Fall 2021

RESEARCH in the ROCK

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UA LITTLE ROCK

UA LITTLE ROCK | OFFICE OF RESEARCH AND SPONSORED PROGRAMS

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***Research in the Rock* is published yearly by the Office of Research and Sponsored Programs at the University of Arkansas at Little Rock**

ORSP Mission Statement
ORSP provides information, services, and support to members of the UA Little Rock community to enable them to compete successfully for outside funding to conduct scientific research; create works of art; compose music; write books and articles; improve their performance in the classroom; and better serve their students, professions, and the public.

Carnegie Classification
UA Little Rock is classified as an R2 doctoral research university by the Carnegie Classification for research universities. This classification describes "high research activity."

Member, University Research Magazine Association

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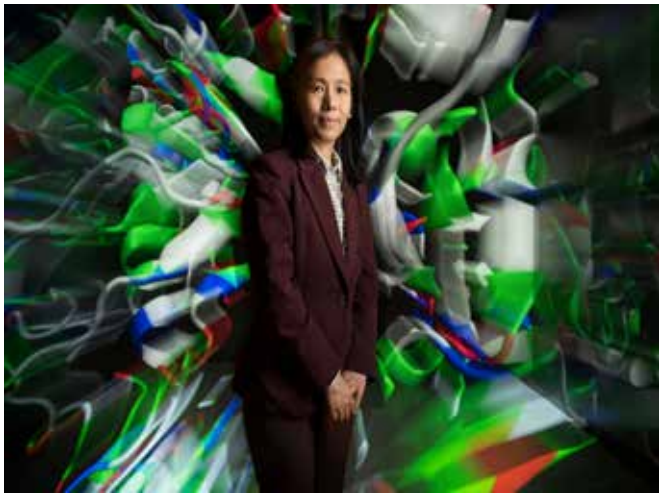

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RENEWING HOPE

In 2020, our campus had to drastically respond to enormous challenges. During that time, UA Little Rock researchers and community service leaders never stopped working to serve our community and find new discoveries to save lives during the pandemic.

Now as we try to move forward, our researchers and community service leaders are doubling their efforts to innovate and formulate new ways to help our communities, improve our infrastructure, grow our economy, and answer tough scientific questions.

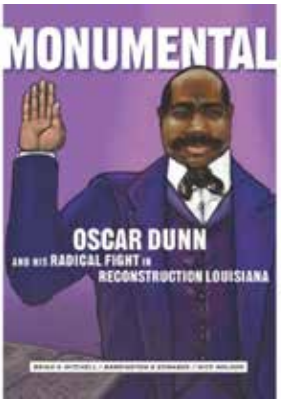
In this issue you will see how UA Little Rock is committed to improving lives in the state and beyond. Here, you will find students and faculty conducting research to stop hate crimes, prepare K-12 students for cybersecurity careers, improve data science curation and security, combat social media disinformation, and improve food agriculture. You will also find social work students actively gaining experience in the field to help children in the state while they earn their degree.

These projects are just a small part of the critical work our researchers and community leaders perform every day. Additionally, students presented their unique research projects digitally for the second year in a row at the Student Research and Creative Works Expo. As difficult as it is to change to a virtual format, UA Little Rock students stepped up to present their research using a myriad of digital tools. This is just one example of our students' diligence and grit.

As we continue to move forward in hope, we recognize that there are more questions to ask and problems to solve. Faculty and student researchers in 2021 are ready to expand their vision for a new future.

RESEARCH NEWS

Dr. Brian Mitchell Receives Phillis Wheatley Award for Graphic History Novel



On May 21, Dr. Brian Mitchell from the Department of History received the 2021 Phillis Wheatley Book Award for his first graphic history book, *Monumental: Oscar Dunn and His Radical Fight in Reconstruction Louisiana*. The story documents the life of Oscar James Dunn, the first Black lieutenant governor and acting governor in the United States.

The Phillis Wheatley Book Award is awarded to books published within the last five years that cover the topic of slavery.

Stuti Chatterjee Receives 2021 Whitbeck Memorial Award

Stuti Chatterjee, a Donaghey Scholar and chemistry and biology double-major, is the 2021 recipient of the Whitbeck Memorial Award. This award is given to an outstanding graduating senior.

At UA Little Rock, Chatterjee researched the use of nanodrugs for cancer treatment with Dr. Noureen Siraj. Additionally, she received two Student Undergraduate Research Fellowship grants and three Signature Experience Awards.

Dr. Bao Vang-Dings named 2021-2022 Public Policy Fellow

Dr. Bao Vang-Dings from the Center for Integrative Nanotechnology Sciences has been named one of nine 2021-2022 Public Policy Fellows by the American Association of Immunologists. In this role, Vang-Dings will learn and participate in the legislative activities of the Association.

Dr. Nitin Agarwal Receives Faculty Excellence Award for Research and Creative Endeavors

Dr. Nitin Agarwal, the Jerry L. Maulden-Entergy Endowed Chair of Information Science at UA Little Rock, is the 2021 recipient of the Faculty Excellence Award for Research and Creative Endeavors. This award is given to researchers at UA Little Rock whose research or creative endeavors are particularly successful and recognized locally, regionally, and nationally.

RESEARCH NEWS

SURF Award Recipient Wins Mural Competition for Ottenheimer Library

2021 Student Undergraduate Research Fellowship Award recipient Emma Chambers recently won a mural competition for Ottenheimer Library on the UA Little Rock campus. Chambers' mural received more than 750 votes. The 8-feet by 16-feet mural hangs on the west side of the library. Chambers is a junior majoring in fine arts.

Dr. Tansel Karabacak Discusses Hot Water Treatment Research at Arkansas Research Alliance Project Scope Presentation

On June 16, Dr. Tansel Karabacak, chair of the Department of Physics and Astronomy at UA Little Rock, spoke at the Arkansas Research Alliance Project Scope Webinar about his unique hot water treatment method to synthesize nanomaterials for a variety of energy, healthcare, and environmental applications. Karabacak became an Arkansas Research Alliance Fellow in 2017.

UA Little Rock Collaborates with Forge Institute and UA Fayetteville to Advance Cybersecurity Research

UA Little Rock is joining forces with the Forge Institute and the University of Arkansas, Fayetteville to advance applied research opportunities in cybersecurity and defending critical infrastructure. Dr. Philip Huff from the Department of Computer Science will collaborate with Dr. Chris Farnell, the managing director of the National Center for Reliable Electric Power Transmission testbed at the University of Arkansas, Fayetteville. The Forge Institute is an organization dedicated to advancing private-public partnerships in the area of cybersecurity and defense.

Srgt. Marilyn Thompson Publishes Essay on Experiences of Black Female Officers

Srgt. Marilyn Thompson from the UA Little Rock Police Department recently published an academic paper about the experience of being a Black female police officer. Her work, titled, "Triple Threat: Black, Female, With a Badge," examines her and other Black female officers' experiences on the job.

TURNING UP THE HEAT

Dr. Wei Zhao creates a new water filtration system using heat and graphene

Water filtration processes have become an essential practice throughout the world that allows communities to access clean, safe water. Traditionally, water is filtered using membrane filters that remove small particles and ions that cause contamination. As the demand for safe, clean water grows around the world, scientists are looking for easier, cost-effective ways to create water filtration systems.

Dr. Wei Zhao, professor of chemistry at UA Little Rock, is working to create an easier and more energy-efficient and cost-effective way to create these systems using layers of graphene, a single sheet of graphite shaped in a honeycomb-like structure. This nanomaterial is synthesized to create graphene oxide, which is graphene containing oxygen-bearing groups. Scientists have been experimenting with graphene oxide for alternative applications such as solar cells and capacitors.

Creating Layers

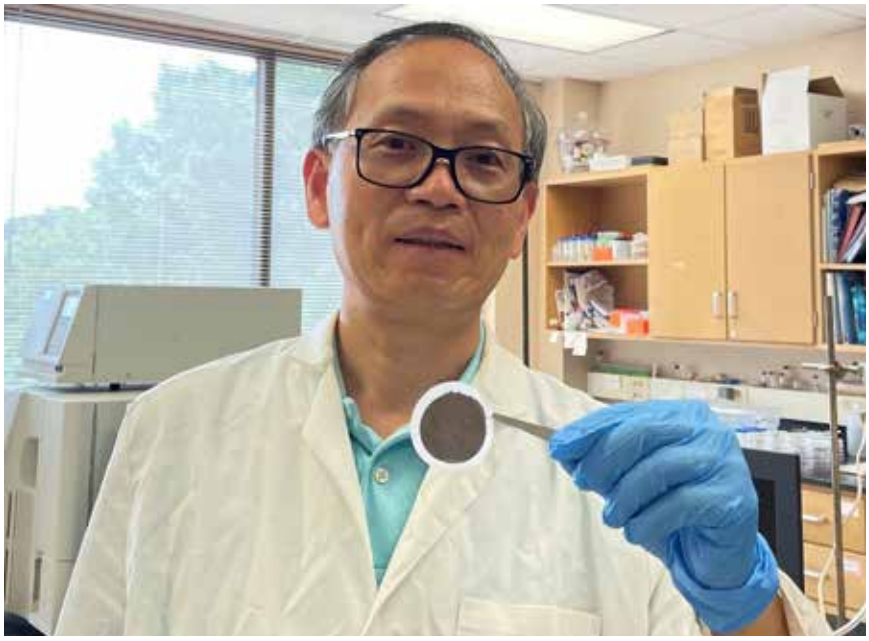
In this project, Zhao is stacking the layers of graphene oxide together to create a membrane for the water to pass through. But these layers have to be at a specific distance in order to let the water pass through and reject the ions. This measurement between layers is called the interlayer distance. When water is applied to the surface, the pristine graphene oxide expands and stops filtration because the interlayer distance becomes so large that ions and molecules can pass through. However, this interlay distance can be tuned to filter different types of contaminants. For many situations, the distance could be 1 nanometer. But for something like saltwater, the interlay distance would have to be around 0.7 nanometers. Because of this small distance, it is much harder to purify seawater to make it drinkable.

"So when it becomes a membrane, the natural question is, 'can we use it as a special material for filtering impurities in water?'" Zhao said. "Because when these layers are building together,...you can tune the distance between the layers, so how to control the distance between its layers is critical...so that is the idea. You contour the layer-by-layer distance and only water can go through and the ions are rejected."

Applying the Heat

In order to tune the distance between the layers and create structural stability, Zhao applies heat to the oxide. The temperature change affects it in a number of ways, so he has to discover the right balance that will create the most stable and robust filter. Applying heat to graphene oxide turns it into reduced graphene oxide (RGO), a material that has more carbon and less oxygen than normal graphene oxide. "So that is kind of the restoration of the structure of graphene," Zhao said. Additionally, in order to provide more structure to the membrane, Zhao applies a polymer, a synthetic material created by molecules, to make it stronger. Zhao explains that the temperature varies depending on the type of polymer used, but it can go up to 250 degrees Celsius.

"So the key is that you want to find out under which temperature you can get the best interlayer distance that meets your needs," Zhao said.



Zhao holding RGO Membrane

Student Collaboration

This project began several years ago when Zhao partnered with two doctoral students to try to use graphene oxide for filtration. But this idea was just a foundation, and was not enough for practical applications. So they applied for a grant from the NASA Small Business Innovation Research and Small Business Technology Transfer programs. These highly competitive federal programs are designed to encourage federal research that can lead to potential commercialization and bring together partnerships between private businesses and nonprofit research institutions. UA Little Rock has also provided Research Cluster Seed Grant and Signature Experience Grants. With these supports, they made extra steps to further understand how applying heat would make the filtration system stronger and more robust.

Throughout the history of this project, Zhao has invited students to work on it and learn the basics of research. As they move forward with their studies, they can take what they have learned and apply it to their own research. Currently, two doctoral students are working with Zhao on the project.

Zhao, who has been teaching and researching at UA Little Rock since 1999, devotes much of his time to helping students learn the art of conducting research. He is a mentor to several students in the Student Research and Creative Works Expo, an annual event that highlights student research projects. As his students move forward, he will be excited to see how they can take this project and make it even better.

Spotlight on Student Researchers: Ruby Trotter

Ruby Trotter is an undergraduate student researcher at the Center for Integrative Nanotechnology Sciences at UA Little Rock. She is a recipient of a UA Little Rock Signature Experience Grant, a program that awards students up to $1,000 to support a research project, creative activity, or community service project that is influential to their academic development.

What is your Signature Experience project?

We've been working with graphene, a nanomaterial that's promising for bone tissue regeneration technologies. Graphene is a single layer of carbon that is shaped in a flat sheet with a honeycomb-like structure and has several good biomedical properties. Graphene is tiny, so we mix it into a solution of water and ethanol to get it evenly dispersed. We have made scaffolds for bone tissue regeneration and want to see how graphene would interact with the human body. Right now, we're studying different pathways by which it would degrade the body, and are continuing to study how useful it would be for bone tissue regeneration in the future. Specifically, we're using microscopic images and ultraviolet-visible (UV-vis) spectroscopy to study how graphene interacts with cells in the immune system and how it degrades over time in the cells. The UV-vis technique allows us to see how light is absorbed as it passes through the sample. Based on that, we can tell the concentration of the graphene mixture in the cells. That way, we can see how much the concentration of the mixture dropped degraded over time.

What do you find most interesting about this project?

I really enjoy the fact that this project incorporates a lot of chemistry and biology. After I graduate, I want to become a physician, and what I'm learning right now contributes to that goal. I love chemistry, and I appreciate that I get to explore biology along with it. I also think nanotechnology is fascinating, because you can take small materials and do big things.

What is it like to work with your mentor, Dr. Shawn Bourdo?

It's really awesome to work with Dr. Bourdo. I started working with him in July 2019, the summer before my sophomore year. He's always been very supportive and outgoing. No matter his schedule, he always accommodates me when I have questions. Even though some of my classes aren't directly related to the work I do at the Center for Integrative Nanotechnology Sciences, I have found a lot of topics that overlap with the work I do, and he has always been there to help me understand these concepts better. I always say I hit the mentor jackpot with Dr. Bourdo.

How did you hear about the Center for Integrative Nanotechnology Sciences?

I didn't know much about nanotechnology when I first started here. Before my sophomore year, I was looking for research opportunities, and the previous student researcher under Dr. Bourdo reached out to me and told me about this position.

What are your plans after graduation?

I want to be a pediatrician and also enter the master of public health program, because I am interested in addressing health disparities in different communities. After graduation, I plan to take a gap year to work as either an emergency medical technician or a medical scribe to gain experience in the field. After that, I plan to enter medical school in 2023.

IMPROVING FOOD SECURITY

For several years, scientists have increasingly looked to nanomaterials that can improve plant growth and production.These tiny, unique materials can help farmers use less pesticides, increase food supply, and grow more nutritious food.

Traditionally, agricultural scientists have used low doses of carbon and metal-based nanomaterials to regulate growth and development of plants. This process is performed by either spraying the materials onto the plants/seeds or applied into the soil or hydroponics. However, scientists have questioned if these carbon or metal-based materials are toxic to humans and the environment, even though they are given in small amounts.

Dr. Mariya Khodakovskaya

Dr. Mariya Khodakovskaya, professor of Plant Biology and Plant Biotechnology at UA Little Rock, has spent decades investigating the use of nanomaterials in plant agriculture. She began her plant research journey in 1992. She received her Master of Science at Far Eastern Federal University in Russia and her PhD in Plant Physiology at the Russian Academy of Sciences. She then began teaching and researching at UA Little Rock in 2008. While at UA Little Rock, she has spent extensive time researching and investigating how nanotechnology can help in the regulation of plant production. In 2018, she received a $464,000 grant from the USDA National Institute of Food and Agriculture, AFRI program to investigate the environmental risks of using carbon-based nanomaterials in food agriculture. This project with the University of Arkansas for Medical Sciences and Texas A&M University is almost complete, but she is now expanding this research to find alternative sources to carbon-based nanomaterials.

"We are finalizing the 'Risk Assessment' project right now," Khodakovskaya said. "However, regardless of the outcome of this project, we are still looking for a more natural replacement to carbon-based nanomaterials."

Thanks to a $474,578 grant from the USDA National Institute of Food and Agriculture, AFRI program in 2020 she and Dr. Virginia Davis, Professor of Chemical Engineering at Auburn University and the Co-Principal Investigator of the project, will investigate if nanomaterials from organic sources can be effective at improving crop function and growth. More specifically, they are looking at nanocellulose particles. Cellulose is an abundant biopolymer found in a variety of plants. Cellulose nanofibers and nanocrystals are tiny cellulose materials found in plants including trees. These tiny materials measure approximately 160 nanometers in length, 5 nanometers in height, and 15 nanometers in width. They are also non-toxic, biodegradable, and renewable.

"This natural replacement may have similar bioeffects...but they should be bio-degradable, more renewable, and more friendly to humans," Khodakovskaya said.

Currently, Khodakovskaya and Davis have compiled extensive preliminary data that show the ability of these nanocellulose materials to absorb into plant cells. They gathered these data using a technique called confocal imaging.

This technique uses laser light to focus on a specific spot in the sample, rather than the entire sample at

once. At Auburn University, Davis will investigate how to modify the chemical processes in the nanocrystals so they can be the most effective at interacting with the plants. She will then send it to Khodakovskaya at UA Little Rock to test the nanocellulose particles on plants and plant cells.

Dr. Mariya Khodakovskaya's Student Research Group

At the time the project started, no published manuscripts have explained this type of project before. Khodakovskaya and Davis believe this novel research will greatly contribute to the field of green nanoscience, a practice that combines green chemistry, the effort to create chemicals that are not derived from toxic substances, and nanotechnology, the practice of using tiny materials for new scientific discoveries.

For this project to work these organic materials need to effectively deliver the necessary nutrients and nucleic acids to the plant cells. Nucleic acids hold all of the plant's essential information and details for them to stay alive. In order for this delivery to happen, the nanomaterials must break through the cell wall and enter into the plant cells. This delivery works perfectly with carbon nanomaterials. If the nanocellulose effectively breaks through the cell wall, it will be a perfect organic alternative. Khodakovskaya explains that using nanomaterials for crop growth will help stabilize crop production if the effects of climate change alter crop and food production in the future.

"If we are considering possible climate change very soon, then we will have much worse conditions to grow plants and much less possibility to enhance the productivity of the plants," Khodakovskaya said. "So we are looking for new technologies. But when we talk about technologies such as using fertilizers for growth regulation, or using genetic engineering, both of those technologies have limitations. But nanotechnology, we think, can help us overcome these limitations."

Using fertilizers, Khodakovskaya says, is very limiting because they are only sprayed on the outside of the plant. This does not enable the plant to fully absorb all the nutrients it needs to thrive.

Khodakovskaya and Davis' project is funded through the Agriculture and Food Research Initiative grant program from the USDA. The goal of this competitive grant program is to increase food and agricultural research in six areas: plant health and production; animal health and production of animal products; food safety, nutrition, and health; bioenergy, natural resources, and environment; agriculture systems and technology; and agriculture economies and rural communities. Their goal is to address pressures and constraints that affect natural resources, changes in climate, and food security.

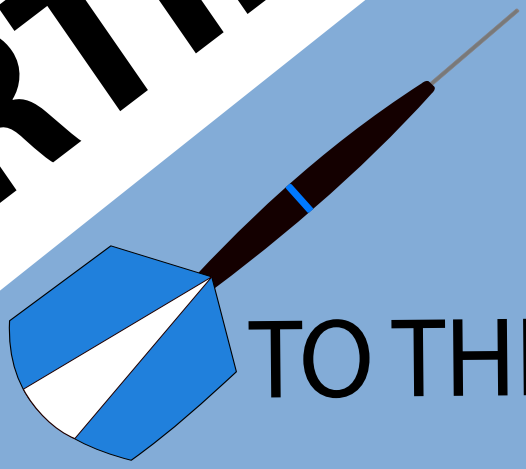
With a background in genetic engineering, plant biology, and nanoscience, Khodakovskaya feels prepared to tackle this important research question.

Combining her efforts with Davis' extensive experience in chemical engineering at Auburn University, she is confident that they will find the answers they need to create green alternatives that enhance crop productivity and health.

"It's great when I have [experience] in genetic engineering. Here, we are looking to use nanocellulose for genetic engineering purposes... also, my experience with carbon nanotubes is important because, during my work with carbon nanotubes, we were able to establish a few methods, (and understand) how to apply nanoparticles to the plants, how to really work with nanoparticles, and what to investigate..."

This work is supported by the USDA National Institute of Food and Agriculture, AFRI project 2021-67022-33995

DARTING



TO THE

FUTURE

Data and computer science are two crucial disciplines that are fast becoming the backbone of economies and businesses across the world. According to the Bureau of Labor Statistics, careers in science, technology, math, and engineering are expected to grow by eight percent, as opposed to 3.7 percent in other occupations.

With these data in mind, leaders in Arkansas are looking for ways to prepare the next workforce in the state for these imperative careers. A group of researchers are combining their efforts to create a statewide consortium that focuses on data and analytics research. This consortium will focus on education and industry collaboration to improve Arkansas's data and computer science-related research capability and competitiveness.

The Data Analytics that are Robust and Trusted project, called "DART," is a large-scale effort that focuses on education and research. The research side is divided into five thrusts that are related to data analytics.

The project is funded by the NSF's Established Program to Stimulate Competitive Research (EPSCoR). This program supports universities, industry, and local governments to build a sustained, robust research infrastructure in states that traditionally receive less NSF funding.

Data science is an emerging field that focuses on organizing and analyzing large amounts of generated data. This sector is becoming more important as the amount of raw data grows. These data can be used for making prediction models, discovering new trends, creating algorithms, and communicating information to the public visually using charts and graphs. Google's chief economist, Dr. Hal Varian, explains that data science will become an even more important skill in the future.

"The ability to take data—to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it—that's going to be a hugely important skill in the next decades," Varian said.

The DART program is a joint effort between UA Little Rock, the University of Arkansas, Fayetteville, the University of Arkansas for Medical Sciences, Arkansas State University, University of Arkansas at Monticello, Southern Arkansas University, Ouachita Baptist University, Philander Smith College, University of Central Arkansas, the University of Arkansas Division of Agriculture, and the Arkansas Economic Development Commission.

Drs. Nitin Agarwal and John Talburt are the principal investigators for the project at UA Little Rock. With them, Drs. Serhan Dagtas, Philip Huff, Mariofanna Milanova, Elizabeth Pierce, Jan Springer, Christopher Trudeau, Mihail Tudoreanu, Richard Wang, Ningning Wu, Xiaowei Xu, and Mary Yang are contributing to the project. Additionally, several graduate assistants at UA Little Rock are assisting with the research in the project.

Even though each research thrust focuses on a particular project, they are not insulated from each other. Each research thrust is relevant to the whole of the project, and researchers in the program can find inspiration and work in tandem with each other. The goal is not to create individual research projects, but to work together seamlessly to strengthen the data science infrastructure in the state.

Automating Data Curation

In one of the research thrusts, Talburt is working on a way to automate the data curation and clean-up process using machine learning. Traditionally, data scientists spend several hours cleaning and standardizing data as they receive it so each piece is formatted the same way in the system.

Dr. John Talburt

By designing automated systems that standardize data, data scientists can instead focus on building analytical models and forecasts.

"Every time people talk about data science they complain," Talburt said. "And their complaint is, well one complaint is there's not enough [data scientists], but the other complaint is even when they have a data scientist, they spend 80 to 90 percent of their time getting ready for analytics and they don't spend a great deal of their time on the actual analysis and building these analytical models because it takes so much time to do the data preparation."

In this thrust, Talburt is working more on theoretical research. On the practical application side, Dr. Dave Ussery from the University of Arkansas for Medical Sciences will use this automated system to curate genomic data.

"The goal of our thrust is to automate to the greatest extent possible the curation, we call it the preparation of data for the analytics," Talburt said.

According to Talburt, who worked at Acxiom Corporation for several years before joining UA Little Rock, manual data formatting is one of the most difficult processes of data curation and analysis.

Currently, the research team is finishing up the first year of the project. In the second year, they will focus on automating data governance, the process of managing data security and integrity. This issue, which is also a critical issue with data scientists, is especially important as more and more users use cloud computing services.

Creating a Better Social Media Environment

Agarwal, the principal investigator on the UA Little Rock portion of the project, is leading the social media and networks thrust that focuses on making the web a safer and productive place.

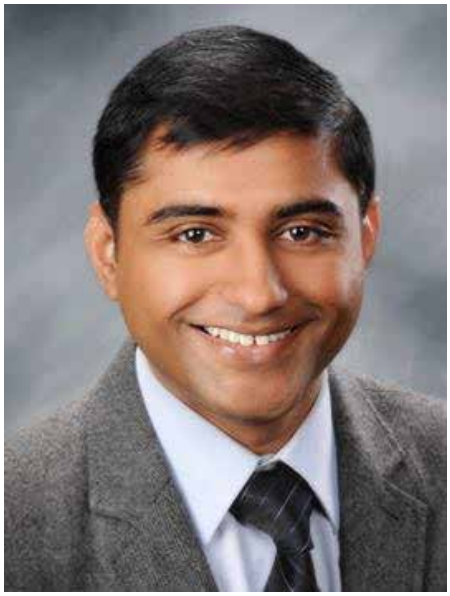
"The goal of the social media and networks thrust is to take data that is available on various social media platforms and develop efficient, reliable, scalable, accurate, explainable, reproducible, and theoretically grounded data science approaches that make the web a safer and [more] productive place," Agarwal said.

Agarwal and his team are developing socio-computational models to better understand malicious behaviors on the web, such as deviant network groups who use social media to advance disinformation.

Agarwal, who is the Maulden-Entergy Chair and Distinguished professor of information science and Director of the Collaboratorium for Social Media and Online Behavioral Studies (COSMOS) Center will address four critical problem areas along with other thrust members:

1. Mining cyber argumentation for collective opinions and their evolution
2. Social computational models for safer social media
3. Auto-annotation of multimedia
4. Informing disaster response through social media interactions.

"These four research directions within the social media networks thrust feed into each other. For instance, automated annotation of multimedia data affords scalability for computational models. Multimedia data from YouTube, Parler, TikTok and other apps comes at a high volume and velocity. Automated annotation is needed to match the speed at which data is coming with the speed at which it can be processed."



Dr. Nitin Agarwal

Additionally, Agarwal explains that informing disaster response through social media interactions feeds into the second critical area of the thrust, i.e., creating socio-computational models for a productive social media. In order to best inform the public about disasters or crises and relief operations, social media needs to be as accurate as possible

without the possibility of misinformation. "Misinformation during crises and disasters affect disaster relief operations," Agarwal said. " That is another way that these different research directions help each other." The social media and networks thrust will work with other DART thrusts such as social awareness, learning and prediction, coordinated cyberinfrastructure, and data curation.

"One of the biggest safety concerns for individuals emerges from the lack of privacy on social media platforms. The research team is breaking new grounds in developing privacy and security-aware approaches," Agarwal said. "Ensuring user privacy is at the heart of our research as we sift through vast amounts of social media data." An important aspect of their research effort is to enhance user's privacy and security by combating social hackers and spreaders of disinformation who use platforms for adversarial purposes.

A Better Future for Arkansas

As Arkansas continues to evolve from an agricultural and manufacturing based economy to a data-driven economy, the DART program will create better opportunities for researchers and educators across the state, which will propel the future workforce and help build a better society for all of us who rely more on technology and data in our lives.

"This project helps us connect all the brilliant researchers in the state in a collage-style image which really brings out the intellectual tapestry of Arkansas"

-Nitin Agarwal

EMERGING FROM THE SHADOWS

In 18th-century France, women's role in society was starkly different than today. At that time, women could not vote or hold political office. Generally, the best course of action for their health and well-being was to marry into a lucrative family.

This cultural view of women affected society's view of their intelligence. Because they were under the jurisdiction of male political leaders and male heads of household, women could not define their agency or craft policies and practices that best affected their future.

Louise Dupin was a unique figure who had an alternative view about the role of women in society. Married to an affluent landowner in an arranged marriage, Dupin held well-known literary salons for decades in Paris. These salons were social get-togethers where participants shared their writings out loud, debated philosophical and political topics of the day, and shared meals and drinks. Famous philosophers attended these salons.

Dr. Angela Hunter from the English department was introduced to Louise Dupin when she was studying famous French author Jean Jacque-Rousseau. When she first heard about the manuscripts, she originally thought they were by Rousseau when a friend tipped her off about them. As she started investigating, she discovered in an online database that they were not by Rousseau, but in fact by Dupin. After this discovery, she traveled to the Harry Ransom Center at the University of Texas, Austin, where she started investigating Dupin.

Finding the Missing Pieces

Since the manuscripts emerged in the 1950s, a number of researchers have attempted to find the pieces of Dupin's thoughts and ideas that have been scattered across the world. In the last few decades, several scholars aimed to put together an edition of the "Work on Women," the largest project Dupin undertook. Until recently, Dupin's philosophical work has been virtually unknown in the mainstream academic landscape. According to Hunter, some libraries and archives didn't always even list Dupin as author in their catalogs; in many instances, her works were filed under Rousseau since much of it was in his handwriting (although that is no longer common).

"That led to a kind of sexist erasure of Dupin in her own work, in her own major work," Hunter said.

Because Dupin's work was never published in its original French, it does not have an English translation available. Until the 21st century, only three small pieces of her "Work" had been published in French.

Hunter's first question when she learned of Dupin's major treatise was how history got to the point where you have to randomly stumble on these manuscripts, even if you have some knowledge of feminist philosophy or intellectual history of the period. While research about and attention to Dupin has begun to increase in the 21st century, including a biography, more work needs to be done to complete a more vivid picture of who she is and what she thought, and how her philosophy contributes to feminist scholarship now.

Dr. Angela Hunter

"This whole Louise Dupin project has this sort of almost curse. She never published it herself, then it was hidden away for over a century," Hunter said. Hunter further explains that a large trove of manuscripts of her writing came up for auction in the 1950s. The scholar Anicet Sénéchal attempted to catalog and organize these manuscripts to the best of his ability, but it was a massive undertaking that needed more time, and some of Dupin's writings to this day are owned by private collectors.

She discovered a professor who was already attempting to transcribe and organize all of her work in order to publish a complete edition. Hunter noticed her by finding little notes she wrote that were stuck into the folders of Dupin's manuscripts at the Harry Ransom Center. Hunter briefly worked with this researcher until her death.

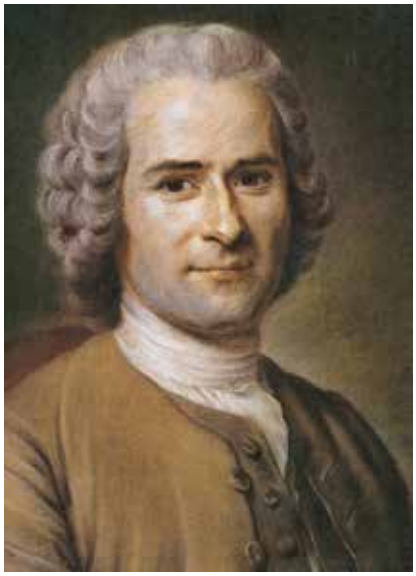
Louise Dupin

Based on her research in Texas, Hunter wrote an article in the publication Eighteenth-Century Studies about the history and importance of Dupin's writings. Dr. Rebecca May Wilkin, a French professor from Pacific Lutheran University who had also recently begun working on Dupin, contacted Hunter to express interest in undertaking a new project together. But translation is not the only important aspect of their work; they want to take selections and organize the edition of selections in a way that gives the most representative picture of her thought.

"We both understood how significant the *Work on Women* was and realized that it was missing from the discussion of both feminist philosophy and French Enlightenment philosophy," Hunter said.

In the meantime, Hunter received a fellowship from the former College of Arts, Humanities, and Social Sciences to travel to the Jean-Jacques Rousseau Museum in Montmorency, France, which holds a

large portion of his manuscripts. Here, Dr. Wilkin and one of her students had also transcribed a large number of manuscripts. Wilkin and Hunter joined forces to create a shared repository of their transcriptions. From this, they wrote a book proposal to publish selections of *The Work of Women* in English, which was accepted by Oxford University Press for its New Histories in Philosophy series.



Jean-Jacques Rousseau

Currently, Hunter and Wilkin are steadily working on the project, meeting regularly to research and translate. In 2020, they received a prestigious Scholarly Editions and Translation grant from the National Endowment for the Humanities. This grant, according to Hunter, will enable them to focus more energy on the project and submit it for publication in December 2021.

Addressing Inequalities

In the 1740s and early 1750s, Dupin wrote her thoughts on law, science, education, sexuality, religion, and the differences between men and women in her philosophical treatise, *The Work on Women*. While French culture at the time emphasized the vast differences between men and women, Dupin vehemently disagreed with the notion that the mental and physical differences between them were objectively scientific. The inequality between men and women, Dupin explains, was primarily due to education and customs, reinforced by laws and other discourses. Because women were not offered the same type of education, men and women were not on equal footing with each other.

Dupin's most radical idea may be that women and men were equal in the state of nature and that women in the past often had more legal rights than in Dupin's era, but gradually, over time, these were stripped away or lost. These facts were then twisted or ignored to support a view of women's natural and necessary subordination to men.

"[Dupin is saying] All of these men have not only been wrong, but they've on purpose tried to downplay women on every level intellectually and physically. And they've done it because they want to be seen as superior," Hunter said. "It's a kind of vanity. Especially in a time of supposed enlightenment, Dupin is shocked that these thinkers take for granted these discourses about men's superiority. She uses history, science, law and philosophy to put this narrative right, so she is writing both within and against the tradition."

Dupin also discussed her ideas to change marriage contracts and laws in order to uphold women's agency and power over their assets. She believed that the marriage institution was the most glaring example of injustice against women in her time. She even argued that marriage contracts should be set in fixed timeframes where the couple would renew several times over their lifetime.

The last section of Dupin's work addressed general customs and morality, including contemporary views of women at the time in areas like language, everyday conversations, and plays and novels. The total work spans 47 chapters, as best can be determined. Hunter and Wilkin have about 39 chapters available to them. Two chapters are in private hands, two are unknown, and two are in rough draft form.

According to Hunter, while Dupin was radical in regard to female equality, she was not as radical when it came to social and economic equality. She upheld and benefitted from the numerous divisions in society.

"It's interesting because she's really radical when it comes to questions of gender equality and not so radical when it comes to social or economic equality. So she seems to believe that a stratified society is useful. Does she think it's necessary in some ways? She suggests that. It's as if she thinks there needs to be a monarchy or an aristocracy or something like that; in other places, she's more what we would

call democratic, more interested in the idea of the republic....she especially thinks that marriage should be based on the ideals of a republic."

Relationship with Rousseau

In 1745, Dupin hired a then unknown Rousseau as her personal secretary. It was during this time that she would audibly share her thoughts and he would transcribe them on paper. This was how Dupin's manuscripts would be confused later with Rousseau's since many of them were in his handwriting.

Hunter says you can see how they worked together just from the original working manuscripts.

"In the manuscripts you can see their working relationship: often we have an early draft of a chapter written in Dupin's messy hand," Hunter said. Then [you can see] a later copy of the same material in Rousseau's writing in the right-hand column and Dupin's hand intervening with deletions, and new or modified text in the left-hand column; then we may also have a completely clean copy in Rousseau's hand, with Dupin's changes made."

Even though Rousseau later became famous, he was considered below her in social standing. Despite this, Rousseau and Dupin became lifelong friends. He worked for Dupin until 1751, and around this time wrote his first philosophical work. Hunter points out that Rousseau gained a good deal of knowledge completing research tasks for Dupin.

In his autobiography, Confessions, Rousseau briefly describes his early relationship with Dupin. He traveled to Paris with very little money. He spoke to a priest who suggested he introduce himself to women of high society, including Dupin. Following his advice, he met Dupin and began working for her as her secretary and son's chaperone.

Succumbing to Peer Pressure

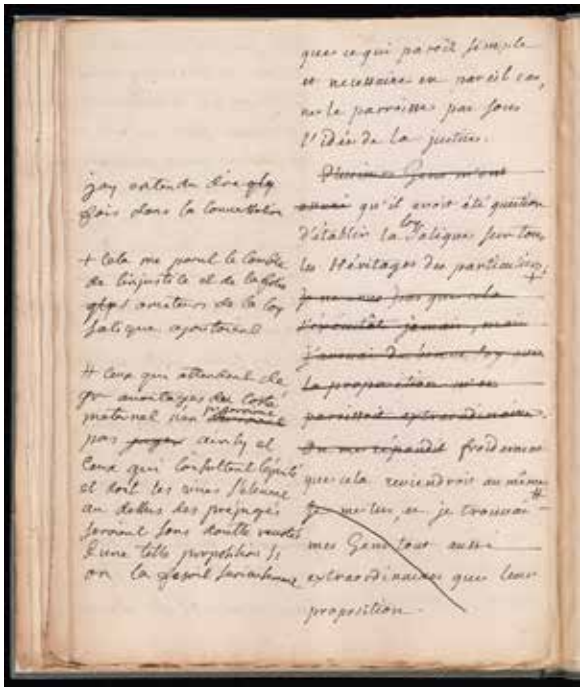
It is unknown why Dupin didn't completely finish and publish her draft. Hunter believes this partly stems from the fact that the writer Montesquieu viciously attacked her and her husband because they published an anonymous critique of his recent work at the time.

Hunter also thinks Dupin thought twice about publishing this work because of how it might affect her social status at the time. How would society view her if she published these radical ideas about gender equality full of critiques of centuries' worth of work by men?

Future Recognition

For Hunter, the most important aspect of this project is making Dupin's work known, available to the public, and easy to find in academic databases that contribute to feminist, philosophical, and historical bodies of knowledge. This recognition will shed further light on the unique contributions of women in the 18th century for other academics.

"In five years, not that she will be widely known, but if you go to look at Enlightenment philosophy or feminist philosophy in history, you'll be able to find her," Hunter said. "You won't have to go looking for Rousseau. You won't have to type in weird keywords. It will be there under these rubrics: under political philosophy, feminist philosophy, Enlightenment philosophy. I think that's just great."



Manuscript page from chapter 28 of The Work of Women, titled, "On Salic Law."

Beinecke Rare Book and Manuscript Library, Yale University

EMPOWERING CHANGE

For undergraduate students, it can be difficult to see how their college experience can effectively change the world around them. But when mentors give them the opportunity to use their skills to produce good in the world, they can seize opportunities that can in turn affect the trajectory of their future careers and the lives of others.

Dr. Tusty ten Bensel, director of the School of Criminal Justice and Criminology and the Justice Research and Policy Center, and Dr. Robert Lytle, assistant professor in the criminal justice department, are currently guiding undergraduate students into the world of research and application. Thanks to a nearly $325,000 grant from the National Science Foundation, they are establishing a three-year project to help a select group of criminal justice undergraduates conduct research on anti-Muslim hate crimes in Arkansas.

The project began when ten Bensel and Lytle started a summer research camp that introduced students to the process and intricacies of research that prepare them for graduate school. Ten Bensel and Lytle started this program because they witnessed how intimidated undergraduate students were at conducting research. They wanted to take out the intimidation and show students how their unique ideas and research can affect change for their communities.

The origins of this research summer camp began when ten Bensel and Lytle were working on a paper that investigated hate crimes against special populations. While working on this research, they discovered that there wasn't much research out there on Anti-Muslim hate crimes. They then realized that this specific research question would be perfect for their students in the summer program.

For criminal justice studies, students have a lot of opportunities to find ways to improve lives for all Arkansas citizens. Arkansas is one of a few states that does not have anti-hate crime legislation. Traditionally, any reported hate crimes in the state are deferred to federal authorities, but no state-level sanctions are in the books. Because of this deference, Lytle explains, the state does not have a mechanism to extensively track hate crimes in the state.

"Not having that kind of system in place to track this information in the state because you don't have a clear, defined law enforcement definition for beyond what the FBI uses, what it means is that we may have at best, inaccurate, at worst, tragically underestimated estimates of the amount of hate crimes that are happening in the state," Lytle said. "So part of what we also hope to be able to do in doing some of these interviews and surveys and things like that over the course of this multi-year project is also get a sense of the scope of the problem."

"That is also one of the unique things about Arkansas that we highlighted, ten Bensel said. "And the [NSF] reviewers were like, 'yes, this study needs to happen now, and it needs to happen where you are at.'"

According to the FBI's most recent Hate Crime Statistics report, Muslims are the second-largest targets of religious hate crimes in the United States, behind Jews. Anti-Muslim sentiment increased exponentially after the Sept. 11, 2001 attacks in New York City, Washington, D.C., and Pennsylvania. Over the past 10 years, anti-Islamic offenses have consistently increased. In 2016, 381 anti-Islamic offenses occurred, which doubled from 2011. Several scholars believe that a number of anti-Muslim hate crimes go unreported.

Dr. Tusty ten Bensel

Ten Bensel and Lytle explain that many Muslims are not aware that actions toward them are considered hate crimes, due to the fact that they may become desensitized and believe that their experience is just a part of life. Uncovering Muslim experiences in the state could help policy makers and the general public enact change that creates a safer environment.

"If they've grown up here in the United States, they've been experiencing it for years now, and so they kind of just shrug it off," ten Bensel said. "And even those that are new to Arkansas, they just don't want to cause any trouble...this is just a part of life here. One of the purposes of this study is to

provide exposure, like, these types of behaviors that you experience are not acceptable and are not experiences to shrug off. So the outcome of this project could have a number of practical and policy implications..."

"When we say harassment, we're not only talking about verbal harassment, which does happen quite a bit," Lytle said. "We're also talking about things that would make people very, very uncomfortable." An example he used for causing discomfort would be a person stalking someone to the door of their house because they believe they could be dangerous." The goal of this project is for students to gain a deeper understanding of anti-Muslim hate crimes in the state. To do this, they need to use methodological techniques to uncover the scope and magnitude of Muslim experiences and discrimination.

This program is funded by the National Science Foundation's Research Experience for Undergraduates funding opportunity. This grant program allows universities to create research opportunities for undergraduate students. Each student in the research program must focus on a specific research question and work closely with a faculty mentor.

The program will run for three summers that last eight weeks at a time. In the first part of the program, students will learn how to conduct sound criminal justice research by synthesizing data, understanding ethical research practices, and focus on Islamophobic experiences. After these intensive workshops, they will interview 15-30 Muslims in the community, asking them to explain their experiences while living in the state. In the second year, they will distribute surveys to a larger population of Muslims in the state.

The interviewees must be older than 18 and be a resident of the state for at least six months. In the second year of the project, students will collect the questionnaires and transcribe interviews. Additionally, students will interview law enforcement and policy makers about their views on hate crime legislation. In the last few weeks of the project, students will finalize that research and give presentations on their findings.

Overall, students in the program are eager to work on this subject. Some students who are planning to pursue their PhD want to take the research they've done and apply it to their graduate studies. When ten Bensel and Lytle first received funding for the project, they immediately received requests from students to join the project.

"As an educator, it's always very rewarding to see that, when students are coming and saying, 'I think what you're doing is really worthwhile. How can I contribute?' They're willing to get into the field and collect the data," ten Bensel said. "I think we've had a positive response from students. They understand that this is a critical issue, a very present issue, a current issue, and so I've seen some good and enthusiasm."

This project is funded by the National Science Foundation under award number 2050161. Any opinions, findings, and conclusions or recommendations expressed in this material are of those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Dr. Robert Lytle

Spotlight on Student Researchers: Chance Melby

Chance Melby recently graduated from UA Little Rock with a degree in computer science and a minor in information assurance. While a student at UA Little Rock, Melby worked with Dr. Philip Huff in the Cyber Arena, a cloud-based cybersecurity education platform that teaches K-12 students a variety of cybersecurity subject areas to reinforce security learning objectives and develop the skills needed to protect the nation's critical infrastructure.

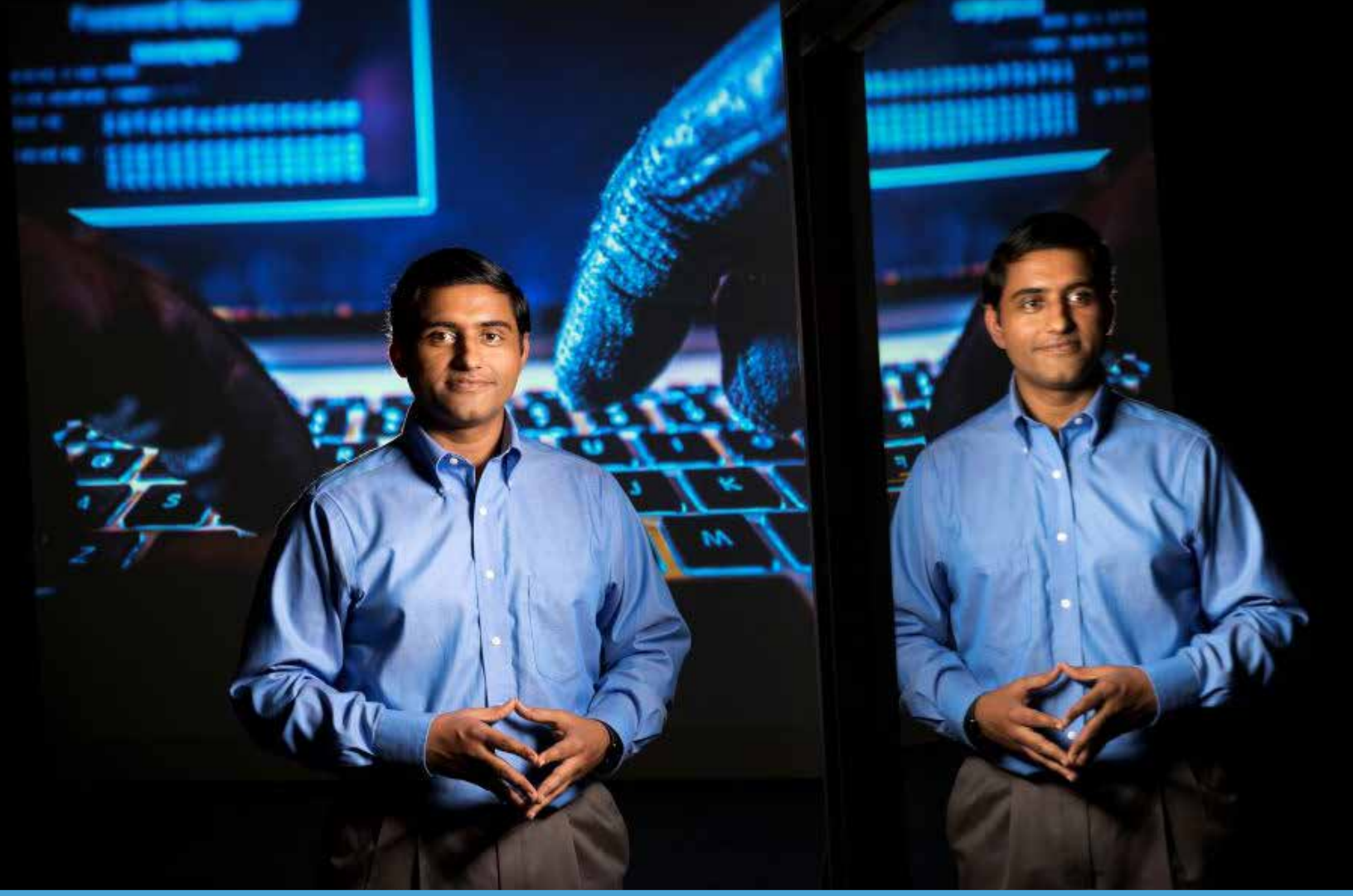
What is your research project?
My project is called "UA Little Rock Classified: An Intentionally Vulnerable Web Application Focused on Teaching K-12 and Undergraduate Students About Web Application Security." Essentially, it's web application that students can interact with and receive hands-on experience with different web security mechanisms, vulnerabilities, and exploits. Also, this project allows students to further their engagement and learn more about web application security in a fun and safe environment. With this project, our hope at the Trojan Cyber Arena is to prepare them to be future cybersecurity professionals.

How does this project work?
This project is within the Trojan Cyber Arena, a Google Cloud project that provides massive scalable cybersecurity labs for K-12 students. Through it, UA Little Rock: Classified is deployed as a Google Cloud Run App that allows students to access the web application anywhere from the cloud. UA Little Rock: Classified teaches young students about the different security mechanisms, vulnerabilities, and exploits that goes with web application security through instructional scenarios that are provided through the Trojan Cyber Arena and in elements of the web application. It's called "UA Little Rock Classified" because there is an instructive scenario attached to it that involves fictional Trojan Cyber Arena employees who are trying to secure classified flags, but do a horrible job at it, hence the vulnerable web application. In different scenarios, the student is tasked with finding those flags through different cybersecurity methods such as exploiting a vulnerability or configuring a security mechanism. Once they have done that, they will receive the 'classified' flag and check it through the Trojan Cyber Arena assessment and complete the scenario and workout.

How many schools do you work with?
As I work with the Trojan Cyber Arena and it's projects, the workouts go out to over 450 students across 80 Arkansas schools. We primarily work with Virtual Arkansas, who reach out directly to the schools.

What is it like to work with your mentor?
Philip Huff is amazing. He's my primary advisor, my mentor, my professor, and my boss. He has taught me a lot of different skills for cybersecurity and even computer science, too. Essentially, he's given me the knowledge and the opportunity to work with Arkansas students and cybersecurity.

What are your plans after graduation?
Currently, I have a temporary position as an intern for the Arkansas Electric Cooperative. After the summer internship ends, I will look for a permanent position in cybersecurity. I'll also be pursuing several information security certification exams.



FINDING THE TRUTH

During the COVID-19 pandemic, misinformation about the virus and vaccinations ran, and continues to run,rampant. Even the most careful media consumers are finding it harder to identify disinformation. We asked Dr. Nitin Agarwal, the Jerry L. Maulden-Entergy Endowed Chair and Distinguished Professor of Information Science at UA Little Rock, to help us better understand this growing global problem. Agarwal is the director of COSMOS, the Collaboratorium for Social Media and Online Behavioral Studies. COSMOS was established as a designated research center at UA Little Rock in 2020.

Social media is being used more than ever during the COVID-19 pandemic. How has this affected people's understanding of the pandemic?

The COVID-19 misinfodemic is an emerging social cyber threat. Because misinformation has dramatically escalated due to the pandemic , it is called infodemic or more specifically, misinfodemic. Tracking misinformation can be extremely difficult because it can originate in the dark corners of the internet with almost negligible consequences for the perpetrators.

Because we can't "lock down" the internet, individual platforms must actively work to keep disinformation off their sites. Social media and retail companies like Facebook, YouTube and Amazon have tried to stop the spread of misinformation by hiring trust and security workers, who do their best to monitor flagged content, watch out for suspicious activity, and suspend bad actors who are spreading misinformation or trying to profit off of the pandemic. But because information spreads like wildfire on the internet, it is becoming too difficult for these workers to catch this content.

Many studies have reported that misinformation travels faster than its corrective information, and the more questionable the misinformation is the faster it travels, as our social circles tend to be larger online than in real life. So, if someone shares or retweets a piece of misinformation, wittingly or unwittingly, they expose all their virtual friends to the content as well, who can then share it with their extended online network, and so on.

What types of pandemic disinformation have you seen this year?

Being a global and rapidly evolving crisis, the nature of disinformation is also extremely diverse and fast-moving. While they share similarities with other disinformation campaigns (e.g., anti-NATO, anti-US, anti-EU, anti-West in the Indo-Pacific region), COVID-19 disinformation campaigns have their nuances, such as global and regional narratives and a range of topics (health, policy, religion, geopolitical affairs, etc.).

Like in other cases, monetization, hysteria, and political agendas are the main motivations for spreading COVID-19 disinformation. For instance, Russian state media is pushing the conspiracy theory that the virus is manufactured by the western elites to suppress the poor (a classic example of hysteria propagation); Chinese state media is pushing the conspiracy theory that the U.S. Army created the virus to halt the Chinese economy. Additionally, scammers use fake websites to sell fake masks and cures in order to ask for private/sensitive information by posing as government websites.

However, there is a significant difference between COVID-19 and other disinformation campaigns that we have studied before. Other disinformation campaigns are typically specific to an entity, event, region, election, or military exercise. However, disinformation about COVID-19 has both global and regional narratives. While fake masks and cures affect a global audience, the regional narratives, such as promoting medicines for bovine coronavirus as a cure for human coronavirus, affect a targeted group or region--in this example, rural/agricultural regions. Moreover, COVID-19 disinformation ranges from health to policy to religion to geopolitical affairs.

It seems like we're fighting an uphill battle in regard to the amount of disinformation we see. How can governments, businesses, and citizens be more proactive in this fight?

With funding from the National Science Foundation and Department of Defense, COSMOS developed a COVID-19 misinformation tracker tool (https://cosmos.ualr.edu/covid-19) to enable detection, investigation, mitigation, and education about cross-platform COVID-19 disinformation campaigns and scams. We also partnered with the Arkansas Office of the Attorney General on this project, as the data it generates is of great interest to both national and local policymakers. Our efforts demonstrate that researchers coordinating with policymakers make a difference, especially when that coordination is ongoing.

Our experience with previous disinformation studies over the last decade helped us develop new methodologies to handle the unique challenges presented by COVID-19 disinformation. We have developed a three-pronged approach. First, we are using our social network analysis and cyber forensic methodologies to identify new cases of fake websites, misinformation content and bad actors. Second, we believe in educating people so that they are self-reliant, because we might not be able to detect all possible cases of misinformation. We go through identified cases and prepare a list of telltale signs of fake websites and stories; this regularly updated list is available on our website, cosmos.ualr.edu/misinformation.

Third, we collaborate with the online community by allowing people to submit suspicious information that they have come across to us; we then vet the submission for potential disinformation using our research-based models.

This is not a one-time process. We repeat it every day to capture as many new cases as possible and raise awareness. This is a complex problem, and COSMOS is glad to be a part of the solution.

How is disinformation affecting the vaccination effort?

Misinformation about vaccines has raised vaccine hesitancy. False narratives, such as cells from dead fetuses being used in vaccine production, whether vaccines are halal or not, Bill Gates embedding tracking chips in vaccines, and vaccine nationalism (vaccines from one country being better than the other), are raising hesitancy among people and, in turn, adversely affecting vaccination effort. Our COVID-19 misinformation tracker has captured many such outlandish claims. Science-informed awareness and health communication policies need to be embraced more to lower vaccine hesitancy or anti-vaccination beliefs.

How can social media evolve to create a better environment for discourse and information?

In order to create a healthier internet, users, platforms, and policymakers must all work together and do their part. The global COVID-19 pandemic has revealed severe limitations in our systems, from science to technology to policy. However, every challenge also presents opportunities to improve. We have conducted substantial research with support from the National Science Foundation and Department of Defense to study how misinformation spreads, how hate speech or toxic discourse spreads, who are the key actors and groups involved in spreading misinformation and hate speech, and what happens when such malicious actors and groups are suspended from online social networks.

These studies have already been accepted for publication at prestigious journals, including Elsevier's Information Processing and Management and Springer's Social Network Analysis and Mining. Through these studies and our work with the Arkansas Office of the Attorney General, we have demonstrated that social media companies and policy makers can remarkably benefit from science-based decision making.

Spotlight on Student Researchers: Stephanie Gilchrist

Stephanie Gilchrist is an undergraduate student researcher at the Center for Integrative Nanotechnology Sciences. A mechanical engineering major, she is a recipient of the UA Little Rock Signature Experience, a program that awards students up to $1,000 to support a research project, creative activity, or community service project that is influential to their academic development.

What is your Signature Experience Project?

We are working on creating hydrophobic and antimicrobial surfaces using materials technology and surface technology. An antimicrobial surface is a surface that kills bacteria. A hydrophobic surface is a self-cleaning surface that repels water. It works similarly to beads of water on leaves.

What inspired you to work on this project?

I began this project right when the COVID-19 pandemic started, so I was inspired to find a way to create self-cleaning surfaces. I am excited to see how this project can be applied in real life and help people keep surfaces clean, especially in hospitals.

What is it like to work with your mentor, Dr. Ganesh Kannarpady?

Dr. Ganesh is wonderful. He's has really guided me with coming up with this project and applying for the Signature Experience program. Because of him, I am able to have my name on a paper before I graduate, which is wonderful. I am also grateful to other researchers who contributed to this project and helped me: Ahmed Hashoosh, Malik Muhi, and Molly White.

How did you hear about the Center for Integrative Nanotechnology Sciences?

I was looking for a job, ideally related to my field. My friend was working for them at the time and persuaded me to apply. Dr. Alexandru Biris, the director of the center, is the coolest. He fosters a wonderful family-like environment of everyone helping everyone. I think anyone interested in working in a research environment should talk to him.

What are your plans after graduation?

I am interested in the business side of mechanical engineering. This summer I will begin an internship with Southwest Power Pool, a nonprofit electric utility company in Little Rock. I hope to work there after I graduate.

ADAPTING TO CHANGE

For the second year in a row, the UA Little Rock Student Research & Creative Works Expo has been held virtually through the digital event management app Whova. Traditionally, this event has been held in person at the Jack Stephens Center on the UA Little Rock campus. In 2020, however, event organizer Dr. Jeremy Ecke, Director of Student Research, had to quickly adapt to a virtual event when the COVID-19 pandemic started in March.

While April 2021 looks better than April 2020 in regard to the pandemic, this year's expo still needed to be held virtually as we entered April 2021. This year, students and mentors created their presentations on YouTube and linked them to Whova. The event also included live presentations, chat boxes for attendees to speak with presenters, and a photo gallery. The online event was live from April 16-23, 2021.

Each presenter works with a mentor faculty member who helps them formulate their projects. In the expo, they are judged based on the quality of their presentation, uniqueness of their research, ability to summarize problems and findings, and the soundness of their methodology. This year, over 130 graduate and undergraduate students participated in the event.

When the expo opened on the first day, Ecke was impressed by the students' presentations. "As I viewed projects today, read abstracts, and joined live sessions, I was struck by the depth and breadth of the intellectual and creative work we are all engaged in," Ecke said. "I have spent several hours at the event today, and I know I need many more days to take it in."

As society slowly begins to open this year, Ecke plans to eventually return to an in-person event once it is safe to do indoor events again. But he also sees how the virtual events have given the committee and students new opportunities to grow and adapt.

"I also hope that we will take some of the lessons we've learned from the virtual presentations and use some of that going forward," Ecke said. "Not all of this has been for the ill. I think we've learned ways of adapting that are going to be helpful in our future research and collaboration, internationally even."

In an op-ed in the Arkansas Democrat-Gazette, Vice Provost for Research and Dean of the Graduate School Dr. Brian Berry shared his enthusiasm for the expo. "As I made my way through the virtual platform this year, I began watching the many videos that students had created detailing their projects," Berry said. "Once again, I was amazed by their creativity, dedication, and professionalism. These students represent the primary mission of UA Little Rock, while their projects represent a seminal learning experience that cannot be duplicated in the classroom."

GRADUATE WINNERS

Engineering
1st Place: Awaad K. Al Sarkhi

Title: "Building a Data Washing Machine for Unsupervised Entity Resolution of Unstandardized References Sources"

Humanities
Honorable Mention: Mackenzie Nunnally

Title: "Women in Ceramics: Forms of Femininity"

Life Sciences
1st Place Tie: Ashley Esparza and Quinshell Smith

Title: "Localization and Functional Characterization of Dictyostelium discoideum Rab32c"

"Nanostructured Antibacterial Aluminum Foil Produced by Hot Water Treatment against E. coli in Meat"

2nd Place: Qingfang He

Title: "Molecular Mechanisms and Anatomical Development of Transfer Cells"

3rd Place: Ilham Kadhim

Title: "Up-Regulation of Osh6 Boosts an Anti-Aging Membrane Trafficking Pathway Toward Vacuoles"

Physical Sciences
1st Place: Zach Smith

Title: "Calculating the Urban Contribution of Surface Water Quality through Cl and 87Sr/86Sr Mixing Models within the Fourche Creek Watershed"

2nd Place: Thuy Le

Title: "Conductive Thin Film Characterization"

Social Sciences
1st Place: Melissa Herrington

Title: "Image-Based Sexual Abuse and Non-Consensual Intimate Imagery as Intimate Partner Violence"

UNDERGRADUATE WINNERS

Creative Works

1st Place: Cristie Armstrong

Title: "The Album Keeper"

2nd Place: Logan Sellen

Title: "Goodbye: An Exploration of Death and Grieving in a Time of Separation"

3rd Place: Andrew Chun and Caleb LeFevre

Title: "From Campus Tree to Campus Table"

Economics

1st Place: Josiah Johnson

Title: "Estimating the Impact of Small Businesses on Crime in the Local Community"

2nd Place Tie: Aleigha Smith and Maximilian Holzmueller

Title: "NBA and the Tax Problem"

"Detecting Plant Diseases with AI"

Education

1st Place: Sarah Carlat

Title: "The American Canon is Outdated"

Engineering

1st Place: Elias Perez Reyes

Title: "Crossbow Loading Mechanism"

2nd Place: Chance Melby

Title: "UA Little Rock Classified: An Intentionally Vulnerable Web Application Focused on Teaching K-12 and Undergraduate Students about Web Application Security"

3rd Place: Phillip Bryan

Title: "Continuous Improvement Web Application"

Humanities

1st Place: Jaelan Nelson

Title: "The History Behind Lorraine Hansberry's Famous Play A Raisin in the Sun"

2nd Place: Lindsey Carl

Title: "The Mermaid Hunter"

3rd Place: Alyia Goudeau

Title: "Beyzus: The Duality and Complexity of the Nature of Beyoncé Giselle Knowles"

Life Sciences

1st Place Tie: Avery McLean and Tram Nguyen

Title: "The Future of Agricultural Herbicide Regulation: The Biological Evaluation"

"International Response in Regard to Impending Glyphosate Regulation"

2nd Place Tie: Gabrielle Roberts and Mataya Duncan

Title: "Enzymatic Studies of F104G SaMTAN Mutant Enzyme from Staphylococcus Aureus"

"Active Transport Processes of Dictyostelium discoideum Rab32C"

Physical Sciences

1st Place: Hannah Krehbiel

Title: "Novel FRET-Based Ionic Materials for Bio Imaging Applications"

2nd Place Tie: Tripti Shukla, Stuti Chatterjee, and Kajal Desai

Title: "Refolding of S. Aureus MTA Nucleosidase to Analyze Biological Activities"

"Tunable Sized Combination Nanodrugs Based on Ionic Materials"

"Revisiting the Chemical Stability of Molybdenum Disulfide Membranes"

Third Place Tie: Lauren Langmaid and Mariela Saavendra-Duran

Title: Studies in the Hydridic Reduction Reactions of Alkynyl Hydrazones via Sigmatropic Rearrangement to Form Allenes"

"Carbon Storage in Fourche Creek Wetlands"

Honorable Mention: Hayley Turner, Shannon Bione, and Shiraz Atif

Title: "Ouch! Determining Factors that Affect Kidney Stone Growth, Formation, Mineralogy, and Morphology"

"Dirt on the Street: Environmental and Health Impacts of Urban Road Dust"

"Cigarette Litter-Derived Carbon Materials for the Adsorption of Dye Pollutants from Water"

Social Sciences

1st Place: Landon DeKay

Title: "Community Issues in Little Rock: The Interplay of Religion, Politics, and Income"

2nd Place Tie: Savannah James and Alex Corrales

Title: "The Effects of Political Party Issue Focus"

"Statute of Limitations Reform: A Window of Hope"

FINDING AN ALTERNATIVE

As medical marijuana continues to gain more acceptance in the medical community, pharmaceutical companies facing new competition from medical marijuana may strategically adjust the marketing of their products to physicians and medical providers. Currently, medical marijuana has been legalized in 36 states and the District of Columbia. Even though it is still a federal crime to be in possession of marijuana, federal authorities have generally allowed legal distributors to operate as long as they follow state guidelines.

In 2009, the federal government released "The Ogden Memorandum," a document that stated that federal funds would not be used to prosecute marijuana users who adhered to state medical marijuana laws.

This new landscape has created new questions for the medical community, especially pharmaceutical companies who traditionally market medicine directly to physicians. Dr. Rhet Smith from the Department of Accounting, Economics, and Finance at UA Little Rock is working with Dr. Thomas Lebesmuehlbacher from Xavier University to investigate how medical cannabis has affected the direct-to-physician marketing process for pharmaceutical companies. This type of marketing, called "detailing," is a process where a pharmaceutical representative meets one-on-one with a doctor to provide extensive information and research about their particular medications.

To conduct this study, they obtained detailing records from the Open Payments database by geographic region to see how pharmaceutical companies are re-tooling their marketing techniques. They also examined whether direct-to-physician marketing strategies change in areas where dispensaries are easily accessed.

In the United States, direct-to-physician marketing is a lucrative business. In 2016, $20 billion was spent on direct-to-physician marketing. This is also a unique facet of American business, as pharmaceutical marketing is not allowed in other countries. According to a 2019 NIH-funded study, medical marketing increased from $17.7 billion to $29.9 billion between 1997-2016. Direct-to-physician marketing increased from $15.6 billion to $20.3 billion.

"What this paper tries to do is connect multiple strands of literature. We look at the literature that has evidence that people are substituting away from prescription drugs following medical cannabis legalization, to suggest that maybe they're moving away from those opioids to medical cannabis, as well as the literature that shows that there's this positive relationship between the amount of marketing, or detailing or gifts that these doctors receive, and how much they prescribe that drug."

Essentially, Smith explains, are pharmaceutical companies changing their marketing techniques in areas where more doctors are prescribing medical marijuana? Additionally, do these companies encourage or discourage medical marijuana use?

"We find detailing is generally unresponsive to medical cannabis legalization," Smith said. "This is likely reflective of a market with strong patient preferences and a small number of doctors that actively recommend cannabis for medical use."

According to Smith, doctors in general are receptive to the idea of recommending cannabis to their patients, but statistically, they rarely prescribe this form of treatment. Smith believes that doctors in general are hesitant because it is such a new form of treatment for their patients. Experience is the best way for doctors to gain knowledge of treatments and medicine, and currently doctors don't have much experience with such a new form of treatment in the traditional medical setting.

"Doctors aren't going to prescribe something they don't know about, and they don't know whether it's effective at treating something until they learn," Smith said. "There is a risk-aversion that protects and benefits patients. They don't want to prescribe something that may not help their patients get the best care."

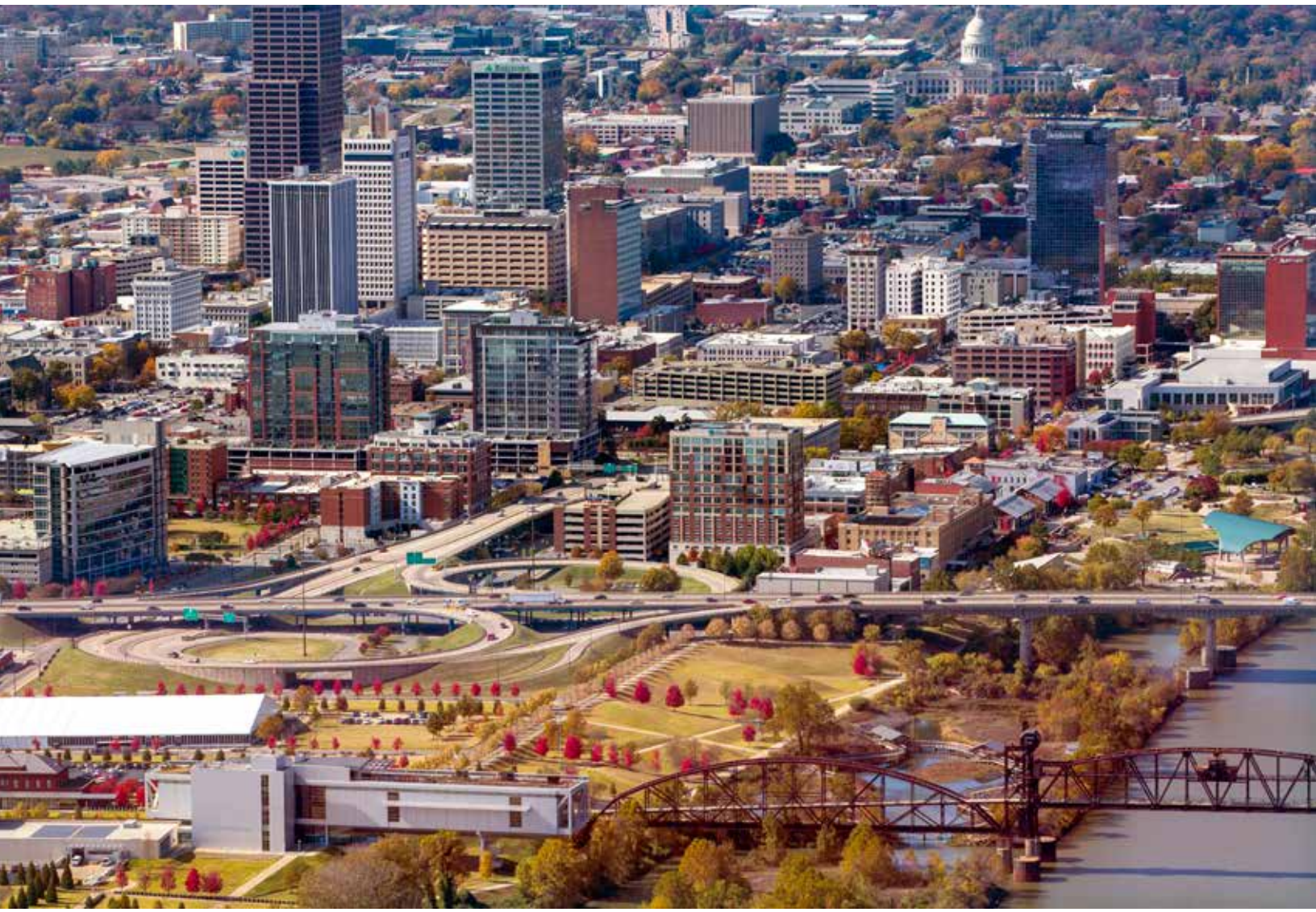
Cannabis has been found to be effective for treating disorders such as chronic pain, post-traumatic stress disorder, and side effects from chemotherapy treatments.

Smith predicts that the medical marijuana industry will continue to expand in the medical marketplace, especially as health officials continue to look for alternatives to opioids, which have come under fire for their high addiction rates and abuse. This problem was the main motivation for Smith's research on this topic in the beginning. He wanted to see if states that legalized medical marijuana saw a reduction in opioid abuse.


Dr. Rhet Smith

"And so the research tends to find that these opioid-related overdoses have been declining as medical cannabis is legalized, or in states that have legalized medical cannabis," Smith said. "So there's this negative relationship. And so what we were trying to do is see if there's a positive relationship between detailing opioid prescriptions and a negative relationship between medical cannabis and opioid abuse."

In Arkansas, the medical marijuana landscape has slowly opened up. Even though voters approved marijuana legalization for medicinal purposes in 2016, it wasn't licensed to be sold at dispensaries until 2019. Part of this delay pertained to establishing the medical marijuana infrastructure, which includes a system for creating medical ID cards, establishing policies and protocols for doctors, patients, and dispensaries, and creating registration procedures. As medical marijuana usage and acceptance expands throughout the United States, the medical industry will continue to evolve to accommodate for its uses.



BUILDING THE ECONOMY

In the higher education landscape today, students are looking for ways to specifically acquire skills that they can immediately apply to a successful career. Universities are actively looking for ways to craft course options that are relevant to skills that businesses are looking for. Students want to ensure that their educational opportunities match the skills that businesses desire.

The UA Little Rock campus is uniquely situated in the state's capitol city at the intersection of commerce and government. In this unique environment, UA Little Rock students can find opportunities to maximize their education and job experience.

This setup is especially helpful for students searching for careers during the economic distress from the COVID-19 pandemic. The economic effects of this event has increased the need to create opportunities for students to acquire skills that will put them in well-paying and stable jobs. This need is especially great in the city of Little Rock. In February 2020, the unemployment rate for the Little Rock-North Little Rock-Conway metro was 3.2 percent. At the onset of the COVID-19 pandemic, the unemployment rate increased to 11.2 percent and slowed down to 8.8 percent by June 2020.

The Arkansas Economic Development Institute at UA Little Rock is strategically finding ways to assist residents in the city, and eventually residents in other areas in Arkansas, who have been impacted by the economic downturn. Thanks to a grant from the U.S. Economic Development Administration, the institute is creating the University of Arkansas College Workforce Response and Training Center.

This three-year collaborative project will provide data-driven solutions to pinpoint and identify what skills that businesses in the city are needing and align curriculum and training to those needs. Additionally, they will identify citizens who have lost their jobs due to the pandemic and align their skills and interests with the skills businesses are seeking. This funding from the Economic Development Administration is from the CARES Act that helps with economic recovery from the COVID-19 pandemic.

This program includes the following institutions: UA System of the Vice President for Planning and Development; the University of Arkansas at Little Rock; the University of Arkansas at Monticello; Phillips Community College of the University of Arkansas; University of Arkansas Community College at Hope-Texarkana; University of Arkansas Community College at Batesville; Cossatot Community College of the University of Arkansas; University of Arkansas Community College at Morrilton; University of Arkansas Community College at Rich Mountain; University of Arkansas Pulaski Technical College; UAM College of Technology - Crossett; UAM College of Technology - McGehee; and, the Arkansas Economic Development Institute.

Phillips Community College of the University of Arkansas: Stuttgart, Arkansas

Photo Credit: Arkansas Deaprtment of Parks and Tourism

University of Arkansas at Rich Mountain

Photo Credit: uarichmountain.edu

"We are building a data structure...where we're interacting with the different major businesses to try to identify where the jobs are, what type of skillsets are needed, etc. We're kind of building a database," Jim Youngquist, executive director of the institute said. "At the same time, we're building a database where we're identifying, through the community colleges, the chambers of commerce, people who may have those skillsets or who may have the capability of being retrained."

Youngquist wants to especially focus on the economic development surrounding the UA Little Rock campus in southwest Little Rock and the 12th street corridor, which was one of the hardest hit areas economically during the pandemic. Currently, the per capita income for this area is $19,621, which is significantly lower than the state average at $25,635 and national average at $32,621.

After the Response and Training Center is up and running in Little Rock, the institute will turn to other colleges and universities in the University of Arkansas System across the state to implement this system in their communities. But Youngquist said this will allow opportunities for UA System schools to work together to offer their unique curriculums. If a community college in another town offers a course that the training center identifies as a need in Little Rock, a teacher from that community college can travel to offer a specific training to students in the area.

Many community colleges in the state specialize in specific areas. For example, the University of Arkansas Community College in Hope-Texarkana offers a power plant technician program. The University of Arkansas Community College in Morrilton is the only nationally certified welding program in Arkansas. Bringing this expertise to Central Arkansas will allow unique opportunities for students. Additionally, teachers at UA Little Rock will travel to other communities involved in the program to offer courses that students would not otherwise have access to.

"What we did in Little Rock will be replicated statewide through the home districts of the seven community colleges and the UA [Monticello] training centers," Youngquist said.

This program will not be limited to only current students at campuses across the University of Arkansas System, but also anyone in the state who is looking to build their skills to get jobs. Additionally, these programs will serve companies in the state who want specific programs for future and current employees.

Youngquist believes that this project will take a lot of effort to be successful, but the collaborative effort between UA Little Rock and other University of Arkansas schools in the state will play an impactful role to enhance economic opportunities to all Arkansans in the state.

"It's going to be quite an undertaking, and I think it's great that UA Little Rock is able to play a role in this," Youngquist said.

The Arkansas Economic Development Institute is housed in the College of Business, Health, and Human Services on the UA Little Rock campus. They provide applied research, economic analysis, disaster preparedness training, technical assistance, and economic development training to advance economic development in Arkansas.

Emma Chambers' mural located in Ottenheimer Library

MAKING WAVES

Five UA Little Rock students received funding from the Arkansas Deaprtment of Higher Education's Student Undergraduate Research Fellowship (SURF). This competitive program allows students to develop their own unique research projects under the supervision of a faculty mentor.

Shannon Bione: Dirt on the Streets: Environmental and Health Impacts of Road Dust

Mentor: Laura Ruhl
Area of Study: Environmental Geology

Shannon Bione is investigating how the contaminates in road dust can affect the ecosystems and organisms in the Little Rock Metropolitan area. In order to do this study, Bione will collect road dust from several locations in the area and perform experiments to see how the dust will interact with surface water, lung fluid, and gastric fluid. Bione hopes to better understand the environmental impact on the plants, animals, humans, and water quality in Little Rock.

Emma Chambers: Seeking Balance: Painting and Moss Preservation

Mentor: Ricky Sikes
Area of Study: BFA, Painting

Emma Chambers will develop at least three large figurative and landscape paintings that combine Chinese ink painting, oil painting, and moss. In these paintings, Chambers will create a sense of unity and balance by using two different media and cultural styles, such as western organic material and eastern technique and design. The overall focus of these paintings is to show the effects of climate change and how we interact with our environment.

Hannah Krehbiel: Novel FRET-Based Ionic Materials for Bioimaging and Optoelectronics Application

Mentor: Noureen Siraj
Area of Study: Chemistry and Spanish

Krehbiel will be developing an inexpensive approach to developing compounds with Forster Resonancy Energy Transfer (FRET) properties. FRET-based materials can potentially create several applications in the bioimaging, optoelectronics (such as solar panels and LEDs), and sensing fields.

Luav Patel: Enzymatic Analysis of Three PFs Homolog MTANs of Borrelia burgdorferi from Escherichia coli

Tripitaka Shukla: Enzymatic Analysis of MTA Nucleosidase from Borrelia burgdorferi

Mentor: Shanzhi Wang
Area of Study: Chemistry and Biochemistry

Patel and Shukla are researching how to isolate and target specific enzymes that are found in B. burgdorferi, the bacterium that causes Lyme disease. Currently, drug resistance to B. burgdorferi has surged and new strategies are needed to combat the disease. Patel and Shukla will purify and characterize the MTAN enzymes and determine inhibitors against the bacterium.

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CREATING SAFE ENVIRONMENTS

Child welfare social work is a unique profession that helps children and families thrive and live emotionally, physically, and mentally healthy lives. These specific social workers are tasked with the enormous responsibility to decide what is best for families and children. This responsibility can be especially difficult at times, as children in vulnerable situations can be assigned to different households, family members, or put into foster care.

Even though this career is so essential, child welfare social workers can be put in many difficult situations. In many instances, they have a huge caseload due to understaffing. Even though social work is a fast-growing career field according to the Bureau of Labor Statistics, these caseloads can cause a high turnover rate. According to Casey Family Programs, the largest foundation for improving foster care in the United States, the annual child welfare caseworker turnover rate for the average state from 2003-2015 was 14-22 percent.

According to a 2013 report from the U.S. Department of Health and Human Services Children and Families, child maltreatment reporting in Arkansas is 72.9 per 1,000 children, much higher than the national average of 47.1 per 1,000. Arkansas' rate is also significantly higher than in neighboring states, such as Texas (28.2 percent), Missouri (56 percent), Oklahoma (63.2 percent) and Louisiana (37.7 percent).

The National Child Welfare Workforce Institute (NCWWI) is a federal program designed to help and support current and aspiring social workers with educational opportunities, internships, and workshops. Funded by the U.S. Department of Health and Human Services, NCWWI is designed to build and sustain the child welfare workforce by improving recruitment, retention, worker satisfaction, stability, and training.

Dr. Stephen Kapp is the co-Principal Investigator for the NCWWI program at UA Little Rock. Housed in the School of Social Work in the College of Business Health, and Human Services, the NCWWI program is a joint partnership between UA Little Rock and the Child & Family Services division at the Arkansas Department of Human Services (DHS), led by Director Mischa Martin. Students in the program receive a stipend to work part time at the Arkansas DHS office and enroll full-time at UA Little Rock. This partnership allows students to gain on-the-ground experience in child welfare. In addition to the stipend, students receive funding for tuition and book expenses. The NCWWI program at UA Little Rock is one of seven NCWWI programs in the country.

The program emphasizes each student's strength and their ability to uniquely use their talents to grow in their career as child welfare social workers. "Generally, the program is to solidify the workforce in child welfare.," Kapp said. "We take their skill set, and combine it with a degree in social work, Kapp explains that social workers not only need adequate theoretical training, but also extensive experience in the field. This is one reason why some social workers quit, Kapp said. They have the degree, but they don't have the experience to handle the day-to-day life that child welfare social work entails.

Dr. Stephen Kapp

"It's pretty intense work," Kapp said. "It's not something you should waltz into...it takes a real commitment...not only does it take knowledge, skills, and abilities, but you have to have a real commitment to the families that you work with."

The coursework in the program goes over specific ethical situations, theoretical frameworks, policy and law practices, and a broad theoretical perspective on family dynamics and interactions. These theoretical perspectives help give a better understanding on best practices when making tough decisions for children and families.

"In child welfare, you face these really hard decisions," Kapp said. "Do you leave the kid at home? Do you pull the kid out? Do you leave the kid at home with their parents? Do you pull one of the parents out? There's a lot of ethical circumstances that you face when they're in that type of practice. We have a code of ethics that we spend a lot of time on with students, where it gives them a roadmap for working through these types of dilemmas."

In addition to the coursework, students in the program will intern under a social worker at DHS that will help them integrate what they have learned in real life situations.

"All the academic components of the program are integrated into the internship," Kapp said. "So whatever courses you're taking, there's a lot of emphasis on how this course material relates to the concrete things you're going to do."

Shana Love is a student in the program and finds that the program is helping equip her for this unique vocation. "If your passion and your goals is to help these families and be there for the long run, and to make a difference with DCFS, then go for it," Love said. Diamond Adams also believes that the program helps her view social work and child welfare in a unique light. "I got to see DHS from a different perspective," Adams said. "I got to see what happens when children come out of the home and those resources that they need. In that internship we were able to go out into the community and find those resources."

The NCWII program offers courses both online and in-person, so anyone across the state can enter the program and intern at their local state DHS office. This program not only helps students become good social workers, but also opens the door to leadership opportunities down the road.

Overall, this program emphasizes the fact that everyone plays a role within their unique gifts and talents. Everyone has to work together to create a safe environment for children in the state.

"From the investigation, all the way up to the health services unit, to the case worker, to the attorney, there's a step," Love said. "Everyone has a place and a part that matches together. And I think that's the benefit and the advantage I have coming into the program."

FINDING A CURE

Despite numerous advances in cancer research, this form of disease, and other types of complex diseases, wreak havoc on millions of people worldwide every day. The American Cancer Society estimates that 1,898,160 people will be diagnosed with cancer in 2021, 17,980 of those cases being in Arkansas. While cancer deaths have declined over the years, it is still a prevalent issue in our society.

Dr. Mary Yang from the Department of Information Science is working with the Midsouth Bioinformatics Center at UA Little Rock to develop deep learning methods by using data to identify key cell networks. Funded by the National Institutes of Health, Yang and her research team extract data to learn more about how cancer cells are developed and how they travel through the body. Big data is a term that describes the process of extracting and analyzing large amounts of complex data.

In this project, Yang uses genome sequencing, a process that investigates the way DNA is ordered in an organism. By using big data techniques to decode the DNA, the research team can pinpoint exactly what types of medicine can target cancer cells. Additionally, they can understand how cancer and other complex diseases can develop in the body, giving researchers a better understanding of how they work and what treatment plans will be best for the patient.

Yang explains that this type of investigation and treatment is better than the traditional method of cancer discovery because it focuses on a single cell, rather than searching through a complex amount of good and bad cells. In a way, traditional treatment is like finding a needle in a haystack, while single-cell genomic sequencing immediately targets that bad cell.

"Even a tiny tissue…it consists of hundreds of thousands of cells," Yang said.

Out of the hundreds of thousands of cells, it can be difficult to immediately find the cancerous cells.

"Because of that, the cancer is harder to treat," Yang said. "One of the reasons is attributed to heterogeneity, so cancer is cell-diverse. So the treatment in our study, based on those average measurements, you can see that could create issues. So you can say as of today, the majority of cancer still lacks a cure."

The research team uses open-source data from research databases such as the National Institutes of Health to conduct the study. The Genomic Data Portal from the NIH National Cancer Institute is a robus, detailed database that allows researchers to download cancer data for analysis and research purposes. Any data produced from research funded by the National Institutes of Health must be reported in this database.

Yang and her research team use the repository to analyze, integrate, and sequence the data using powerful computers that can handle large amounts of this complex information. Bioinformatics is a unique interdisciplinary field that combines computer science, biology, information science, mathematics, and statistics to analyze biological data to better understand and treat diseases.

Yang enjoys inviting students to work on this project and allows undergraduate and graduate students to work with her in the lab. This collaboration allows students to gain real-world research skills that can propel them for research positions in biomedical science.

The Midsouth Bioinformatics Center is a joint effort between UA Little Rock and the University of Arkansas for Medical Sciences that merges medical and information science to provide extensive bioscience computational resources and training to faculty, staff, and students in the region.

Yang has spent several years applying her unique approach to cancer research. She received her PhD in Computational Science in Biological Physics and Master of Science in Experimental Solid State Physics from Purdue University. She received her Bachelor of Science in Applied Engineering Physics from Hunan University in China. In 2017, she received two research awards and was elected to the board of directors of the Midsouth Computational and Bioinformatics Society. Additionally, she is a fellow of the International Society of Intelligent Biological Medicine. In 2019, Yang received the UA Little Rock Faculty Excellence Award for Research and Creative Endeavours.

Research reported was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number R15GM137288. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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