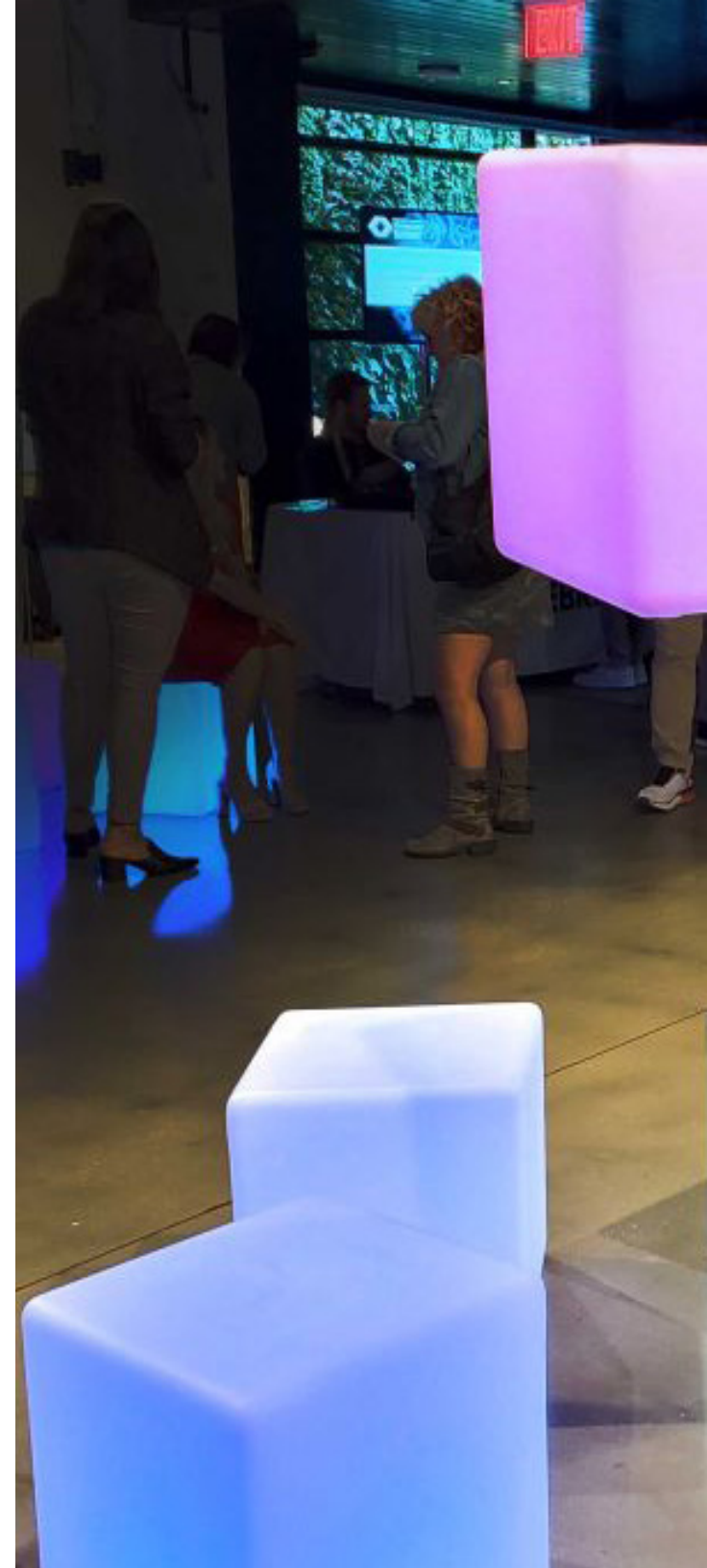


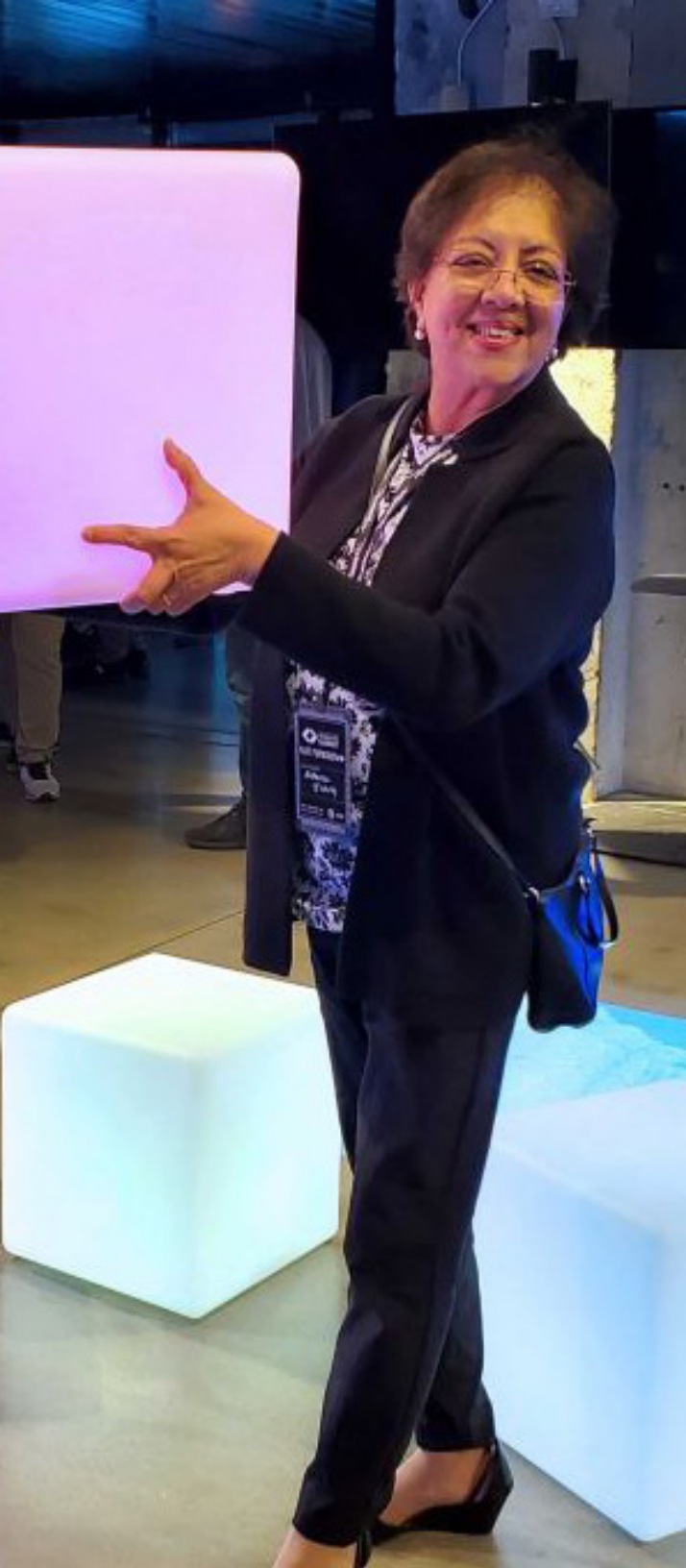


INSTITUTE FOR INTEGRATIVE & INNOVATIVE RESEARCH

I³R - Highlights 2023







From our Executive Director, Ranu Jung

Dear Friends,

Welcome to 2024! The Institute for Integrative and Innovative Research was established to be a pioneering institute. It is a new model for driving innovation for societal impact and economic development. I invite you to join our journey in forging an institute that focuses on *convergence*: the merging of ideas, approaches and technologies from widely diverse fields of knowledge to stimulate innovation and discovery. Join us in our vision to be the recognized leader in convergence research for societal impact and the preeminent partner in creating and deploying comprehensive, transformative, and scalable innovations that stimulate economic growth and improve health and well-being in Arkansas and beyond.

From our groundbreaking clinical trial of our innovative prosthetic hand system to our important work in sustainable proteins to our continuing commitment to the Grand Challenge of Integrative Health, I³R is moving forward in significant and impactful ways. I am so proud of what we accomplished in 2023 and am pleased to share with you our milestones and achievements over the past year in research, innovation, education, and empowerment. Our team is passionate and driven by purpose. I am excited about what is to come. All of us, together, are continuing to *bring the future to the now*.

Ranu Jung, Ph.D.

Associate Vice Chancellor

I³R Founding Executive Director and Endowed Chair

Distinguished Professor of Biomedical Engineering

The I³R blueprint for success

I³R's blueprint for success has four key components:



Collaboratories

Our framework for the people and spaces that make convergence a reality. *Collaboratories of People* who are adaptable, driven by purpose, and vested in addressing the institute's grand challenge as part of a convergent team. *Collaboratories of Physical and Digital Spaces* where convergent teams engage – deliberating ideas, leveraging knowledge and expertise, and taking action.



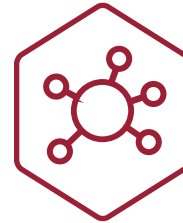
Education and Empowerment

This is how we make the impact of I³R lasting and sustainable. We are committed to fostering a sense of belonging for all and empowering women and other groups underrepresented in the workforce.



Research Excellence and Innovation

We uphold rigorous standards in pioneering novel solutions to 'wicked' problems to propel our university and the region as research leaders.



Growing Wheel of Impact

We use the expertise, resources, and opportunities available within the university system and leverage the assets present in our unique geographic location to deploy scalable innovations.





Collaboratories

If convergence is *how* we carry out the mission and vision of I³R, then collaboratories are the *who* and *where* in the equation.

Collaboratories of People refers to the convergent teams formed to achieve a specific goal or pursue solutions to a ‘wicked’ problem. Driving one of the institute’s key 2023 milestones, a *Collaboratory of People* made expansion of our Neural-enabled Prosthetic Hand clinical trial to **Walter Reed National Military Medical Center** – a first of its kind collaboration for the university – a reality through the awarding of a \$4.9 million Department of Defense grant.



Collaboratories of People share knowledge, leverage expertise, and take action, as in the example of I³R’s **collaboration with the University of Arkansas Pat Walker Health Center** to prepare and submit a proposal to the NIH National Institute on Drug Abuse Challenge. The proposal aims to create substance use screening, prevention, and intervention tools for implementation in the university’s primary care clinic, which averages 30,000 office visits per year and whose patients include young adults starting to experiment with substance use or already exhibiting high-risk substance use behavior. The collaboration resulted in a \$5,000 cash prize to create the Razorback Rapid Substance Screening and Intervention Tool.



Impact:

I³R is enabling new research and funding opportunities for the University of Arkansas.

Impact:

I³R has the capability to support other university units with grant preparation and submission.

The **Sustainable Proteins Consortium for Population and Planetary Health** is another *Collaboratory of People* with a shared objective to address a growing global concern. As the world population surges past 8 billion people, demand for meat is expected to outpace supply. Leveraging NWA's unique ecosystem, the Consortium proposes to create a scalable model for accelerating advances in protein production – from cultivation to consumer.

The pinnacle representation of physical *collaboratories* – the **state-of-the-art I³R building** – reached several construction milestones throughout the year. In June, Chancellor Robinson, Congressman Womack, and associate vice chancellor and I³R founding executive director Ranu Jung, welcomed more than 200 people who gathered to celebrate “Topping Out” the building. The diverse audience included university leadership, college deans, department chairs, faculty, staff, and students as well as the project's construction crew and design teams, community leaders, board of trustee members, industry partners, and media. Everything about the building – from its workspaces and labs to its central location – is designed to foster collaboration, integration, and innovation.

Collaboratories of People are leveraging their respective areas of expertise and using AI to level the playing field for small and mid-sized farmers. Assistant Research Professor Meredith Adkins and her team of researchers and industry partners have been awarded up to \$5M in Phase 2 funding from the **NSF Convergence Accelerator program** to build **Cultivate IQ**, the AI driven software the team designed in Phase 1.



Impact:

I³R is positioning the region as the global leader in sustainable protein production to ensure a reliable domestic supply of protein for U.S. markets and bolster national security.

Impact:

This three-story, approximately 144,000 square foot facility will be home to leading edge technology, lab space, and research equipment, with expansive spaces designed to bring people together to generate ideas and move those ideas toward innovation.

Research Excellence and Innovation

The Institute's current research projects are led by two distinct teams:
Adaptive Neural Systems Group and Community Development Group.

Research Project: Neural-enabled Prosthetic Hand (NEPH)
Team: Adaptive Neural Systems Group

The purpose of this study under the guidance of Drs. James Abbas and Ranu Jung is to evaluate a new investigational prosthetic system called the neural-enabled prosthetic hand (NEPH).

It is intended to provide the sense of touch, grasp force, and hand opening to the user by wirelessly sending electrical stimulation pulses to electrodes implanted in nerves of the residual limb. The system uses measurements from sensors in the prosthetic hand to adjust the pulses continuously so the nervous system is activated and the user perceives sensation as tasks are performed with the prosthesis.

In January, through a collaboration with University of Arkansas for Medical Sciences (UAMS), the innovative prosthetic hand system pioneered by I³R researchers was successfully implanted in the first Arkansan and only second person in the world to receive the novel device, a major milestone in the clinical study. In September, the groundbreaking prosthetic device was implanted in a second Arkansan.

The project reached another major milestone when collaborating surgeons, clinicians, and researchers from Walter Reed National Military Medical Center (the second site for the clinical trial) twice visited the institute to be trained on the implant and research procedures.

Research Project: ExtendedTouch a.k.a. xTouch
Team: Adaptive Neural Systems Group

Neuro-haptics in virtual reality (VR) is a leading-edge innovation that allows users to feel touch sensations within a virtual and augmented environment. In traditional VR, users can manipulate objects, but the aspect of touch remains unavailable. ExtendedTouch (xTouch) is a wearable neuro-haptic platform being pioneered by I³R researchers under the guidance of Assistant Research Professor Andres Pena that is designed to enable people to dynamically interact with and feel objects in VR environments. It uses a patented nerve stimulation technique featuring combinations of electrodes on the wrist that stimulate the underlying nerves. When these nerve points are stimulated, the sensation of touch can be felt at the fingertips. This form of stimulation is called neuro-haptic feedback. I³R researchers are pairing this technology with virtual reality and exploring the impact of applying xTouch to physical rehabilitation practices.

In 2023, the team entered into an agreement with BioCircuit Technologies, an Atlanta-based neurotechnology company, to develop custom neurostimulation components that will enable future deployment of the system in clinical (lab) and non-clinical (at-home) settings.

Additionally, the team has filed an invention disclosure for a novel method of encoding stimulation parameters for a peripheral nerve stimulation sensory feedback system.



Research Project: Cultivate IQ

Team: Community Development Group

With large industrial farms dominating production and global trade expanding, local farms have increasingly struggled to connect to distributors and food buyers. I³R is addressing this challenge through Cultivate IQ, an AI data insights software platform funded by the National Science Foundation's Convergence Accelerator Grant, designed to connect small and medium-sized farms to distributors. Offering transparency and useful information across the food supply chain, this tool will allow farmers to know what to grow, how much to grow, and who to sell it to.

In 2023, the team led by I³R Assistant Research Professor Dr. Meredith Adkins, completed Phase 1 of the NSF Convergence Accelerator Grant and was awarded nearly \$5 million in additional funding – with \$2 million already obligated to conduct Phase 2 of the project - bringing the total intended federal investment to nearly \$6 million.

The grant effort is highly convergent and cross-disciplinary, with co-principal investigators from food safety, AI/ML computer engineering, industrial engineering, and agricultural economics, as well as two centers, the Indigenous Food & Agriculture Initiative and the Center for Advanced Spatial Technologies. The University of Arkansas team is joined by collaborators from University of Arkansas System Division of Agriculture, University of Arkansas at Pine Bluff, University of Florida, University of Wisconsin-Madison, and two industry partners, Junction AI and Cureate. [Watch the Phase 1 video.](#)



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Research excellence is I³R and the whole of the University of Arkansas. Through convergence research and innovation made to scale – we will change the world.

- **Margaret Sova McCabe**
Vice Chancellor, Research & Innovation

Education and Empowerment

Educating and empowering tomorrow's generation is the cornerstone of I³R's lasting and sustainable impact. It begins with professional development and research opportunities for our own team, extends to University of Arkansas, and in alignment with the university's land grant mission, reaches all corners of the state and beyond.



I³R Speaker Series

The I³R Speaker Series has brought together more than 20 distinguished speakers and panelists for substantive discussions about a diverse range of topics related to Integrative Health, including:

- Unlocking the Power of Convergence Research for Societal Impact
- Building Sustainable Food Systems
- The Food and Well-being Connection
- Metabolic Health, Aging and Exercise
- Technology and the Brain
- Vagus Nerve Stimulation
- Graduate Students on the Leading Edge of Innovation
- Asset-based Approaches to Broadening Participation in Engineering and Computing Education

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Participating in a working lab gave me hands-on experience most people won't get until they begin working in their profession.

- Dylan Pledger
I³R undergraduate research assistant



Undergraduate Research

I³R is committed to supporting student success and inclusivity. One of the most exciting ways we're doing this is through our Undergraduate Research program, which gives students robust, hands-on research experiences. We're excited to expand the program beyond University of Arkansas - Fayetteville to welcome student researchers from throughout the University of Arkansas system as well as Northwest Arkansas Community College and other Arkansas institutions of higher education. This statewide impact is also consistent with our mission as a land grant university.





Inspire Fund

2023 saw the introduction of the Inspire Fund, a charitable giving effort to grow key institute initiatives. In alignment with the university's focus on student success and the institute's emphasis on education and empowerment, the first priority initiative to be funded is undergraduate research.



Establishing the fund is a major milestone, giving friends of I³R an opportunity to join us in solving 'wicked' problems and advancing the institute's mission with their charitable contributions."

- **Ranu Jung**
Associate Vice Chancellor and I³R
Founding Executive Director



Growing Wheel of Impact



Mission Statement

Driven by purpose, we pioneer solutions to wicked problems through convergence research across academic, industry, government, and nonprofit sectors to make a positive impact by creating and deploying innovations at scale.



Strategic Visioning Workshop

In April, nearly three dozen academic, industry, non-profit and community representatives participated in a day long Strategic Visioning Workshop with the goal of refining I³R's mission and vision statements as well as outlining a high-level 3-year strategic roadmap and recommended next steps. More than 30 stakeholders across I³R and University of Arkansas (including all deans), as well as key community and industry experts, offered feedback in pre-workshop interviews intended to obtain a diverse set of perspectives on the market and I³R's role.



NWA Tech Summit

I³R's participation and sponsorship of the NWA Tech Summit advanced the Institute's vision to be a leader in FoodTech, HealthTech, and CyberOps vectors; strengthened our position in the emergent tech ecosystem; and fostered significant connections. The three-day event featured two I³R sponsored breakout sessions related to our Grand Challenge of Integrative Health.

Vision Statement

I³R at the University of Arkansas will be the recognized leader in convergence research for societal impact and the preeminent partner in creating and deploying comprehensive, transformative and scalable innovations that stimulate economic growth and improve health and well-being in Arkansas and beyond.



White House Forum on Campus and Community Scale Climate Change Solutions

In March, Dr. Meredith Adkins joined other climate, sustainability, and resilience thought leaders from across the country for a forum convened by the White House Office of Science and Technology Policy. Discussions showcased how innovative ideas and actions can advance climate change efforts on college campuses while benefiting the surrounding communities and beyond.



White House Demo Day

In November, Dr. Jung and Dewey Hickey, the first Arkansan to receive the novel neural enabled prosthetic hand, were invited to participate in the 2023 American Possibilities: White House Demo Day. This event served as a platform to exhibit breakthrough advancements made possible through federally funded research and development. Dr. Jung and Mr. Hickey engaged with representatives from the White House and various federal agencies, who extended appreciation for the dedication and contributions of the pioneering projects underway at the University of Arkansas. The recognition emphasized the collective effort to make these advances available to society at scale.



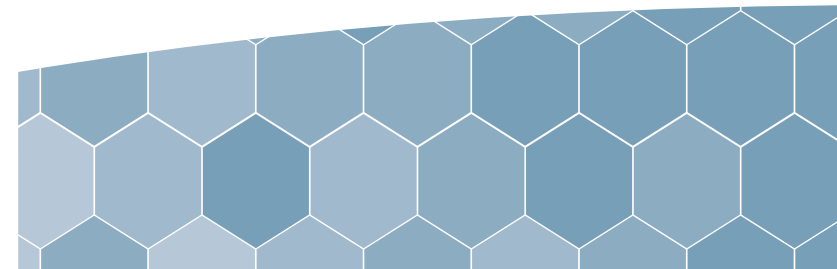
Innovator of the Year Award

Dr. Ranu Jung was named Innovator of the Year by the Bentonville Chamber of Commerce and Ernst & Young during the NWA Tech Summit. The award recognizes individuals who have demonstrated outstanding technical and entrepreneurial talent, contributed positively to Northwest Arkansas, and helped advance the region's economic ecosystem.



IEEE EMBC Conference

Dr. Ranu Jung represented the University of Arkansas and I³R and served as Finance Chair at the 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society in Sydney, Australia. The conference featured the theme "Engineering Better and More Resilient Healthcare for All." IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. Dr. Jung will serve as Chair of the 46th Annual International Conference. The theme for EMBC2024, to be held in Orlando, FL, is "Technology and its Promise for Equity and Access for Well-Health."



Economic Development

I³R has a dual mandate to advance research and innovation at the University of Arkansas as well as stimulate economic growth in Northwest Arkansas and throughout the state. Industry partnerships, like that with Arkansas Childrens' Hospital Northwest in which I³R provided prototyping services for a new patented children's arm brace, are key to achieving I³R's economic development charge.

I³R's current and future capabilities, including 3Tesla-MRI, whole-body calorimetry, and additive manufacturing, are intended to generate similar industry engagements that will foster economic growth in the region and state.

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The University of Arkansas has a significant role to play in shaping the state's economic future and I³R, as an engine for industry collaboration and innovation, will lead the charge.

- **Mike Malone**
Vice Chancellor,
Economic Development

Prosperous regions across the country are defined by well-rounded and diverse economies. At the epicenter of one of the fastest-growing regions in the country and with proximity to industry leaders and a robust business sector, I³R is leading the charge in fostering a robust innovation infrastructure and increasing investments in research and commercialization that will strengthen the region's competitive advantage on a global scale.

- **Nelson Peacock**
President & CEO
NWA Council

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I³R Team Achievements and Recognitions

- Awards, Scholarships, Fellowships: 9
- Grants (7): ~\$13.3M
- Invention Disclosures/Patents Filed/
Patents Granted/Licenses: 9
- Presentations: 23
- National Outreach: 18
- Arkansas first-in-the-world human NEPH clinical trials: 2



New Hires: 15

- 1 Non-Tenure Track Faculty Researcher
- 1 Graduate Researcher
- 4 Undergraduate Researchers
- 9 Staff



Engagement

Social Media

- Total Audience Net Growth: +138%
- Total Impressions: +527%
- Total Engagements: +943%
- Engagement Rate: +66%

Website

- Total Visitors: 31,239 (+33%)

9

Invention Disclosures/
Patents Filed/Patents
Granted/Licenses

2

Arkansas first-in-the-world
human NEPH clinical trials

Total Grant Dollars:

~\$13.3M

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I³R is unmatched in its passion, purpose and pursuit of solutions to 'wicked' problems. They are building a new paradigm for how universities can partner with industry, government and non-profit sectors for global impact.

- **Michael Thompson**
Principal Engineer for
Critical Infrastructure & ICS Cybersecurity
Mitre

Headlines

NORTHWEST ARKANSAS
Democrat  **Gazette**

UA celebrates milestone for new research institute



Arkansan second person in the world receive neural-enhanced prosthetic hand transplant

AXIOS NW Arkansas

UA institute gets \$5 million for prosthetics research

Arkansas Democrat  Gazette

Linking Arkansas farmers, buyers is grant aim



amp
Arkansas Money & Politics

THE FUTURE IS NOW: UA'S I³R A CATALYST FOR INNOVATION THROUGH INTEGRATIVE HEALTH



Prosthetic hand developed by UA institute featured at White House event



Ranu Jung
Celebrated as
Ernst & Young
Innovator of Year





Institute for Integrative &
Innovative Research
UNIVERSITY OF ARKANSAS.

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