

forward

IOWA STATE UNIVERSITY FOUNDATION

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 The Nanovaccine Institute at Iowa State



"Tomorrow's diseases will look very different from today's diseases and certainly from yesterday's diseases, so the ways we counter them must be very different. That's what we're working on."

*Balaji Narasimhan,
Director, Nanovaccine Institute
Anson Marston Distinguished Professor
and Vlasta Klima Balloun Faculty Chair,
Chemical and Biological Engineering*



A science of **billionths**, with potential for **billions**

FOR YEARS, MODERN MEDICINE HAS BEEN LOSING THE BATTLE AGAINST WHAT BALAJI NARASIMHAN CALLS "THE ENEMY." HE'S TALKING ABOUT DISEASE.

He says it's an urgent matter, as some diseases are reemerging, such as whooping cough, some are new, such as SARS, and others, like bacterial infections, are gaining immunity to once-successful treatments.

"We must bring new tools to the fight," he says, "because the old ones are no longer working."

As director of the Nanovaccine Institute, headquartered at Iowa State University, Narasimhan is helping create the new tools. He and an interdisciplinary team of 65 researchers at 20 universities, research institutes, national laboratories, companies and healthcare coalitions from across the nation are working to deliver life-saving treatments and disease-preventing vaccines around the globe. The tools are based on particles so small you could line a thousand of them across the dot above this *i*.

For the researchers, these particles are their David against a towering Goliath. And if they can slay the giant, healthcare around the world will forever change.

"The motivation for the work we do is to make people's lives better," says Narasimhan, Anson Marston Distinguished Professor in chemical and biological engineering, and Vlasta Klima Balloun Faculty Chair. "To solve real-life problems. It's why we come to work every morning."

Story by

Susan Flansburg

Photos by

Dan McClanahan

While the science of nanotechnology is complicated, the potential healthcare outcomes are breathtakingly straightforward: Dramatically improved treatments and preventions for everything from cancer to autoimmune diseases could be on the near horizon. And they will ride in on a tiny Trojan horse.

This metaphor, too, is popular among the institute's researchers. It perfectly describes how a microscopic nanoparticle, unique to each treatment, is designed to carry medications and vaccines into otherwise nearly impenetrable locations. Not only are these infinitesimal warriors able to slip past defense barriers, they also deliver their payload precisely and only where it needs to go, more effectively and with fewer side effects.

This has immense implications for human and animal health. Our immune systems are built to block intruders, whether good or ill. If needed medication can reach the appropriate target in the first place, many currently incurable diseases can be better treated or even cured. And if medication can arrive more precisely at the location it's needed – and not where it isn't – higher doses can be safely and tolerably administered.

“One approach to repairing damaged nerves is to engineer nerve cells that produce and secrete neurotrophic growth factors built within nanoparticles, so that one day, a neurosurgeon could simply pull a device off a shelf and implant it within an injury.”

Donald Sakaguchi,
Morrill Professor, Genetics,
Development and Cell Biology
(opposite)

ALL SYSTEMS GO

In the bustling labs of the Nanovaccine Institute scattered across campus, Iowa State chemical and biological engineers collaborate with immunologists, neuroscientists, microbiologists and other experts from 14 different departments. This large-scale, interdisciplinary collaboration promotes seamless interaction among experts in the sciences, economics, social science, public policy and even the commercial sector. Such a systems-based approach allows concurrent and thorough investigation of questions from fundamental science to marketability and affordability.

It's one of the main reasons for basing the institute at Iowa State, long a leader in interdisciplinary collaboration. The marriage of life sciences and engineering first began at the university in the 1960s and yielded expertise in the core platform of nanotechnology. Other resources, from the veterinary college to the nearby USDA and animal vaccine manufacturers, bring significant value to the research process.

“Iowa State has the intellectual bandwidth and assets to support this initiative,” Narasimhan says. “We know how to engage in the necessary systems-based approach. For example, social scientists help us understand how the new products will be perceived. Other experts help evaluate issues of adherence, cost, shipping and storage.”





IMMUTABLE IMMUNITY

Nanovaccine Institute researchers are designing nanoparticles for many uses: Some will sneak through the hard, fibrous surface of pancreatic cancer tumors to deliver chemotherapy. Others will cross the blood-brain barrier to treat diseases like Parkinson's. Others yet will help build powerful and long-lasting immunity to diseases like influenza and parasites that destroy the brains of children in Africa.

One research thrust is a universal influenza vaccine that is reliable, globally deployable and conveys full, lifelong immunity in one dose. Using a novel, non-egg-based manufacturing process, the nanovaccine likely won't require needles or refrigeration and will withstand variabilities during shipping. Surya Mallapragada, Distinguished Professor and Carol Vohs Johnson Chair in Chemical and Biological Engineering, calls it the Holy Grail of vaccines.

Nanoparticles will make it possible.

"The exciting thing about working in an interdisciplinary group is looking together at new approaches and challenges to be met and learning from each other."

*Surya Mallapragada,
Associate Vice President for
Research, Distinguished
Professor and Carol Vohs
Johnson Chair in Chemical
and Biological Engineering*

“We are taking the proteins H and N, which are antigens on the surface of the influenza virus, and putting them on the surface of the nanoparticle so the immune system will recognize it as an invader and attack,” she explains.

As the nanoparticle erodes and delivers its payload, the immune system will discover proteins buried in the middle common to all strains of flu virus. These proteins can provoke a full immune response, and teach the immune system to respond more vigorously to influenza.

Successive formulations of this universal nanovaccine are being developed using outcomes of testing in mice. Marian Kohut, Barbara E. Forker Professor in Kinesiology, oversees this part of the institute’s work.

“What we know about humans we first learn in mice,” she says.

*Marian Kohut,
Barbara E. Forker Professor
in Kinesiology*

“For example, we see greater immune response to vaccination in younger mice than we do in older mice. So one of the questions becomes, can we teach the aged immune cells to behave like young immune cells?”

Because she’s working in tandem with researchers in other fields, Kohut can easily explore with them whether adding a metabolism-altering agent to the nanovaccine would enhance the immune response in older adults.

“Working in one lab like this enhances the interdisciplinary component of the institute,” she says. “We can address all sides of the questions at the same time in our experiments.”

When ready for human clinical trials, the institute’s medical school partners, including the Mayo Clinic, the University of Iowa and the University of Nebraska Medical Center, will take over. Researchers expect that to happen yet this year.

Kohut studies how nanoparticles can be modified in different ways to elicit a type of immune response that may vary depending on host factors like age, stress or nutrition. It could mean a flu vaccine that is tailored for effectiveness in the very young to the very old.

HOME/TEAM ADVANTAGE

This spring, Iowa State begins construction on a much-needed centralized home and state-of-the-art research space for the institute on the fifth floor of the Advanced Teaching and Research Building. The \$7 million project will be funded by the university and donor support, including recent alumni gifts of \$2 million from Jim Balloun, \$1 million from Mike and Jean Steffenson, and \$300,000 from Bob Lane. Once completed, the fully-integrated, one-of-a-kind facility will position the institute to be more competitive in pursuing grants and to accelerate commercialization of its research. And it means invaluable synergy for faculty and students.

Morrill Professor and neuroscientist Donald Sakaguchi says being able to collaborate during his and his students' experiments on nerve regeneration not only leads to a more efficient use of time, it models the future of scientific investigation.

"Having students and trainees working in the lab alongside faculty means we are mentoring the next generation of scientists," he says.

Professor of veterinary microbiology and preventative medicine Gregory Phillips calls it team science.

(Continued on p.12)

"Genetically engineering bacteria to produce colored pigments allows for easy visual detection. These microbial biosensors act as small sentinels to provide early warning of infection and other diseases in both human and animal hosts. They are also being used to discover new compounds with antibacterial activity as a way to potentially combat antibiotic resistance of microorganisms."

Gregory Phillips,
Professor, Veterinary Microbiology and Preventive Medicine

Fighting the (new) good fight

Antibiotics are one of humankind's greatest life-saving discoveries. Not only are they important to human health, but antimicrobials are widely used for the prevention and control of animal diseases. In recent decades, however, the value of these "wonder drugs" has diminished due to the drastic increase in antimicrobial resistance, as more bacteria develop an ability to fight off the drugs that are used to stop them in their tracks. Illnesses that were once easily curable with antibiotics could soon become life-threatening, endangering public health and raising the specter of multi-billion dollar medical costs and economic losses.

But the solution is not as simple as just developing different, stronger types of antibiotics. Instead, antimicrobial resistance, or AMR, is a complicated challenge with both origins and impact in human health, animal health and our environment – and in the connections between all three systems. Solving such complex problems requires interdisciplinary research that brings together expertise from the molecular- to ecosystem-level.

That's why Iowa State has joined with the USDA Agricultural Research Service, Mayo Clinic, the University of Nebraska-Lincoln, University of Nebraska Medical Center and the University of Iowa in the new Institute for Antimicrobial Resistance Research and Education. The institute, based at Iowa State, involves a team of more than 100 researchers, educators, clinicians and extension personnel all dedicated to a "systems" approach that integrates better understanding of the biology of AMR organisms with our crop and animal agroecosystems, and social and environmental effects.

"Antimicrobial resistance touches each of us in our daily lives," said Paul Plummer, associate professor of veterinary diagnostic and production animal medicine at Iowa State, and executive director of the Institute for Antimicrobial Resistance Research and Education. "This new institute provides a great resource for the entire country as we work to build strong, collaborative research and educational programs to mitigate this risk."





GIFTS *at* WORK

EXTENDING IOWA STATE'S IMPACT THROUGH PHILANTHROPIC GIVING

(Continued from p.10)

“There’s more to it than just having collaborative research projects,” Phillips says. “In addition to a shared responsibility for using modern technologies and experimental methods in which each individual cannot be an expert, the Nanovaccine Institute includes a common vision to prevent and cure disease, and generate new approaches to understand complex systems related to human and animal health.”

Phillips’ research centers on the microbiome and antibacterial resistance, the latter of which is also the focus of a new national institute based at Iowa State. *(See sidebar p.11)*

Michael Wannemuehler, the institute’s associate director and chair of the veterinary microbiology and preventative medicine department, focuses his research on vaccine work as well as the host-bacterial disorders that influence diseases such as Crohn’s disease. He says students working within the institute’s complex talent pool will have more than a leg up when they graduate.

“The interdisciplinary research approach these students are being trained in will solve the health problems of the century – flu, tetanus, plague, parasites, neurological conditions,” he says.

Phillips says simply, “Our hope is that it will change the world for the better.” ■

“Globally, millions of children die because they do not receive booster immunizations. Single-dose vaccines would protect these children. Another area single-dose vaccines would impact is food animal medicine – improved animal health as well as reducing costs associated with administering booster immunizations to livestock species, especially pigs and cattle.

Michael Wannemuehler,
Associate Director, Nanovaccine Institute
Professor and Chair, Veterinary
Microbiology and Preventive Medicine

➤ **The place for blue sky thinking**

Rising on the Iowa State campus is the Student Innovation Center, slated to open in 2020 and supported in part by donors like Boeing, Land O’Lakes and HNI, with a lead gift of \$30 million from an anonymous alumni couple.



Photo: Chris Gannon

AT THEIR SERVICE

Helping create the welcoming environment for veterans at Iowa State are donors who, like all of us, value their service to our country.

By Steve Sullivan | Photo by Paul Gates



➔ Community spirit

Logan Dunn gets in the spirit at a recent Thursday Night Dinner hosted by the ISU Veterans Center.

GRACIELA ORANTES IS A WEST POINT GRADUATE who served nearly eight years in the U.S. Army, including deployments to Afghanistan and Kuwait. Logan Dunn served four years in the Coast Guard and can tell you stories about dramatic sea rescues.

Military service doesn't necessarily prepare you for college life, though. That's why Iowa State student veterans like Orantes and Dunn turn to the university's Veterans Center.

Established in 2012 and stationed on the third floor of the Memorial Union, the center is a "base camp" where student veterans connect and access services.

"Many in Iowa State's student veteran community are nontraditional by virtue of being older and having families and children," says Jathan Chicoine, Veterans Services coordinator and a former U.S. Navy SEAL. "They've had extraordinary experiences and come to college with additional responsibilities beyond earning a college degree."

Iowa State has more than 2,500 military-affiliated students, drawn, in part, by the university's strong ranking among military-friendly colleges. The ranking is based on the range of academic, financial and social support provided for student veterans.

Orantes, who is studying veterinary medicine, got a good indication of that support during her application process.

"I was overseas in Kuwait, in a totally different time zone, but the university worked with me to get my application completed. They were awesome," she says.

Once Orantes moved to Ames, where she now lives with her mother and sister, the Veterans Center was the second place she went after getting her university ID. Center staff helped her



➔ To soldier on

Transitioning from the military to college can be difficult for many a student veteran. Beyond their own service on behalf of our country, they often have loved ones who make sacrifices. For many wounded or disabled veterans, financial difficulties can hamper their desires to advance their education and careers.

Many donors wish to recognize the sacrifices made by student veterans like **Graciela Orantes** and their families through scholarships such as that established by Colleen Beaman Ellis, a 1966 Iowa State graduate in mathematics, or through funds such as the Veterans Community Gratitude Fund. In addition to the financial and programmatic assistance provided, these funds also convey to veterans and their families the heartfelt thanks of a grateful nation.

get military benefits and financial aid in order and provided funding from the donor-supported Veterans Community Gratitude Fund to assist Orantes with finances while she awaited scholarships.

The center also provides one-on-one academic coaching and educational workshops to help students with study skills, time management and exam preparation.

"These students have been away from the classroom setting for so long," Chicoine explains. "We want to leverage resources to remove the barriers to academic success. When we do, students perform remarkably well."

Dunn, a civil engineering major who lives in Ames with his wife, a nurse, is among the many student veterans to take advantage of the tutoring offered through the center.

"I spent four years not using anything other than rudimentary math. Trying to do calculus ... I might not still be here today if it weren't for tutoring at the center," he says.

The Colleen Beaman Ellis Scholarship for Veterans he received "helps me not have to worry so much about working extra jobs so that I can focus more on studying."

Because socialization is a key component of a successful transition process, the center has an annual meet-and-greet with student veterans, faculty and staff. A weekly dinner at a local church gives student veterans and their families a welcome opportunity to gather.

"We come from a collective culture where we look out for each other," Chicoine says. "We try to create that environment here." ■

SCENES OF CHANGE

With support from the Transforming Liberal Arts and Sciences fund, ISU Theatre sets out to engage us both on- and off-stage.

By Karol Crosbie | Photo by Paul Gates



➔ Rehearsal of fortunes

Practicing Offenbach's "Orpheus in the Underworld," Pluto (**Zachary Smith**) seals the fate of Eurydice (**Rayna Morano**).

THERE'S NEW ENERGY in the ISU Theatre program these days. Support from the Transforming Liberal Arts and Sciences endowed fund, established by an anonymous alumni couple, has inspired and empowered faculty and students to rethink their mission.

"We've taken a deep dive into who we are and who we want to be," says Brad Dell, director of ISU Theatre. "We're getting to the heart of why theatre matters. How are we using our gifts and passions to be engaged, responsible citizens within our community?"

Scene I

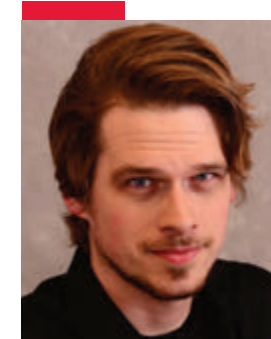
Evening rehearsal has begun for "It's a Wonderful Life: A Live Radio Play" in the program's Carver Hall practice room. Artist-in-residence Eglá Hassan, who has Skyped with the students and faculty for almost two months, is now on campus for six weeks, where she will direct the play and lecture in multidisciplinary classes. The extended residency, made possible by the Transforming LAS gift, contributes to the program's commitment to equity and diversity, Dell says.

Hassan can be seen sometimes taking a student aside for a private talk, or sometimes involving the whole group, as she digs into a character's motivation.

"Working with the students in this production is interesting because not all are theatre majors," she says, adding, "That's not a handicap, because the things they learn in a rehearsal or a production – the sense of empowerment – they will take that with them wherever they go."

Scene II

The curtain has fallen on the opening night of the music and theatre department's opera collaboration – Offenbach's rollicking "Orpheus in the



It's often difficult for people to see value in the arts and in training new artists. So I can't thank donors enough for believing in us as students and as future professionals, and trusting us with the power to change the world. Because that is what theatre is – the power to start discussion and change the world for the better.

CHRIS CULVER

Bachelor of Music 2017,
Bachelor of Arts 2018



Underworld." Hundreds of audience members have congregated in the lobby of Fisher Theater for refreshments and a reception to meet the cast and crew. Opening night receptions like this are a new part of the program's outreach, Dell says.

Among the group are students attending an ISU Theatre production for the first time. With the help of the Transforming LAS fund, performing arts majors were supplied with free tickets to introduce friends to a new experience. Freshman performing arts scholarship recipient Abigail Markus brought three friends – all engineering majors – to the production.

"They'll be back!" she says.

Scene III

This spring, Assistant Professor of Theatre Amanda Petefish-Schrag is collaborating with Iowa State's Office of Diversity and Inclusion and with local community partners to tell Iowa's immigrant stories. "Iowa Odyssey (Or How We Got to Here)" will be performed at Fisher beginning April 26, followed by various versions of the production being performed off-campus in local communities. The Transforming LAS fund, Petefish-Schrag says, is allowing the theatre program to research questions like "Where does theatre happen?" and "What are obstacles to participation?"

"We're connecting with our history as a land-grant university and with our unique position to be an innovator."

"We hope that our presence on campus is everywhere ... not just at Fisher Theater," Dell adds. "We've done pop-up performances in the library to help get out the vote, and for the ReAct exhibition series at the Christian Petersen Art Museum, because all of Iowa State's students are our students." ■



An energizing accessory

For Courtney Beringer, adding sewing to her wheelhouse wasn't as challenging as she expected it to be. Along with fellow senior in mechanical engineering Sam Vande Loo, Beringer spent the past three years working with Eulanda Sanders, chair of the department of apparel, events and hospitality management and Donna R. Danielson Professor in Textiles and Clothing, to develop and prototype a solar panel-equipped backpack.

"After conducting focus groups and online surveys, it was clear that students would use and benefit from a book bag with charging capabilities based off solar energy," Beringer says. The team then completed textile testing to determine the best fabric for a bag that needed to protect electronics but also function as a normal book bag. "Sam and I learned how to develop design patterns for the bag and sew – both oddly similar skills to engineering, it turns out."

With the help of recent AESHM doctoral graduate Chanmi Hwang and current AESHM doctoral student Bingyue Wei, the team has completed three prototypes of the bag. Beringer, a recipient of the Charles F. Frederiksen Leadership Award, is also starting the patenting process and, along with Vande Loo, received the 2018 International Textile and Apparel Association Undergraduate Student Best Paper Award.

IMPACT



Those indispensable things

Consider technology such as the cell phone or tablet: At first people were skeptical of their value. Now it's hard to imagine life without them.

Next to weave themselves into the fabric of our lives are emerging information systems technologies known collectively as the Internet of Things. IoTs are inter-connected, "smart" devices – from security systems we can adjust from our phones, to wearables like Fitbits that allow us to monitor our sleep patterns and set daily activity goals – promising to greatly improve the quality and productivity of our lives and of society.

At Iowa State, Sree Nilakanta, the Kingland Graduate Director of Business Analytics in the Ivy College of Business, and colleagues are exploring the adoption of IoT in agriculture. "Farming is becoming more data-driven and dependent on an emerging digital ecosystem," he explains. "Our research has identified the factors that contribute to the use of IoT by farmers."

In their study, the researchers wanted to know specifically farmers' views on their ability to manage their farm operations using IoT and on their relationship with a technology provider, and the perceived joint value creation. "The more general policy question was 'did the use of these technologies help create or enhance value for the farmer and/or technology provider?' We found that the use of industrial IoT was perceived to impact environmental sustainability – that is, better land use."

Understanding the dynamics involved in farmers and producers ultimately adopting these technologies is key; with IoT and big data applications poised to play a big role in ramping up global food production to feed billions in the coming decades, we may just find we can't imagine living without them.

IMPACT

Rolling 'clone

Double buck. Pulp toss. Underhand chop.

Perhaps you're wondering "Are these karate moves?" Nope. These are a few of junior Abby Zabrodsky's favorite competitive events at the annual Midwestern Forester Conclave, an intercollegiate timber sports competition. During her freshman year, Zabrodsky, who decided to partake in timber sports at the encouragement of her peers in the ISU Forestry Club, and her partner won first place in the logrolling event – an accomplishment she'd never dreamt of before arriving at Iowa State.

This past year, Zabrodsky participated on the co-ed and women's logrolling teams at Conclave and took home second place in both events, helping Iowa State secure third place overall. "Iowa State has really been making a name for itself as a competitive timber sports team," she says. "I'm glad I've had a chance to contribute to that."

Zabrodsky, a Dean's Leadership Scholar in the College of Agriculture and Life Sciences and recipient of the Elaine Boge Scholarship, notes that taking advantage of experiential learning opportunities – like competing at Conclave and studying at the Rod and Connie French Conservation Camp in Montana – has helped her confirm her ultimate career goal: to make an impact on the world's forests and connect people with the natural world.



Photo by Dan McClanahan



RECOGNIZING IOWA STATE'S MOST DISTINGUISHED

Please join us for Iowa State University's 2019 Distinguished Awards Celebration on Friday, April 26, at 2 p.m. in Benton Auditorium, Scheman Building. This year's honorees are:

ORDER OF THE KNOLL CORPORATION AND FOUNDATION AWARD:
Kent Corporation

ORDER OF THE KNOLL FACULTY AND STAFF AWARD:
David and Marianne Spalding

ORDER OF THE KNOLL CARDINAL AND GOLD AWARD:
Warren and Beverly Madden

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Dana and Martha Robes

HONORARY ALUMNI AWARD:
Labh S. Hira and Tahira K. Hira
Deborah J. Ivy

DISTINGUISHED ALUMNI AWARD:
Gary L. Griswold
Dr. DeRionne P. Pollard
Jonathan Rich

Details at isualum.org/dac

NOTABLE QUOTES

“Iowa State provided me with many great opportunities as a student. I was able to learn the basics of business and agriculture, meet many influential people and access the resources I needed to begin my entrepreneurial journey, especially through the Ag Entrepreneurship Initiative, where I received exceptional support.”

— Colin Hurd, a 2013 graduate in agricultural studies and business, who was recently named to Forbes’ 2019 30 Under 30 list for manufacturing and industry. He is founder and CEO of Smart Ag, a company he created in 2015 to help solve the growing labor crisis in production agriculture by commercializing autonomous farming solutions. While a student at Iowa State, he received numerous scholarships, including support from the Murray Wise Associates Agricultural Entrepreneurship Fund.



“Being able to fund my college experience through a number of scholarships makes me feel fulfilled knowing that I have not only put forth the effort to apply for them, but I have also done the work beforehand that makes me a candidate for the support. Pursuing a college degree, especially in a five-year program, is not a cheap endeavor. Having weight lifted off my shoulders due to both the monetary and organizational network support that accompanies each scholarship has helped me chase my goals head on.”

— Zoey Mauck, senior in landscape architecture and community and regional planning, who was named a 2018 Udall Scholar – one of only 50 students from across the nation chosen for leadership, public service and commitment to issues related to the environment or Native American nations. Mauck is a recipient of numerous other scholarships, including the Ray Wyrick Scholarship for Excellence, and is an avid cyclist with a mission to make communities more bicycle- and pedestrian-accessible.



“[Funding] the professorship was an easy decision for me, because out of all the classes I took at Iowa State, there was nothing better than being at the Ag 450 Farm. It really equipped me for my career. And once you get to know about this university and what it does, it’s just unbelievable, so it makes it easy for us to give.”

— Jim Frevert, a 1960 graduate in farm operation, who along with his wife, Clare, established the James and Clare Frevert Ag450 Faculty Fellowship, which is held by the professor-in-charge of the Ag 450 Farm – the only completely student-managed farm at a land-grant university in the United States. This past September, the farm celebrated its 75th anniversary.

ACCOLADES



A garden to feed the soul

Seventy percent of children with incarcerated mothers have emotional or psychological problems. At the Iowa Correctional Institution for Women in Mitchellville, about 62 percent of the roughly 740 women have children under the age of 18 and are incarcerated for an average of four and a half months – enough time to become disconnected from their families.

That’s why a team of Iowa State landscape architecture students designed and built the Children’s Garden at the correctional facility, which serves as a space where incarcerated women and their children can play, explore and strengthen their bond.

The design team sought to empower the women by engaging them directly with the project – a design theory known as participatory design. The women joined in focus groups and collage and model workshops, which enabled them to be fully involved in the planning of the garden. The incarcerated women and design team were also directly involved in the construction of the garden, from site grading to building a security wall, and learned a host of new skills along the way.

With support from donations to FundISU, the Iowa State University Foundation’s crowdfunding platform, the team was able to incorporate play equipment, seating, lighting and landscaping into their design, which would have otherwise been too costly to include.

Students from the College of Design have been involved in projects at the Iowa Correctional Institution for Women since 2011, and in addition to the Children’s Garden, the collaboration has resulted in a multipurpose outdoor classroom, a decompression area for staff, a healing garden for the special needs population and food production plots. In fall 2018, the team received the Student Community Service Award of Excellence from the American Society of Landscape Architects for their work on the garden, an award they also took home in 2015.

A LASTING TRUST

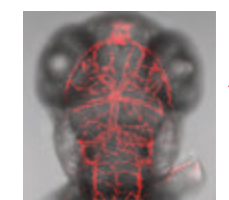
A trio of grants by the Roy J. Carver Charitable Trust of Muscatine, Iowa, will advance areas at Iowa State University that have previously benefited from the Carver Trust’s support.

A \$745,545 grant is already at work in the construction of the new zebrafish research facility in the Advanced Teaching and Research Building on campus, which will support gene-editing research and allow the pursuit of exciting new grant opportunities using the zebrafish model.

In addition, the Carver Trust has committed \$200,000 to support renovations that will transform Parks Library’s first floor into a hub for student services, while expanding collaboration and study space.

Lastly, a \$161,290 grant will support core facility instrumentation in the Office of Biotechnology with the acquisition of a wavelength-dispersive spectrometer, which will enable Iowa State to expand its materials characterization capabilities.

These grants demonstrate the Carver Trust’s commitment both to Iowa State over the long term – and to advancing scientific knowledge to improve human health and strengthening innovative learning opportunities for students throughout Iowa.



Researchers can activate fluorescent genes in zebrafish to cause certain tissues to glow, an indication their gene editing techniques are working as planned.



By Sylvia Bachmann
Photo: Paul Gates

THE WORLD ACCORDING TO SARAHBETH

Illustration: Evanny Henningsen

WAYS TO GIVE

➔ The Iowa State University Foundation can help you give a gift that moves lives forward.

Sometimes what could be viewed as a disadvantage actually provides a vantage never seen before.

WHEN ONE OF YOUR FICTIONAL HEROES IS Stargate's Colonel Samantha Carter, you learn a thing or two about overcoming adversity ... and making the world a better place. **Sarahbeth Barlas**, a fourth-year veterinary medicine student from Canton, Michigan, was diagnosed with double-deficit dyslexia during her first year of veterinary school, but she refused to give up her dream of improving the welfare of animals. Instead, the learning disorder has only expanded her view of the world.

Barlas, who received the Elfriede Apteker Scholarship and is a two-time recipient of the Dr. Sydney La Rue Scholarship in Veterinary Medicine, recently shared her unique perspective on learning, life and loving what you do.

On determination

"My double-deficit dyslexia is comprised of both auditory dyslexia and a short-term memory processing disorder (dysnomia). I have managed to keep up with my studies through sheer determination and learning some special study skills. Now I hope to serve as a model for other students with learning disorders."

On clubbing

"I love the ISU-CVM clubs as a way to round out my education, and I want to give a special shout out to the Veterinary Business Management Association, which addresses business and management issues.

These are skills that practicing veterinarians need, yet don't necessarily learn as part of the curriculum. The club has been invaluable and provides networking opportunities for my future."

On horsing around

"Having ridden horses through childhood, I had to stop working with them when I started college. But I continued my hobby of creating miniature custom tack for model horses, which I sell through my Summer Storms Studios. I am incredibly thankful for a hobby that allows me to use those years of experience as an excuse to make art and remain close to the amazing animals that inspire me."

On her "fishy" mission

"Animal welfare is my passion. I believe that veterinary medicine can educate pet owners on how to care for their pets, particularly pet fish. I want to widen the gap between neglect due to abuse and neglect due to ignorance. I love teaching and talking with people just as much as I love animals, and I think we can help reduce neglect cases with client communication. Forming those relationships and reaching for this goal is what gets me up every morning!"

You'll find Barlas's designs at www.SarahbethBarlas.com.

Maury Clark



"I came to Iowa State during the depression. My parents were farmers and had no money. I had to work my way through school, at one point holding three jobs while carrying a full academic load. Dot and I weren't interested in having our names on a building. It was the students walking through those halls we wanted to help. That's why we started our two scholarships – so students like I was won't have to work so much. They can have a life outside of class."

– **MAURY CLARK**, class of 1943, electrical and computer engineering. Clark and his late wife, Dorothy (class of 1944, home economics), established the Dorothy Avery Clark and Maurice R. Clark Scholarships for students with high financial need in the College of Engineering and in the College of Human Sciences. In 2018, Clark celebrated his 75th year as an Iowa State alumnus.

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Just how small is a *nanometer*?

Period at the
end of a sentence
**300,000
nanometers**

Thickness of
a dollar bill
**110,000
nanometers**

Human red blood cell
7,000 nanometers

E. Coli bacterium—
2,000 nanometers

Nanovaccine particle
300 nanometers

Flu virus
20 nanometers

Forward

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