

2022

# Conquest

Johnson Cancer Research Center

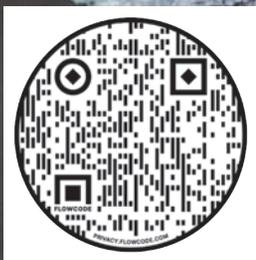


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**100%** of donated funds stay at K-State to support cancer research and education and the university.

**\$435,791** was awarded in 2021 for faculty and student cancer research and training.

**85** faculty researchers are fighting cancer in 20 departments of 5 colleges.



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## The fight starts here!

The fight starts here! Kansas State University faculty members conduct basic and translational cancer research that leads to improved prevention, diagnostics and treatments, while also training the next generation of scientists and medical professionals. To support the Johnson Cancer Research Center's vision to conquer cancer in our time, visit [cancer.k-state.edu/support](https://cancer.k-state.edu/support) or use the QR code above. With your help, we make a difference!

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As we begin a new decade of Conquest magazines and COVID-19 persists, we continue to fight cancer using both established and innovative methods. In addition to important friends and events from the past, we have new researchers, collaborations, programs, advisors and donors. In this issue of Conquest, you will meet some of our longstanding and new friends.

This issue spotlights three faculty researchers. Dr. Duy Hua, who is finishing up his career in chemistry, designs novel methods of detecting and treating multiple types of cancers, and is part of our initial Cancer Research Collaboration of Excellence (CRCE). Dr. Carl Ade in kinesiology investigates how chemotherapy damages the heart, and is part of our new CRCE. Dr. Erika Geisbrecht, in biochemistry and molecular biophysics studies cell growth to determine what goes wrong in the uncontrolled growth of cancer cells.

We also bring you two stories about supporters who want to make a difference in cancer research. Christy Linders, of Manhattan, created a new award to assist early-career cancer researchers. Read how this award is making a difference to Dr. Stephanie Shames in biology. K-State Quarterback Skylar Thompson and his family are giving back to K-State while also honoring his late mother and grandfather by providing an undergraduate Cancer Research Award.

We also showcase past and present students. Dr. Scott Rottinghaus, a new member of our advisory council, is a former undergraduate cancer researcher who has had an outstanding career treating patients and rare diseases through medicine and clinical research. Davanté Hammer, a senior in microbiology, is well prepared for medical school this fall with experience in both cancer research and creating a business plan for cancer therapeutics. These stories illustrate how Cancer Research Awards, funded by your donations, make a difference in students' lives and future endeavors.

We are excited for the "new normal" after the past two years. We look forward to seeing old friends and meeting new ones at events in the coming year. You can see some of this year's exciting events on the inside back cover.

Thanks to all our past and new supporters! With your continued help, we will advance science and work to find a cure for cancer.

A handwritten signature in black ink that reads "Sherry D. Fleming".

Sherry D. Fleming, Ph.D., Director and Fiedler Chair

1 Chalmers Hall, 1711 Claflin Road, Kansas State University, Manhattan, KS 66506-3901

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# Promising discoveries

## Microbiology student does research to fight cancer, gain experience for future in medicine

By Marcia Locke

One of Kansas State University's most promising students is working to shrink cancerous tumors. Davanté Hammer, a senior from Scandia, Kansas, majoring in microbiology and pre-medicine with a minor in business, does immunology research that could someday help fight melanoma, a deadly skin cancer.

Hammer works with Sherry Fleming, professor of biology, to understand how melanoma grows and how to decrease tumor growth. He uses special peptides created by Fleming to control immune cells that play a role in the body's response to cancer and other threats. Peptides are short chains of amino acids, which are molecules that form proteins. Fleming's peptides, modified from a normal blood protein, slow tumor growth in mice by changing the blood vessels and possibly the white blood cells in the tumor.

Hammer got involved in this research after working with Fleming on a business project for his minor. With support from an entrepreneurial scholarship from the Kansas IDeA Network of Biomedical Research Excellence, he wrote a business plan to license her peptides to a pharmaceutical company when ready. Fleming was impressed by Hammer and invited him to work in her laboratory.

Getting involved in research has benefited Hammer in many ways.

"Through my work in the lab, I've been able to learn more about the role research plays in understanding science and health care, as well as many unique research techniques," Hammer said. "I'm currently learning new lab techniques that are being used to fight COVID."

Research experience will help Hammer achieve his educational and career goals. He wants to go into sports medicine and is currently applying to medical schools.

"Doing research has allowed me to see the comparison between health care and research, and to develop better skills for planning ahead and learning how to do experiments and follow certain protocols," Hammer said.

Hammer received a Cancer Research Award from the Johnson Cancer Research Center in fall 2021. He appreciates that it allows him to focus on research instead of having to work outside of school. He also received a 2021 Division of Biology Most Promising Student Award.



"Most students in my lab have the interest and scientific ability to do the job, but Davanté stands out because of his excellent time management, self-motivation and reliability," Fleming said. "In addition, despite not having had a class on the immune system, Davanté took it upon himself to learn about the cells we work with."

Hammer also recognizes other positive influences in his life. He feels fortunate to have a supportive mother and family, he said. And he credits his

high school science and math teachers for getting him interested in science and pushing him to work hard and better himself as an individual.

His research experience has been meaningful in other ways as well.

"I'm able to see how the novel peptides I work with could play a role in fighting cancer in the future, and that's pretty cool to be a part of."



**44** undergraduate students co-authored scientific publications in the past 5 years.

# Going far with K-State

## Biology alumnus helps cure rare diseases

By Marcia Locke



Scott Rottinghaus, M.D., grew up in the small town of Westmoreland, Kansas, about a half-hour north of Manhattan, home to Kansas State University. When it came time for college in 1991, K-State was an easy choice. Although he didn't go far for college, his K-State education took him far in life.

Rottinghaus is now vice president and head of clinical development for hematology and nephrology at Alexion Pharmaceuticals, AstraZeneca's rare diseases unit. He first joined the pharmaceutical industry with Pfizer in 2007 after working as a physician for several years. He also continued seeing patients as an assistant clinical professor at Yale University from 2008 to 2019.

At K-State, Rottinghaus majored in biology and classics, with a vision to attend medical school. One day early in his freshman year, he asked his biology professor, Richard Consigli, if he could join the Consigli lab to learn more about basic research.

Before long, Rottinghaus was studying polyomavirus, a virus that causes cancer in mice, in the Consigli Lab. He cloned and characterized its structural proteins. He also had the opportunity to have his experiments flown on the space shuttle to see how viruses assemble in microgravity.

Joining a lab proved to be a great step in Rottinghaus' educational journey. He published articles in scientific journals, participated in a National Institutes of Health summer research program, won a Marshall scholarship to pursue a master's degree in biology at Cambridge University, and was recognized by USA Today.

To support his laboratory research experience, which he says was transformative, Rottinghaus received three Cancer Research Awards from the Johnson Cancer Research Center.

"The Cancer Research Award really made a difference for me because it allowed me to focus on research with less concern that I needed to get a job on the side," he said. "And the experience not only set me up for success in graduate school, where I studied DNA repair, but it also set me up for my future pathway and career in science."

Rottinghaus's medical school dreams came true. He earned his degree from Mayo Medical School and did his internal medicine residency at the Mayo Clinic in Minnesota. While there, he studied vaccines for viruses like Hepatitis B and measles. Later, he would also work with HIV and influenza vaccines.

Now, with more than 20 years in medicine and pharmaceuticals, Rottinghaus is helping Alexion develop medicines to treat rare diseases.

"It's exciting to do something nobody's done before and to help a person who hasn't had any help before," he said.

"Dr. Consigli really inspired me to an early career in basic research that has led to a longer career in medicine and clinical research," Rottinghaus said. "His interest in virology, which he instilled in me, inspired me to pursue infectious diseases as a medical subspecialty. I love patient care, but I figured out I wanted to cure people's diseases through scientific research, and I really like it."

Outside of work, Rottinghaus stays busy with his wife, Catherine, and seven children ranging in age from 2 to 21 years old. He is also active in numismatics, the study of coins and other currency, and has served three terms as governor of the American Numismatic Association. In 2021, he joined the Johnson Cancer Research Center's Advisory Council.



**\$200,000** a year is dedicated to training students to do scientific research.



# Cancer-fighting compounds

## Longtime K-State chemist helps detect cancer and discover new drugs

By Marcia Locke

Duy Hua has had a long, illustrious career in organic chemistry and drug discovery. After 39 years at Kansas State University, he is set to retire this summer. But he has a couple of important cancer research projects to finish up first.

Hua, a university distinguished professor of chemistry, is an expert in medicinal and synthetic organic chemistry. He makes chemical compounds for detecting and counteracting diseases.

Hua has been involved with the Johnson Cancer Research Center since he arrived at K-State in 1982 when the center was still new. He and now-retired biology professor Jean-Pierre Perchellet studied several new anti-cancer compounds produced by Hua. Their work earned them a four-year grant from the National Cancer Institute, a part of the National Institutes of Health.

Over the years, Hua's work evolved to mainly support the development of drugs for heart and Alzheimer's diseases, viral infections and cancers. He is currently working on two cancer-related NIH grants.

For a \$1,371,000 NCI grant led by Jun Li, professor of chemistry, Hua is helping develop a breast cancer diagnostic device that electronically detects and profiles specific enzymes that are prevalent in people with breast cancers. The technology could work for other cancers as well.

For this project, Hua has designed special short peptides, which are chains of amino acids. Amino acids are molecules that combine to form proteins. His team attaches gold chips

to one end of the peptide chain and iron-containing molecules called electron reporters to the other. This generates a sort of molecular electronic current that is detectable in a blood sample. Some enzymes found in breast cancer cells can cut the peptide. If this occurs, the electrical current is cut, signaling the presence of breast cancer cells.

Hua's second NIH grant, for \$1,213,260, is for developing metallic nanoclusters as catalysts to alter complex molecules, including anti-cancer drugs. Sometimes, drugs can be altered slightly to offer new benefits. Catalysts are used to cause reactions that change molecules in a controlled manner. Hua's catalysts contain two metals — usually gold and copper or gold and palladium. The gold pulls electrons away from the other metal, which enhances the metal's reactivity. These nanoclusters react with various molecules faster and with less energy than other catalysts.

"We have developed new chemistry that we hope medicinal chemists can use in the future to create new medicines," Hua said.

Throughout the years, Hua has mentored many undergraduate and graduate students, including at least 35 recipients of Johnson Cancer Research Center awards. He appreciates how much the program benefits both the students and his laboratory.

"We train the students, teach them how to carry out research, and in return, they're able to contribute to our research and make important, useful discoveries for science and medical research," Hua said. "Students and I enjoy working together. And, to receive the awards, they have to be excellent students."

He is grateful for the center's support in his early years, which helped sustain his laboratory when his grant funding was down.

"Through all the years, the center was extremely helpful, and I think it had a big impact and supported a lot of young people at the university," Hua said.

**\$1,340,709** was invested in promising cancer studies in the past 5 years.

# Trimming cancer

## Biochemist discovers protein involved in normal and abnormal cell growth

By Marcia Locke

Cancer is a group of many diseases in which some of the body's cells grow out of control and spread throughout the body. Instead of dutifully dying when they're old or damaged so that new cells can take their place, they keep growing and multiplying. These cells may form tumors, spread and invade other parts of the body.

Erika Geisbrecht, professor of biochemistry and molecular biophysics, studies how cells develop and move. According to Geisbrecht, the ability of cells to change shape and move around is important for the formation of many body tissues, including muscles and nerves. Cell movement is also required for the immune system to work properly.

"Unfortunately, sometimes cells lose the ability to function and move normally and this may result in birth defects or cancer," Geisbrecht said. "We want to better understand this phenomenon so we can help treat diseases like cancer that result from abnormal cell growth and movement."

Geisbrecht's research focuses on signal transduction pathways involved in tissue development and maintenance. That is, she studies how chemical or physical signals are transmitted through a cell to cause molecular events that influence cell behavior. While studying a particular developmental process, she and her team discovered a new protein that influences cell growth.

The protein, encoded by a gene called TRIM32, is mutated in people with a type of muscular dystrophy. Research in the fruit fly, an important model organism for studying genes in humans, showed that mutation or loss of this gene causes muscle degeneration. Later research also surprisingly showed decreased cell and brain size. This implied that, in addition to promoting healthy muscle tissue, TRIM32 likely had a role in regulating normal cell growth.

Geisbrecht's group set out to determine if TRIM32 also regulates uncontrolled cell growth. Using fruit flies again, they found that removing this gene did indeed result in less tumor growth. The study, published in the journal *eLife* in March 2020, was supported

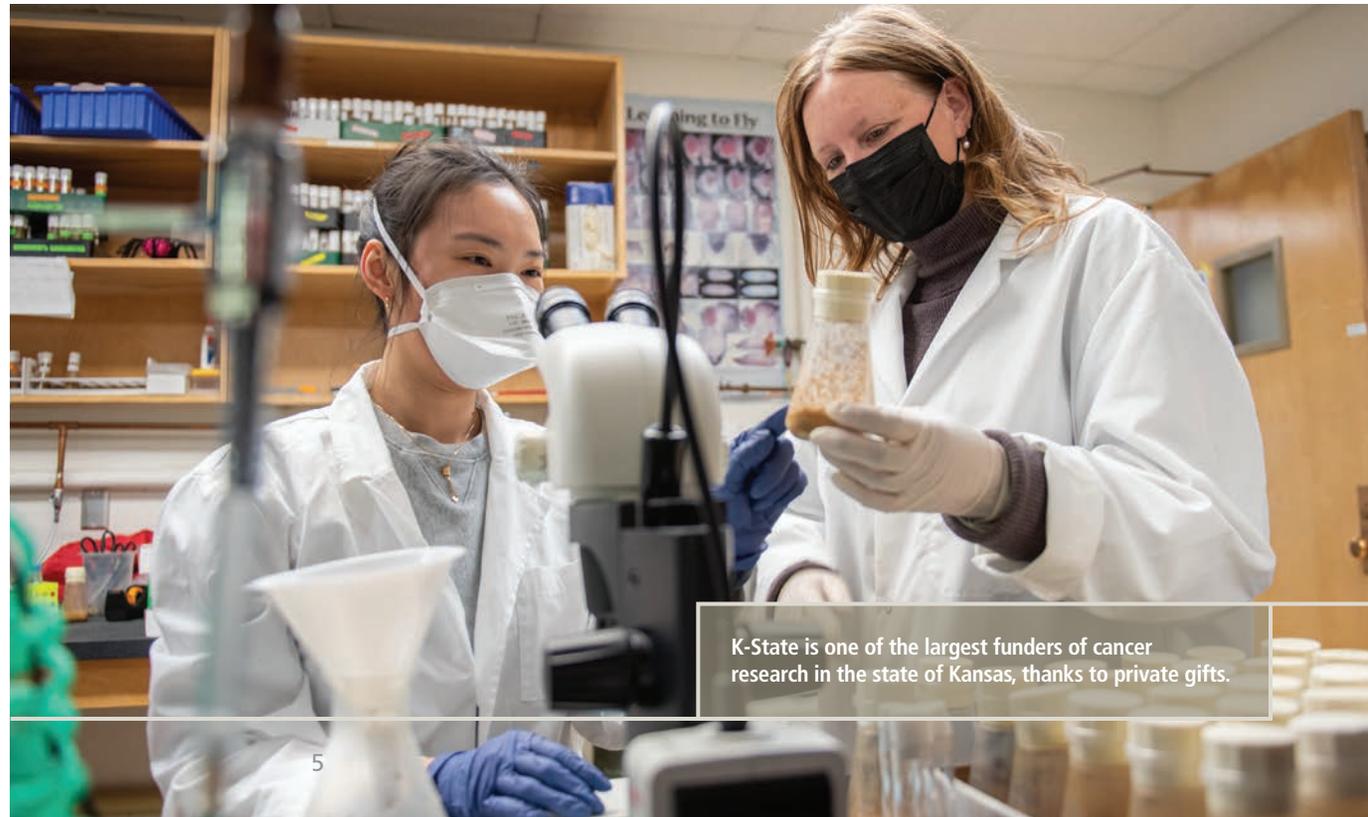
by the National Institute of Arthritis and Musculoskeletal and Skin Diseases, part of the National Institutes of Health.

"TRIM32 is expressed in all cells of the human body and therefore may be a regulator of growth in normal and cancerous tissues," Geisbrecht said. "A better understanding of TRIM32's function could help find therapies to limit the growth of cancers that overexpress it."

Geisbrecht always includes students on her research team. Growing up, she assumed she would attend medical school, but after

working in a lab during her first semester of college, she changed her plans to pursue graduate school. Mentoring undergraduate students is her way of exposing them to the importance of research, whatever their career path may be.

Geisbrecht has served as a mentor to eight Johnson Cancer Research Center undergraduate student award recipients. She has also received center funding to help purchase laboratory equipment.



K-State is one of the largest funders of cancer research in the state of Kansas, thanks to private gifts.

# Toxic treatment

## Getting to the heart of the problem

By Marcia Locke

Cancer treatment saves lives, but it can also be hard on the body. Some treatments damage the heart and vascular system. Kansas State University integrative physiologists are doing laboratory and clinical research to get to the heart of the problem.

According to Carl Ade, associate professor of kinesiology, 14 million U.S. cancer survivors experience cardiotoxicity, or damage to the heart and vascular system, after cancer treatment. Their hearts and vessels become weaker, stiffer and less efficient at pumping blood, which can lead to disease and premature death.

Moreover, to avoid that risk, patients may be given reduced doses of chemotherapy or radiation, resulting in less destruction of cancer cells. This raises their chances for cancer recurrence and decreased overall survival.

"There are chemotherapies that are really effective at targeting cancer cells, but some patients, who are maybe older or have underlying risk factors, can't be given the optimal dose because of the potential adverse side effects," Ade said.

Ade and his team study how chemotherapy, immunotherapy, hormone deprivation and radiation change cardiovascular function. Their big-picture approach involves basic research with cell cultures, pre-clinical research in animals and clinical research in humans actively receiving treatment.

In the laboratory, the researchers examine heart muscle and vascular cells and the changes they undergo when exposed to a chemotherapy drug. For their clinical research, they observe heart size, blood flow and small blood vessel function using imaging technology like echocardiography and vascular sonography.

"So, we have this nice translation from very basic science to clinical practice," Ade said. "We're in the lab observing the effects of a drug at the cellular level and then in the clinic taking measurements in patients before and after they get the same chemotherapy."

The team aims to identify and characterize patients at risk of developing cardiotoxicity. If they can predict cardiovascular

dysfunction, they can take early steps to mitigate it while also fighting the cancer.

A couple of Ade's studies look at the effects of two specific drugs.

Fluorouracil is effective against colorectal cancers but can cause cardiovascular problems. The researchers apply a small amount of the drug to the skin, where it won't compromise the whole treatment, and see how the small blood vessels react. This less invasive method can inform them about what may happen in the larger cardiovascular system.

The breast cancer drug, Doxorubicin, alters heart function and stiffens the aorta and other vessels around the heart. The researchers are investigating whether the changes occur in the vessels before they do in the heart. If so, they could gather data and set criteria for predicting heart problems by simply observing vessels.

The ultimate goal is to develop screening, diagnostic and management strategies — whether lifestyle or pharmacological — to integrate with cancer treatments and alleviate or reverse cardiotoxicity.

A partnership with Stormont Vail Health's Cotton O'Neil Cancer Center and Heart Vascular Clinic, in Topeka, Kansas, has made it

possible to work directly with cancer patients, many of whom are eager to support research.

"We've had an outstanding collaboration with Stormont Vail," Ade said. "We have our own dedicated space there, so patients can go to their oncology and heart appointments and also visit us fairly seamlessly."

Ade is doing some other cancer research as well. For the Cancer Research Collaboration of Excellence in Tumor Microenvironment Studies, an initiative supported by the Johnson Cancer Research Center, he studies vitamin D's effect on ovarian tumors.

This work could not be done without the students, Ade said.

"I have outstanding graduate students who interact professionally with patients, do rigorous data collection and are first authors on almost every paper," he said.

He applauds the Johnson Cancer Research Center for offering students funding that makes their contributions possible. And he recognizes that, in turn, he can have a bigger impact.

"After they help do our work and get trained to do research, they go on to be scientists themselves, so our impact as professors grows as the students go out and make a difference in their fields."



Our faculty averages 25 publications of research findings per year.

# Stronger together

## Quarterback Skylar Thompson rallies support for K-State cancer research

By Marcia Locke and Heather Strafuss

K-State Quarterback Skylar Thompson's goal for his last year at K-State was to finish on a high note, and not just in football. He wanted to have a positive impact on people. So, he took his team mentality off the field to support cancer research at the university he loves.

Thompson's mother died of breast cancer when he was just 6 years old. Seven months later, his grandfather died of pancreatic cancer. Throughout his life, and especially when he was young, he was very troubled by this loss.

"They were two of the most influential and meaningful people in my life, and I had a really hard time wrapping my mind around that loss," Thompson said. "I now believe a big reason I've faced these challenges is so I can have the ability to impact others while honoring my mom and grandfather."

In October 2021, he and his family established the Thompson Family Cancer Research Fund for the Johnson Cancer Research Center in memory of his mother, Teresa Lynn Thompson, and grandfather, John Walter Thompson.

"I have a deep love and passion for K-State," Thompson said. "To be able to support a cancer research center at my university is very special to me. It means a lot to work with those so passionate about this cause."

Thompson pledged to the fund all proceeds from October sales of his "Stronger Together" apparel in honor of Breast Cancer Awareness Month. Additionally, he used a personal email message and social media to invite K-State supporters to donate to the fund.

The K-State family's response was extraordinary. By January, donations to the fund totaled \$21,590. Every donor received a thank-you video from Thompson and a letter from the center.

In April, the Skylar Thompson Family Cancer Research Award will be presented to an undergraduate student doing breast cancer research in the chemistry department.

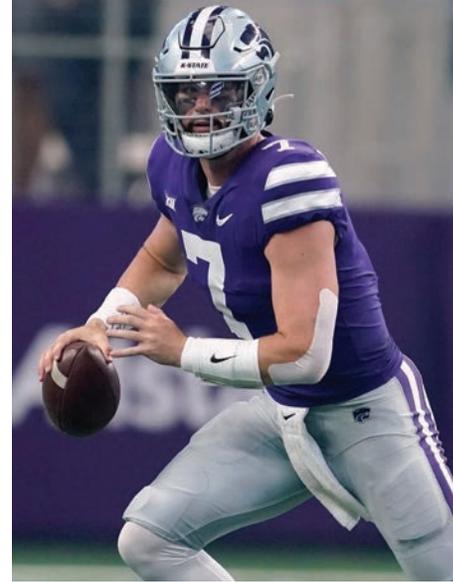
Thompson is a proud Wildcat who takes the university slogan of "family" to heart, and he is grateful to everyone who joined this effort.

"Thank you for your support, both throughout my years as a Wildcat on the football field and in this aspect of my life that means so much to me," Thompson said. "I have a great feeling that if my mom and grandfather knew what we are doing, they'd be very proud."

Thompson definitely finished on a high note. On top of all his football, academic and other accomplishments, he raised thousands of dollars to help K-State fight cancer.

"Although my time at K-State is complete, I'll continue to be dedicated to supporting cancer research at the Johnson Cancer Research Center."

To donate to the Thompson Family Cancer Research Fund, go to [cancer.k-state.edu/support/thompsonfund.html](https://cancer.k-state.edu/support/thompsonfund.html).



Every gift helps, and generally more than **95%** of gifts are less than **\$1,000**.

# Sparking discovery

## Special gift helps explore new idea for fighting leukemia and other blood cancers

By Marcia Locke

Great scientific discoveries often start with just a spark of an idea. A scientist is going about her usual research when she discovers something that takes her in a whole new direction. But building that idea into a research project isn't easy or cheap.

That's why the new Linders Family Cancer Research Expansion Award is so helpful. Thanks to a generous donation from Christy Linders, Manhattan, Kansas, the Johnson Cancer Research Center is able to award start-up funds for junior investigators to pay for supplies and personnel to work on a new cancer-specific study.

In 2021, the center awarded \$12,500 to Stephanie Shames, assistant professor of biology, to explore a new idea she had for fighting acute myeloid leukemia and other blood cancers.



Shames studies how bacteria both cause disease and help the body fight disease. Using bacteria called Legionella, she investigates how bacterial pathogens interact with their host. Specifically, she looks at proteins that are required for infection yet also help the immune system detect the pathogen.

While studying a Legionella protein and its impact on the immune system, Shames made a discovery relevant to cancer. With her Linders Award, she gets to explore it further.

Shames is investigating a component of protein complexes called proteasomes, which break down unneeded or damaged proteins. She focuses on a protein that activates proteasomes and is important to the survival of leukemia cells, which are cancerous white blood cells. She wants to inhibit, or restrain, the activator protein and its proteasome, as inhibiting specific proteasomes in leukemia cells reduces their survival.

"We hope our study of this protein will offer new information about the mechanisms of leukemia cell biology and lead to the development of new anti-leukemia therapeutics," Shames said.

Linders, a breast cancer survivor, said she is pleased to support this compelling and promising project, recognizing that life-saving cancer treatments start with basic research.

"Dr. Shames' research doesn't relate directly to the cancers I'm passionate about, but it's still something that could go somewhere," she said.

Linders has been deeply affected by cancer. Soon after fighting breast cancer herself in 2013, she lost her husband, Clark, to pancreatic cancer when he was 62 years old. Before that, he had also fought testicular cancer at age 27 and prostate cancer in his mid-50s.

Clark and Christy Linders

The Linders have had a huge passion for K-State cancer research. In the 1990s and 2000s, the former owners of six Manhattan-area McDonald's restaurants hosted many annual "Raise the Roof" fundraisers atop their Westloop restaurant. Rain or shine, radio personality John Anderson spent all day on the roof urging listeners to get him down by raising \$5,000 for the Johnson Cancer Research Center. The Linders always ensured success by donating at least \$1,000.

One thing about the center that impressed the Linders is its multidisciplinary approach.

"Having people in engineering, biology, veterinary medicine — all of those people working together — to me, that is really interesting and so necessary when you're doing research on something like cancer," Linders said.

She hopes her latest gift will help advance innovative research that leads to better ways to fight cancer without harming the body.

"In the big scheme of things, it's not a lot of money," she said. "I might just be buying test tubes. But if that's what Dr. Shames needs, then that's what I'm happy to do. And if we can get more people to do these small things, then we can help the researchers get where they need to be.

"After you fight cancer, it's a part of you," Linders said. "I want to support efforts that are strengthening to our society, that keep people alive and hopeful."

Programs to advance K-State cancer research and education are made possible by private donations.



More information and registration:



**Ride for a Cure**  
Johnson Cancer Research Center  
Kansas State University

**Help us raise  
\$100,000  
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Log your rides from Aug. 1–Sept. 17, 2022  
Celebration Event: Saturday, Sept. 17, 2022



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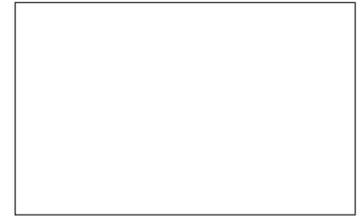


**ROB REGIER MEMORIAL**  
GOLF TOURNAMENT



Fri., Sept. 16, 2022  
Colbert Hills Golf Course, Manhattan

[cancer.k-state.edu/newsevents/regier.html](http://cancer.k-state.edu/newsevents/regier.html)



## Cancer Research Departments and Units

### **College of Arts and Sciences**

Biochemistry and Molecular Biophysics  
Biology  
Chemistry  
Physics  
Sociology, Anthropology, and Social Work  
Statistics

### **College of Agriculture**

Entomology  
Grain Science and Industry  
Horticulture and Natural Resources  
Plant Pathology

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Electrical and Computer Engineering  
Engineering Extension  
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Mechanical and Nuclear Engineering

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