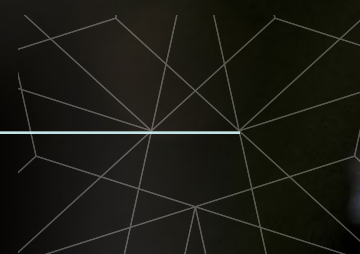




KUMMER INSTITUTE

FOR STUDENT SUCCESS,
RESEARCH AND
ECONOMIC DEVELOPMENT

BRINGING MORE
POWER TO
SMALLER SPACES





IN MEMORIAM

JUNE MARIE KUMMER

Dear Friends,

Our Missouri S&T community lost a beloved friend, **June Marie Kummer**, earlier this year. Her remarkable life was defined by her generosity and commitment to educational excellence. She passed away on Jan. 8, 2024, at the age of 93.

June Kummer and her late husband, **Fred Kummer**, donated \$300 million to Missouri S&T in 2020 to establish the Kummer Institute for Student Success, Research and Economic Development. Their donation is the largest single gift ever to any public or private university in Missouri and one of the largest ever to any university.

"Both Fred and I realized how we have been so overly blessed our entire life," she said during the filming of the couple's gift announcement in 2020.

June, who earned an architectural degree from Washington University in St. Louis in 1951, married Fred in 1954. He earned a bachelor's degree in civil engineering from S&T in 1955. Together they built their business, HBE Corp., from a small, "mom and pop" general contracting business into the world's largest design-build firm specializing in health care. Over the years, they built over 1,000 hospitals across the United States and they also established Adam's Mark Hotels & Resorts, a chain of 23 upscale hotels in 13 states.

"I learned a lot about engineering from Fred, and he learned a lot about design from me," she said in a 2021 *Missouri S&T Magazine* interview.

Devoted philanthropists, the Kummers supported Missouri S&T and many other organizations. Their substantial gifts can be seen throughout campus.

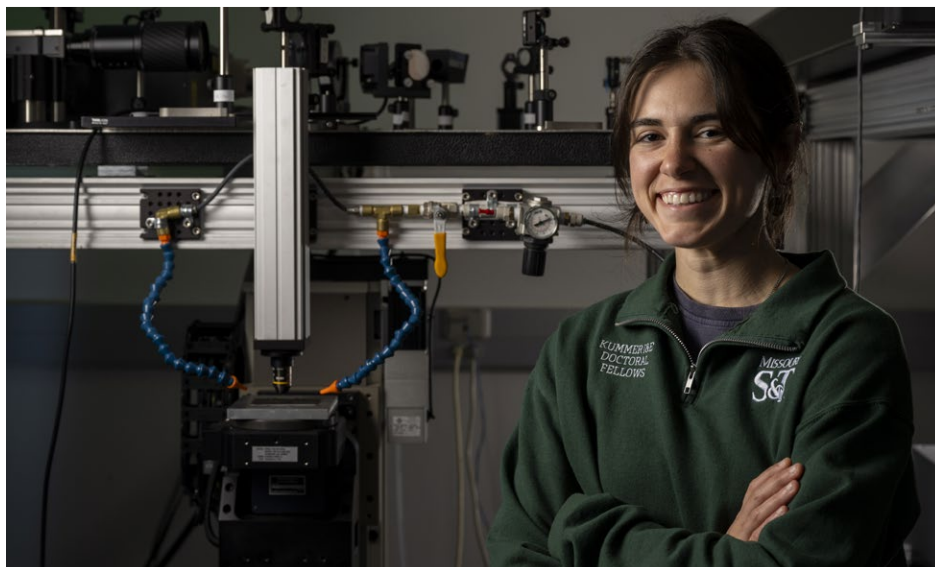
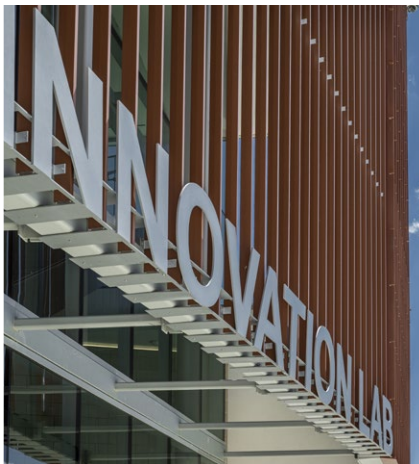
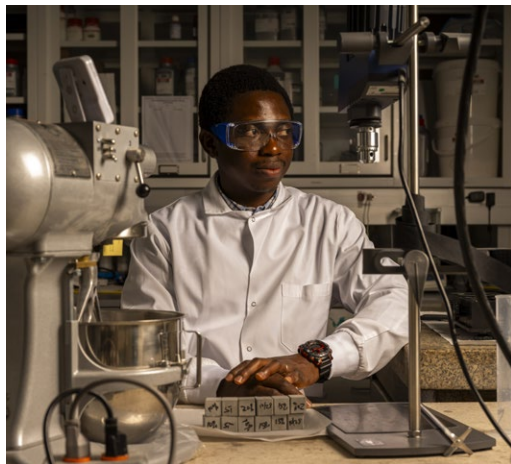
They supported the expansion of Butler-Carlton Civil Engineering Hall, the creation of the Kummer Student Design Center, the Toomey Hall expansion for mechanical and aerospace engineering, construction of Hasselmann Alumni House, and the alumni house's Fred and June Kummer Garden.

Indeed, the couple's gifts can be seen throughout campus, supporting 1,300 undergraduate students who are Kummer Vanguard Scholars — plus the 22 scholars who graduated in May — and nearly 50 Ph.D. students who are Kummer Innovation and Entrepreneurship Doctoral Fellows.

Fred passed away in 2021, shortly after his 92nd birthday. He and June were married 68 years. They were two remarkable individuals who were an outstanding couple for nearly seven decades! To me, it seemed like June and Fred were meant to be together. I'd like to think that they have reunited. Certainly, their legacy continues to live on at S&T and beyond.

Sincerely,

Mo. Dehghani
Chancellor, Missouri S&T



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We thank those who serve on the Kummer Institute Foundation Board of Directors

OUR IMPACT

Since the founding of the Kummer Institute in 2020, the Kummer Institute Foundation Board of Directors has made significant investments in S&T, including buildings, scholarships, endowed faculty positions and more.

\$3.3 million

awarded to the Kummer Institute Center for Advanced Manufacturing, as part of \$9.1 million in funding through the Department of Higher Education and Workforce Development's MoExcels Workforce Initiative.

(Read more about this project on page 21.)

\$450,300

awarded for research through the Kummer Missouri S&T Ignition Grant Initiative.

\$4 million



for student scholarships and fellowships during the 2023–24 academic year. This includes both undergraduate students (Kummer Vanguard Scholars) and graduate students (Kummer Innovation and Entrepreneurship Doctoral Fellows).

13



invention disclosures made by Kummer Ignition Grant recipients and Kummer I&E Fellows in FY23 and FY24.

\$750,000+

raised in October 2023 during the Kummer Day of Giving match program.

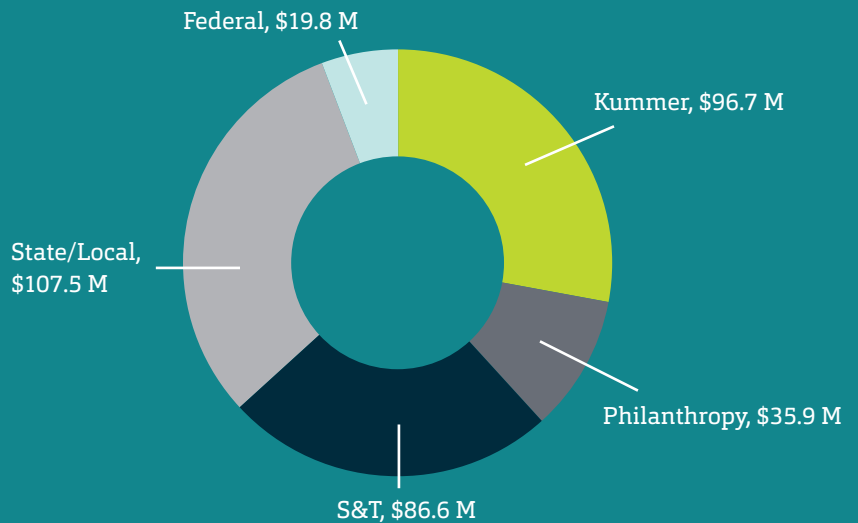
163



summer camp scholarships totaling \$95,015 offered by S&T's Kummer Center for STEM Education.

Funding sources for the arrival complex

(FY 2024)





Greetings from Missouri S&T and welcome to the annual report for the Kummer Institute for Student Success, Research and Economic Development.

It has been four years since the transformational gift from Fred and June Kummer created the Kummer Institute. In this report, we review a few of the many ways that gift continues to have a significant impact on S&T.

The first full cohort of Kummer Vanguard Scholars will earn their S&T degrees in the coming year, as will the first cohort of Ph.D. students supported by Kummer Innovation and Entrepreneurship (I&E) Doctoral Fellowships. Each of these students will be a long-enduring part of the Kummer legacy.

Over the past four years, we have leveraged the Kummer gift against state, federal and other philanthropic resources to transform the physical landscape of S&T. This past year, we opened the Innovation Lab, a spectacular space where our students will have access to labs, classrooms and other facilities to tap their creative imaginations. Over the next several years, we will open and dedicate the Welcome Center, the renovated and expanded Applied Research Center (formerly the Engineering Research Lab), and the Missouri Protoplex, a 100,000-square-foot facility designed to transfer S&T research and innovations to industry and to anchor the new research campus overlooking Interstate 44.

This focus on economic activity is another legacy of the Kummer gift, as is the creation of the Kummer College of Innovation, Entrepreneurship, and Economic Development. This year, we welcomed the founding dean, **James D. Sterling**, to campus. We are excited about his plans to transform the intellectual, entrepreneurial and educational landscape of S&T.



There are many other examples of the transformational effect the Kummer gift is having on S&T. To name just a few, the Ignition Grant Initiative and Kummer research centers are sparking new directions in research, K-12 educational initiatives led by the Kummer Center for STEM Education continue to expand S&T's STEM outreach, and the Kummer gift continues to enable new faculty endowments and degree programs.

As always, if you want to know more about the Kummer Institute, don't hesitate to contact us at ki@mst.edu.

Cordially,

Richard K. Brow
Executive Director of Operations

Kummer Institute for Student Success,
Research and Economic Development

KEY MOMENTS 2023-24

AUGUST 2023

S&T welcomes 337 new Kummer Vanguard Scholars and 9 new Kummer I&E Doctoral Fellows to campus.



OCT. 1, 2023

Shelley D. Minter begins as founding director of the Kummer Institute Center for Resource Sustainability.



OCT. 9, 2023

S&T celebrates the third anniversary of the transformative \$300 million gift from June and Fred Kummer.



OCT. 5, 2023

Leaders break ground for the 116,000-square-foot Missouri Protoplex, which will anchor S&T's planned manufacturing and innovation campus north of Interstate 44.



MARCH 1, 2024

Richard K. Brow begins his duties as executive director of operations of Kummer Institute.

MAY 2024

First Kummer Vanguard Scholars graduate.

These students graduated before the first cohort of scholars by attaining college credits before attending Missouri S&T.



JUNE 1, 2024

James D. Sterling begins his duties as the founding dean of the Kummer College.



APRIL 11, 2024

S&T dedicates the Innovation Lab, a building designed to inspire and ignite students' imaginations.

APRIL 18, 2024

Leaders break ground on the expansion of the Applied Research Center.



James D. Sterling joins Missouri S&T as vice provost and founding dean of the Kummer College of Innovation, Entrepreneurship, and Economic Development.



AN ACADEMIC ENTREPRENEUR

James D. Sterling brings a fairly traditional portfolio of academic credentials to his role as vice provost and founding dean of the Kummer College. But he's also an entrepreneur, and he sees no reason the two should be mutually exclusive.

"I'm an academic entrepreneur," says Sterling, who began his role June 1.

The Kummer College is not the first academic institution Sterling has helped start. He's worked in labs and research organizations and launched a biotech startup. He brings to every conversation a seemingly irrepressible curiosity about the art and science of transforming discoveries into ventures. Even his resume radiates an entrepreneurial spirit.

Sterling earned a Ph.D. in mechanical engineering from the California Institute of Technology in 1987. He joins S&T from the Keck Graduate Institute, a member of the Claremont College consortium in California, which he joined in 2000 as a founding faculty member. In addition to serving as director of the school's intellectual property and technology transfer committee, he helped launch Minerva University, started by Silicon Valley entrepreneurs in 2014, as founding interim dean of natural sciences and director of Minerva Labs. Sterling traces his interest in product development and entrepreneurship to the roles he held at Los Alamos National Laboratory, TRW and Advanced Projects Research.

Not surprisingly, entrepreneurship and innovation figure prominently in his vision of what the college can become.

"The Kummer College can be of service to the entire university by teaching entrepreneurship," he says. "Through curricular offerings and active engagement with our alumni network, academies and advisory groups, we will help S&T leverage STEM expertise to translate discoveries into ventures, whether those are startups or innovations with corporate partners."

A key part of the facilitation process Sterling envisions is providing real-world, hands-on class projects, drawing on innovations underway both in Rolla and the region. By collaborating with alumni who are leaders in their fields, students will draw on insights and mentorship to bridge the gap between academic learning and practical application.

He cites **Delbert Day** as a great example of the connections between S&T and its surrounding communities. Day, who earned a bachelor's degree in ceramic engineering from Missouri S&T in 1958,

"... not only are you creating ventures that provide value to humanity, but you're also educating students in the process."

is a Curators' Distinguished Professor emeritus of materials science and engineering. A member of the National Academy of Engineering, he played a pivotal role in developing radioactive glass microspheres that are being used at sites around the world to treat patients with inoperable liver cancer. He was also instrumental in forming Mo-Sci Corp. in Rolla, which manufactures glass microspheres and other glass products used in the health care industry.

"One important characteristic of the entrepreneurial mindset is that not only are you creating ventures that provide value to humanity, but you're also educating students in the process," Sterling says.

Sterling says his decision to come to S&T was driven in part by the opportunity to play a key role in translating discoveries into societal benefit. He believes the Kummer College is uniquely positioned to build an entrepreneurial culture that spans S&T, from disciplines and departments that have been innovating for 150 years to the school's bioengineering initiatives, which represent the intersection of the physical sciences and engineering with biological sciences and medicine. That confluence, according to Missouri S&T Chancellor **Mo Deghani**, is poised to become one of the greatest areas of academic and scientific research ever imagined — and Sterling is intrigued by the possibilities.

For now, his priorities include adding faculty to support research, teaching, and participating in S&T entrepreneurship, growing impactful programs with global impact, and developing a college culture that involves all stakeholders in the planning and implementation processes.

"We have a unique blend of engineering management and systems engineering, along with economics and business and information technology, which complement the robust historical base of engineering management," Sterling says. "The departments fit well together and provide building blocks for innovation and entrepreneurship."

CONCRETE CONTRIBUTIONS

I&E Fellow seizes opportunity to contribute knowledge to the scientific community

After completing his Ph.D. in industrial chemistry in Nigeria, his home country, **Ugochukwu Ewuzie** worked as a laboratory scientist for a global energy company. Spending his days working on synthetic fuels and waste created by various refining processes, Ewuzie began to wonder not just how to reuse those waste byproducts but how to reuse them in a way that's good for the environment. That's where the road to Missouri S&T and his second Ph.D., this one in chemical engineering, began to pave itself in concrete — literally.

Concrete is made of water, sand, gravel and cement, which is the binder that holds the composite together. When manufactured, the cement also emits a lot of environmentally unfriendly CO₂. Starting at the micro-level, Ewuzie's research is testing the feasibility of substituting up to 50 percent of the cement in concrete with other materials. Among those other materials is the ash left behind when the waste generated by converting gas into liquid is incinerated.

Ewuzie says he's never doubted the stories about melting glaciers, but that climate change became personal for him following his mother's death.

He and his family were trying to dry leaves, a Nigerian tradition and custom that produces food. In December, in the middle of Harmattan — a dry, dusty and usually cold period on the African west coast — Ewuzie and his sibling discovered that it was too hot and humid for the leaves to dry. The dehumidifying process that normally completes itself "in the twinkle of an eye," says Ewuzie, simply did not happen.

"That's when it dawned on me that the climate is changing more than I ever imagined," he says. "It's necessary to do whatever we can do to reduce CO₂."

Working primarily in S&T's Sustainable Materials Laboratory under **Monday Okoronkwo**, Ewuzie is exploring what happens — beyond a reduction in CO₂ emissions — when the standard formula for concrete is altered. Can a foundation made of concrete containing substituted cement support what rises above it? How much pressure can a more environmentally friendly mix of concrete withstand? And, because the implications of a few minutes more or less are enormous, how long does concrete with substituted cement take to set?

Ewuzie is mindful of the all-encompassing nature of his work: Altering the composition of concrete has the potential to impact many facets of daily life, from roads and runways to bridges, 3D printing and foundations for skyscrapers.

Ewuzie isn't sure where the next phase of his career may lead. He is sure that he'd like to help bridge the gap between chemists in the labs and chemical engineers working at sites across the globe. And the programs and people at S&T, he says, comprise a support system toward achieving that goal that most Ph.D. students can only imagine.

"The support is more than monetary — it's an investment in our future and a bridge to our dreams."

"The Kummer I&E Fellows program has eased the financial burden of doctoral studies, which is especially important for those of us with families," says Ewuzie, who is a married father of three. He says he worries less, and can focus more on his research, knowing his family is a few blocks from campus rather than on another continent.

"It has also allowed me to contribute valuable knowledge to the scientific community. The support is more than monetary — it's an investment in our future and a bridge to our dreams."



Each Kummer I&E Doctoral Fellow receives a graduate research assistantship position on campus, a fellowship and tuition remission for required coursework for up to four years.

TRANSFORMATIONAL

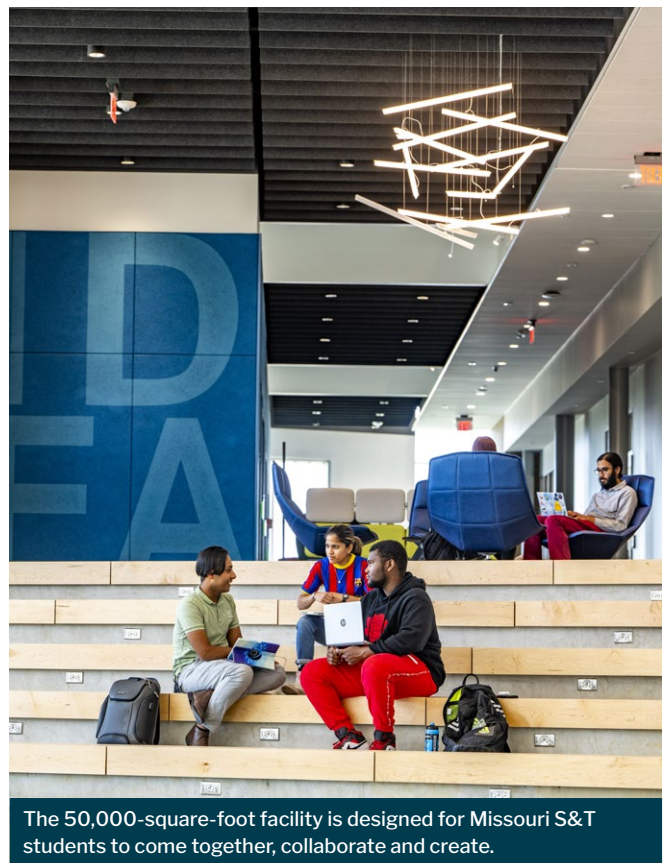
CHANGE IN RECORD TIME

The gift from Fred and June Kummer is transforming S&T. It funds scholarships for undergraduates and doctoral students in each of S&T's three colleges. It supports the expansion of STEM-focused summer camp offerings that introduce young minds to academic and career options they didn't know existed. It's also supported construction of buildings designed and equipped to help students develop an entrepreneurial mindset and hone their instinct for innovation.

Innovation Lab

The Innovation Lab, which was officially dedicated in April 2024 includes spaces useful to students across disciplines, from art to aerospace. Its modular classrooms, collaborative labs and soaring central atrium exude the energy of a hands-on learning environment, inspiring possibility thinkers, discoverers and trailblazers in their quest to transform the status quo into solutions to problems of the future.

The building is already an on-campus home for the imagination and creativity of students from across the university. It has been described as a place where ideas collide, and where students will flex their entrepreneurial muscle and begin to realize the true power and depth of their drive to innovate.



The 50,000-square-foot facility is designed for Missouri S&T students to come together, collaborate and create.



Innovation Lab



Artist rendering of the Missouri Protoplex

Missouri Protoplex

The Kummers' gift supports several projects currently underway, including the Missouri Protoplex, which will serve as the hub of the manufacturing and innovation campus. When it opens in 2026 on the north side of U.S. Interstate 44, the Protoplex will offer unique opportunities for students, researchers and manufacturers to learn how to employ advanced manufacturing techniques and technologies in support of a trained workforce that will keep Missouri manufacturers competitive in the global economy.



Fred Stone, associate vice chancellor for facility planning and operations, considers the gift from June and Fred Kummer a game changer for S&T, the state and the region.

"We're able to make transformational change in record time because of the gift's magnitude. And thanks to that magnitude, we are seeing the big investments the board makes in strategic initiatives and grant programs inspire others to join the effort of bringing the vision for the Missouri S&T of the future to reality. It is what June and Fred Kummer hoped for, and it is exactly what's happening today."



Artist rendering of the Applied Research Center

Applied Research Center

The 30,000-square-foot addition to the Applied Research Center (formerly the Engineering Research Laboratory) and the renovation of the existing space will provide state-of-the-art labs to support interdisciplinary research teams from across campus. The gift is also supporting the modernization of teaching spaces in Schrenk Hall East for biological sciences and chemistry.



Artist rendering of the Welcome Center

Welcome Center

With an eye toward future students and other visitors, the university broke ground on the 32,000-square-foot Welcome Center in April 2023. It will stand directly east of the Innovation Lab, taking its place among more familiar S&T landmarks like the Rolla Building and the Havener Center. In addition to housing the admissions team and providing event and meeting space, the Welcome Center, true to its name, will serve as a beginning point for S&T visitors, including future students.

IGNITING CURIOSITY

A \$300 million gift to a university is likely an abstraction in small, often-underfunded communities, but for students who come to S&T for a STEM camp, the impact has the potential to last a lifetime.

S&T's STEM camps offer students access to equipment, expertise and activities that simply are not available at their own schools.

Courtney Jones, director of the Kummer Center for STEM Education, says the summer camps deliver directly on June and Fred Kummer's mandate to broaden STEM outreach.

"Tax revenues determine school funding, so districts that have little or no tax revenue cannot provide the same opportunities as districts with more resources," says Jones. "That slows students down in ways that can impact them throughout their lives."

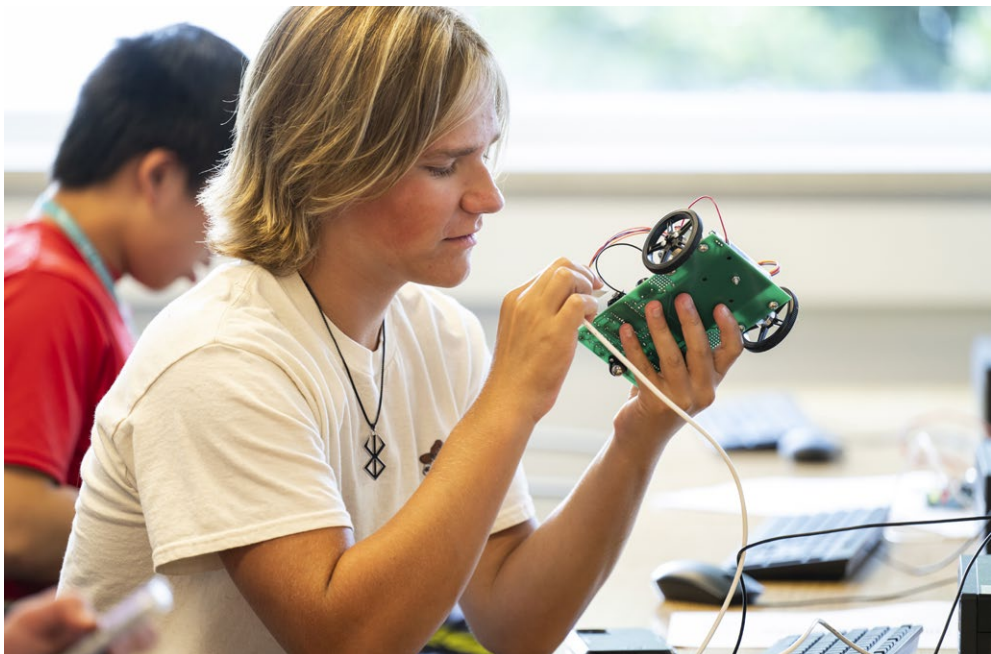
"...we hope to introduce them to educational and career opportunities they didn't know existed..."

Jones says the goal of the STEM Center, particularly the summer camps, is to equalize educational opportunities.

In 2024, 1,003 students from mostly underserved districts attended one or more of the 28 camps at S&T.

Jones sees the camps as a way to ignite curiosity.

"Curiosity is powerful," she says. "As we provide students with opportunities to deepen their understanding of a particular topic, we hope to introduce them to educational and career opportunities they didn't know existed prior to their experience here."



\$95,015

in summer camp scholarships awarded to 163 campers (2024).



Creating value for students

Rachel Kohman explains Kummer Student Programs by describing the impact it has on student success. “We connect the dots across campus, bridge the work from different departments and translate it into a value-add for S&T students,” says Kohman. “Rather than just making new things, we lean into the incredible work already being done on campus and encourage students to capitalize on existing opportunities.”

Kummer Student Programs is home to scholarships made possible by the gift from Fred and June Kummer — the Kummer Vanguard Scholars program for undergraduates, and the Kummer Innovation and Entrepreneurship (I&E) Doctoral Fellows program, for Ph.D. students. There are currently 1,300 Kummer Vanguard Scholars and 47 I&E Fellows.

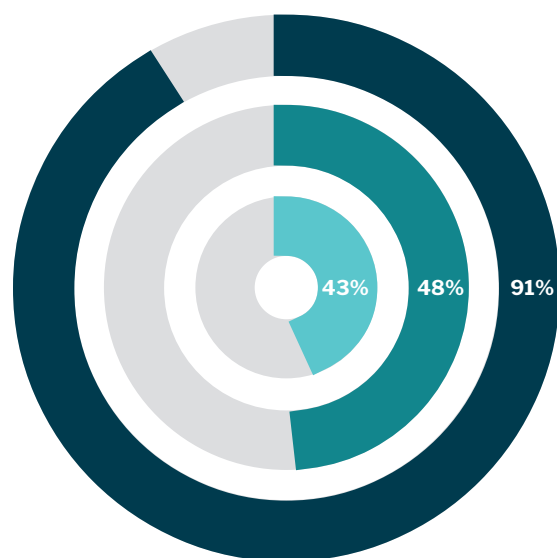
Kohman, who has directed the program since 2021, was named the 2024 recipient of the Dr. Elizabeth Cummins Women’s Advocate Award. She credits her team for the success of the program.

“Many team members started in other departments, so we have a wealth of institutional knowledge,” she says. “That gives us a broad view of the gaps that need to be filled to increase our impact on student success.”

Finding good partners across campus is key, she says.

Kummer Colloquiums, for example, are led by alumni, faculty and staff who volunteer to develop creative, hands-on, discussion-driven programs.

Colin Potts, S&T’s provost and executive vice chancellor for academic affairs, led one in which students envisioned the university of the future. And **Phillip Mulligan**, assistant teaching professor of mechanical and aerospace engineering, led a colloquium on reverse engineering that evolved into a summer camp offered by the Kummer Center for STEM Education. Kohman, ever the optimist, says the experience may inspire young students to eventually become a Kummer Vanguard Scholar or I&E Fellow.



● Programming ● Financial Aid ● Sense of Community



91%

of students strongly agree or agree the Kummer Vanguard Scholars programing influenced them to remain at S&T.

Followed by financial aid provided by the scholarship (48%) and sense of community created by the Kummer Vanguard Scholars program (43%).



90%

Average retention rate of Kummer Vanguard Scholars who persisted to Fall 2023.

- Fall 2021 cohort retained into their third year at 86.9% compared to 72.8% retention of STEM majors who are not Kummer Vanguard Scholars.
- Fall 2022 cohort retained into their second year at 92.1% compared to 83.6% retention of STEM majors who are not Kummer Vanguard Scholars.

3.52

Average GPA of Kummer Vanguard Scholars for academic year 2023–24.

- Fall 2021 cohort average GPA of 3.45 compared to 3.1 of STEM majors who are not Kummer Vanguard Scholars.
- Fall 2022 cohort average GPA of 3.59 compared to 3.13 of STEM majors who are not Kummer Vanguard Scholars.



Rachel Kohman, director of Kummer Student Programs.

“...we lean into the incredible work already being done on campus and encourage students to capitalize on existing opportunities.”



BRINGING MORE POWER
TO SMALLER



SPACES

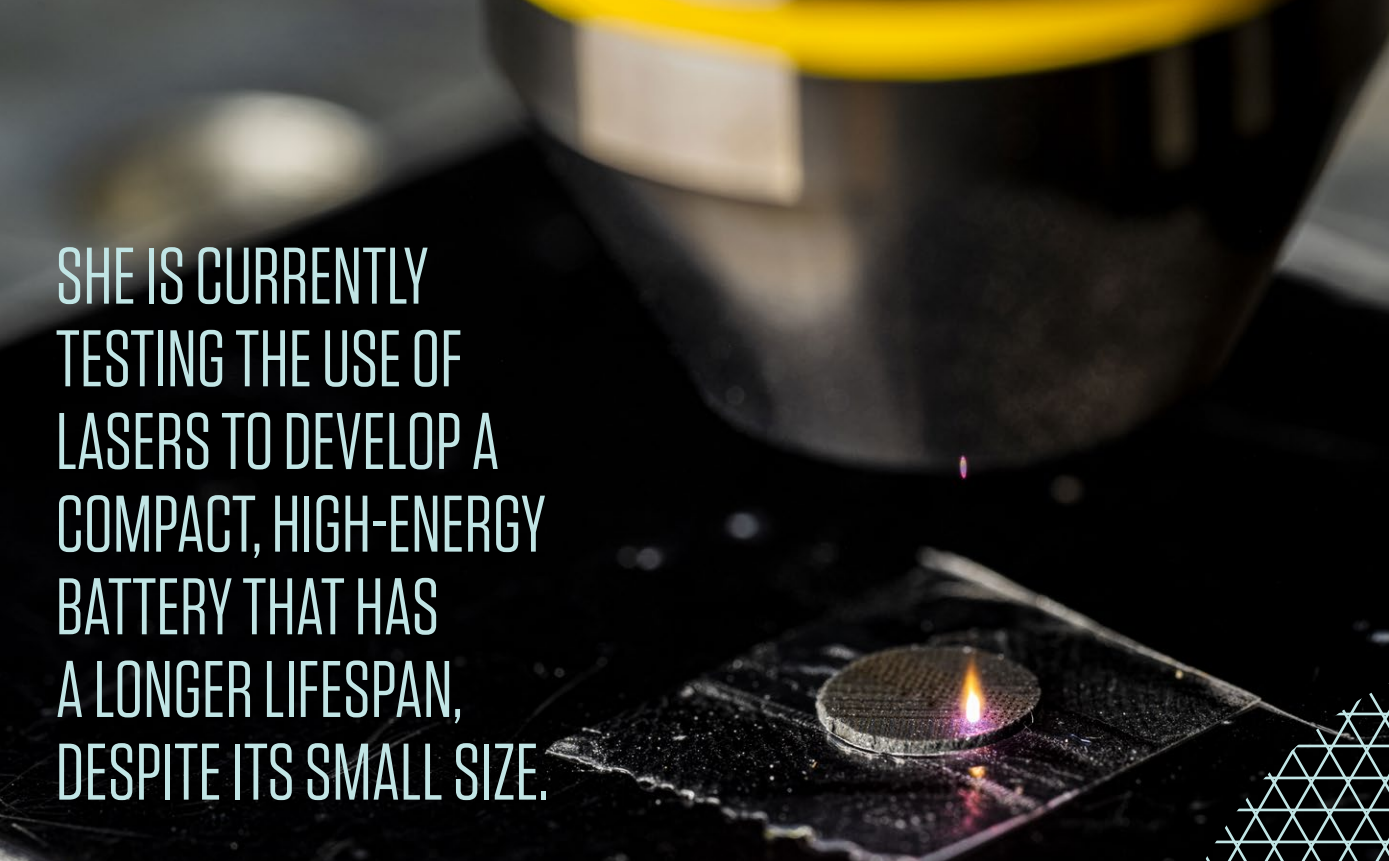


When Gracie Boyer was a child, one of the many questions she asked her father, a diesel mechanic, was how their refrigerator worked. After he explained, she had several follow-up questions, including:

How would it function if the external temperature was dramatically higher due to the world being on fire? Could an appliance maintain a consistent temperature internally when subjected to extreme fluctuations externally? A few years later, consumed by curiosity, she disassembled an alternator her father had discarded to learn more about its purpose and function — and whether or not it had a future beyond the scrap pile.

Today, her scenario-based approach to learning serves her well as a Ph.D. student in mechanical engineering, a Kummer Innovation and Entrepreneurial (I&E) Doctoral Fellow, and an environmentally minded researcher. The fellows program is funded by the \$300 million dollar gift the late June and Fred Kummer, a Missouri S&T graduate, made to the university in 2020. Each fellow receives a graduate research assistantship position on campus, a fellowship that's paid out each semester, tuition remission for required coursework for up to four years and support to offset the costs of professional development.

"I'm still interested in saving the earth," says Boyer, who grew up in Cadet, Missouri, an unincorporated community in eastern Washington County, "but I don't think it's as simple as I used to."



SHE IS CURRENTLY TESTING THE USE OF LASERS TO DEVELOP A COMPACT, HIGH-ENERGY BATTERY THAT HAS A LONGER LIFESPAN, DESPITE ITS SMALL SIZE.

Earlier this year, MOREENERGY, a team of S&T students that includes Boyer, won \$75,000 in the Microbattery Design Prize competition sponsored by the Advanced Materials and Manufacturing Technologies Office of the Department of Energy. Along with competitions focused on various sustainability topics, the microbattery challenge was offered through the energy department's American-Made program, which challenges innovators and entrepreneurs to contribute to clean energy solutions.

S&T's team proposed a micro battery for hearing aids. The team was one of eight selected to advance to the second phase of the competition to build and test a prototype, conduct a techno-economic analysis, and write a business plan. If the team advances, it will be required to develop an economic viability plan.

"Hearing aid batteries are either disposable, which creates waste, or they have reduced functionality because they're so small," Boyer says. "Also, we want to create batteries that let users take advantage of the ways hearing aids are evolving. Some are adding Bluetooth functionality, for example."

In April, Boyer won first place in the poster competition for S&T's Graduate

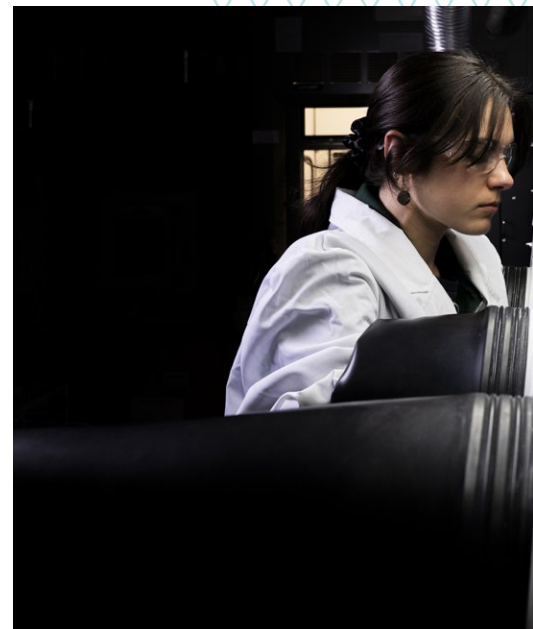
Research Showcase for her poster "Enabling Advanced Architectures for Thick and Anode-less Electrodes through Advanced Ultra-Short Laser Micro-Structuring." She is currently testing the use of lasers to develop a compact, high-energy battery that has a longer lifespan, despite its small size.

Boyer says her favorite aspect of the I&E Fellows program is the opportunity to continue the work she started with **Jonghyun Park**, associate professor of mechanical and aerospace engineering, who was her advisor while working toward her bachelor's degree at Missouri S&T, which she earned in 2022.

"I'm very grateful for the continuity from my undergraduate experience to my Ph.D. program," she says. "I knew going into my doctoral program that I meshed with my advisor, which is important."

Boyer loves the solitary nature of research, but she also thrives on collaboration. The I&E Fellows program, she says, feels like a perfect combination.

"Research is important to me because it helps me see different parts of mechanical engineering," she says. "I like to know how things work, and I really like learning in general, which is what I'm getting paid to do every day as an I&E Fellow."





“I like to know how things work, and I really like learning in general, which is what I’m getting paid to do every day as an I&E Fellow.”



As important as her lab work is, she relishes being part of the research community fostered by the fellowship program.

“Research can feel really isolating, but when I see what other students in other departments are working on, I see similarities,” she says. “I’m not alone trying to figure something out all on my own.”

Boyer cites the workshops and other networking opportunities made possible by the Kummer Student Programs staff as another advantage of the I&E Fellows program.

“They promote collaboration,” she says. “The workshops and other activities put faces on names of people in other departments. Learning about the work being done in other disciplines gives me ideas for my own research.”

Boyer says one of the benefits of doing research is learning in other areas.

“I knew next to nothing about chemistry or materials science before I started my research,” she says. “Now I know a little more.”

Her work has also inspired her to learn beyond labs and classrooms.

She’s building an A-frame cabin in Ironton, Missouri, with her boyfriend, who earned a mechanical and aerospace engineering degree from S&T. She’s not sure which career path she’ll follow, but she can picture herself living her post-doctorate life there, perhaps consulting remotely for an engineering firm. She’s learning to play banjo. And she rebuilt a transmission from what she refers to as her “collection” of vans.

“I think anybody can learn anything,” she says. “Watch someone who knows what they’re doing and then try. You’re already doing something more than you were before.” ○



PLANTING SEEDS FOR SOCIAL IMPACT

“The support has made it possible for me to establish connections both on and off campus, fostering positive relationships with peers in my field.”

Meeting a big challenge with a big solution, such as impending climate disaster, by accelerating research, development and deployment of breakthrough and highly scalable carbon-negative technologies across massive industrial sectors. Or mitigating the risk of fire often associated with the batteries that power electric vehicles.

These are just a couple of the innovations that could result from a program that provides seed money to researchers to help them prepare to compete for large grants.

In its most recent round of awards, announced in April, the Kummer Institute invested \$183,000 in six faculty-led research proposal development projects through the Kummer Ignition Grants for Research and Innovation initiative.

Ranging from \$20,000 to \$60,000 per project, the grants support researchers as they develop proposals for multi-million-dollar grants from federal agencies, foundations and corporations. To apply for the program, principal investigators are required to submit proposals for at least \$500,000 to any government agency, foundation or private non-profit organization.

“S&T researchers are pursuing solutions to some of our greatest challenges,” says **Kamal Khayat**, vice chancellor for research and innovation. “By supporting the early stages of research, the Kummer Institute is making critical investment in research that will have a significant societal impact.”

Hongyan Ma, associate professor of civil engineering, received an Ignition Grant during the fall 2022 cycle to help avoid climate disaster by leveraging engineered systems that use converted CO₂ to enhance carbon mineralization in concrete. Ma’s ultimate vision is economy-wide carbon negativity.

Guang Xu, associate professor of mining engineering, received an Ignition Grant during the fall 2021 cycle for research on the fire risks associated with batteries that power electric cars. In addition to being able to involve a student in the research, one of the key benefits of the grant is a deeper level of collaboration, according to Xu.

“It’s been a catalyst for me to expand collaborations, enhance my research endeavors and ultimately succeed in the competitive landscape of large grant applications,” says Xu. “The support has made it possible for me to establish connections both on and off campus, fostering positive relationships with peers in my field. As a result, I’ve collaborated with researchers from a diverse range of disciplines, which contributes to larger and more impactful grant proposals.”



Kamal Khayat, vice chancellor for research and innovation; Hongyan Ma, associate professor of civil engineering; and Guang Xu, associate professor of mining engineering

1. Shelley Minter (center) works with student teams during the 2024 Micro Grand Challenge.
2. Noah Johnson, sophomore in mechanical engineering and 2024 Micro Grand Challenge winner.

1

SUSTAINABILITY

In pursuit of the big-picture vantage point

One way the Kummer Institute Center for Resource Sustainability is having an impact is fairly obvious. Over the last year, led by the center director **Shelley Minter**, who joined S&T last fall, it's brought in three industry contracts and three federal grants totaling more than \$1 million in funding for research on a range of sustainability topics.

But there's another, more subtle impact, which is a shift to a more systemic way of thinking about sustainability.

"Sustainability is a theme that runs through water quality and availability, wastewater treatment, energy, mining and the electrification of industry, but in most institutions work in those areas is done separately, in silos," says Minter.

That's changing at S&T. When considering how to make one area more sustainable, Minter encourages people to also examine how that improvement impacts other areas.

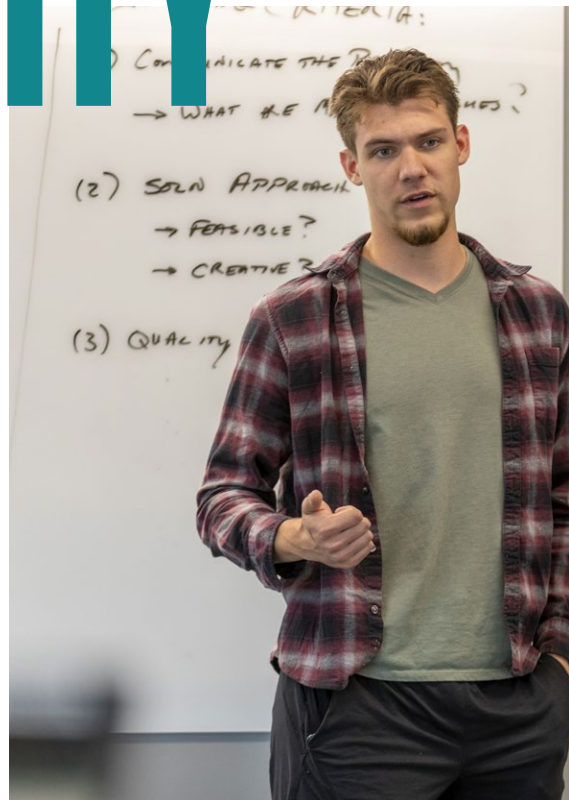
That shift was at the core of the Micro Grand Challenge, which Minter organized in partnership with Kummer Student Programs

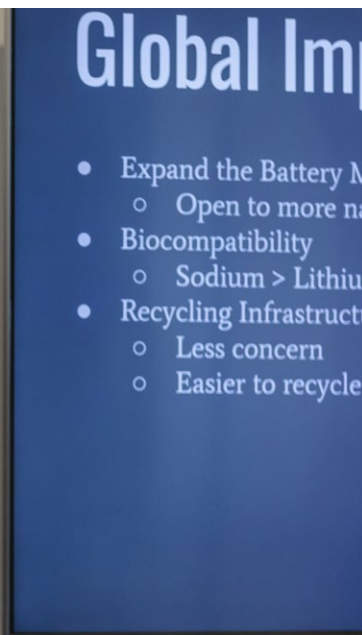
and the Opportunities for Undergraduate Research Experiences (OURE). Participating students were given just a few hours on a Sunday afternoon in April to come up with a solution to a problem that exemplifies how Minter and many in her field look at sustainability: improving sustainability in one area almost always causes a negative impact on sustainability in another.

Wind and sun are sustainable, renewable sources of energy that are much more environmentally friendly than coal or gas. But lithium-ion batteries, which are almost impossible to recycle, are by far the most common means of storing the energy they create. Without storage, solar

and wind power can only be used when the sun shines and the wind blows. As the amount of space occupied by wind and solar on the energy grid continues to grow, so does the lithium-ion battery problem.

Noah Johnson, a sophomore in mechanical engineering from Washington, Illinois, and a Kummer Vanguard Scholar, won first place in the challenge. His solution is to replace lithium-ion batteries with sodium batteries, which check nearly all the environmental boxes but do not store energy as efficiently as lithium. That shortcoming is what Johnson will address by conducting his own research, funded by OURE and supervised by Minter.





- Expand the Battery M
 - Open to more na
- Biocompatibility
 - Sodium > Lithiu
- Recycling Infrastructu
 - Less concern
 - Easier to recycle



Creating research opportunities for S&T students is just the beginning of what Minter hopes will become a tradition of getting faculty and students involved not just in the center's activities but in articulating its strategy as well.

"We want to take advantage of the opportunity to leverage our students' creativity as we think about the future of the Center for Resource Sustainability," she says. "We are taking a pretty holistic approach to sustainability, and we plan to do much more in areas like wastewater treatment, environmental remediation and carbon capture."



EMPOWERING MISSOURI MANUFACTURERS TO COMPETE ACROSS THE GLOBE

The Kummer Institute Center for Advanced Manufacturing, working with two other schools in the state, is embarking on a mission to help Missouri manufacturers become and stay globally competitive by educating their future employees — engineering and technical students — in advanced manufacturing technology and modern production equipment.

The project, Bridging the Manufacturing Critical Skills Gap, was awarded \$9.1 million in Missouri's FY 2025 budget, which included a historic level of support for the University of Missouri System. The project was awarded in collaboration with East Central College and St. Charles Community College. The project is part of the Department of Higher Education and Workforce Development's MoExcels Workforce Initiative.

"Missouri needs to prepare students to help their future employers become and stay globally competitive manufacturers known for innovative products and processes," says **Richard Billo**, director of the Kummer Institute Center for Advanced Manufacturing and distinguished professor of mechanical and aerospace engineering. "That's why it's absolutely imperative that Missouri's higher education institutions increase the pipeline of engineers and technicians ready for employment in Missouri manufacturing companies."

S&T will modernize its undergraduate manufacturing curriculum to incorporate new technologies, workforce-aligned coursework and hands-on experience with production-scale equipment. All new course material and equipment that will be used to help educate S&T manufacturing students has been selected by Missouri manufacturers that hire these students.



Richard Billo, director of the Kummer Institute Center for Advanced Manufacturing

St. Charles Community College plans to offer new degree and certificate programs to support emerging technology. In addition, St. Charles Community College and S&T will develop a strategy to streamline student progression into industry employment, and to expand K-12 outreach to create awareness of manufacturing careers. The collaborative outreach is expected to impact more than 6,000 students over the grant's 12-month performance period.

East Central College, a two-year community college based in Union, Missouri, will construct a state-of-the-art advanced manufacturing center as part of its planned new campus in Rolla.

STEM OUTREACH



5,000+

students from Missouri K-12 public and private schools visited the S&T campus during the 2023-24 academic year.

The Kummer Center for STEM Education welcomed over 5,000 visitors to Missouri S&T's campus during the past year to introduce children and teens to possible careers they may not have imagined before. Representatives also went on the road, taking hands-on educational activities to schools and communities throughout the state.



Expanding Your Horizons

Following a chemistry demonstration (above, middle), approximately 500 middle school students participated in activities throughout campus (top and left) during the Expanding Your Horizons event on Oct. 13.



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STEM Mobile visits to Missouri schools, interacting with over 11,000 K-12 students.



STEM Day

Students from Cuba Middle School watch pieces of their LEGO creation fly apart. Held on National STEM Day on Nov. 8, students in grades 6–12 explored science, technology, engineering and math concepts through fun activities.



Engineering Day

As part of National Engineering Week, S&T hosted a visit by junior high and high school students on Feb. 22 to experience various aspects of engineering. The materials science and engineering department hosted a bubble-blowing activity.



Regional STEM Conference

S&T's second annual Regional STEM Conference, held July 24–25, brought teachers from K–12 schools in south central Missouri to learn about new techniques to invigorate their classrooms.



May the Fourteenth Be With You

Elementary school students learned about STEM concepts by engaging in hands-on workshops during this space-themed event at S&T on May 14.



Missouri State Fair

The STEM Center, along with S&T employees and students, went on the road to bring educational experiences to fairgoers in Sedalia Aug. 8–18. Children of all ages checked out virtual reality (above), drove robots (left) and watched live demonstrations.

THE FREEDOM TO EXPLORE



Conleigh Hardin, a senior in civil engineering from Austin, Texas, attended a large high school but was in a program with fewer than 200 students. She liked the scaled down, personal feeling of it, and when it was time to decide on a college, she chose Missouri S&T for its size relative to the huge engineering colleges closer to home.

“I’ve gotten to know people across many different disciplines, in and out of my major,” she says.

As an S&T student — and particularly as a member of the inaugural cohort of Kummer Vanguard Scholars — Hardin values the freedom to explore.

“There’s room for people to be pioneers here.”

“There’s room for people to be pioneers here,” she says.

So far, her own personal pioneering experiences include serving on the first Kummer Vanguard Scholars student steering committee, working with Engineers Without Borders’ Guatemala team, finding her people in Chi Omega and discovering her interest in public transportation by spending a semester in Madrid, Spain, completing two internships and participating in a colloquium on sustainable building.

And, most memorably, she enjoyed being part of a small group of students that traveled to St. Louis to meet the late **June Kummer**.

“She was interested in what we’re studying and our plans for the future,” Hardin recalls. “It was inspiring to meet someone who was persistent in her studies and ambitions, a woman in what was then a male-dominated world of drafting and architecture, who found her niche, became successful and shared that with so many people.”

As for Hardin’s own plans, she’s been influenced by the two internships she’s completed at an engineering firm in her hometown that specializes in government projects.

“Austin is a place with lots of big ideas, and it was cool to see how many people are involved in transportation infrastructure and how the process works,” she says.

During her second internship, Hardin had the opportunity to work with the firm’s transit and railway group, which confirmed her interest in public transportation as a career.

“I’ve always associated civil engineering with transportation,” she says. “And I think good public transportation is crucial for most cities.”



Front row (left to right), Payton Faust and June Kummer; Back row (left to right), Emily Gurley, Angela Rayles, Conleigh Hardin, Kaitlyn Dunahee, Mo Dehghani, and Rachel Kohman.

With Gratitude

Missouri S&T is grateful for the leadership and dedication of those who have served on the Kummer Institute Foundation Board of Directors during our third year of operation.

Dr. Mohammad “Mo” Deghani

PRESIDENT AND CHIEF EXECUTIVE OFFICER

Missouri S&T chancellor

Dr. George P. “Bud” Peterson

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*Joined the board in July 2024



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CELEBRATING

A RECORD-SETTING \$94 MILLION YEAR OF PHILANTHROPIC SUPPORT

Fred and June Kummer's vision continues to inspire our generous alumni and friends. Missouri S&T has concluded a record-setting year of fundraising, thanks to the transformative generosity of an extensive community of donors.

Philanthropic contributions for 2024 totaled over \$94 million, making it one of the most successful fundraising years in the university's history.

"We are immensely grateful for the increasing support our donors are providing," says **Tory Verkamp**, vice chancellor of University Advancement. They recognize the difference a Missouri S&T education makes, and by investing in scholarships, faculty, state-of-the-art programs and capital improvements, are not only elevating but also expanding access to the S&T experience."

The results for fiscal year 2024, which ended June 30, were only surpassed by S&T's 2021 fundraising year that included a \$300 million gift from the Kummers.

"Giving of this magnitude is a wonderful endorsement of our commitment to developing leaders equipped to solve for tomorrow," says **Chancellor Mo Dehghani**. "Our donors are stakeholders in Missouri S&T's success."

