The resulting four-part TV series, *Vanderbilt*, uses both real-life and fictitious characters to explore the history of Asheville in the Gilded Age, with themes that still resonate today.

Research for the project—funded in part by an Undergraduate Research Experience and Creative Activity (URECA) grant—took McTyre to Asheville more times than she can count. It gave her a deep appreciation for intellectual, philanthropist, and country gentleman George Vanderbilt's contributions to the city's ecology,

I want to continue developing it and turn it into something marketable.



Photos by
Andy Heidt



economy, and progressive identity. It gave her insight into the life of his wife, Edith, and the experiences of the Black Highlanders, the African Americans who helped shape the culture of Southern Appalachia. It gave her a historical perspective on the social issues of race, gender, and class that were roiling the world around her even as she wrote.

And, as she prepared to graduate into a highly competitive creative field, it gave her a body of work to build on. *Vanderbilt* isn't finished yet.

A PASSION PROJECT

Back in high school, McTyre wasn't sure what kind of film work she wanted to do, but she thought she might need a fast track to Hollywood to do it. To that end, she considered various small arts schools before making the more pragmatic decision to attend MTSU.

"It was offering a really well-rounded kind of program, and it felt more like a liberal arts approach," she said. "If I didn't end up doing film, there would be a lot of ways to do interdisciplinary work and kind of make it my own."

At MTSU, she pursued every opportunity that opened itself up to her. She studied film and media in England—her dream destination—for three weeks as a participant in the U.S.-U.K. Fulbright Summer Institute; won a Buchanan Fellowship that covered her full tuition as well as books and other benefits; and was a global ambassador for the Office of Education Abroad.

AND AS SHE PREPARED TO GRADUATE INTO A HIGHLY COMPETITIVE CREATIVE FIELD, IT GAVE HER A BODY OF WORK TO BUILD ON.

But it was the research requirement of her Honors curriculum that compelled her to finish the project she had started when she was 17.

"I chose to do this for my thesis because I knew that if I dedicated the time to it now, I would get it done," McTyre said. "I'm the type of person that's always got a million ideas, but sometimes it's hard getting them done, especially something to this scale."

The scale of the writing project was enormous: four episodes at some 70 pages (or an hour and a half) each, covering the years 1888 to 1895—from the Biltmore's siting to its completion. The writing alone took McTyre four semesters. The research required not just multiple trips to the mansion, whose 175,000-square-foot floorplan she now knows by heart, but also to the University of North Carolina–Asheville, where she researched the real-life characters of George Vanderbilt and his future wife, Edith Dresser.

She also tried to understand what life must have been like for the fictitious character Henry, a Black teenager who becomes the estate's stable boy. While African Americans in Asheville were systemically oppressed, they tended to have more economic opportunity and suffer less egregious abuse than they might have elsewhere in the South, McTyre says.

Even then, Asheville was a tourist town, she notes, and "there were white city officials who were more willing to work together in order to create a more peaceful experience for everybody. I think it was a very progressive environment."

McTyre knew that as a white woman, she risked not getting Henry's story right; much of her research at UNC–Asheville was intended to mitigate that risk, she says. But she was determined to include stories like Henry's and Edith's, which are largely absent from traditional American historical narratives, including that of the Biltmore.

"There are so many people that did so much for [the mansion]," she said. "Their legacy is a part of it too."



**SHE ALSO TRIED TO UNDERSTAND
WHAT LIFE MUST HAVE BEEN LIKE
FOR THE FICTITIOUS CHARACTER
HENRY, A BLACK TEENAGER.**



Emily McTyre

Class: Graduated Fall 2020

Major: Video and Film Production

Faculty mentor: Leland Gregory

Project: Screenwriting *Vanderbilt*
historical TV series about
Biltmore founder

McTyre's Biltmore could be seen as a metaphor for the United States, where gauzy self-reflection regularly gives way to hard truths. That was true throughout much of 2020, as McTyre was writing *Vanderbilt* and found herself revising it in light of what she was seeing in the news. While she largely followed her characters' lead, she says, "I also paid attention to a lot of the things coming up in the world, and I wanted the story to accurately reflect that, because from the beginning I wanted it to be a source of reflection and analysis and a way for people to reassess now through the past lens."

MY ULTIMATE GOAL IS TO CREATE CONTENT THAT EMPOWERS YOUNG MINDS TO BECOME CARING, PASSIONATE LEADERS OF THE FUTURE.

The power of historical fiction is in its relevance, she says. "A show that might be set in the past but is reflective of today is a good way for present-day viewers to work through some of those problems. It gives them a distance, so the more uncomfortable conversations can be had."

THE STORY CONTINUES

McTyre's plans for *Vanderbilt* didn't end with her graduation last November.

"I want to see it through," she said. "I want to continue developing it and turn it into something marketable, find producers that will help me make it, and then hopefully see it on screen one day."

McTyre will take the project with her even as she pursues her dream—developing and producing children's media, ideally for an education-focused company such as PBS or Sesame Workshop.

"My ultimate goal is to create content that empowers young minds to become caring, passionate leaders of the future," she said.

Whether we're looking backward or forward, McTyre wants us to keep the important conversations going. [MTSU](#)



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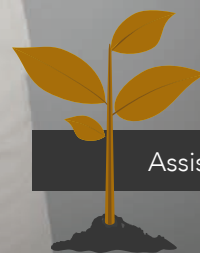
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**May 1 deadline
for freshman
scholarship acceptance**



Silver, Fall 2020



Assistant, Fall 2019

A BOLD QUEST

ASPIRING DOCTOR TAKES ADVANTAGE OF OPPORTUNITIES AS A TRANSPLANT IN A NEW LAND

“Funny story,” Omar Ali responds when asked about his family’s 2015 move from Egypt to Nashville. “It was Tuesday, and my dad said, ‘Pack up your suitcase.’ I said, ‘For vacation?’ He said, ‘No, forever.’ And I said, ‘When are we leaving?’ He said, ‘Thursday.’ ”

Ali’s father, an accountant, had just finished a career at the U.S. Embassy in Cairo. He’d decided to take advantage of a perk of retirement, the chance to immigrate to the United States, where he hoped there would be more opportunities for his family—especially advanced educational opportunities for his two sons.

Ali, who was 16 at the time, didn’t appreciate being uprooted overnight. “My mind was blown,” he said. “I told my friends, and no one would believe me.”

Now he understands his father’s strategy, which left him no room to step back, no time for self-doubt. Ali essentially parachuted into an alien landscape, hit the ground running, and didn’t stop, hurdling language and cultural barriers and racing toward every academic opportunity that presented itself.

“My attitude is, ‘If I’m going to fail, at least I tried,’ ” Ali said. “I don’t want to fail because I didn’t even try.”

There has been far more trial than failure in his academic journey. That includes a condensed, ambitious undergraduate career at MTSU, where Ali built a research-heavy pre-medical school résumé. Late last fall, just five years after landing at Nashville’s Glenclyff High School as a midyear sophomore, he was ready to graduate from college, eager to learn where he would land next.

What might look like an obstacle is actually an opportunity.



Photos by
J. Intintoli



THE AUDACITY

Research begins with audacity—a tendency to question the unquestioned and try the untried. “Audacious” also describes Ali’s approach to life.

Given the option to ease into high school while he learned English, Ali chose the alternative: going total immersion in the day and doing extra online work at night so he could graduate in 2017. By senior year he was taking Advanced Placement courses, had a 4.0 GPA, and was one of eight Glenciff High School students selected to receive medical assistant training as a Saint Thomas Health Scholar.

He also was playing football, as a wide receiver. He’d never played the sport before, but he’d been a standout handball player in Egypt, and he missed athletics.

THERE ALSO WAS PLENTY OF RESEARCH, SOMETHING PRE-MED STUDENTS ARE ENCOURAGED TO DO.

“There was no handball in Tennessee. People didn’t know what it is. So I joined the football team,” he said.

In 2018, Ali’s freshman year at MTSU, he drove down to Auburn University to try out for the U.S. men’s handball team. He wasn’t allowed to with just a Green Card, but an assistant U.S. coach recruited him to join the Los Angeles team, for which he’s played ever since, schedule permitting.

At MTSU, his schedule was beyond busy—a full course load, a part-time job as a phlebotomist at Saint Thomas West, and volunteer work as

a medical assistant with the hospital's Medical Missions at Home program. There also was plenty of research, something pre-med students are encouraged to do to gain a competitive edge. Ali is competitive too; most athletes are. But his goal in doing research was more about process than winning a prize.

ASKING THE RIGHT QUESTIONS

Ali has known he wanted to be a doctor since he was a boy and saw firsthand how a doctor's willingness to question the unquestioned affects patient outcomes. In one case, the patient was his dad, who had been prescribed a medicine that made him sick. It took a second physician to diagnose the problem and correct it not just with different medicine, but with a prescription for lifestyle changes.

"The second doctor was able to gather more questions to get to know his health status, get to know his family, get to know what he did besides just taking the medication," Ali said. "And from that point I knew it's doable to look for other factors that may be the cause for your health status. Not just, 'Oh, you're sick—here's your medication.' It doesn't have to be that way."

As a pre-med student at MTSU, Ali wanted to learn how to ask the right questions. That's what led him to the lab of Yangseung Jeong, assistant professor of Biology, just after his freshman year.

"Dr. Jeong is a forensic scientist and I was a Biochemistry major, and that's a huge gap," Ali said. "But what I was thinking was to enhance my ability to see the bigger picture. In my opinion that's how you go after things: You look at them from different angles—and simple things even more."

That summer Ali began what would be the first of two projects under Jeong, studying fly species involved in human decomposition. He spent long hours in the lab, and by spring his work had paid off in good results and an Undergraduate Research Experience and Creative Activity (URECA) grant.



**RESEARCH BEGINS WITH
AUDACITY—A TENDENCY TO
QUESTION THE UNQUESTIONED.**



Omar Ali

Class: Graduated Fall 2020

Major: Biochemistry
(pre-medical track)

Faculty mentors:

Yanseung Jeong; Scott Handy

Projects: Research on forensically important flies; bones; and organic chemistry

Ali calls Jeong one of the greatest mentors he's had. "He took me under his wing and made me see that what might look like an obstacle is actually an opportunity to get to know yourself even more and see how much you can do," Ali said. "I think looking at things from that perspective changed the game."

Ali began a new project under Jeong—finding a data-driven way to match pairs of human bones. When the remains of multiple bodies have been comingled, sorting them out can be a challenge, he says, and failing to do so successfully compromises the accuracy of subsequent forensic analyses. Ali's research aimed to help develop a more objective method than the naked eye, using 3D CT scan data, also funded by a URECA grant. He was even listed as first author when the research was published in *Forensic Science International* in 2020.

While Ali was still immersed in that project, he took on yet another one under Chemistry Professor Scott Handy. Between his two research projects, his schoolwork, and his part-time job at Saint Thomas, "I felt like I had four kids who were crying at the same time," Ali said.

The COVID-19 pandemic presented a different set of challenges. With both his parents temporarily laid off, Ali took on extra shifts at work while trying to balance senior-level courses and preparation for the Medical College Admission Test. He says it was disappointing, but perhaps a blessing in disguise, that two national scientific conferences at which he'd been invited to present that spring were canceled and that an exclusive summer internship at Vanderbilt University's School of Medicine was relegated to Zoom.

"I was the only kid from Tennessee, and I was extremely happy to be one of seven out of 450 [applicants]," he said. "It got me on their radar."

If obstacles are opportunities to learn about oneself, Ali learned that he can squeeze 25 hours of work into a day and stay relentlessly positive when things don't work out despite his herculean efforts. Such skills should serve him well in medical school. [MTSU](#)



START A REACTION

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11:1 student-to-faculty ratio in major allows undergraduates to get involved in high-quality research projects.

**May 1 deadline
for freshman
scholarship acceptance**



Gold, Spring 2020

Assistant, Fall 2019

CRISIS MANAGEMENT

NURSING STUDENT USES RESEARCH ON ELDERCARE WORKFORCE TO IMPROVE THE HEALTH CARE LANDSCAPE

A Nursing degree might be the closest thing to job insurance. Demand for nurses always outstrips supply, which means that they can command a good salary and find work almost anywhere.

That's why Zachary Sanchez decided to major in Nursing. But through his undergraduate research at MTSU, he learned about a gap in the nursing workforce that is stressing the entire U.S. health care system. And, through his contribution to that research, he may help mitigate that crisis.

The problem is largely demographic, but it's exacerbated by poor lifestyle choices. America's second-largest generation, the baby boomers, is hitting the age when health tends to decline and years of bad habits manifest as chronic conditions. According to the U.S. Census Bureau, there are 73 million boomers. By 2030, all of them will be 65 or older.

That demographic shift is already affecting every facet of medicine in profound ways, Sanchez says. Nurses now spend 75% of their time caring for older patients, and hospitals are feeling the impact too.

"This was a generation that didn't focus on taking care of their bodies as much as other generations," he said. "There was a lot of smoking, a lot of drug use. And now we're seeing very sick people entering this age frame, and they're overloading hospitals.

"What would be preferable would be sending these people to long-term care facilities, assisted nursing facilities, skilled nursing facilities, where you can give them good health care . . . because they can be managed at these places—not easily, but fairly. If you can manage these conditions well, it's much less likely that they'll become acute."

He likes clinical work,
but he loves research.



Photos by
Andy Heidt

NURSES NOW SPEND 75% OF THEIR TIME CARING FOR OLDER PATIENTS.



The key to this strategy is expanding the number of nurses trained to care for seniors, a workforce that is currently far too small. The first step to filling that gap is understanding why it exists, Sanchez says. That was the goal of his Undergraduate Research Experience and Creative Activity (URECA) project.

A PRACTICAL APPROACH

Sanchez, a first-generation college student from Brentwood, is practical in his decision-making. He is pursuing a Nursing degree because he thought it would offer more job flexibility than veterinary medicine, his original career choice. Practicality also drove his choice of schools.

“MTSU’s Nursing program is one of the best—I think it might be the best—in the state,” Sanchez said. “MTSU is just a really good school. But it’s affordable, too, which is a big thing. My family isn’t rich or anything.” When he found out about URECA grants, which pay undergraduate students a stipend for their research work, he took full advantage of the program.

He’d had research on his mind since his freshman year, but he started looking for opportunities in earnest when he began taking Nursing courses as a junior. Opportunity came in the form of an email from Jamie Burriss, who facilitates the URECA program for MTSU’s Undergraduate Research Center. She sends out regular e-blasts encouraging students to apply for a grant. This one happened to catch his eye.

MTSU'S NURSING PROGRAM IS ONE OF THE BEST . . . IT'S AFFORDABLE, TOO.

Sanchez emailed her back, and she explained the application process—“It’s quite a bit of paperwork,” he said—and then put him in touch with Shelley Moore, associate professor of Nursing. Sanchez was the first Nursing student to apply for

a URECA grant, and Burriss told him Moore would make a good faculty mentor.

The first step to getting a URECA grant is finding a mentor to oversee the application process and supervise the research project. While some students come prepared with a project idea, which the mentor can then help refine, it's also common for the mentor give the student a piece of an established research project.

THE FIRST STEP TO GETTING A URECA GRANT IS FINDING A MENTOR TO OVERSEE THE APPLICATION PROCESS AND SUPERVISE THE RESEARCH PROJECT.

That was the case with Moore. She pulled Sanchez onto one of her research projects, focusing on the eldercare workforce crisis—particularly students'

willingness to work with geriatric patients. Sanchez won two consecutive URECA grants as he spent his junior year helping Moore and her Nursing colleague Amanda Flagg develop a scale called Beliefs and Attitudes on Working with Older Adults (BAWOA). The scale uses a quiz to measure people's attitudes about nursing care and knowledge about caring for older adults.

Sanchez helped write, format, and hammer out technical details of the quiz and will help with its deployment—first among MTSU Nursing students, then among a general population of nonmedical people, as a baseline. The plan is to test the Nursing students over the course of their education, to gauge how their attitudes change over time.

"The main goal, obviously, is to find attitudes, and from that finding [understand] why nurses aren't



going into this field,” Sanchez said. “We can use what we learn to correct misinformation or even to fix problems that might be deterring people, so hopefully we can have an increase of nurses going into this field.”

A NEW DISCOVERY

Sanchez, now a senior, says last year was “hectic.” Between coursework and clinicals, nursing school is notoriously challenging, and that’s without research thrown into the mix. But it’s doable for students who are “willing to step out there” and use the resources available to them, he says.

“It’s all about being willing to ask for help and understanding when you need it,” he said. “I would not have completed any research projects without the incredible insight of Dr. Moore, who agreed to spend countless hours working on a project with some random student who emailed her out of nowhere.”

IT’S ALL ABOUT BEING WILLING TO ASK FOR HELP AND UNDERSTANDING WHEN YOU NEED IT.

All those hours together gave Sanchez an opportunity to talk to Moore about additional medical subjects he would like to explore, such as Alzheimer’s and other neurodegenerative diseases.

And without that year helping design and plan implementation of the BAWOA scale, he might not have made the discovery that will shift the trajectory of his nursing career: He likes clinical work, but he loves research.

“I plan to continue to a master’s or doctorate level—and do further research,” he said.

Call it a URECA moment. [MTSU](#)



Zachary Sanchez

Class: Junior

Major: Nursing

Faculty mentors: Shelley Moore and Amanda Flagg

Projects: Research about attitudes and knowledge to address nursing shortage for eldercare

TAKE CHARGE

Prepare to help meet the dynamic and complex health care needs of society by training in the art and science of nursing at MTSU.

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MTSU Nursing students receive training in five core competencies: communication, critical thinking, personal and professional relationships, the nursing process, and leadership.

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- 7 nursing skills training labs
- Training in simulation labs
- No. 15 U.S. ranking for M.S.N. degree

Nurses are in demand because of increased emphasis on preventive care, rising rates of chronic conditions, and aging baby boomers.

**May 1 deadline
for freshman
scholarship acceptance**



Terraforming (literally, "Earth-shaping") of a planet, moon, or other body is the hypothetical process of deliberately modifying its atmosphere, temperature, surface topography or ecology to be similar to those of Earth to make it habitable by humans.

Source: Webster's New World College Dictionary

TRUE BLUE MARS

MTSU UNDERGRADUATES SPEARHEAD ADVENTUROUS INTERDISCIPLINARY RESEARCH VENTURE TO COLONIZE THE RED PLANET

Considering how COVID-19 turned higher education upside down, you'd think 2020 would have been a bad year for the Office of Research and Sponsored Programs to launch a multidisciplinary undergraduate research project like no one at MTSU had tried before.

Then again, maybe a pandemic that forced us to reengineer our most basic routines (how we teach our kids, get our food, do our jobs, travel safely) was the perfect context for the Blue Mars Initiative. It made the project's overarching question—How can humans make Mars habitable?—seem less theoretical, more necessary. Perhaps even urgent.

The fact that David Butler came up with the idea in 2017, back when our Earthly ways of doing things appeared to be working pretty well, makes him seem prescient now. But thinking ahead is part of his job as vice provost of research.

"My goal is to take MTSU from where it is now as a research institution and into the future in a very aggressive way in terms of grant funding," he said. "People who fund grants fund solid, innovative, creative, forward-looking ideas that have social relevance."

Butler chose the topic, based loosely on author Kim Stanley Robinson's trilogy about terraforming and colonizing Mars, because it touches every academic discipline—not only science, technology, engineering, and math (STEM), but also language, art, communication, business, and government.

"The more you explore Mars and humanity, the more you understand Earth and humanity. It's an interesting byproduct," he said. "Every time we think about a human being on Mars, whether they're eating, sleeping, partying, reproducing, creating art, sitting in jail, whatever it is, you think about how that's different on Earth, and it makes you look at Earth and our social systems—our engineered systems, our type of humanity or our lack thereof—in a new way. Because you have to question everything."

Photo Illustration by
Brian Evans



COMMENCING TAKEOFF

Butler originally geared the Blue Mars Initiative for faculty members and doctoral students, but most of them were already committed to multiyear research. So in late 2019, he opened the project to undergraduates as part of MTSU's Undergraduate Research Experience and Creative Activity (URECA) program, which offers grants for extracurricular scholarship.



"What I realized is that those who are the most enthusiastic and would bring probably the most innovative ideas to bear in a more creative, forward-thinking way were undergraduates," he said.

The first adventurer was then-freshman Luke Gormsen, an Aerospace Technology major from Brentwood. Gormsen says he knew coming into college that he needed to do research, "but I had no idea what that was going to look like or where I needed to start."



He contacted Jamie Burriss, who facilitates the URECA program, saying he wanted to do research and needed a faculty mentor. Burriss contacted Butler.

"Jamie said, 'There's this guy . . . ' and my answer was 'yes,' " Butler said.

During the Spring 2020 semester, Gormsen researched the logistics related to moving terrain on Mars—specifically, how to modify the hydraulics of a Caterpillar excavator to survive space flight and Martian conditions.



The project was "excellent," Butler said. When Burriss proposed a team URECA project focused on Blue Mars, Butler loved the idea.

Gormsen liked the idea too. "I didn't really know what that was going to look like either, but I thought, 'Hey, the more people the better.' "

He started thinking of a second project, and he picked up a second major, Physics, for good measure.



Pictured top to bottom:

Jared Frazier, Assistant, Spring 2019; Platinum, Summer 2019; Gold, Fall 2019; Silver, Fall 2020

Katelin MacVey, Silver, Spring 2020; Gold, Fall 2020

Winton Cooper, Assistant, Fall 2020

Luke Gormsen, Assistant, Spring 2020; Silver, Fall 2020

David Butler, Vice Provost for Research and Dean, College of Graduate Studies

Photos by Andy Heidt

VIRTUAL TRAVELERS

The Blue Mars URECA team had to hold its first meeting via Zoom. But that was no problem given the casual nature of their collaboration.

“We created our own assignments, and we’re working on them; but we’re more than happy to talk to each other about them and offer assistance if it’s needed, or if someone needs an extra hand in research, things like that,” said team member Katelin MacVey, a senior Honors student from Nashville.

She’s writing a novella about a three-year, six-member mission to Mars. Her primary research involves reading a dozen books, including the Robinson trilogy, geographical manuals of Mars, and an official manual for astronauts on the mental health effects of space travel.

“I’m exploring what it would be like to psychologically and psychiatrically experience that pervasive, deep blackness of space away from Earth,” she said. “We are an Earth-specific species. We’ve sent people off the planet, but they’ve always been able to see it. I’m interested in what happens when they no longer can.”

Writing fiction, particularly fantasy, was just a longtime passion for MacVey when she transferred to MTSU from community college in 2018. She’d always been a STEM kid, and she enrolled as an Animal Science major. But she switched to English halfway through her junior year.

“I promised myself that if I’m going to go to college and I’m going to pay for it, I might as well do something that I enjoy,” she said. “I’m also a German and Photography minor—because where else am I going to learn these skills?”

Of the team’s current four projects, MacVey’s is the only creative one. Her left brain’s a little rusty, she says; she plans to run the highly technical details past her teammates.

“I love space and astronomy and all that stuff,” she said, “but physics and astrophysics are way above my head.”

QUESTION EVERYTHING

Quantum dots fall into the highly technical category, so we’re grateful that Jared Frazier moved along from that topic—the focus of his last URECA project, for which he won a prestigious two-year Goldwater Scholarship—to a new topic for Blue Mars.

Frazier, from Spring Hill, is a junior majoring in both Chemistry and Computer Science. This is his fourth URECA grant (“I’m going for the record,” he said). His goal is to use machine learning and six Martian years of atmospheric data collected by NASA’s *Curiosity* rover to predict the weather on the Gale crater. Weather is a critical consideration when it comes to infrastructure that requires a certain climate and temperature.

Machine learning isn’t the best way to predict the weather, Frazier says, but in the future he can apply the data analysis technique he’ll use for this URECA project to chemistry, finance, just about anything.

IT TOUCHES EVERY ACADEMIC DISCIPLINE— NOT ONLY SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH.

“It’s a transferrable skill, which is really what I was interested in, especially considering the instability of the world as it pertains to the pandemic,” he said.

Unlike quantum dots, that line of thinking is easy to understand. Frazier already saw two plum research opportunities vaporize in 2020—a fully funded summer at the Helmholtz Institute in Germany, and his backup plan, materials research at New York University in Manhattan, funded by



the National Science Foundation. He needed any further opportunities to be sustainable, something he could do remotely if necessary. Blue Mars filled the bill.

"I'd heard about the Blue Mars Initiative, and I'm really into mathematics and statistics and quantitation, so I thought, 'Okay, what can I do with that?'"

Frazier is also into poetry and music and theater—as in he writes poetry, plays guitar and piano, and performs, most recently in *Ride the Cyclone* at MTSU. In choosing a major, he made a calculation similar to MacVey's but landed on the other side.

For the purposes of Blue Mars, he could do a lot with those subjects, too. (What is language like

in isolation? How does sound transmit through Martian air?)

"Suggesting that we would only do engineering and science stuff, and not write or sing or listen to music or paint or build aesthetic structures, that's just not who we are as human beings," Butler said.

CASHING IN ... OR CHECKING OUT

Human beings also are interested in making money wherever they can, including outer space. Privatization is rapidly changing the model of space travel.

"SpaceX wants to get us to Mars by some kind of vehicle by 2024, and NASA wants to get to the moon again by 2024," Gormsen said. "Whether



either of those expectations is realistic doesn't really matter. It shows you who's leading at this point, which is private commercial companies."

His Blue Mars project involves identifying Martian landing spots that would be commercially attractive. He says his list will almost certainly look different than the list of ideal landing spots NASA put together 10 years ago.

"NASA doesn't have the threat of going bankrupt if things don't pan out. They tend to do things a lot more slowly and tediously, with a lot of testing," Gormsen said. "And then what they want when they get to Mars can look different from what a commercial company wants. NASA might choose an area with a lot of geology spots that they want to look at. Well, a space company that's worried about turning a profit, somehow someday, is not going to be intrigued by that."

For junior Winton Cooper, nothing about Blue Mars is purely academic. Climate change is already ravaging his native Bahamas with increasingly intense hurricanes. The commonwealth is projected to be 80% underwater within 100 years.

For Bahamians, the concept of having to abandon home for an alien landscape is not theoretical. Neither is the Sisyphean challenge of pushing back against a hostile environment.

THE CONCEPT OF HAVING TO ABANDON HOME FOR AN ALIEN LANDSCAPE IS NOT THEORETICAL.

When Cooper describes his URECA project, it feels personal:

"My specific focus is whether it would be feasible for scientists and future colonists to go to Mars and attempt to terraform, or make Mars lifelike, when space weather events continue to beat

Mars and basically dial back the clock on any progress made."

It's a STEM project, although it sounds rhetorical. To gauge the feasibility of terraforming, he's analyzing seven years of spacecraft data and professional research on specific space weather events.

And Cooper's a STEM guy, or at least that's how he envisioned himself when he came to MTSU to study Aerospace Technology. But during orientation, he switched to Environmental Science. That's where he found his passion—and a lot of unanswered questions.

"What does the world do when a country disappears? What happens to a sovereign people when their land is made uninhabitable because of the environment? What does environmental refugeeism look like 50 years from now?"

DEFINITELY NOT RHETORICAL QUESTIONS

"We need real change—yesterday," Cooper said. "And the only things that drive actionable change are grassroots campaigning, nonprofit organizations, and policymaking."

Cooper got his first taste of policymaking in high school, as a member of the Bahamas Youth Parliament. He has continued down that path in college, serving on five University committees and now as executive vice president of MTSU's Student Government Association.

He wants to experience as much as he can at MTSU and then travel abroad, always cognizant of his mission to take what he learns back to the Bahamas.

No matter how far they go, travelers carry their home base with them. [MTSU](#)





A NURTURING NATURE

FACULTY MENTORS HAVE ONE THING IN COMMON: THE HEART FOR IT

UNDER HIS MENTORSHIP,
UNDERGRADUATES EXPERIENCE THE
FULL SCOPE OF ACADEMIC RESEARCH.

Anyone who has nodded off during a lecture on “the powerhouse of the cell” or who thinks they remember what mitochondria look like (kidney beans with dot-and-radiator insides?) should peek through one of the powerful microscopes in Dave Nelson’s lab, where he’s conducting multiyear research on what he loosely calls “mitochondrial quality control.”

“They’re not these isolated little beans or sausages,” said Nelson, an MTSU associate professor of Biology. “They’re these dynamic networks made of branching string-like structures that are constantly undergoing fission and fusion and are spread all throughout the cell.”

For the undergraduates on Nelson’s team, seeing those structures in action—using fluorescent dyes to tag them, and then watching them respond in real time—has an impact no classroom experience can match. And the research these students are doing now will make them “far, far more competitive” later if they apply for medical or graduate school, Nelson says.

Nelson allows students to participate on his projects as early as their sophomore year, after they’ve learned basic lab protocol. He provides scrupulous supervision, especially at first; his equipment is expensive, and his research is tax-funded. But by students’ third year in the lab, he gives them far more autonomy. Under his mentorship, undergraduates experience the full scope of academic research—not just sitting at the bench, but applying for a grant, presenting their work, attending a conference, possibly even getting published.

Nelson tries to give them the head start in research that he wishes he’d gotten.

"I went to a good university in the U.K., but the real research experience was crammed into the final semester with our degree, and I didn't think that I was really ready for graduate school after that," he said. "I went straight to Ph.D. and I was successful, but I came out a rather naïve and wet-behind-the-ears new post-doc.

"I think I would have benefited tremendously from the kind of mentorship that our students at MTSU get as undergraduates, spending not three months but three years in the lab."

That's the culture in MTSU's Biology Department, whose physical, academic, and funding infrastructure creates built-in opportunities for mentorship.

That culture can be found in other departments too, although it often looks nothing like the traditional setting of Nelson's lab.


It's in the off-campus barn where Jessica Carter and her students chat while collecting milk samples. It's also in the residential cul-de-sacs where Jette Halladay has arranged for her students to perform children's theater. No bench, no slides, no microscope. What a mentor needs most is the heart for it.

SEEING THOSE STRUCTURES IN ACTION . . . HAS AN IMPACT NO CLASSROOM EXPERIENCE CAN MATCH.

BOOTS ON THE GROUND

Carter, an Animal Science professor, has the heart, but she also needs the help. Unlike Biology, the School of Agriculture, which she directs, has few advanced degree programs. As a result, it has fewer graduate students, who are typically the workhorses of faculty-led research, assisting with data collection and other time-consuming tasks.

Fortunately, she has far more undergraduates coming to her for research opportunities now than when she began teaching at MTSU 18 years ago. One driver is the Undergraduate Research Experience and Creative Activity (URECA) program, which awards grants for student research. Another is the Honors College, which requires a research project (or the creative equivalent) for graduation. And yet another is the fact that many students majoring in Animal Science—Agriculture's largest program—plan to apply to veterinary or graduate school; they need research to bolster their résumés.



Dave Nelson (Biology) involves undergraduates in research on Parkinson's and cancer, focusing on cell signaling dynamics.
photo by Andy Heidt



Jessica Carter (Agriculture) incorporates undergraduates into her research related to beef and dairy farming at MTSU's farm labs. photo by J. Intintoli

But just because Carter has student boots on the ground doesn't mean she can hang hers up. Research in beef and dairy farming, her academic specialty, requires close oversight.

THAT INFORMAL TIME TOGETHER IN THE DAIRY BARN YIELDS SPECIAL DIVIDENDS.

"We do have farm staff, but certainly as a faculty mentor, it's my job to make sure that the student is protected and also knows how to do things properly," she said.

Carter is with her mentees "every step of the way" when they work with livestock. She might spend hours side by side with a student, scoring feet or taking milk or bedding samples. That informal time together in the dairy barn yields special dividends, Carter says.

"What I like most about undergraduate research is you get to know those students more closely than just in the classroom, because you're out in the morning or the afternoon or on the weekend, interacting with them in a totally different setting,"

Carter said. "Often you stay in contact with these students for years, and hopefully you're making some kind of impact on them. At least that's the goal, that you're helping them decide on their career and their paths."

A special reward of mentoring is watching students come into their own through the research experience. Carter recalls the smart but extremely shy young woman who transferred into Animal Science from community college. Collaborating with peers, faculty, and farm staff and then presenting her research boosted the student's confidence, Carter says. The metamorphosis was more striking because it happened over the course of two short years.

THE TOUR GUIDE

Confidence isn't necessarily in short supply among performing artists. But steady employment often is, Halladay says.

"Truthfully, I try to tell our students that they're going to have to create work for themselves, so learning grant writing is important as an artist," she said.



Jette Halladay (Theatre) assists students in funding, writing, performing, and staging a show, usually on an international tour.
photo by J. Intintoli

As an MTSU Theatre professor and faculty mentor, Halladay uses both her grant-writing skills and a lot of creativity to fund projects for her students. That's because the Theatre program has no equivalent of Biology's academic research model, with a professor leading a team in the lab. Halladay is more like a producer, handling logistics behind the scenes, while her students take the lead in writing, acting, directing, and stage-managing. There's also no arts equivalent to the myriad federal grants available for sciences.

"I'm always looking for money for my students, because when I lead a study abroad, I take a show—not a class, but a show—and we perform where we go," Halladay said. "But that means that I need to take the students who can act or do the performance, which are not always the students who have the money to do study abroad."

She's taken student troupes to Russia, Britain, Finland, Latvia, Honduras, and Ireland. Asked how she makes it happen, she says, "Divine intervention." But it's mostly her: Halladay networks with artists in other countries to find venues and applies for every grant available at MTSU. She suspects the URECA

program established a group category because so many of her students were receiving grants.

The international travel typically caps off an academic year of work. Students spend one semester writing the show and a second term performing. The *Walking in Sunlight* show that toured Ireland, based on the life of *Grand Ole Opry* legend Uncle Dave Macon, took two years.

Halladay's latest production, *Story Bandits*—in which students perform tales written by young children in the audience—was set to go to Guatemala last March. Then the pandemic struck, and she had to get creative. *Story Bandits* became a class, and the show went on a socially distanced tour in neighborhoods across Murfreesboro.

"Cul-de-sac theater" was her students' idea, Halladay says. She'd planned to do a Zoom thing, "but the students came in and said, 'We want to perform for the children, and we have an idea how to do it.' "

That's the hallmark of a good mentor: When she steps back, her mentees step forward. It's a dance being done daily at MTSU. [MTSU](#)

SOAR ABOVE

Students committed to developing and sustaining an active research environment at MTSU can now join the new Student Organization for the Advancement of Research (SOAR).

Why join?

- Workshops and training to increase collaboration and skill-building
- Assistance to prepare poster presentations and develop abstracts for national conferences
- Facilitation of travel to the National Conference on Undergraduate Research
- Peer mentoring for students new to undergraduate research

Showcase your scholarly work at annual events open to students:

- MTSU Summer Research Celebration
- Fall Undergraduate Research and Creative Activity Open House
- Posters at the Capitol
- Scholars Week

PERENNIAL SUCCESS

RESEARCH REAPS REWARDS FOR ALUMNI DURING AND AFTER THEIR TIME AT MTSU

Participating in undergraduate research can open up further opportunities in college and beyond. The alumni profiled here prove that a degree from MTSU is more than a degree—it is a résumé. These former grant winners share how MTSU's Undergraduate Research Experience and Creative Activity (URECA) program helped shape their lives.

CLEVER CALCULATIONS

Joe Gulizia's academic journey has been a series of calculated choices. When you're a first-generation college student, he says, you want to make "the financially correct decision."

So, for the Fairview native, it was community college first, then MTSU. He arrived with no itinerary—just good grades and an open mind—and then forged his own path to success at MTSU and beyond. Four URECA grants helped fund the journey and light the way.

Gulizia won all four URECAs under the mentorship of Kevin Downs, associate professor of Agriculture: two for Honors research on ruminant nutrition and two more for research in poultry science. The poultry project wasn't required, but it piqued Gulizia's interest.

Research got him excited about learning. It turned him from a good student to an excellent one. "That's when my biggest growth happened," he said. It required a major time commitment—he had to quit his job, a financial sacrifice the URECA grants offset—but the calculation paid off.

Now Gulizia is pursuing master's and doctoral degrees through Auburn University's nationally ranked poultry science program, with a fellowship from the Honor Society of Phi Kappa Phi. He is



THE ALUMNI PROFILED HERE PROVE THAT A DEGREE FROM MTSU IS MORE THAN A DEGREE—IT IS A RÉSUMÉ.

certain that his research experience at MTSU helped him win the highly competitive award last year.

“Anybody can get good grades if they put their mind to it, but what stands out is going above and beyond,” Gulizia said. “I would think the research stuck out to them because it’s not what a lot of undergraduates do.”

From his new perspective at Auburn, where he has worked with as many as 2,880 chickens compared to the 240 at MTSU, Gulizia sees further value in that early experience.

“You have room to make mistakes, to get out all the kinks, and fail,” he said. “You can still fail in a graduate program, but obviously the weight is heavier. You’re now working heavily with company-funded research and the large reputation of your major professor.”

Gulizia is leaning toward industry work—he loves the idea of improving feed to grow healthier birds and provide people with cheaper, healthier meat—but a career in agricultural extension is an appealing choice, too. All he knows is that without his URECA experience, he likely wouldn’t be in a position to choose.

PLAYING IT HIS WAY

Jette Halladay, MTSU Theatre professor, needed a banjo player. She was putting together an original production based on the life of the *Grand Ole Opry*’s first superstar, Uncle Dave Macon.

No banjo player, no show.

Then she saw Austin Derryberry plucking away—part of an Uncle Dave Macon Days tour, no less—and she knew she’d found her guy.

Derryberry, then a high school senior from Unionville, had been playing fiddle since age 5 and started a band at 13. He knew his family expected him to attend college, but he also wanted to keep traveling and playing the old-time music he loved.

Halladay invited him to do both: As an MTSU student, he could join the show and its three-week tour of Ireland.



RESEARCH TURNED HIM FROM A GOOD STUDENT TO AN EXCELLENT STUDENT.



After four undergraduate projects at MTSU, Joe Gulizia landed a national scholarship to conduct graduate research in poultry science at Auburn University.



Early in his MTSU career, Audio Production alumnus and musician Austin Derryberry funded most of his costs for an MTSU international theatrical tour through a URECA grant.

**YOU DON'T HAVE TO
FIT A MOLD TO GET
A URECA GRANT.**



"I courted him," she recalled. "I said, 'We want you, and I'm going to do everything I can to help you get a grant to pay for this.' "

Derryberry obliged by applying to MTSU and then nailing his URECA grant. Halladay's students will work tirelessly on their craft but are often less dedicated to grant writing. Derryberry broke that pattern, she says. "Austin pays attention to academics, so his grant was good when he wrote it. I think he got most of his trip paid for. And that's an expensive trip," she said.

Derryberry, who had never toured outside the country, describes the experience in Ireland as eye-opening.

"It was great to see how other folks live and to hear their stories," he said. "I've always been fascinated by people's lives, how they got to where they are."

The moral of his story? You don't have to fit a mold to get a URECA grant. Derryberry wasn't a Theatre major—or even a Music major.

"I'm hard-headed about music," he said. "I didn't want to go through the music school because I felt like they would have made me change the way I play. So I figured I would still be in the music realm but try to learn something new."

After meeting the head of MTSU's recording engineering program through Halladay's show, Derryberry decided to major in Audio Production. He graduated in 2019, kept playing and touring, and learned to make guitars—a craft that became his career.

What he loves most about the job is that every instrument is unique. "That sound has never been in the world before," he said.

"I'll always play music. I'll always want to travel and meet different people and see different cultures. . . . But I'm really enjoying building guitars every day."

He's making music on his terms, again.

A NEW VENUE

Even for a nontraditional student, Lucas Remedios took an unorthodox route to MTSU.

He finished high school in Vancouver, Canada, at age 16 and moved to Nashville with his older brother. Their band, Sam and Luke, was gaining traction back home. They were hoping to build on that success in Music City.

“We pursued that for a few years, and we had a lot of fun, but then my brother decided that he wanted a concrete future, so he enrolled in Computer Science at MTSU,” Remedios said. “I followed suit a few months later.”

Being a 22-year-old freshman was no big deal at MTSU, especially in Computer Science, he says; most of the good friends he made there had a prior degree or career. (Here’s guessing that he wouldn’t have been bothered by the “nontraditional” label anyway.)

He dove right in, joining and eventually leading the student chapter of the Association for Computing Machinery. He also won three URECA grants working on artificial intelligence research for Joshua Phillips, an associate professor of Computer Science. Phillips’ academic specialty is artificial neural networks, a form of AI that models the human brain.

With URECA funding, Remedios says, he could afford to spend time on research, which he believes was instrumental to his acceptance as a doctoral student at Vanderbilt University’s Institute for Surgery and Engineering.

“I really wanted to get into Vanderbilt—it was my top choice,” he said. “The lab I’m in does medical imaging, so it’s a different take on applying computer science. . . . You’re looking at anatomy and how you analyze what’s going on with the patient based on the image, using AI and other methods.”

With Remedios’ enrollment at Vanderbilt, his path officially diverged from his brother Sam’s.

“He’s also in graduate school now; he’s in a Ph.D. program at Johns Hopkins,” Remedios said. “We still talk about music, but it’s a lot harder now that he’s in Baltimore.”

They might be doing it separately this time, but Sam and Luke are making themselves heard. [MTSU](#)



WITH URECA FUNDING, HE COULD AFFORD TO SPEND TIME ON RESEARCH.



Luke Remedios is now a doctoral student at Vanderbilt University’s Institute for Surgery and Engineering following his MTSU research on artificial intelligence.



I AM *true*
BLUE

MIDDLE TENNESSEE STATE UNIVERSITY