ARKANSAS

SCIENCE & TECHNOLOGY PLAN

2024

The bedrock of the State of Arkansas is an intricate network of rich mineral deposits and geological wonders that developed over one billion years ago. Spectacular limestone caves are surrounded by massive shales laced with veins of quartz crystal - the Arkansas State Mineral. Crystalline quartz, as depicted on the cover, only forms under extreme heat and pressure. These striking crystals are the result of a chain reaction that began with the transformation of just one molecule. That molecule - the seed - becomes the nucleus of an ordered structure that recruits surrounding molecules in all directions to crystallize, one layer at a time.

The State's knowledge-based economy has grown in a similar fashion over the past decade, as we have fostered entrepreneurial chain reactions from seeds that crystallized years ago with continued focus on use-inspired research and innovation. We are now presented with the opportunity to sustainably transform Arkansas and secure our role in the national research enterprise. Meeting the challenge will require unprecedented collaboration across all sectors, working together to leverage our existing strengths and secure new resources.

We recognize we are on the threshold of a new era of highly networked activities that aligned around our shared vision for Arkansas as a place where science and technology drive a knowledge-based economy that benefits our citizens and creates solutions to challenging issues facing the nation.

The 2024 Arkansas S&T plan is hereby submitted for approval by the State of Arkansas.

The Arkansas Science Advisory Committee

The Science Advisory Committee (SAC) serves as the State's jurisdictional Steering Committee for the Established Program to Stimulate Competitive Research (EPSCoR).

Voting Members
- Bryan Barnhouse, Arkansas Research Alliance
- Dr. Travis Marsico, Arkansas State University
- Dr. Janet Wood, Arkansas Tech University
- Dr. Abdel Bachri, Southern Arkansas University
- Dr. Bob Beitle, University of Arkansas
- Dr. Brian Berry, University of Arkansas at Little Rock
- Dr. Dan Voth, University of Arkansas for Medical Sciences
- Dr. Mansour Mortazavi, University of Arkansas at Pine Bluff
- Dr. Stephen R. Addison, University of Central Arkansas

Ex-Officio / Non-Voting Members
- Dr. Larry Cornett, Arkansas NIH IDeA
- Dr. Constance Meadors, Arkansas NASA EPSCoR & Arkansas Space Grant Consortium
- Jennifer Fowler, Arkansas Economic Development Commission

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Approval of the 2024 Science & Technology Plan

Placeholder : Approval by Secretary of Commerce Hugh McDonald

Executive Summary

The Arkansas Science Advisory Committee is honored to present the 2024 Science & Technology (S&T) Plan, a seed to enable the crystallization of focused research and innovation planning, and serve as a foundation for the Arkansas scientific community. It is intended to serve as a road-map, a living document with direction, and to be held accountable. This Plan is informed by a comprehensive gathering of data and insights from a wide range of stakeholders across academia, government, industry, and public non-profits.

Since the publication of the 2018 S&T Plan, Arkansas has made remarkable strides in several key research areas underpinned by innovative initiatives and bolstered by significant investments in research and education. These efforts highlight our strengths and illuminate the challenges facing the State's technology-based economy. Central to this plan is the recognition of those strengths, which serve as the foundation for future opportunity and hold the potential to improve the quality of life for Arkansans.

To ensure the translation of research accomplishments into economic development, the 2024 Plan advocates for enhancing the infrastructure that supports innovation, fostering closer collaborations between academia, industry, and government, and prioritizing investments that bridge the gap between research and market application.

PROGRESS

Collectively, stakeholders across Arkansas made progress towards the goals outlined in the 2018 S&T Plan. Highlights of that progress are summarized below and described in more detail later in this document.

2018 Goal: Facilitate Competitive Expansion for Innovative R&D
- The State invested nearly $12M in direct funds to support and stimulate innovation through core programs at AEDC from 2018 - 2023.
- The State awarded $5.46M in matching funds from 2018 - 2023 to Arkansas colleges and universities in order to secure Federal research grants.

2018 Goal: Establish Targeted Priorities
- Investigators have successfully competed for millions in Federal investments that significantly advanced research and education in data science, artificial intelligence, materials science, and cybersecurity.
- Multiple investments were leveraged to strengthen and integrate high-performance computing resources, providing access to students and faculty statewide.

The 2024 Plan's strategies and goals are intended to grow the State's technology-based economy and foster innovation. Success will be accomplished by educating and training a skilled workforce, recruiting and retaining relevant employers, and scaling capacity for research and innovation in target growth sectors (below).

SUMMARY OF RECOMMENDATIONS

Strategy 1: Promote Alignment with Federal Investment Priorities
- Increase the number of competitive, collaborative proposal submissions to Federal funders for investments in critical technologies and target growth sectors:
    - Lithium, Steel, and Advanced Energy
    - Advanced Agriculture and Resilient Food Production
    - Next Generation Transportation and Logistics
    - Population Health
- Promote alignment of research and education with the State's key industries.
- Increase interaction with Federal agencies and encourage service as proposal reviewers.

Strategy 2: Train and Retain a Robust STEM Workforce
- Increase the types of credentials and experiential training programs, both traditional and non-traditional, in relevant fields.
- Increase the size of the State's STEM workforce and emphasize retention of STEM talent at all levels.

Strategy 3: Invest in Maintenance of Infrastructure & Facilities
- Increase support for maintenance of research infrastructure, including the high-performance computing facilities and the people that manage them.
- Increase accessibility and utilization of research facilities and instrumentation through shared-use and expanding the core facilities exchange.

Strategy 4: Incentivize Innovation and Partnerships
- Increase State funding for tech-based economic development and incentivize collaboration.
- Remove restrictions in enabling legislation to make grant funds more flexible and impactful.

Strategy 5: Increase R&D Engagement & Sustainability
- Expand the jurisdictional steering committee, conduct regular reviews and updates of the committee's charter to ensure fairness, broad participation, and accessibility.
- Develop a formal process for annual review and revision of the State's S&T plan.
- Increase engagement with other stakeholders to expand research capabilities and opportunities.

Research & Development:

Progress Since 2018

Technology-Based Economic Development

The State continues to support growth of the R&D ecosystem through grants and incentives offered by the Arkansas Economic Development Commission (AEDC). AEDC has also administered the State's National Science Foundation (NSF) EPSCoR Track-1 awards since absorbing the Arkansas Science & Technology Authority in 2015, as a result of efforts to consolidate and streamline state government.

AEDC is housed in the State's Department of Commerce, along with the Division of Workforce Services, Office of Skills Development, Development Finance Authority, Arkansas Manufacturing Solutions (the State's official Manufacturing Extension Partner), and other aligned agencies. AEDC staffs the Science Advisory Committee, and offers funding to support translation of EPSCoR-funded research products. Since 2021, the core grant programs (below) supporting technology-based economic development are housed under AEDC's Small Business & Entrepreneurship Division.

CORE SCIENCE & TECHNOLOGY PROGRAMS

Small Business Innovation Research (SBIR) Matching Grant
Act 166 of 2017 created the Arkansas Small Business Innovation Research Matching Grant Program. The program administered by the Division of Science and Technology of the AEDC, awards discretionary matching grants of up to 50% of the amount of a federal Small Business Innovation Research (SBIR) Grant, with a maximum grant of $50,000 for SBIR Phase I awards or $100,000 for SBIR Phase II awards.

Technology Transfer Assistance Grants (TTAG)
This grant program assists Arkansas firms in developing products or processes through the transfer of solutions to technology-based industry-driven problems, enhancing the market competitiveness of Arkansas-based firms. TTAG funds costs associated with transferring new or existing technology from a qualified applicant such as a public or private enterprise, laboratory, college or university to an enterprise based in Arkansas.

Technology Development Program (TDP)
This program provides bridge financing for qualified projects focused on innovation and leading-edge science and technology. The grants assist in the commercialization of new, high-tech products and processes developed in Arkansas. TDP projects must have a well-developed concept and a project plan that demonstrates how the project will lead to employment growth and will expand entrepreneurship in Arkansas.

Arkansas Business & Technology Accelerator Grant Program
Also established by Act 165 of 2017, this program provides discretionary grants up to $250,000 to eligible applicants administering a business and technology accelerator. Business accelerator programs are a way to connect innovative, early-stage companies with investors, mentors, and industry professionals who can assist the companies to successfully develop. The goal of this funding is to recruit entrepreneurs to start and grow businesses in Arkansas.

Funds Awarded Annually from State Science & Technology Grant Programs, 2018 - 2023

Year	SBIR Match	TTAG	TDP	Accelerator	Annual Totals
2018	$750,000	$66,250	$450,000	$500,000	$1,766,250
2019	$637,500	$63,750	$300,000	$1,925,000	$2,926,250
2020	$325,000	$82,500	$250,000	$1,225,000	$1,882,500
2021	$175,000	$68,625	$150,000	$2,075,000	$2,468,625
2022	$550,000	$48,125	$350,000	$993,455	$1,941,580
2023	$100,000	$42,500	$100,000	$739,030	$981,530
Program Totals	$2,537,500	$371,750	$1,600,000	$7,457,485	$11,966,735

The table above includes the amount of funding awarded annually by AEDC through the SBIR Matching Grant, TTAG, Technology Development, and Accelerator Grant Programs since 2018. The annual budgets for each program has remained consistent throughout this time period, despite variation in the amounts awarded.

In addition to the programs above, AEDC awards matching funds that are needed to secure Federal research grants. From 2018 - 2023, AEDC provided a total of $4M in matching funds to secure the National Science Foundation (NSF) EPSCoR Track-1 award of $20M, and awarded an additional $1.46M to colleges and universities for awards from the National Aeronautics & Space Administration and other Federal agencies.

Arkansas Statewide Technology Commercialization Center

The Arkansas Statewide Technology Commercialization Center (ASTCC) was established in 2008 to support technology-based companies across the State. The goals of this program are to assist entrepreneurs in translating ideas into viable businesses, and to create high-paying jobs for Arkansans.

The program was branded as Innovate Arkansas from 2008 - 2023, and funded by AEDC at a total of $22.8M or approximately $1.5M annually. During that time, the program served over 820 companies which were responsible for creating more than 6,000 jobs with an average salary of $41,085. Additionally, it helped raise more than $473.6 million in capital for its client companies and helped establish five investment networks in Arkansas. Clients reported an additional $406.5M in private investments and $939.3M in revenue during the same time period.

The ASTCC contract was recently awarded to Startup Junkie and rebranded as Arkansas Innovators, Startups, and Entrepreneurs (ARise). The program will offer services to technology ventures in Arkansas at every stage of development, including consulting, concept validation, scaling strategies, navigating access to capital, guidance from subject matter experts, connections to relevant industry partners, and digital resources. ARise will also host networking events, workshops, and webinars on relevant topics. These services are offered at no charge to entrepreneurs statewide.

The Arkansas Research Alliance (ARA) is a public-private partnership that invests in research to stimulate innovation, encourage collaboration, and deliver economic opportunities across Arkansas. ARA member institutions include the University of Arkansas at Fayetteville, University of Arkansas for Medical Sciences, University of Arkansas at Pine Bluff, University of Arkansas at Little Rock, Arkansas State University, the University of Arkansas System Division of Agriculture, and the U.S. Food and Drug Administration's National Center for Toxicological Research (a Federal research laboratory).

THE ACADEMY > > > >

ARA's cornerstone is its Academy, which awards outstanding research faculty under three programs, summarized below. Academy members also have access to the Impact Grants program, which offers targeted funds for 12-month projects to secure extramural funding, commercialize research products, or accelerate high-risk/high-reward discoveries.

ARA SCHOLARS The Scholars program plays a pivotal role in bridging university research and economic development. Scholars are recruited from out of state into positions at ARA member institutions to concentrate on established, commercially viable research competencies.	**ARA FELLOWS** The Fellows program supports distinguished researchers at ARA member institutions with a $75,000 grant paid over three years.
	INNOVATION SCHOLARS The Innovation Scholars program is a recruitment tool to attract early career researchers with a $200,000 grant paid over three years.

A study on the economic impact of ARA was published in 2023 and reported that since 2011, ARA has invested a total of $8.3M in its Scholars and Fellows. As of June 2023, those 39 ARA Academy members have generated a total of $205.7M in additional research funding. The total leveraged investments of $8.3M have yielded $4.4M in FY23 state tax revenues alone, with combined state tax revenues over the full 13-year period totaling $26.1M. ARA is supported by its member institutions, its Board of Trustees, and the State of Arkansas.

ARA organizes the annual Arkansas Bioinformatics Consortium (AR-BIC) conference, in partnership with member institutions and the Arkansas Biosciences Institute. AR-BIC represents a community of scientists throughout the State who share a mission to develop, leverage, and enhance bioinformatics expertise and resources to solve public health challenges. The annual conference is attended by roughly 200 individuals representing academic institutions, federal labs, and industry. The 2024 theme focused on the real-world impact of artificial intelligence, highlighting innovative research accomplishments within the public health domain and computational alternatives to animal testing.
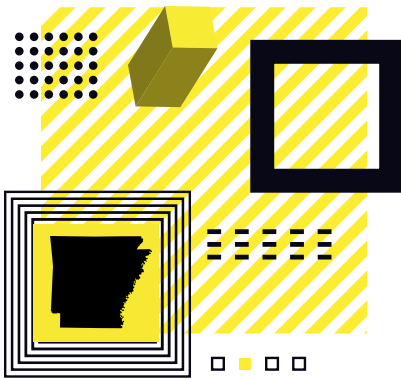
High Performance Computing & Coordinated Cyberinfrastructure

Research in nearly every scientific domain relies on advanced computing. Over the past decade, State and Federal institutions have invested significantly in high-performance computing (HPC) and coordinated cyberinfrastructure across the State.

ARKANSAS RESEARCH PLATFORM ARP

The Arkansas Research Platform (ARP) is the result of a collaboration initiated in 2020 between the University of Arkansas, the University of Arkansas for Medical Sciences, and the Arkansas Research and Education Optical Network focused on expanding access to high-performance computing resources to faculty, students and staff at academic institutions across the State. This collaboration has established a frictionless environment across which researchers can conduct computationally intensive research.

ARP allows researchers in Arkansas to a set of shared cyberinfrastructure resources to improve collaboration. As of 2023, faculty and students at all institutions of higher education in the State can quickly and securely access HPC resources, usually at no cost to their institutions. This is a valuable achievement that will provide a foundation for computational research and education for years to come.

ARE-ON

The Arkansas Research and Education Optical Network (ARE-ON) is a purpose-built, highly resilient fiber-optic network that provides broadband and other services to two-year colleges, public and private universities, and hospitals across the State. Members have up to 100G, 10G, or 1G unlimited bandwidth with direct access to tier-1 internet services, national research networks like Internet 2, and low-latency access cloud service providers. Arkansas-based members connecting with ARE-ON can access private and high-bandwidth connections to other members. ARE-ON also serves as the fiber backbone for ARP and supports relevant initiatives statewide.

AHPCC
Arkansas High Performance Computing Center

The University of Arkansas High Performance Computing Center (AHPCC) provides expertise, high performance computing hardware, storage, support services, and training to enable computationally-intensive and data-intensive research. The AHPCC is available to all Arkansas faculty, staff, students, and to their collaborators. AHPCC supports ARP as well as Individual researchers by providing publicly available and dedicated compute nodes.

Shortly after the publication of the 2018 S&T Plan, the SAC began working to develop a competitive proposal to the NSF EPSCoR Track-1 Funding Program. The proposed statewide project addressed recommendations outlined in a 2017 commissioned report on advancing the State's competitiveness in data analytics and computing. The proposal was successful, and in 2020 NSF awarded $20M to fund 'Data Analytics that are Robust and Trusted' (DART). The State of Arkansas contributed a $4M cash match to secure the Federal investment.

DART has engaged more than 300 faculty, students, and other stakeholders across Arkansas to conduct research and provide training in data science and data analytics. The award will end in 2025, and several efforts to sustain momentum in data science research and education are underway. To date, researchers supported by DART have produced seven patents, published more than 220 scientific journal articles and book chapters, and submitted more than 140 competitive proposals for additional research funding, securing an additional $51.3M.
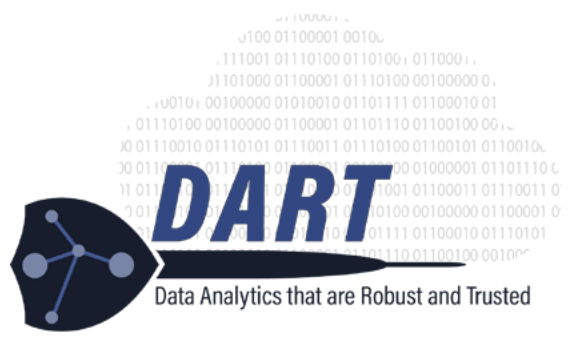
The Collaboratorium for Social Media and Online Behavioral Studies (COSMOS) at the University of Arkansas at Little Rock has been supported by over $20M from the Department of Defense and other Federal agencies. COSMOS is focused on analysis of social movements and campaigns, information and influence operations, mis/disinformation campaigns, computational and AI-based propaganda tactics, algorithmic warfare, and the rise of violent extremism.

Forge Institute, an organization based in Little Rock, has grown significantly in recent years and offers multiple programs related to cybersecurity and defense. The Forge Consortium for Cyber Innovation (CCI) provides funded opportunities for students, faculty, and industry to develop next-gen cybersecurity capabilities. The University of Arkansas at Little Rock, the University of Arkansas at Pine Bluff, the University of Arkansas, and data industry leader Acxiom are members of CCI. Act 1085 of 2019, also knows as the Arkansas Cyber Initiative, established a public-private partnership between Forge and the Arkansas Economic Development Commission to create the Arkansas Cyber Defense Alliance with a mission to reduce cyber threats across the State. Forge additionally operates the Arkansas Cyber Defense Center (ACDC) in collaboration with public, private, and academic partners to provide cybersecurity training and support to Arkansas-based organizations. The success of these initiatives has resulted in the creation of the Forge Fellowship and Forge Academy, re-skilling and up-skilling programs that offer experiential learning and career readiness in cybersecurity and related fields.

Strategic Priorities for Research, Innovation, & Workforce Development

The scientific priorities outlined in this plan are intended to address technical and societal challenges that are not inherently unique to Arkansas, but that provide significant barriers and significant opportunities for the State's R&D enterprise. These strategies and goals are directed at all stakeholders for coordinated efforts to deliver sustainable impact.

Federal agencies administer a significant source of funding for research, innovation, and education. Most agencies publish strategic plans and budget requests that provide insight into their near-term investment goals. The National Science Board and the Office of Science and Technology Policy regularly publish reports and goals that influence grant and loan programs at many agencies. Additionally, key legislation such as the CHIPS and Science Act and Inflation Reduction Act include specific investment mandates to Federal funders. Alignment of research and development in Arkansas' industry strengths, combined with strategic pursuit of diverse Federal investments, will increase the State's competitiveness in securing relevant funding.

In 2022, the National Science and Technology Council published a list (right) of critical and emerging technologies that are significant to domestic security.

Arkansas has existing strengths in several of the identified sectors, indicated in highlighted text. Investigators are encouraged to pursue additional investments in these sectors.

- Advanced Computing
- Advanced Engineering Materials
- Advanced Gas Turbine Engine Technologies
- Advanced Manufacturing
- Advanced and Networked Sensing and Signature Management
- Advanced Nuclear Energy Technologies
- Artificial Intelligence
- Autonomous Systems and Robotics
- Biotechnologies
- Communication and Networking Technologies
- Directed Energy
- Financial Technologies
- Human-Machine Interfaces
- Hypersonics
- Networked Sensors and Sensing
- Quantum Information Technologies
- Renewable Energy Generation and Storage
- Semiconductors and Microelectronics
- Space Technologies and Systems

GOALS

☐ Increase the number of competitive, collaborative proposal submissions to Federal funders (including the Department of Energy, Department of Defense, National Science Foundation, Department of Agriculture, National Institutes of Health, Department of Labor, Department of Transportation, and other agencies) for investments in the critical technologies above, and the following targeted sectors: Lithium, Steel, and Advanced Energy; Advanced Agriculture and Resilient Food Production; Next Generation Transportation and Logistics; and Population Health.

☐ Encourage faculty statewide to serve as proposal reviewers for Federal programs, which leads to increased competitiveness and stronger relationships with agency staff.
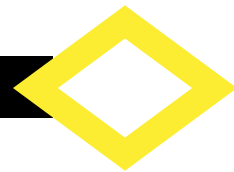
Critical minerals are categorized as being essential to the economic and national security of the U.S., and are defined by the U.S. Geological Survey and the Secretary of the Interior. The most recent list of 50 identified critical minerals includes aluminum, cobalt, gallium, graphite, lithium, manganese, nickel, titanium, and zinc.

Global production trends have changed drastically in the past thirty years. In 1995 the U.S. was responsible for more than 30% of the world's lithium. That number has declined over time to just 1% in 2021. To address this, the U.S. plans to invest more than $437 billion to incentivize domestic lithium production and battery manufacturing, with enabling legislation to funding agencies like DOD, ENR, NSF, and others. Over the next 20 years, a predicted $7 trillion will be invested in the domestic production of batteries and electric vehicles. Efforts to establish relevant educational programs, training opportunities, and to develop or strengthen critical infrastructure in support of these sectors are of high priority.

Recent investments from Standard Lithium, Exxon Mobil, and Equinor have sparked a lithium boom in Southern Arkansas, with experts estimating that Arkansas could ultimately produce up to 15% of the world's supply of battery-grade lithium. The Smackover Formation is a massive porous limestone aquifer that stretches across the southern US. Operations to extract bromine from the brine in the Smackover formation from wells in Arkansas have been ongoing for decades, and recent studies show the same brine is rich in high grade lithium. This presents an enormous opportunity for Arkansas in business development, research, and education.

In January 2022 U.S. Steel announced plans to build a steel mill 'of the future' in Osceola. This was the result of the largest economic project in the history of Arkansas, with an estimated economic impact of $5.2 billion. 900 employees will ultimately be hired to operate the facility which will generate up to 200,000 tons of electrical steel annually and rank Mississippi County as the top steel-producing county nationwide.

Since 2018, the University of Arkansas has secured investments from the National Science Foundation to develop the MonArk Quantum Foundry and the Multi-user Silicon Carbide (MUSiC) Research and Fabrication Facility. MonArk is an innovative research center jointly led with Montana State University, with the overarching mission to accelerate two-dimensional materials research for quantum technologies in the US. Once construction of the MUSiC facility is complete, it intends to provide workforce training, educational opportunities, and recruit industry-sponsored projects related to semiconductor manufacturing. Other momentum from investments in nano-scale materials science and advanced energy materials are impacting multiple regions and industry sectors in the State, and should continue to be supported and expanded.

The US food and agriculture sector is vulnerable to disruption and damage from a variety of threats such as contaminants, pathogens, adverse weather events, and natural disasters. A recent national security memorandum charges Federal agencies to ensure the resilience and security of domestic food production through outlined strategies. The strategies range from general risk assessment, monitoring, and mitigation tactics, to maintaining stockpiles of veterinary vaccines, developing a plant disease recovery system, and significant investments in research and education. A number of grants and other initiatives will support expansion of degree and certificate programs in food sciences, agriculture, veterinary medicine, microbiology, chemistry, statistics, biorisk management, climatology, cybersecurity, and epidemiology.

According to the USDA, Arkansas faced the highest rate of food insecurity in the nation, impacting an estimated 16.6% of households, compared to the national average of 11.2% of households. An estimated 6.5% of Arkansas households were impacted by very low food security in 2022. USDA defines low food security as households experiencing reduced quality, variety, or desirability of diet, and very low food security as households experiencing multiple indications of disrupted eating patterns and reduced food intake.

Arkansas has gained momentum in this area, with a number of investments and initiatives that should continue to be supported. In 2020, the Walton Family Charitable Support Foundation announced a gift of $194.7 million to establish the Institute for Integrative & Innovative Research (I³R) in Northwest Arkansas. The grant created an endowment for hiring faculty teams, for supporting for state-of-the-art facilities that will include additive manufacturing, maker space, microscopy and imaging, cleanroom, pre-clinical labs, and human subjects study labs including multi-modal brain imaging. In 2022, Governor Asa Hutchinson convened a Food Desert Working Group in partnership with the Winthrop Rockefeller Institute to examine research on food deserts and provide recommendations for strategies and programs that could increase food access and food security.

Arkansas institutions have been awarded over $4.2M from the National Science Foundation Convergence Accelerator Program, a cross-cutting initiative designed to address societal challenges with multi- disciplinary research and innovation. Three of the four projects awarded are focused on increasing Arkansans' access to nutritious food, two of which were awarded to I³R.

Arkansas investigators have significant potential to compete for research funding through the USDA. Ongoing efforts in understanding the connection between genomics and phenomics, designing resilient crops, precision agriculture and AI-assisted farming, and biochemical engineering are closely aligned with the agency's current strategic plan. Arkansas will remain eligible for USDA EPSCoR through FY27 as mandated in the CHIPS and Science Act. Investigators are also encouraged to pursue funding opportunities relevant to this topic area from the National Science Foundation and National Institutes of Health.

Next Generation Transportation & Logistics
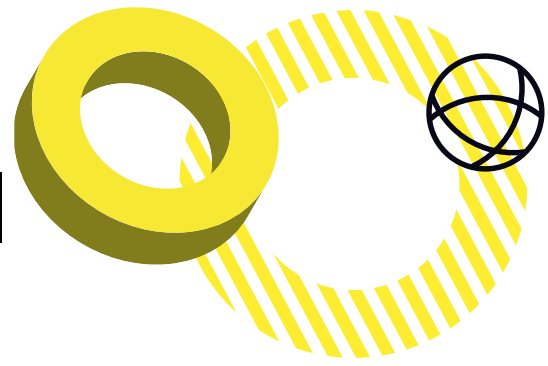
Arkansas is home to more Fortune 500 companies than many peer states, including industry titans Walmart, J.B. Hunt, Tyson Foods, and Murphy U.S.A. Other companies headquartered in Arkansas such as Dillard's, ArcBest, Simmons Foods, and Hytrol along with the dozens of large manufacturers and other businesses across the State heavily prioritize transportation and logistics. The modern logistics and distribution industry is highly complex and interconnected, and increasingly relies on advanced computing and automation.

Federal funders have also placed emphasis on this topic, with huge investments in next-generation technologies, alternative fuel and energy sources, and advanced communications and analytics to enable more efficient logistics. Major Federal initiatives to support vehicle electrification and autonomous systems, combined with the industry base in Arkansas, provide tremendous opportunity for research and education funding.

Arkansas research institutions have developed a cluster of specialized expertise in industrial and transportation infrastructure engineering, successfully competing for Federal and private investments and solidifying key industry partnerships. The University of Arkansas has established several related research centers such as the Center of Excellence in Logistics and Distribution (CELDi), the Mack-Blackwell US Department of Transportation University Transportation Center, the Maritime Transportation Research and Education Center (MarTREC), and the J.B. Hunt Innovation Center of Excellence are all closely affiliated with the university's industrial engineering program, which has been cited by Arkansas industry stakeholders as a key resource for talent and thought leadership around transportation systems applications. Many of these centers operate in close partnership with Arkansas companies or public infrastructure management agencies around joint research projects and faculty embedding and sabbatical programs.

The growth that Arkansas has experienced in data analytics, artificial intelligence, computing, and communications will also provide a good foundation to pursue new investments. Investigators are encouraged to explore modern solutions to the modern challenges facing this topic like integration of hardware and software, multimodal and intermodal connectivity, smart and resilient transportation networks, tracking and optimizing autonomous assets, and worker augmentation or assistance technologies. Further development of the advanced transportation and logistics ecosystem should continue to be supported, and could provide significant and sustainable traction for the State's innovation economy.

Arkansas faces persistent disparities and low national rankings in regards to life expectancy, maternal health outcomes, and other measures of public health. Heart disease and cancer, the first and second leading causes of death in the U.S., are prevalent statewide. The impacts resulting from health disparities and lack of access to healthcare are well-researched and documented. It is imperative that stakeholders across the State prioritize education, workforce development, and innovation in health and medicine. Attention to these issues has grown recently, with a number of possible solutions under development.

Governor Sarah Huckabee Sanders signed an executive order in early 2024 to establish a committee that will investigate maternal and infant health, and prepare a comprehensive plan to address related challenges. Soon after, the State announced grant awards totaling $20M under the Arkansas Linking Industry to Grow Nurses (ALIGN) program. These awards to institutions of higher education are intended to support an increase in nursing professionals and nursing apprenticeships. Recipients were required to find a healthcare employer partner to contribute matching funds, resulting in an additional $40 million secured for the initiative.

UAMS investigators have been particularly successful in competing for NIH awards related to health disparities. The National Institute on Minority Health and Health Disparities awarded $18.9M in 2021 for the creation of a Center for Research, Health, and Social Justice. This was one of 11 such awards which are intended to reduce the disparate impacts of chronic disease, specifically cancer and cardiovascular diseases.

NSF announced a new program in 2022 called Regional Innovation Engines as a direct response to mandates in the CHIPS+ Act. The program invited applicants to propose Type-1 development projects of up to $1 million, or Type-2 implementation projects of up to $160 million. More than 700 concept outlines were submitted, and full proposals were allowed by NSF invitation only. NSF initially awarded just 44 Type-1 development projects, followed by ten Type-2 awards nationwide.

The Arkansas Center for Health Improvement received a Type-1 Development award, the sole award to Arkansas, for healthcare and food access in the Delta region of Arkansas, Louisiana, and Mississippi. The project has convened dozens of stakeholders from across the country and is working to submit an implementation proposal which will be due in early 2025. If successful, this would bring up to $160 million in NSF funding and up to $1 billion in leveraged contributions to support innovation and workforce development in healthcare and food security across the region.
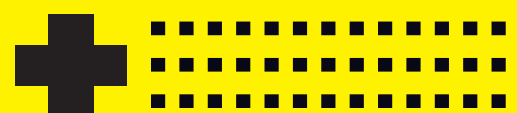
Arkansas has experienced a number of successes, yet faces persistent challenges in developing and retaining STEM talent. A skilled workforce with diverse skills is critical for sustainable innovation and economic growth. Low rates of higher education attainment indicate that the types of credentials offered may not be relevant or are too expensive for most high school graduates, resulting in students leaving the state or choosing not to pursue further education.

Trends in awarded credentials indicate the need for a significant effort. While the number of certificates of proficiency and master's degrees awarded in Arkansas have risen in recent years, the number of awarded bachelor's degrees and technical certificates have decreased. In 2023, just 15,408 baccalaureate degrees were conveyed, the lowest since 2014.

In 2024, the State announced a new program, Higher Industry Readiness through Educational Development (HIRED), which will provide an unprecedented $88M investment in workforce development. The funding will be granted to implement workforce training programs that are aligned with key industry sectors and advanced STEM competencies. Increasing the types of credentials offered, including experiential and vocational training programs, with an emphasis on accessibility for Arkansans is recommended. The HIRED program is an important step in that direction.

Promote Interdisciplinary and Experiential Learning

K12 schools and institutions of higher education should offer educational programs that bridge domains and disciplines, utilizing problem-based learning and direct experience with relevant technologies and tools. Disciplines like engineering and data science encompass many skills and competencies that are relevant to the State's key industries.

Expand Credentials, Certifications, and Degree Programs

A robust workforce is comprised of people with varying levels of skill and expertise. The concepts of education and workforce development should be defined in the broadest sense to include the K20 academic system as well as apprenticeships, micro-credentials, industry certifications, and other programs for upskilling and reskilling. Colleges and universities are encouraged to partner with other campuses to provide flexible, transferable degree pathways such as 2+2, 2-then-2, or 4+2 programs. These pathways significantly increase opportunities for learners and contribute to retention. Programs like STEM Prep, administered at the University of Arkansas, or online course-sharing platforms expand access to STEM courses for students at under-resourced campuses.

GOALS

- Pursue or provide annual funding to support and expand the STEM Prep program (or similar alternatives), in order to provide more access to quality courses for community college students across the State.

- Implement a new grant fund to incentivize partnerships between institutions of higher education for additional 2 + 2, 2 -then- 2, or 4 + pathways.

- Increase the types of apprenticeships and experiential training programs in fields that are relevant to Arkansas industry and aligned with Federal priorities.

Institutions of higher education across the State also face challenges in retaining talent, especially non-tenured or early career STEM faculty, and research administrative staff. Reversing this drain of talent and support for R&D must be prioritized and incentivized.
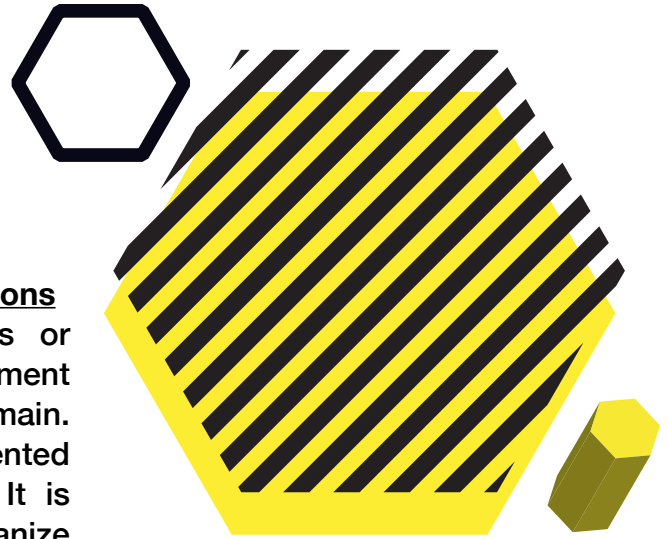
Increase Engagement with Professional Organizations
Regional and national professional organizations or scientific societies can provide meaningful engagement and development for professionals in nearly any domain. Experiencing a sense of belonging is a well-documented factor in retention of STEM talent at all levels. It is recommended that stakeholders continue to organize workshops, symposia, and conferences to showcase the State's talent and resources.

Increase Alignment of Research and Education with Key Industries
The State has experienced persistent loss of STEM talent and gaps in the workforce pipeline, which over time results in companies being forced to hire, or operate, elsewhere. Stakeholders must work to increase alignment of educational pathways, credentials, and workforce development investments with the State's key industries. This will lead to retention of talent and of employers.

GOALS

- Increase the number of workshop and conference proposals submitted to Federal funders. Convening professional communities in Arkansas will raise awareness of the State's strengths, as well as bring economic benefits through travel and tourism.

- Provide scholarship funds for students and early-career faculty to join professional societies that are relevant to their respective fields, incentivizing membership on the condition of being enrolled or employed at Arkansas institutions of higher education.

- Expand programs like the ARA Scholars and Fellows and provide unrestricted seed funding for early-career, non-tenured researchers to retain STEM talent in the State.

- Promote engagement of the private sector in development and implementation of educational programs in order to increase retention of STEM talent and employers.

Arkansas is home to unique assets, resources, instrumentation, equipment, and facilities that each require a certain level of attention and investment. Infrastructure for a thriving R&D ecosystem is incredibly important and should be well-maintained. Equipment and facilities that provide access to additional investments or new capabilities should also be considered. This will increase competitiveness and capacity for research and education.

Advanced Cyberinfrastructure

High-performance computing facilities in Arkansas have experienced consistent, significant increases in both the demand for access to computational resources and need for support in designing and implementing research tasks. Since 2020, the Arkansas High Performance Computing Center (AHPCC) at the University of Arkansas has supported a threefold increase in the number of users and twofold increase in usage of computing resources. Most AHPCC services are provided free of charge to eligible researchers, resulting in estimated savings of over $10M since 2020. While much this activity is driven by UARK researchers, demand from other campuses has also increased. Special efforts should be made to ensure that HPC services keep pace with technology, and that the faculty and staff responsible for managing these critical resources are supported and retained.

Core Facilities Exchange (CFE)

The CFE is an online platform and database of research instrumentation and accompanying services available at laboratories across the State, established in 2021 by the Arkansas Research Alliance. In recent years, the concept of shared-use facilities and cross-sector collaboration to enable industry-sponsored R&D has become increasingly popular. Stakeholders are encouraged to implement creative models for businesses to use and access advanced instrumentation or equipment, as well as expand access to facilities and infrastructure for investigators. The CFE intends to create awareness of and facilitate access to diverse resources and expertise. This effort, modeled after successes in other states, should be supported and further developed.

Secure Facilities for Information & Safe Research

With the increase in research activity and investments related to information and cybersecurity, investigators and other stakeholders would benefit from access to secure infrastructure such as a sensitive compartmented information facility (SCIF) that meets guidelines specified by intelligence community standards. Such facilities enable access to new, significant funding streams at agencies like the Department of Defense.

GOALS

◇ Increase funding at the State and institutional level to support continued maintenance of advanced cyberinfrastructure and HPC facilities, and competitive salaries for HPC administrators.

◇ Promote utilization and expansion of the CFE, incorporating resources and instrumentation at campuses that are not currently participating. Incentivize and prioritize investments in secure facilities that support research in cybersecurity, secure communications, and other topics.

Federal funding programs are increasingly targeting partnerships for investment. Meaningful collaboration is not only more competitive, but also results in sustainable impact. Partnerships among industry, academia, nonprofits, and government can translate use-inspired research to tangible economic and societal benefits, and develop a relevant workforce to grow the knowledge-based economy. It is recommended that partnership and collaboration be prioritized among all stakeholders in the State's innovation ecosystem.

Stakeholders and investors are encouraged to support the growth of startups and small and medium-sized enterprises through incubators, accelerators, and innovation hubs. Entrepreneurial support organizations have demonstrated eagerness to collaborate and partner with a variety of organizations to streamline and raise awareness of service offerings.

New business services, entrepreneurial training programs, venture funds, incentives, loans, and grants can further strengthen this ecosystem and generate sustainable growth in relevant technology sectors. The State should consider creative ways to leverage funding and develop new programs to support startups and entrepreneurs at various stages of development.

GOALS

■ Increase the annual appropriations for tax credits, grants, the Quick Action Closing Fund, and other incentives that support tech-based economic development and entrepreneurship.

■ Update restrictive language in legislation enabling matching grants that limits the number of awards or specifies a narrow range of Federal programs. For example, the SBIR Matching Grant language should be revised to remove the cap on total number of awards to applicants and to include STTR as a qualified Federal program for matching funds.

■ Incentivize partnerships with new matching grant programs or reserved resources for collaborative projects involving organizations from multiple geographic areas or multiple sectors.

The Arkansas R&D ecosystem has grown substantially over the past two decades, and the vision of this plan is to maintain momentum and support for unprecedented achievement. The need for broader engagement and focused effort to sustain a robust network is clear. It is recommended that stakeholders in this ecosystem immediately turn to strategic planning that incorporates into science and technology planning how that planning is sustained and broadened in 2024 and into the future.

The Arkansas Research Alliance recently contracted with TEConomy Partners to assess the State's research competencies and associated industry growth opportunities. The assessment took into consideration several quantitative factors by analyzing data on research awards, patents, publications, and program trajectory, and examined state, national, and international market opportunities. The data analysis was given substantive context with guidance from a 20-member project advisory group comprised of members reflecting Arkansas' leading industry clusters, research universities, federal lab, and economic development leadership, along with 60 interviews of stakeholders of similar composition. The report identified seven key areas of opportunity in emerging or advanced stages of maturity that align with the reports authored by the National Science and Technology Council and National Science Foundation, respectively. This report has not yet been published, but is planned for release in the fall of 2024.

This effort, as well as increased engagement and outreach among colleges and universities state-wide, provide an excellent foundation for an increased emphasis on the development and review of the State's Science & Technology Plan moving forward. It is under this consideration that the following goals are outlined and directed internally to the SAC.

GOALS

- Expand the jurisdictional steering committee with additional representatives from educational institutions, state government agencies, and industry. The SAC charter should be reviewed regularly and updated to ensure fairness, broad participation, and accessibility.

- Develop a formal process for annual review and revision of the State's S&T plan, including consideration for necessary resources and accountability.

- Increase engagement with other stakeholders in and beyond Arkansas to expand research capabilities and opportunities.

Conclusion

The Arkansas 2024 Science & Technology Plan seeks to recognize the significant strides made and the significant work needed to achieve a bold vision. This plan outlines our commitment to leveraging Arkansas's strengths in science and technology for the benefit of all residents. It emphasizes practical steps toward innovation, economic growth, and enhanced quality of life, reflecting the collaborative efforts of academia, industry, and government.

Our focus remains steadfast on implementing strategies that build a resilient and inclusive ecosystem, conducive to research and development, workforce training, and public-private partnerships. These efforts aim to position Arkansas as a competitive player in the national science and technology landscape.

We appreciate the contributions from various stakeholders across the state, including the leadership from Governor Sarah Huckabee Sanders and Cabinet Secretaries, who have been instrumental in guiding this vision. As we move forward, we remain dedicated to fostering a culture of innovation that addresses current challenges and anticipates future opportunities.

This plan is a testament to our collective resolve to advance Arkansas's science and technology sectors. We embark on this journey with a clear focus on actionable outcomes, ready to make a lasting impact on the State of Arkansas.