Spring 2023

RESEARCH in the ROCK

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PRESERVING A LEGACY

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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."

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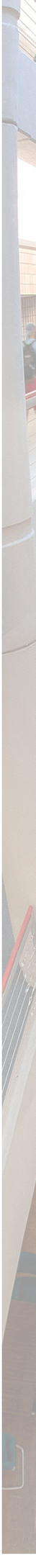
Cover Photo: Ruby Trotter, student researcher at the Center for Integrative Nanotechnology Sciences



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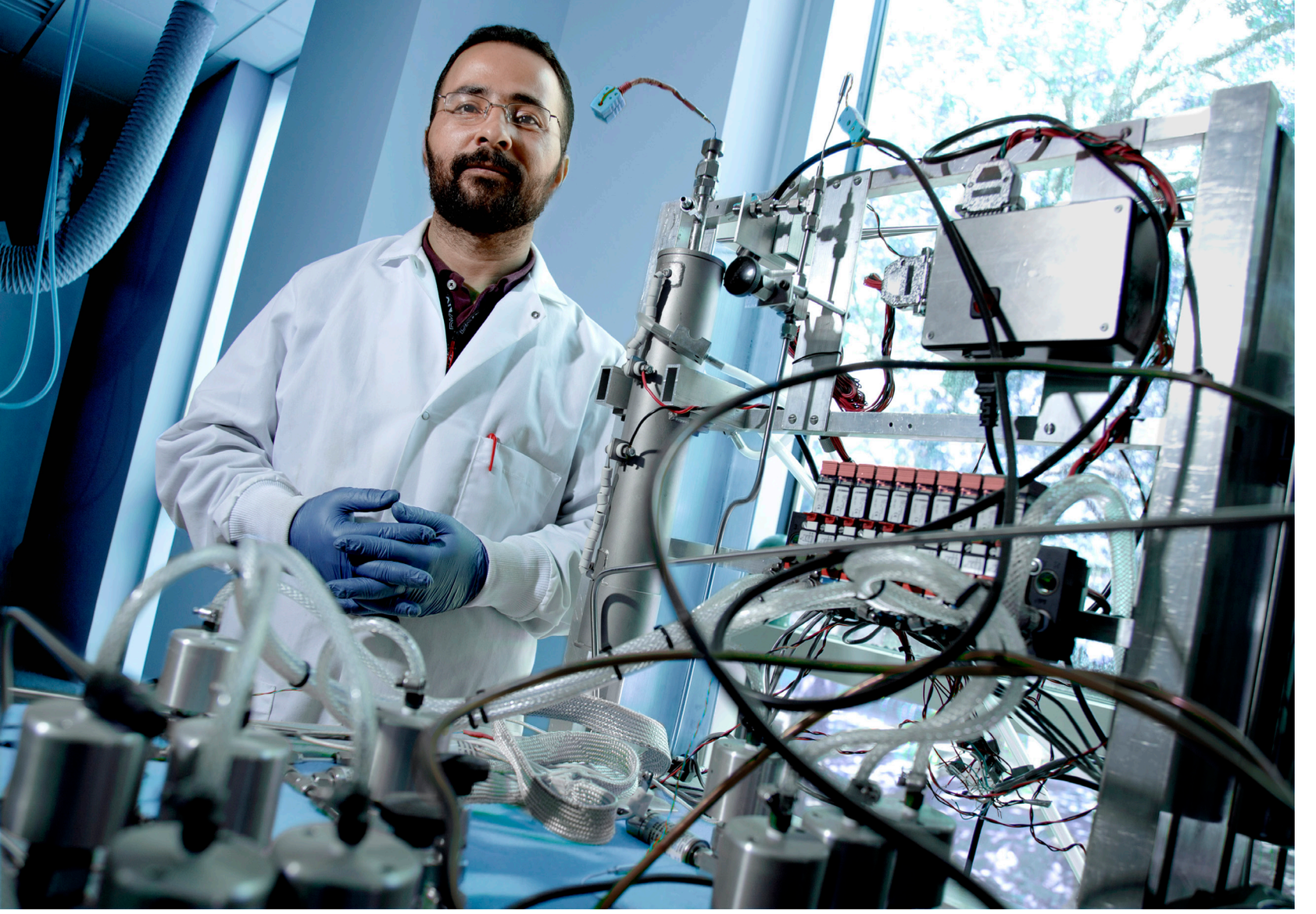
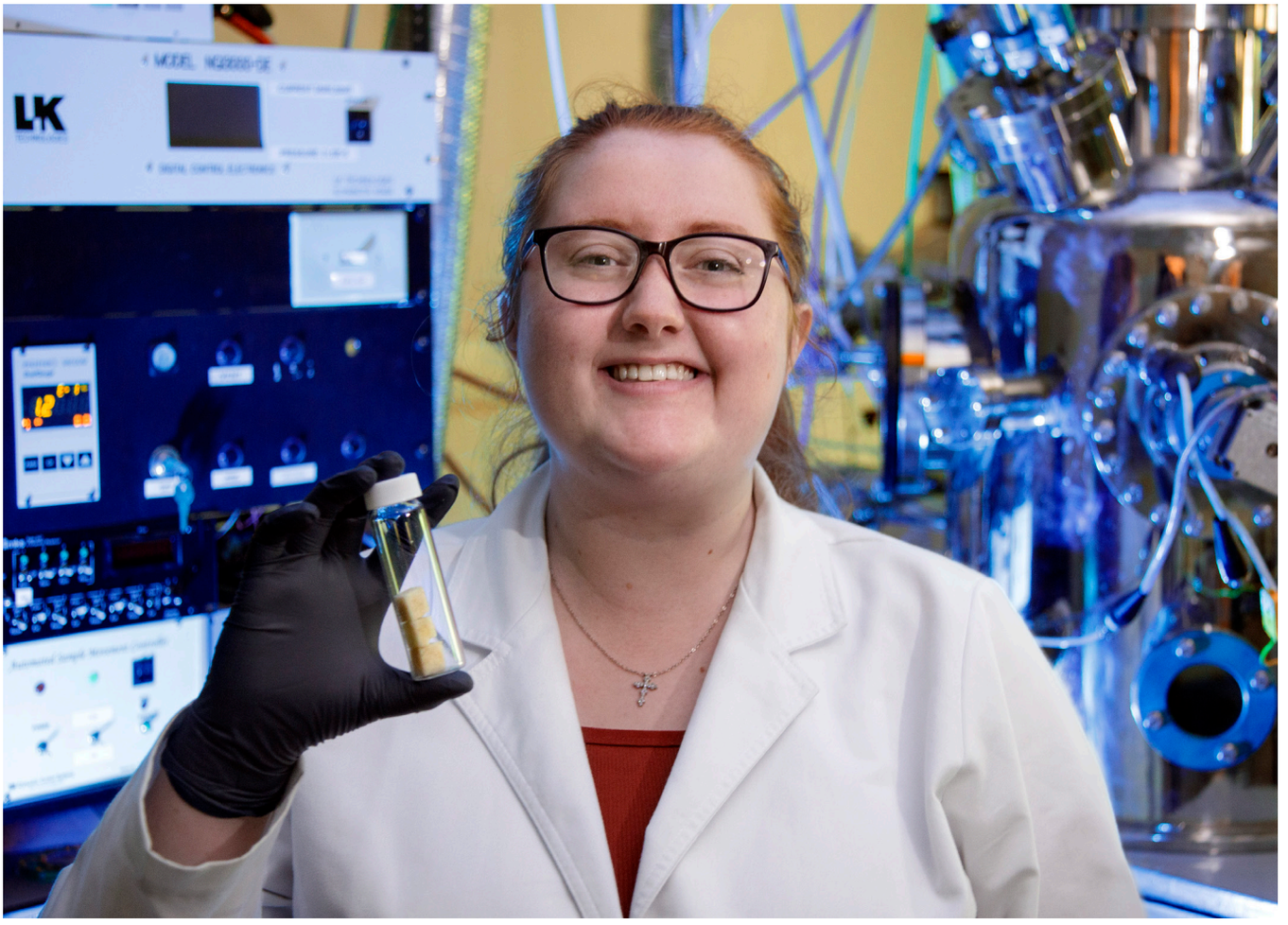


BRINGING IDEAS TO LIFE

The life of a researcher, writer, artist, or community service leader can be daunting. Not only do they have to focus on the intricacies of their projects, they have to go through the administrative aspects in each step of development, from writing the proposal, to establishing the budget, to ensuring the funds are spent according to protocol. And then they have the difficult task of waiting to see if their project will even become a reality.

All of this can be overwhelming, especially during the past three years, but every day we see UA Little Rock faculty, staff, and students bring their ideas to life and put in the work needed to present their unique solutions to problems in the world.

This issue includes projects that train tomorrow's cybersecurity leaders, highlight a leader in the Arkansas African American community, and use public radio to raise awareness of cultivating and sustaining urban forestry. You will also find projects on social media forensics and machine learning to make our lives in the digital world more organized. The incredible work it takes to bring these projects to life changes lives for generations. Supporting and celebrating the work of those seeking grants is an imperative aspect of our campus culture. May we continue to support those on our campus who wish to make our communities and the world a better place.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RESEARCH NEWS

Khodakovskaya Latest UA Little Rock Inductee to Arkansas Research Alliance Academy

Dr. Mariya Khodakovskaya, professor of biology and the director of Applied Science Graduate Programs at UA Little Rock, was inducted into the Arkansas Research Alliance Academy of Scholars and Fellows. This prestigious honor recognizes top research scientists across six Arkansas research institutions: University of Arkansas, Fayetteville; UA Little Rock; UAMS; Arkansas State University; UAPB; and the FDA's National Center for Toxicological Research.

With this fellowship, Khodakovskaya received $75,000 toward her research, which focuses on using biotechnology and nanotechnology to improve agricultural and industrial plants.

Moore Named Director of Undergraduate Research and Mentoring

Dr. Michael Moore is the new director of undergraduate research and mentoring, replacing Dr. Jeremy Ecke. In this position, Moore leads the Signature Experience Program and the Student Undergraduate Research Fellowship.

NSF Awards UA Little Rock nearly $2 million to Increase Student Success in STEM Education

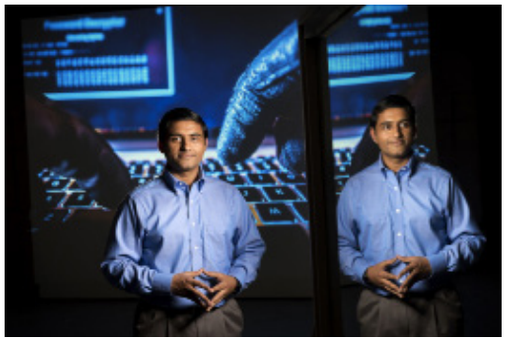
The National Science Foundation has awarded the UA Little Rock Donaghey College of STEM nearly $2 million to increase engagement and student success in STEM-focused education programs. This award is the largest NSF grant awarded to UA Little Rock.

ASBTDC Awarded $125,000 FAST Grant to Support Arkansas Entrepreneurs

The Arkansas Small Business and Technology Development Center was awarded $125,000 from the U.S. Small Business Administration to provide assistance through the Federal and State Technology Partnership Program (FAST). FAST provides training, mentoring, and technical assitance to small businesses and startups, especially in underserved communities.

RESEARCH NEWS

Agarwal Awarded $5 million to Evaluate Emerging Cyber Threats

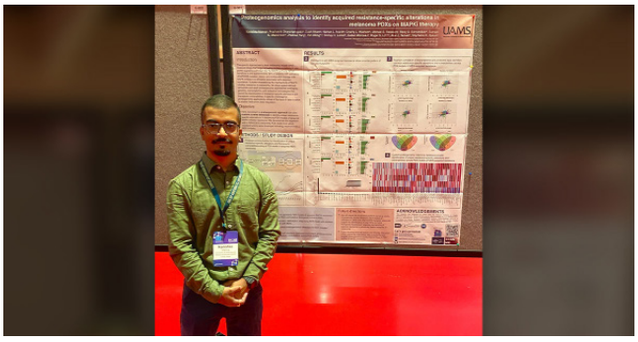


Dr. Nitin Agarwal, the Maulden-Entergy Chair and Distinguished Professor of Information Science at UA Little Rock, has been awarded $5.2 million from the U.S. Army Research Office to develop socio-computational capabilities to evaluate emerging cyber threats.

Siraj Awarded Faculty Excellence Award for Research and Creative Endeavors

Dr. Noureen Siraj from the Department of Chemistry has received the 2022 Faculty Excellence Award for Research and Creative Endeavors. The Faculty Excellence Awards recognizes extraordinary faculty in teaching, research or creative endeavors, and public service.

Doctoral Student Researcher Recognized for Discovering Theraputic Vulnerabilities



Kanishka Manna, a doctoral student in the UA Little Rock/UAMS Bioinformatics program, has been recognized for identifying theraputic vulnerabilities to combat complex diseases using a custom protein database.

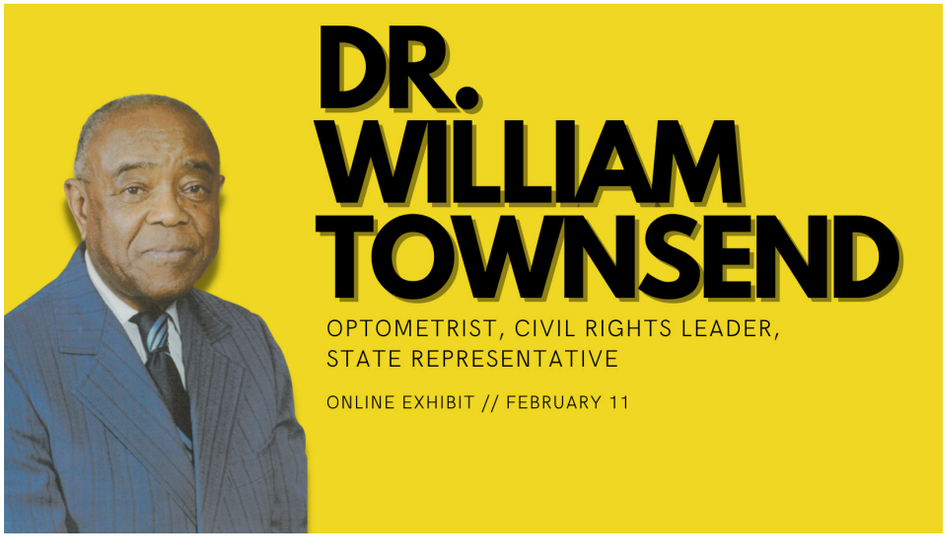
Littlefield Named "Legend Among Us" for Contributions to Black History

Dr. Daniel Littlefield, director of the Sequoyah National Research Center, has been honored as a "Legend Among Us" at the 8th Annual Arkansas Heritage Celebration of Black History Month presentation.

The award was presented by author Jason Irby, who stated that Littlefield was honored for his unique contributions to shared Black and Native American history.

DR. TOWNSEND'S VISION

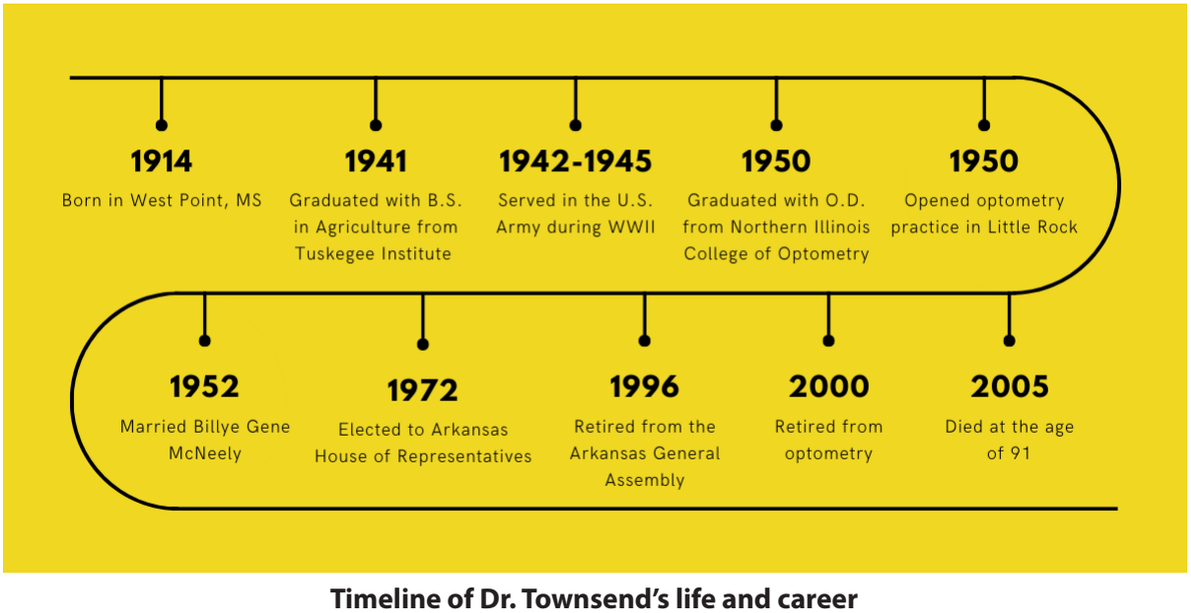
Center for Arkansas History and Culture Creates Online Exhibit to Highlight the Life of Little Rock Optometrist, Civil Rights Leader, and Arkansas State Representative



Little Rock holds vibrant and unique African American history thanks to influential leaders who affected the course of the city today. One of these is Dr. William Townsend, a respected leader in the city's African American community in the mid- and late 20th century. Dr. Townsend held many unique roles throughout his life. In 1950, he became the first Black optometrist in Arkansas. In 1972, he became one of the first Black legislators in the Arkansas General Assembly since the 1890s and then the first Black chair of the Aging and Legislative Affairs Committee.

The UA Little Rock Center for Arkansas History and Culture (CAHC) in February 2022 processed, digitized, and created a Character Collection to celebrate the life of Dr. Townsend. This project was possible thanks to the African American History and Culture Grant from the Arkansas Humanities Council. This website showcases the life and accomplishments of Dr. Townsend through images and text. CAHC archivist Cody Besett processed the collection, and Emily Summers Yarberry created the Character Collection. CAHC Character Collections highlight local historical figures who made a significant impact in Arkansas communities.

The idea for this project began when CAHC received Townsend's scrapbooks, which housed images and documents from his time in the Legislature, along with personal photos. According to Besett, the scrapbooks were deteriorating due to the acidic housing that stored the collection. To properly protect and store the collection, they needed to



Timeline of Dr. Townsend's life and career

move it to pH-neutral housing. "For this particular collection, the arrangement, how we originally got it, was not terribly difficult to actually deal with," Besett said. "It was actually the housing that it was in. So they're in scrapbooks, and usually scrapbooks contain a lot of housing that is not particularly at archival grade." Besett further explained that the original plastic housing normally degrades the materials. Besett removed the housing and put the photographs into pH-neutral folders. While going through this process, he digitized the photographs and papers while processing the collection, an unideal, but necessary, scenario due to time constraints.

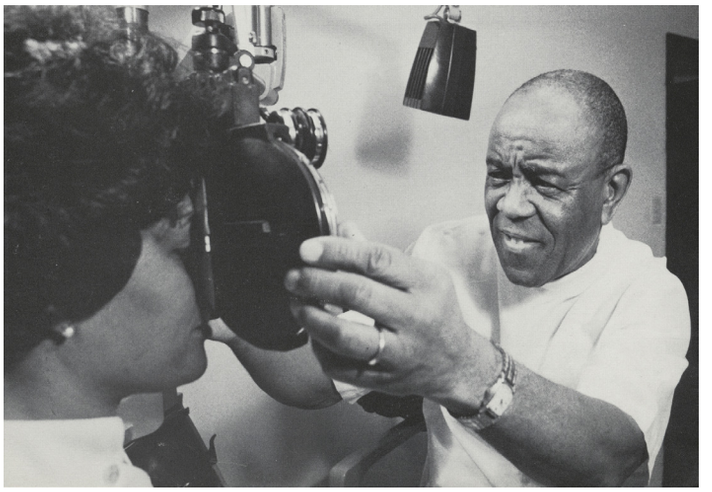
Most of the items in the collection pertain to Townsend's time in the Arkansas Legislature, with a few personal materials such as letters and birthday cards from his wife and daughters. He additionally had a few items that pertain to community outreach.

Dr. Townsend serving in the Arkansas General Assembly

Education and Military Service

After his formal military discharge, Townsend attended Howard University in Washington, D.C. to study pre-medicine. He then moved to Chicago to attend the Northern Illinois College of Optometry, where he earned his Doctor of Optometry degree in 1950. Once he became a licensed optometrist, he moved back to Little Rock where he became the first Black optometrist in Arkansas. Townsend practiced optometry in Little Rock for 50 years.

Townsend was born on July 30, 1914, near West Point, Mississippi. Shortly after, his family moved to Earle, Arkansas. After school, he attended the Tuskegee Institute in Alabama and became a platoon leader in the Army Lieutenant Cadet Corps. In 1942, he enlisted in the U.S. Army and served 45 months in World War II, during which he traveled to North Africa, Italy, France, Germany, and Entgland. During this tenure, Townsend received a Purple Heart and became a sergeant.



Dr. Townsend giving eye exam to patient

Civil Rights Leader and Politician

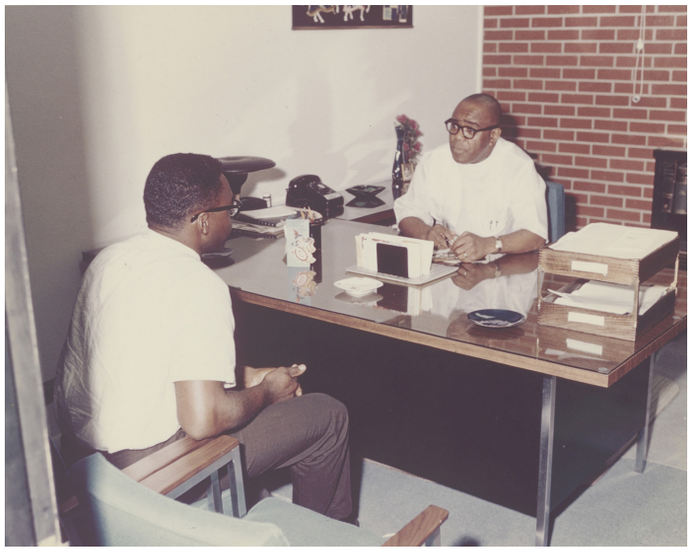
In addition to his optometry practice, Townsend was a member of the Arkansas Council on Human Relations, a non-profit organization that sought equal opportunity for all citizens in Arkansas. In this organization, Townsend helped desegregate Hoxie High School in Hoxie, Arkansas. Additionally, he worked with local white businessmen to help desegregate downtown Little Rock in the early 1960s.

In 1972, Townsend was elected to the Arkansas General Assembly, the first Black state representative since the 1890s. As a state legislator, Townsend was a chairman of the House Aging and Legislative Affairs Committees and Vice Chairman of the House Education Committee. During his tenure, he focused on bills to improve healthcare, housing, employment, and education in the state. In September 1985, he was influential in the establishment of Dr. Martin Luther King, Jr.'s Birthday as a holiday in Arkansas. In 1993, he co-authored the

Arkansas Civil Rights Act, the landmark act that prohibited discrimination based on race, religion, gender, disability status, or national origin.

"We celebrate remarkable Arkansans like Dr. Townsend," said Dr. Jess Porter, Executive Director of CAHC. "It's an honor to help preserve his legacy in making Arkansas what it is today."

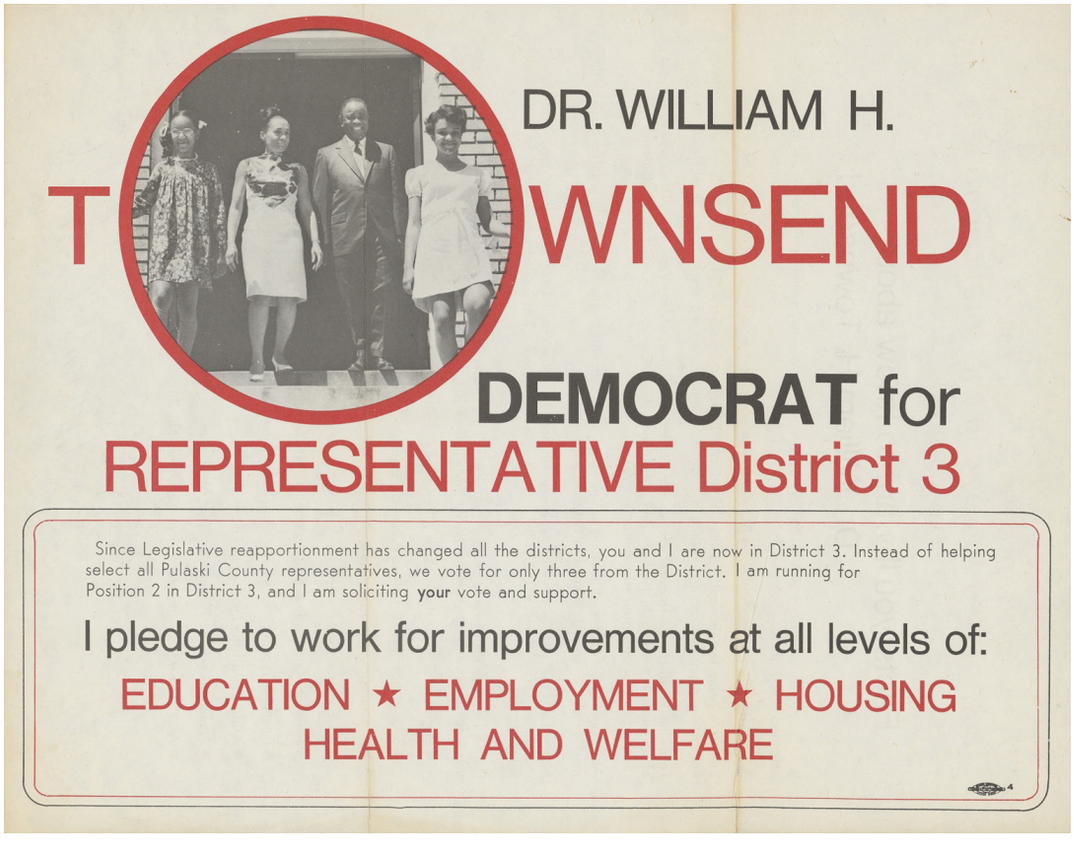
CAHC is in partnership with the Central Arkansas Library System and housed in the Bobby L. Roberts Library in downtown Little Rock. Their mission is to preserve materials and resources related to Arkansas history and make it accessible to the general public. Additionally, CAHC engages with the community regularly through outreach, programming, and exhibits to help facilitate understanding of Arkansas' vital contribution to U.S. history and its influence on the future.



Dr. Townsend speaking with a patient at his clinic on Wright Ave. in the early 1980s

Dr. Townsend addressing the Arkansas Optometric Association in Hot Springs in 1975

Dr. Townsend honored as World War II Purple Heart recipient at the Arkansas State Capitol in 1993



Campaign sign for Dr. Townsend's election to the Arkansas General Assembly

FRESH AIR AND NEW DISCOVERIES

The 2022 Student Research and Creative Works Expo Returns to an In-Person Celebration

After two years of virtual expos, the 2022 Student Research Expo was back as an in-person experience for students, faculty, and staff. The outdoor event took place on the UA Little Rock campus with unique and vibrant research and creative exhibits that highlighted the students' unique projects. While the digital format was necessary and successful at the time, presenting in-person provides a unique experience that allows greater ways to collaborate and build relationships. This event was also different from the in-person events in the past, which normally took place in the Jack Stephens Center on the UA Little Rock campus. Dr. Michael Moore, the new director of the event, believes the outdoor space provided a more welcoming and unique atmosphere than the traditional indoor events.

"[I think] it created a much more welcoming atmosphere than I'm used to at some research conferences," Moore said. "I think it helped students who have not been in that environment before engage with research in ways maybe they wouldn't if it was just a bunch of rows of posters."

Creating a welcoming and inclusive environment for students to learn about research is the most important aspect of the expo.

"...the important thing for me is that everybody knows that the Research and Creative Works Expo is for everybody at UA Little Rock," Moore said. "It doesn't matter what background and experience you have, if you feel like you have something you want to share with the UA Little Rock community, the Research and Creative Works Expo is the place to do it, and we're more than excited to help people think about what they could share."

Moore stresses that research is for everyone, not just a select few students. Conducting research also provides essential skills for life and the workplace, such as critical thinking, communication, and problem solving . This event allows students to practice and hone these skills, ask questions, and develop new ideas.

GRADUATE WINNERS

Computer Science and Information Science

First Place: Dayo Banjo and Connice Trimmingham
*Title: "*ImageToon"

Second Place: Carlos Ochoa
*Title: "*Smartphone-Based AR/MR Video Passthrough Headset Prototype"

Engineering, Engineering Technology, and Construction Management

First Place: Phillip Bryan
Title: "Engineering Consistency in Large 3D Prints"

Second Place: Nilesh Chaudhari
Title: "Study of Fluidization Behavior of Solid Waste Materials for Sustainable Production of Carbon Neutral/Negative Green Fuels"

Third Place: Hatim Raji
*Title: "*Effect of Composition on Damping Characteristics of NiTi Shape Memory Alloys"

Life Science

First Place: Samantha Macchi
Title: "Investigation of Cytotoxicity Mechanism of Porphyrin-Based Nanomedicine"

Second Place: Nazneen Begum
Title: "Osh6 Down-Regulates Pro-Aging TORC1 via Gga2"

Third Place: Andrew Ramirez
Title: "Elucidate the Function of Vacuolar-ATPase B Subunit 1 Gene on Root Structure and Development"

Physical Science

First Place: Ghusoon Al Bazzar
Title: "Synthesis and Characterization of Low- Cost, High-Performance Cu2O – ZnO Core-Shell Nanorods"

Second Place: Mavis Forson
Title: "Photophysical Characterization of Porphyrin-Fullerene Dyads"

Third Place: Karie Sanford
Title: "Catalytic Degradation of Macromolecules Using Benign Method"

Service Work and Professional Application

First Place: Tyler Riley and Angelita Faller
Title: "Student Perceptions of Textbooks and Course Material: Program Assessment for Ottenheimer Library"

Social Science

First Place: Ronia Kattoum
Title: "Factors that Determine if Students See Themselves as Future Chemistry Learning Assistants"

Second Place: Trye Price
Title: "A Qualitative Examination of Victimization among LGBTQIA+ Adults in Arkansas"

Third Place: Lacey Roughton
Title: "Non-Religious Identity and Experiences of Crime"

UNDERGRADUATE WINNERS

Computer Science and Information Science

First Place: Danica Mobley
Title: "Immersive VR Application for the Performing Arts"

Creative Work

First Place: Emma Chambers
Title: "Sourcing from Nature: Making and Using Paint from Locally Sources Pigments"

Second Place: Kevin Davidson
Title: "Restoration of Fluid Circuit Apparatus"

Third Place: Julia McPeake
Title: "Modern Life, A Satire of Modern Life"

Economics

First Place: Caleb Boutin
Title: "Destroying Ships or the Industry: Legal and Economic Consequences of Not Defining a Ship in the Shipbreaking Industry a Vessel"

Education

First Place: Samantha Cougill
Title: "Touching History"

Second Place: David Caldwell
Title: "Peer Engagement: In-person vs. Online using Learning Assistants"

Engineering, Engineering Technology, and Construction Management

First Place: Michael Frey
Title: "Modernizing Motorcycle Instrumentation and Display"

Second Place Tie: Noah French
Title: "EZ-Transport Folding Canoe"

Michael Flowers
Title: "Cost-Benefit of Adding Wind-turbine Generator"

Third Place Tie: Nuh Jakoet
Title: "Drowsy Driving Detection With EEG Signals and Sensor Fusion."

Ibrahim Suid
Title: "Reinforced Shape Memory Polymer Composites Actuator for Surgical Devices"

Health Science

First Place: Anabelen Rodriguez

Second Place: Cecile Barnes

Third Place: Khristina Huff

Humanities

First Place: Jordan Hancock
Title: "Masculinity and Felinity in William Blake's Fallen World as Told through Large Colored Prints"

Second Place: Aiyana Burgess
Title: "Talking Knots – Quipu Theories and Narratives throughout the Twentieth and Twenty-First Centuries"

Third Place: Carmen Ramirez
Title: "Influences of Native Guatemalan Music on the compositions of Jesus Castillo (1877-1946)"

Interdisciplinary

First Place: Ahad Nadeem
Title: "Student-created H5P Practice Questions for Biology Students"

Second Place: Nicholas Jaeger
Title: "Analyzing the Constitutionality of Blue Laws through the Scope of the Commerce Clause"

Third Place: Mataya Duncan
Title: "The Effects of Different Trellising Systems on Blackberries"

Life Science

First Place: Sadie Goss
Title: "Tunable Filtration Systems
for Pollutant Removal"

Second Place Tie: Amie Brint
Title: "A Continuation of GSDMD's Function in Multiple Sclerosis"

Gabrielle Roberts
Title: "The Study of Gasdermin D Mutation in Cancer Research"

Third Place: Ibraheem Abbood
Title: "Mutagenesis of Staphylococcus Epidermidis to Inhibit Biofilm Formation on Polystyrene Surfaces"

Physical Science

First Place Tie: Meagan Herbold
Title: "Applied Physics for the Design and Construction of Articulated, Electronic Wings"

Ruby Trotter
Title: "Nanomaterial Effects on Degradation of Polymer Biomaterials"

Second Place: Lauv Patel
*Title: "*MTA Nucleosidase Inhibition Through Mutant Kinetic Characterization"

Third Place: Tayler Gamble
Title: Studies in the Hydridic Reduction Reactions of Alkynyl Hydrazones via Sigmatropic Rearrangement to Form Allenes

Social Science

First Place: Ahad Nadeem
Title: "Food Deserts in Little Rock"

Second Place: "Cameron Russell"
Title: "Examining the Evolution of ICC Funding"

Third Place: Anthony Best
TItle: "Building a Tool for Measuring the Decibel Analysis for Research in Teaching"

CULTIVATING THE URBAN CANOPY

Anyone who has ever searched for a shady spot in a parking lot knows at least one benefit of trees in urban environments. According to the National Urban and Community Forestry Advisory Council, however, urban forests do far more than provide shade. They help with stormwater management and protect drinking water. They create a sense of place and improve walkability. They reduce the urban heat island effect and help cut energy use. They even improve human health and well-being, and they can reduce traffic accidents and the severity of injuries for car and pedestrian or cyclist crashes, according to the council.

The council's 10-year plan for urban forests puts their annual benefit at $17 billion.

"Trees are good for the environment, but they also are good for property values in neighborhoods. And for just quality of life," said Nathan Vandiver, the former general manager of UA Little Rock Public Radio (KUAR/KLRE).

UA Little Rock Public Radio received a $12,000 underwriting grant from the Arkansas Department of Agriculture Forestry Division to promote the

value of community trees. Public Radio matched the grant, doubling the number of announcements that were run on stations KUAR 89.1 and KLRE 90.5.

"KUAR and KLRE are valued services in the community. They serve roughly 70,000 listeners a week–at the time we applied for this, it was roughly 80,000," Vandiver said. "KLRE and KUAR, they're valued services. They have an engaged audience–civically engaged people, and folks who tend to have a higher level of education than the average population in any given area. So it's a great audience to get your message out to, whether it's a public service announcement or or just information about a business."

KLRE has been on the air for 50 years, and the stations are vital parts of Arkansas' media landscape. Since the stations are public entities, they're not allowed to run traditional ads, but, Vandiver said, "we are allowed to share information about corporate supporters or organizational supporters."

"That's what underwriting is. It's informational messages about supporters of the station."

The announcements were meant to raise awareness about the Forestry Division's work to promote urban canopies. They also covered their "free tree Friday" seedling giveaways, seedling sales through their Baucum Nursery, and the season for planting bare-root trees.

"Whether it's a nonprofit or a governmental entity, it's considered a noncommercial entity–and we can share more information from noncommercial entities." Vandiver said. "So we can do PSAs, that sort of thing, and that's essentially what this was. It was like a PSA for trees and for the Forestry Commission and for the programs that were highlighted with the spots."

Laurie Pierce, then an underwriting coordinator for UA Little Rock Public Radio, heard about the grant and had the idea to use it for a less traditional purpose–Vandiver said these grants often go to more direct uses like tree planting programs. "She pitched the idea through the grant application of using it to raise awareness for the program and raise awareness for other programs that provide trees for communities. " Pierce created example scripts and worked with Forestry Division staff to edit and refine them, along with developing other scripts. Vandiver oversaw the process, making sure the scripts met FCC regulations. The stations used Nielsen ratings to estimate the reach of the spots and report back to the Forestry Division.

The stations also got "feedback from the Forestry Commission that individuals from the community were calling to take advantage of their tree opportunities," Vandiver recalled. He said that although the grant has ended and the stations could not immediately reapply for the program, they're looking into applying for the grant again.

UA Little Rock Public Radio's mission–to deepen insight into the human experience, empower decision-making, and enrich the lives of those they serve through quality news and cultural programs–complements and helps advance the Forestry Division's goals of raising awareness about the importance and value of community trees.

UA LITTLE ROCK PUBLIC RADIO | FM89.1 KUAR | Classical 90.5 KLRE

CLEAN DATA

Each of us creates a mountain of data as we move through the world. But data can require a lot of preparation in order to get anything useful out of it. Dr. Ahmed Abu-Halimeh, an assistant professor with the Information Science Department, says "if you look at data, you cannot think of any industry without data. And every time, when we talk about data or where the data exists, there are data quality issues and problems."

"This is going to be actually one of the trends now," he says of data quality. "It's required everywhere, especially when we are in the era of big data." Abu-Halimeh has received a grant from the Arkansas National Science Foundation Established Program to Stimulate Competitive Research (AR NSF EPSCoR) Data Analytics that are Robust and Trusted (DART) track to develop machine learning models for data curation.

For this project, Abu-Halimeh is working on a tool called the Data Washing Machine using machine learning. It's a joint tool that several UA Little Rock researchers are working on, led by Dr. John Talburt. Abu-Halimeh compares it to a physical washing machine: "You just dump the dirty clothes in there, and you just set the dial. Add some cleaners there and then set it to the level, to the speed for what you want to do or to what extent you wanna clean these clothes." But it's still limited in what it can do. "So far, or at the current stage the Data Washing Machine only cleans the data by removing duplications or repeated records, and the mislabeled or misspelled data elements," he noted.

One example Abu-Halimeh gives of the Data Washing Machine's work is his own surname. Depending on the software, his name might be entered correctly (with a hyphen), as two words with

a space, or as one word. It might even be split up, with the first part counted as a middle name. "So here is the Data Washing Machine. One of the things that we can do is basically take those records, combine them, replace each one and do some kind of processing and treating the records, and we have a lot of algorithms and we have a lot of calculations and where we can just compare those records," he explains.

"We use something called tokens–and these tokens, we use their frequency just to make sure which one is repeated the most, and we consider that to be the most accurate one or the most correct one." Abu-Halimeh's current project is part of developing the tool further.

Currently, the Data Washing Machine uses rules to do its work, but Abu-Halimeh is working on getting it to teach itself how to clean data, through unsupervised machine learning. "My research now is all of these processes that I just mentioned to you. It's basically worked according to some set of rules," he says. "But we don't want these rules anymore. I want machine learning algorithms to be taking the lead there. I want an algorithm, once we have three different records, the algorithm itself will do the job for me."

According to Abu-Halimeh, researchers report that just "20% of their time they spend on modeling and problem solving and 80% for data preparation. So you can imagine–I spend like 80% of my time just combining the data and doing all that stuff to make it ready so I can apply my solution–so this will become very handy. Because you already have machine learning algorithms there, it will basically do the job for you."

This has the potential to save companies significant money by freeing up their data researchers to spend more time on problem-solving. The Data Washing Machine is "going to be a new solution available for companies and researchers to use," Abu-Halimeh says.

This project is funded by the National Science Foundation under award number 23-EPS4-0027. 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.

SOCIAL MEDIA SHAKEUP

Dr. Nitin Agarwal is the Jerry L. Maulden-Entergy Chair and Distinguished Professor of Information Science at UA Little Rock. He is the founding director of the COSMOS Research Center, which stands for Collaboratorium for Social Media and Online Behavioral Studies (https://cosmos.ualr.edu). He is a faculty fellow at the International Computer Science Institute at the University of California, Berkeley. He is a world-renowned researcher at the forefront of social computing, socio-cognitive security, information and influence operations, mis/disinformation campaigns, computational and AI-based propaganda tactics, algorithmic warfare, social cyber forensics, machine learning, and privacy. At COSMOS, he leads projects with a combined funding of over $20 million from various U.S. federal agencies, including the Department of Defense (DOD) , the Defense Advanced Research Projects Agency(DARPA), and the National Science Foundation (NSF).

He has published 10 books and over 300 articles in top-tier peer-reviewed forums with several best/top paper awards and nominations. He has received several domestic and international media mentions. He received the university-wide Faculty Excellence Award in Research and Creative Endeavors in 2015 and 2021. Agarwal received the Social Media Educator of the Year Award at the 21st International Education and Technology Conference. "Arkansas Times" featured Agarwal in their special issue on "Visionary Arkansans." Additionally, he is an International Academy, Research and Industry Association (IARIA) Fellow, an Arkansas Academy of Computing (AAoC) Fellow, an Arkansas Research Alliance (ARA) Fellow, and an IEEE senior member. His research was recognized as one of the top 10 solutions for "Countering Cognitive Warfare: The invisible Threat" by NATO's Innovation Hub out of 132 teams from the 30 NATO member nations. World Health Organization (WHO) recognized his

COVID-19 misinformation tracker as one of the key technological innovations globally to address the COVID-19 pandemic.

How has social media evolved over the last two years?

Nitin Agarwal: To discuss social media's recent evolution, we must talk about the elephant in the room, Twitter. It is one of the most prominent social media platforms in the western world and is of keen interest to journalists, celebrities, influencers, public figures, organizations, any individual sharing a conscious stream of thoughts, and researchers like us, who use social media data for studying humans' cyber social behavior. But the seismic changes at Twitter happened fast. Since Elon Musk's takeover of Twitter, good and bad speculation about this issue has appeared. From my perspective, several challenges exist with Twitter, such as the infestation of bots, widespread misinformation, hate speech prevalence, disturbing and toxic content, and the inherent bias and lack of transparency in algorithms that curate our feeds. These problems are all severe and Musk has recognized them as such. Addressing these issues would make a big difference in how people digest information from Twitter.

However, certain actions have also become a cause for concern, such as the bungled launch of the paid subscription, banning several prominent journalist and influencer accounts that has put a dent in Twitter's ad revenue stream, and eviscerating the content moderator team (also known as the trust and safety team). Most recently, Musk's poll on whether he should continue as the CEO resulted in an unfavorable response from Twitterati, which has led to uncertainty in the leadership and vision. I believe time will tell.

A world existed before Twitter, and whatever happens, a world will exist after it. Twitter alternatives like Mastodon, Koo, and others are already scooping up the Twitter diaspora. Nevertheless, Twitter has changed our communication culture. Terms like hash-tagging or retweeting didn't exist before Twitter.

We witnessed seismic shifts in Big Tech in 2022. The mass layoffs were indeed shocking, whether you look at Twitter, Facebook, Google, Amazon, or other technology companies. News reports and internal company memos (now public) showed that the technology companies over-recruited during COVID-19 in anticipation of post-pandemic business gains or profits, which turned out to be a missed target. The tech industry refers to this recalibration as right-sizing instead of downsizing. Such cases point towards a bigger issue with Big Tech, however. Some of these wildly successful companies lack vision beyond simply scaling up their operations. They need to develop a serious interest in the social and civic implications of their products or services. A more measured approach is needed—one that increases the currently scant oversight, but doesn't stifle the entrepreneurial spirit.

But more importantly, we need to think about why social media platforms and the Web 2.0 phenomenon emerged in the first place. The goal was to democratize information production and consumption, meaning anyone should be able to produce, access, or consume information. Prior to social media, information production was controlled by a select group of publishers. Now anyone with a phone can become a citizen journalist in a way that connects us beyond all geographical barriers and time zones. From that angle, Twitter, and social media in general, has played a major role in accomplishing the goal of information democratization—whether it's raising awareness about a social issue, mobilizing support for a campaign, organizing a protest, or creating large-scale social movements.

However, some off-and-on cases show the adverse impact of how this technology has affected society. Due to the openness of these platforms, it's hard to control who says what, giving rise to various types of aggressive, malicious, or deviant behaviors. Some examples include wittingly or unwittingly espousing misinformation to put vulnerable populations at greater risk, spreading toxic discourse, programming adversarial discourse bots to cause polarization, or creating threats posed by violent extremists (e.g., to the operational security of a mission, or around military bases). Furthermore, the lack of transparency in these platforms' algorithms, which curate our content

feeds, perpetuates implicit biases that affect our behaviors. These and other forms of deviant behaviors are the focus of various studies I am leading at our COSMOS Research Center.

What projects is COSMOS working on right now?

Quite interestingly, much of the information nowadays is consumed via user-generated multimedia content-sharing platforms like YouTube, TikTok, Instagram Reels, etc. According to recent statistics, YouTube has the second-highest share of global Internet traffic, recording 15 billion daily visits. Over 500 hours of video footage is uploaded every minute, and nearly 700,000 hours of videos are streamed on YouTube. So, we must look beyond the text-based communication medium (e.g., Twitter). We need to study these fast-paced video-sharing platforms and examine the wide spectrum of emergent socio-digital behaviors and evolving communication culture. Some of the recent research projects I am leading at our COSMOS Research Center focus on these questions, with over $10 million in funding from DOD and NSF.

At a broader level, we should consider how to leverage these platforms to bring our communities together and build resiliency with equal stakes from scientific research, innovation, education, and policy. As we have seen, social media platforms can lead large social movements and transform societies toward democratic values and principles. Demonstrably, they have the potential to bring people together and provide the means for civil discourse.

Recently, however, these principles seem to have taken a back seat. We should ensure that civil discourse can be brought back to our communities to heal and make them more resilient, which is one of the primary thrusts of our recent research projects. In a competition organized by NATO's Innovation Hub, in which 132 teams across 30 member nations participated, the solutions developed at our COSMOS Research Center were recognized by NATO as one of the top 10 solutions to counter the invisible threat of cognitive warfare. These efforts are funded by the Department of Defense's Minerva Research Initiative and the National Science Foundation through grants totaling nearly $3 million.

What new behaviors have you seen in the last two years?

To a large extent, people are recognizing various malicious behaviors on social media platforms. For instance, we're starting to see that the adversarial tactics that were initially quite successful in sowing discord or provoking hysteria in our communities aren't as successful now. This could be an early indication of the increasing level of awareness about such adversarial efforts in our communities. We need to be cautiously optimistic, though, since the adversarial tactics will evolve just as we are evolving.

Moreover, social media platforms are ramping up efforts to combat malicious behaviors and stem the tide of fakery, although there is still a long and winding road ahead.

Further, social media netizens are becoming more tolerant of diverse opinions, meaning we're seeing early signs of breaches in conventional echo chambers. We're in a delicate phase in that process and need to keep nudging it in the right direction. With proper education, generational investments in advancing behavioral research-driven innovations, appropriate policy implementations, and visionary leadership at the helm of social media companies, this positive change can be amplified to build resilient communities.

Based on our research for various U.S. DOD and NSF-funded projects, from general discourse on social media platforms to the security-related discourse in the Americas, Europe, and Indo-Pacific region, we started seeing this change during the COVID-19 pandemic when people began to realize the serious threats of COVID-19 misinformation to their lives and the lives of their loved ones. I believe it was a wake-up call—that not everything being pushed on social media is true, and one has to be extremely cautious in believing what is posted on anyone's feed or Facebook page.

History has taught us that adversity is a great binding force. We've all been through the pandemic together and felt the effects of COVID-19 in almost every part of our lives. This brought us closer to not just fighting the pandemic but also the "misinfodemic"—the misinformation mania that came along with the pandemic. Misinformation had always been there, but during COVID-19, it touched our lives at new levels. COVID-19 shifted people's opinions about the information presented in social media, how to be more aware, and how to teach ourselves media literacy.

With seed funding from Arkansas Research Alliance (ARA), our COSMOS Research Center launched a research-driven educational effort to raise awareness about COVID-19-related misinformation and scams in our great state of Arkansas. ARA helped establish a partnership between COSMOS and the Arkansas Office of the Attorney General, which was vital for the success of this effort. We put together a COVID-19 misinformation tracking website that shed light on misinformation, scams, and conspiracy theories running amok on the Internet. We tracked the growing impact of our website, especially in remote parts of Arkansas that could be highly vulnerable to such misinformation campaigns. That was certainly a highly rewarding experience for us to see that our work—a tiny effort in the large scheme of things—was making a difference in people's lives. The World Health Organization recognized our effort as one of the key technological innovations developed across the world to address the COVID-19 pandemic. Now, additional funding from DOD and NSF is helping sustain this effort.

What can you tell us about the next big things at COSMOS?

We're expanding our focus to study scenarios from multiple domains, countries, and cultures that play out predominantly in multi-platform and multimedia information environments. The regions of interest include the Americas, Europe, Indo-Pacific, and Africa. We emphasize understanding the role and affordances of digital communication platforms in these societies and how they're used by information actors (human, Artificial Intelligence, and hybrid actors) who may have malicious intent. In the past year, we witnessed key changes to the technological landscape, which urges us to examine the co-evolution of communication technologies and human behavior in various contexts.
We step into the future with several important research questions plus seismic shifts in the technological landscape and complex real-world problems. These challenges create an infinite spectrum of opportunities
where interdisciplinary and multi-sector contributions await.

The findings shared here have resulted from studies funded in part by the U.S. National Science Foundation, U.S. Office of the Under Secretary of Defense for Research and Engineering, U.S. Army Research Office, U.S. Office of Naval Research, U.S. Air Force Research Laboratory, U.S. Defense Advanced Research Projects Agency, Arkansas Research Alliance, the Jerry L. Maulden/Entergy Endowment at the University of Arkansas-Little Rock, and the Australian Department of Defense Strategic Policy Grants Program. The researchers gratefully acknowledge the support.

SURF winner Juan Martinez

SURF winner Arisha Ishtiaq

2022 STUDENT UNDERGRADUATE RESEARCH FELLOWSHIP WINNERS

In 2022, eight UA Little Rock students were awarded funding from the Arkansas Department of Higher Education's Student Undergraduate Research Fellowship (SURF). This competitive program allows students from all universities across the state to develop their own research and creative projects under the supervision of a faculty mentor.

Sahana Bettadapura—Probing the Role of Caspase 1 in Familial Parkinson's Disease Causing Mutations of Alpha Synuclein
Mentor—Dr. Shanzhi Wang

Sahana Bettadapura is investigating whether a specific enzyme causes the mutants of a protein to form the wrong structures commonly found in patients with Parkinson's Disease. This research aims to shed light on the development of the disease.

Caleb Boutin—Destroying Ships or the Industry: Legal and Economic Consequences of Not Defining a Ship in the Shipbreaking Industry a Vessel
Mentor—Dr. Casey Rockwell

Caleb Boutin is researching the complexities and implications of maritime law not adequately defining the term "vessel" within the shipbreaking industry, which traditionally determines the limitation of liability within the industry of disassembling ships to recycle and reuse
their resources.

Juan Martinez—Photocatalytic Water Treatment with Zinc Oxide Nanostructures by a Simple Hot Tap Water Process
Mentor— Dr. Tansel Karabacak

Juan Martinez is researching a new hot-water treatment method to create zinc oxide nanostructures that will decrease water pollution and develop new robust methods to treat water.

Sadie Goss—Injectable Hydrogel Using Functionalized Guar Gum for the Application of Drug Delivery
Mentor—Dr. Anindya Ghosh

Sadie Goss is researching how to synthesize injectable hydrogels to deliver drugs for treating diseases and regenerating bone tissues. This minimally invasive injectable gel will use guar gum, a natural fiber modified with adamantyl moieties, a water-resistant compound group. When mixed with a solution of starch derivatives, the modified guar gum forms a gel in situ. Such gel is ideal for drug delivery and tissue engineering.

Arisha Ishtiaq—In Vitro Characterization of ChemoPPT Nanomedicines
Mentor— Dr. Noureen Siraj

Arisha Ishtiaq used an ionic material approach to develop a combination cancer therapy nanomedicine under Dr. Noureen Siraj's supervision. She utilized more than one therapeutic mechanism to kill the cancer cells selectively with enhanced cytotoxicity. She performs all photophysical and invitro characterization.

Kierra Parker—Tuning Reduced Graphene Oxide-Based Filtration Membranes for Osmotic Power Generation
Mentor—Dr. Wei Zhao

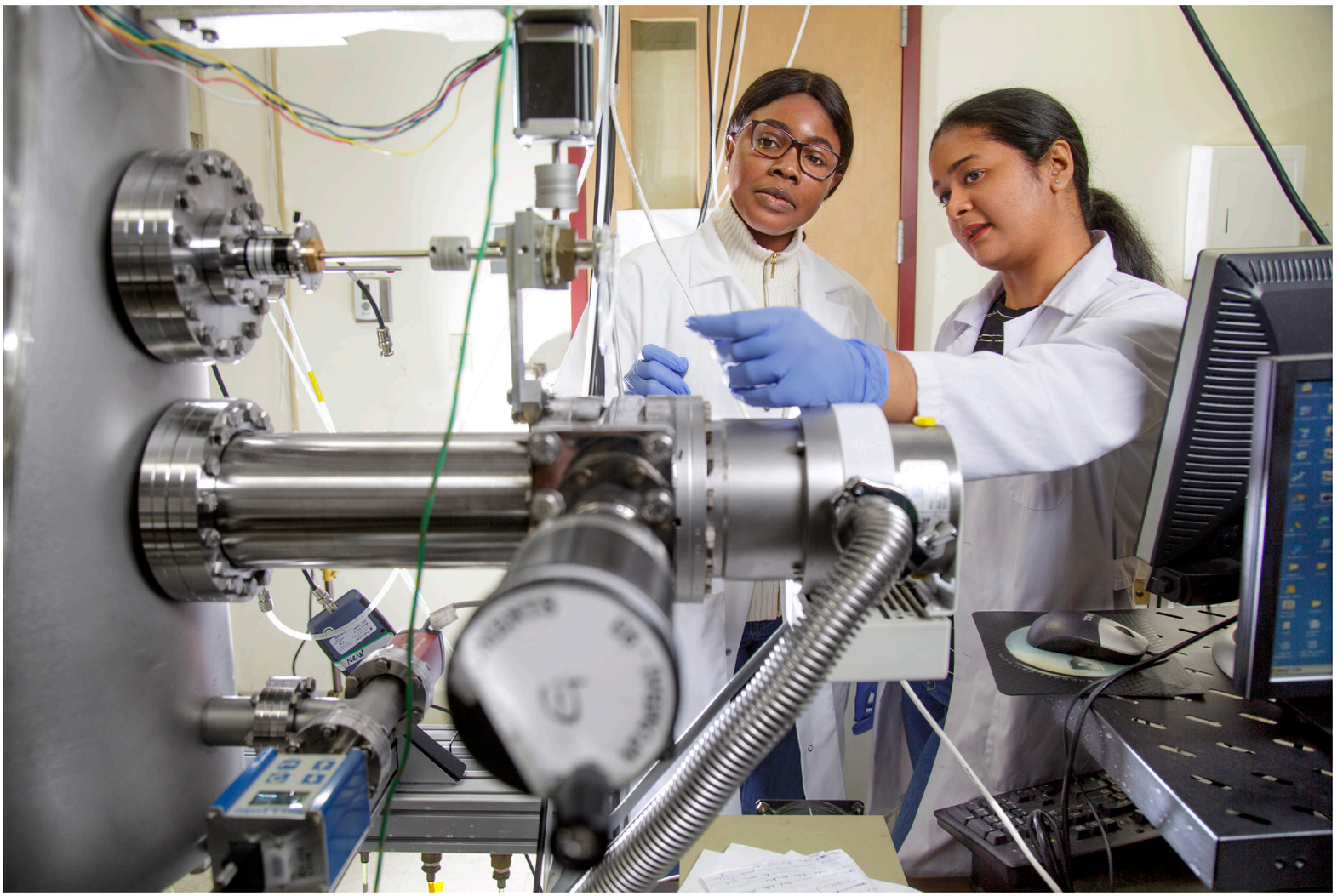
Kierra Parker is creating unique reduced graphene oxide-based water filtration membranes to harvest osmotic power, a renewable energy that generates electricity when solutions of different salinities are mixed, like captured rainwater over the ocean.

Bryant Parnell—Food Injustice: Mapping West Memphis Food Environments
Mentor—David Baylis

Bryant Parnell is studying the food environment landscape in West Memphis, Arkansas and determining areas of the city that have limited access to healthy and affordable foods using digital research and fieldwork methods.

Nuh Jakoet—Drowsy Driving Detection Through Integration of EEF and Camera Signals
Mentor—Dr. Kamran Iqbal

Nuh Jakoet is developing a noninvasive device that can determine driving fatigue by tracking electroencephalography signals. This device will track and process these signals in real time. Additionally, a Raspberry Pi camera device will track rapid eye movement to create an additional set of data.



PRESERVING A LEGACY

The Sequoyah National Research Center (SNRC) at UA Little Rock is celebrating its 40-year anniversary as the premier resource for Native American manuscripts and archival materials. The center, originally called the American Native Press Archives, was founded in 1983 by Drs. Daniel Littlefield and James Parins, who were both tenured faculty in the English Department at UA Little Rock. SNRC, the largest depository of Native American expression in the world, houses an expansive collection of Native American periodicals, manuscripts, books, and artwork.

In 1983, Littlefield and Parins' endeavor started while traveling to Arizona State University to research Native American newspapers and writers. They discovered the library was about to dispose of their Native American newspaper collection. After feeling uncomfortable about the situation, they asked the library if they could take the collection. The library agreed, and they loaded Littlefield's camper connected to his pickup truck full of boxes and newspapers. After this trip, they journeyed to the American Indian Studies Center at UCLA and the Huntington Park Public Library to gather more donations. From 1981-2011 they published

multiple books on Native American publications and writers, adding to the historical knowledge of Native American writing and journalism.

From 1983-2005, SNRC had no operating budget. Littlefield and Parins volunteered their time, with the help of local and national grants, to the center located in Stabler Hall. They slowly collected and preserved newspapers and other Native American writings and artifacts that people donated as they learned more about its mission. In fiscal 2006, SNRC was recognized as an official unit on campus and received an operating budget. In 2008, they moved from Ottenheimer Library to the University Plaza. In 2011, SNRC hired their first archivist, Erin Fehr, to process, manage, and preserve archival materials. Currently, the center possesses nearly 2,800 titles from about 200 tribes in the U.S. and Canada.

Archivist Erin Fehr demonstrates the digital kiosk of Trail of Tears history at SNRC

In 2022, SNRC moved from University Plaza to the Fine Arts building on the UA Little Rock campus. Thanks to a grant from the Arkansas Natural and Cultural Resources Council, they were able to obtain new compact shelving to better store and secure their collections of manuscripts, newspapers, and other unique files related to Native American writing and history.

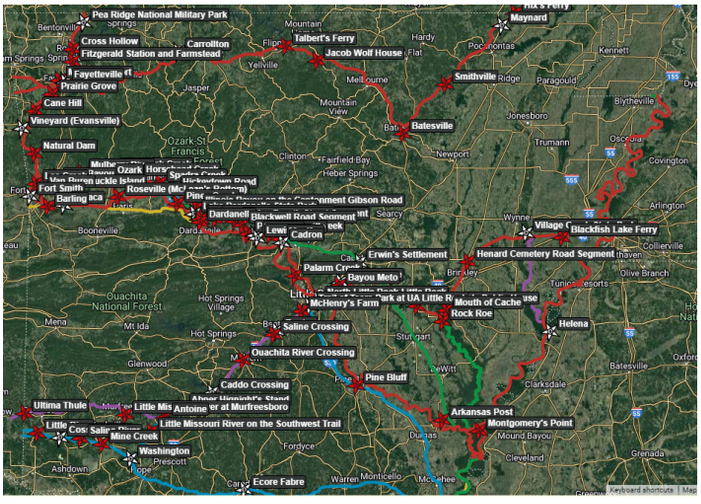
In the past, SNRC has received grants for unique educational experiences that teach patrons and students about the Trail of Tears. In 2018, they received nearly $58,000 from the Arkansas Natural and Cultural Resources Council for an interactive touch-screen kiosk that shows a map of the Trail of Tears in Arkansas along with pictures of the sites and original manuscripts that correspond to each location. The interface is also available to access on their website as a digital exhibit.

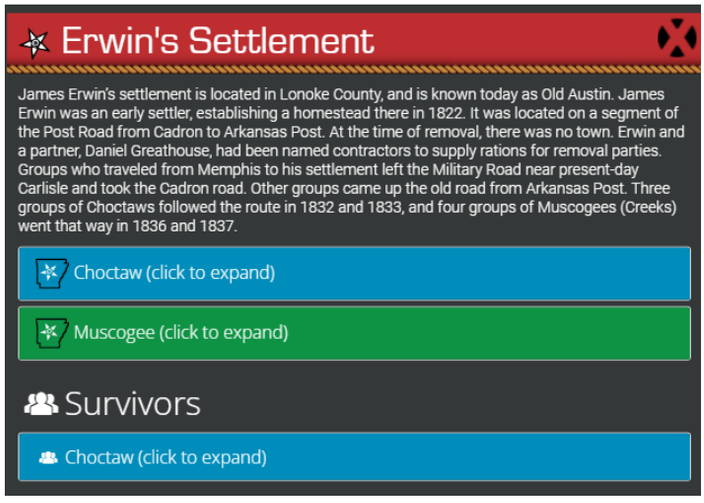
Thanks to the dedication of Littlefield, Parins, and Fehr over the past 40 years, SNRC plays a vital role in Native American history in the United States and the world.

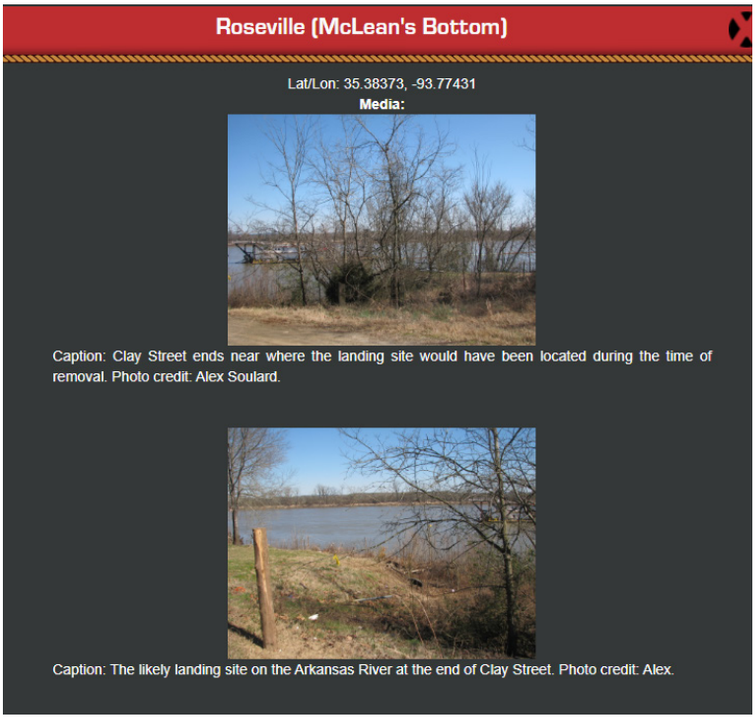
Newspaper collection at SNRC

Plaques representing grants awarded by the Arkansas Natural and Cultural Resources Council

Collection of books owned by Cherokee author Robert J. Conley







Screenshots from SNRC's Trail of Tears digital kiosk and online exhibit

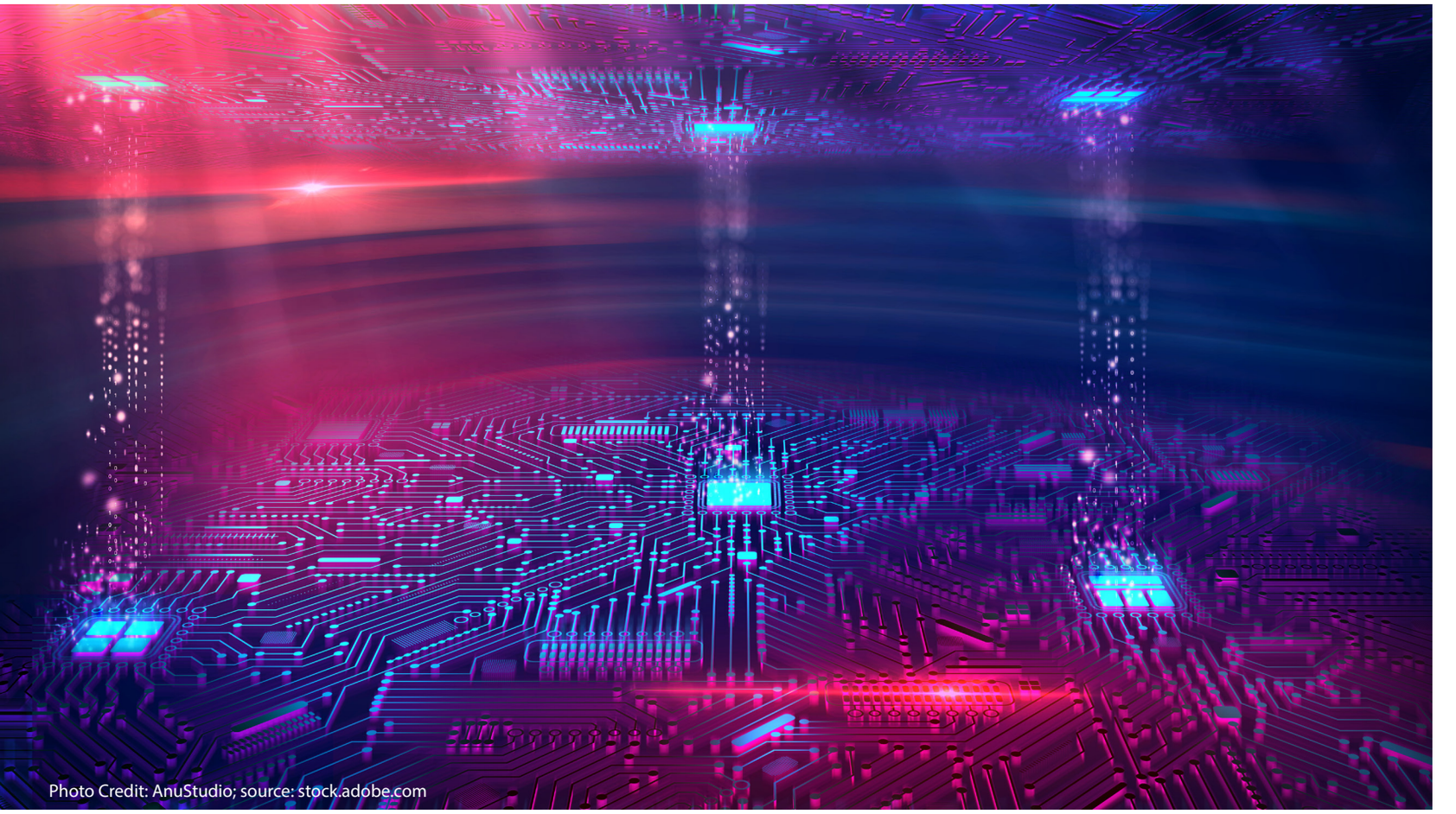


Photo Credit: AnuStudio; source: stock.adobe.com

DATA YOU CAN COUNT ON

Every 10 years, the United States Census Bureau sends a survey to every resident to gather statistics on community populations in the country. This type of data collection is crucial to gain a better understanding of the nation's citizens and non-citizens. Accurate census data is used to reapportion seats in the House of Representatives; allot money to state governments and local communities; contribute to accurate government, business, and nonprofit decision-making; and identify needs during emergencies and disasters. The U.S.Constitution requires the federal government to take a census of the country's population every 10 years.

Accurately managing and organizing this information for more than 300 million people, however, is a daunting task. Not only do you have to collect the raw data, you also have to organize and process it in a way that is usable.

Dr. John R. Talburt, the Acxiom Chair of Information Quality and Professor of Information Science at UA Little Rock, is leading a project in collaboration with the Arkansas Department of Information Systems to help the Census Bureau organize its data. In this project, he and his co-investigators, Dr. Xiaowei Xu and Dr. Mariofanna Milanova, are helping the bureau improve its ability to link individuals between censuses and link census data to other administrative data. In particular, Dr. Xu and Dr. Milanova are experts in machine learning, especially the use of large language models like those that have been in the news lately.

"What we're trying to do is help them improve their processing in two ways," Talburt said of the Census Bureau. "The first way is to preprocess the data better, to break down the records into those individual components that help the understanding. And then the second is to actually link records based on group membership--association if you will. Those are the two main things we hope to deliver to them are these processes that they can use."

To explain what parsing is, Talburt gave an example of a person's name and address. "If you have a

record that comes in and has a name and address on it, in order to process it, many systems require you to break it down into components like a first name, title, middle initial or middle name. And then street, the addresses like the street number, the directional, the street name. There are many granular parts to names and addresses, and breaking it down into those is called parsing."

Talburt is using machine learning to parse the data. Machine learning is essentially the process of teaching a computer how it should learn and process information.

"Machine learning in general, is just the idea of having computers do what people do," Talburt said. "The idea is that if a person can do it, then the goal is, can you program the computer to do it? That is the broader goal of artificial intelligence. Machine learning is an area of artificial intelligence that says 'Can you build a system that actually learns to do what people do--like a child, the way you teach the child to talk and to be self-sufficient.' And so machine learning is that part of artificial intelligence that's focused on systems that can learn from examples."

The second goal of the project is to improve linking the people together from census to census. For this part of the project, the team is using graph technology and group membership. "That's where you've got John Doe, Mary Doe in the 1990 census and then you find the same names at the 2000 census. So you try to connect people up even though they may have moved to different addresses by the fact that you see the same group of people. So it's a group membership, or in this case a household."

One of the biggest issues the project has faced is getting access to data, Talburt said, noting that census information is very sensitive. "So we don't get direct access to the data set right now. A lot of the work we're doing is with simulated data that looks like Census Bureau data but is not real data."

But his group is working to address that problem. "One of the things we're working on is how can we hand off some of our work, like our programs that we're developing, for them to run on their real data– and also at the same time, looking at what it would take to get some of our researchers qualified to be able to go into their systems to do the work directly," he explained. "But that's a very long process to get people approved."

UA Little Rock's partnership with the State of Arkansas has provided another way to address the hurdle of data access, Talburt said. "They also work with a lot of data," he pointed out.

"Our research faculty and student research assistants have been approved to access their system. So we'll be able to go down to their building, inside their firewalls, and try some of our programs on the state data."

Dr. John Talburt

"We already have people vetted for that. So that's another way that we'll be able to demonstrate some of our work."

Talburt first came to UA Little Rock in 1983 before leaving to work for Acxiom Corp's research and development organization. He returned to UA Little Rock in 2005 to help form the university's data quality program. In addition to many honors, numerous publications and several patents, in 2021 and 2022 he was named one of the Top Academic Data Leaders by CDO Magazine.

Talburt reiterated the impact of the project and its potential effect on every American. "It's great to think that here we can help out the federal government do a better job. The census has always been an issue because so much depends on it, like how many representatives we have and certain turn-back funding. So anything we can do to help make that process more accurate and efficient I think would be good for everybody."

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