



UWM RESEARCH FOUNDATION
ANNUAL REPORT 2016

➤ Chancellor's Message

With a \$1.5 billion annual impact on the Wisconsin economy, the University of Wisconsin-Milwaukee (UWM) plays a critical role in our region's prosperity. At the core of that is the innovative and transformative research by faculty, staff and students in areas that include water, energy and health care. For more than a decade, the UWM Research Foundation (UWMRF) has helped make our research engine strong. We are proud to share this update to recognize those achievements and extend our deepest gratitude to our corporate and foundation partners who make this research support possible.



Mark Mone

Mark Mone
Chancellor of UWM





BUILDING ON RESEARCH STRENGTH

UWM joined the nation's elite research institutions in 2016 with its designation of "highest research activity" from the Carnegie Classification of Institutes of Higher Education. The rating was bestowed upon only 115 of the 4,665 universities evaluated. In Wisconsin, only UWM and UW-Madison made the top tier. Since 2006, the UWMRF has helped create an environment that has led to this important distinction. The foundation's Catalyst Grants and corporate partnerships have helped advance research. And UWM's Ideas Challenge – the student entrepreneurial ecosystem – and the I-Corps program, sponsored by the National Science Foundation (NSF), are helping build a culture of innovation that stimulates the commercialization of ideas while enhancing the success of our graduates.

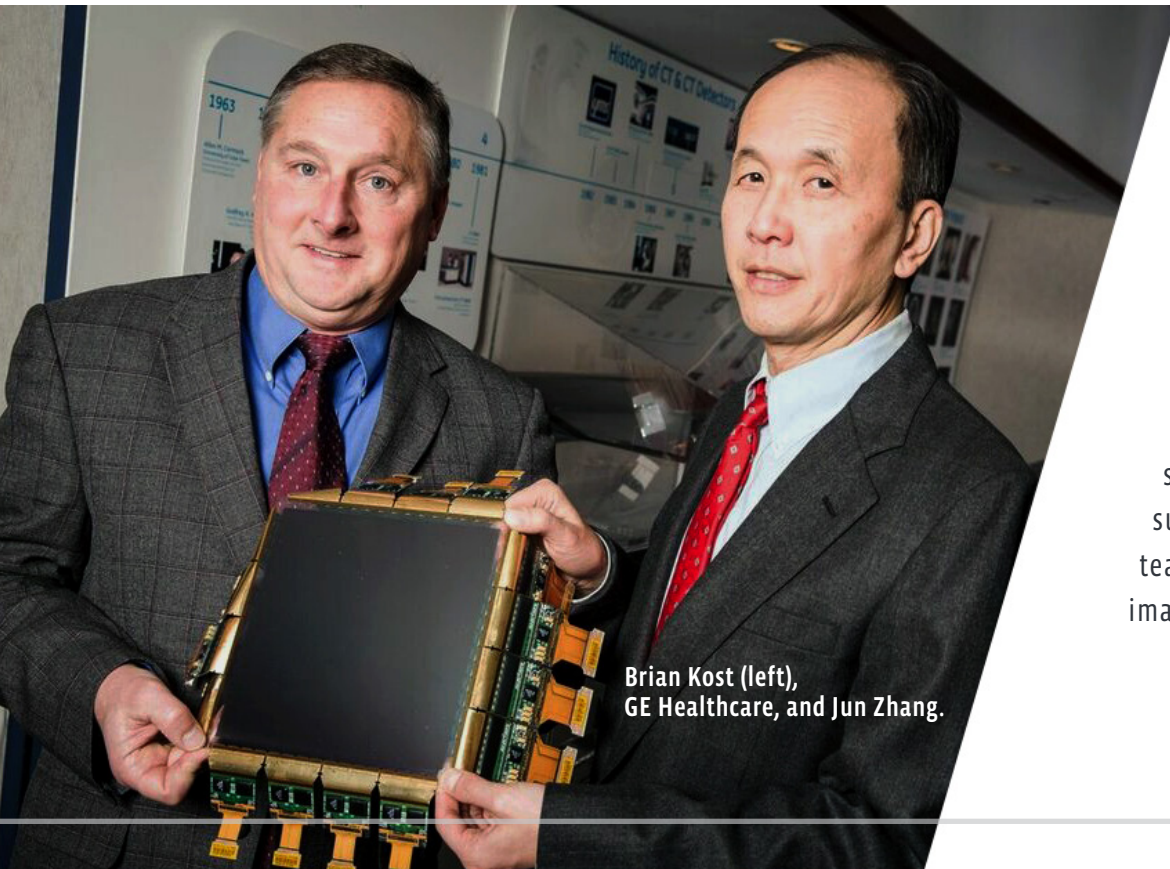
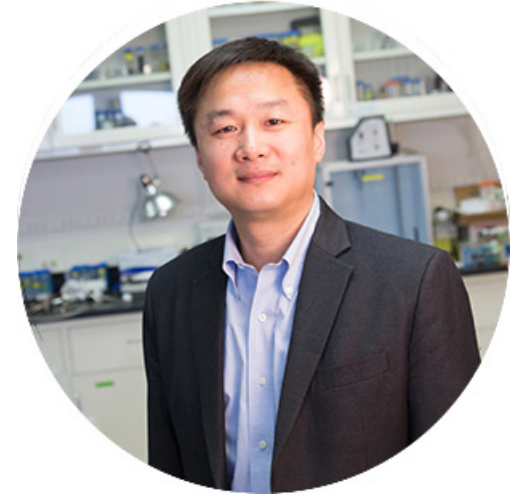


\$59

million in
research expenditures

FOSTERING CORPORATE PARTNERSHIPS

Junhong Chen is not only a successful researcher but also a leader in corporate partnering and entrepreneurship. Chen, distinguished professor of mechanical engineering, has attracted more than \$7.7 million in grants for his pioneering work in contaminant-sensing platforms and next-generation nanotechnology for battery, green energy and electro-catalyst uses. He directs the Water Equipment and Policy Center, a 7-year-old Industry-University Cooperative Research Center funded by the NSF. Industry partners in the center help drive research programs relevant to their businesses. Chen's startup, NanoAffix Science LLC, is working to bring a novel sensor technology patented and licensed by the UWMRF to the market.



Brian Kost (left),
GE Healthcare, and Jun Zhang.

➤ **Advanced X-Ray Imaging**

The GE Healthcare Catalyst Grant Program is strengthening partnerships with UWM and innovative researchers such as Jun Zhang, professor of electrical engineering and computer science. Working with Brian Kost, general manager of imaging subsystems and engineering at GE Healthcare, Zhang and his team are conducting research that may reduce the price of imaging equipment without compromising image quality.



CATALYST GRANT PROGRAM

Thanks to support from the Lynde and Harry Bradley Foundation, the Rockwell Automation Charitable Corporation, the Richard and Ethel Herzfeld Foundation, and GE Healthcare, the UWMRF provides seed-funding for promising research through its Catalyst Grant program. To date, there has been \$4.2 million invested in 80 research projects with \$16 million in follow-on funding produced. More than 100 researchers and early-stage work has been supported by Catalyst Grants and in the last 10 years, the program has accelerated the pace of discovery by supplying researchers with a foundation that continues to build on innovation.

 **\$4.2** million
awarded



CATALYST GRANTS SUPPORT GREEN TECHNOLOGY

➤ **Smart-Grid Energy Management System**

The aim of Lingfeng Wang's work is to integrate renewable energies into the existing power infrastructure. Building on UWM's strength in computation, and with help from a Catalyst Grant, Wang, associate professor of electrical engineering and computer science, developed user-friendly tools that manage the switching of renewables in smart buildings. The underlying algorithms rely on adaptive learning in dynamic environments.

.....  **\$16 million**
follow-on funds



Bruce Bathurst (left), Alan Schwabacher, and Peter Geissinger (right).



➤ Wastewater Sensors

Peter Geissinger, associate professor of chemistry, has an expertise in sensor technologies for use in water. With support from a Catalyst Grant, Geissinger partnered with Advanced Chemical Systems to create a long-lasting sensor that can detect and monitor heavy metals in wastewater discharge. Geissinger and longtime collaborator Alan Schwabacher, associate professor of organic chemistry, are also working with Bruce Bathurst, Advanced Chemical Systems, to develop a new kind of chemical probe for real-time sensing. Advanced Chemical Systems has already licensed the patent on the original work, and the UWMRF is pursuing a new patent application for the team's latest innovations.

CATALYST GRANTS SUPPORT DRUG DISCOVERY

➤ Anti-Cancer Pro-Drugs

Alexander Arnold, associate professor of chemistry and biochemistry, has discovered novel compounds that offer safe and effective suppression of tumors in animal models. The compounds modulate a cancer-causing gene that interacts with the body's "master regulator" of calcium, called the vitamin D receptor (VDR). Normally, the receptor interacts with a form of vitamin D to drive proper cell growth and differentiation. However, malignant cells with high metabolic activity and impaired VDR signaling can cause tumor growth that is less responsive to cancer drugs and cancer immune therapy. Arizona-based Systems Oncology LLC, a machine learning-based biotechnology company that mines datasets to find new cancer therapies, has licensed the patented drug compounds from the UWMRF.



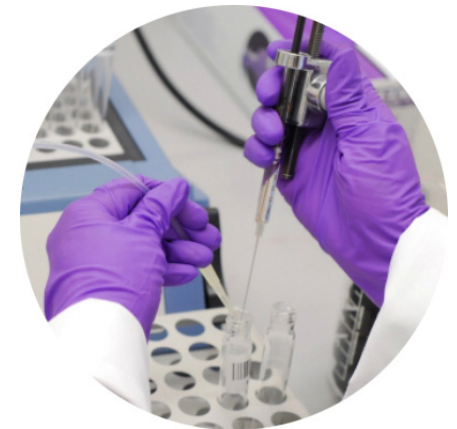
.....
13 faculty
startups



James Cook (left) with Daniel Knutson, a graduate student in the Cook lab.

► **Novel Asthma Treatment**

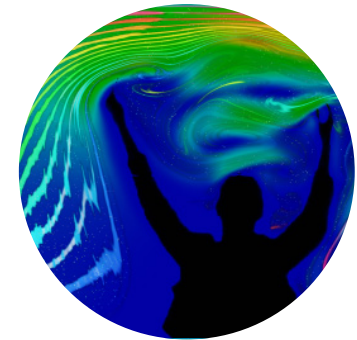
James Cook, distinguished professor of chemistry, has received several UWMRF Catalyst Grants for his work with drug compounds for depression, anxiety, addiction and asthma. The UWMRF owns 14 issued or pending patents from Cook's work. Now he is collaborating with Alexander Arnold and Doug Stafford, director of Milwaukee Institute for Drug Discovery, to develop compounds that are effective for pain and seizure in animal models. The researchers and the UWMRF have partnered with Neurocycle Therapeutics, a drug-discovery startup company, to pursue further funding to advance pharmaceuticals with veterinary and human applications.



TRANSFORMING RESEARCH AND INNOVATION

➤ Immersive Fluid Flow Experience

Tom Hansen has created an interactive display that demonstrates the physics of air and fluid dynamics. The doctoral candidate and information processing consultant calls his flexible and low-cost system the Immersive Fluid Flow Experience, and it can be used in a variety of educational environments. The software has been licensed by Science Kinetics, a company that specializes in custom design and fabrication of interactive exhibits for use in museums, science centers and other public spaces.



.....  **60** license/option agreements

➤ 3D Motion Tracking System

Brian Armstrong, professor of electrical engineering, has been developing 3D-motion tracking systems for more than a decade. These systems have applications in medicine, industrial automation, 3D animation, sports biomechanics and robotics. His technology has evolved into a patented 3D measurement system that uses a single camera and a unique target to measure six degrees of movement. Armstrong's startup company, Metria Innovation Inc., has licensed aspects of the technology from the UWMRF. The company currently has a Phase II SBIR grant to develop the system for biomechanics applications. It is already being used in more than 20 MRI scanners globally to correct the image after patient movement obscures it.



Research partner, Kristian O'Connor (left), associate professor of kinesiology, and Brian Armstrong.



NSF I-CORPS PROGRAM

The I-Corps (Innovation Corps) program was developed by the NSF to accelerate the transfer of technologies developed through academic research to the marketplace using a proven “lean launch” approach. The UWMRF is delivering this impactful program to UWM and partner institutions – Concordia University, Marquette University, the Medical College of Wisconsin, and the Milwaukee School of Engineering. During the intense four-week program, teams of faculty, researchers, and graduate students learn the process of “customer discovery.” So far, 55 teams have completed the program. UWM and the UWMRF have recently teamed up with the Wisconsin Economic Development Corporation to expand the program to professionals working in health care. And the NSF has provided additional funding to offer training to nursing students as a means to increase diversity in entrepreneurship.



55 I-Corps teams
trained since 2015

CREATING AN ENTREPRENEURIAL ECOSYSTEM

➤ Graphene Monoxide Battery

Two UWM physicists are part of a team that discovered a new hybrid semiconducting nanomaterial, Graphene Monoxide (GMO). The material is based on graphene – a single-layer carbon structure. Because the material exhibits superior electrical and thermal conductivity, Marija Gajdardziska-Josifovska, professor and dean of UWM’s Graduate School, and Carol Hirschmugl, professor of physics, believe it can improve performance of lithium-ion batteries. Funding from the Catalyst Grant program has helped the team scale up production of GMO. After completing the NSF I-Corps entrepreneurial training program last summer, the professors formed Safeli LLC, completed a license agreement with the UWMRF, and are pursuing support to prove the technology in battery applications.



Marija Gajdardziska-Josifovska (left),
and Carol Hirschmugl.



ADVANCING FACULTY TECHNOLOGY

➤ Superhydrophobic Cement Admixture

Konstantin Sobolev, professor of civil engineering and mechanics, has developed a sealant that can be used on the surface of traditional and lower-quality cement to considerably extend lifespan. Sobolev, whose lab also developed a high-performance, water-resistant cement composite, had completed both the NSF I-Corps program in Milwaukee and the three-month national I-Corps program. This allowed researchers to determine the feasibility and success of commercializing the sealant and after conducting more than 100 interviews with potential customers, his team is now exploring the formation of a startup company.



1,500 I-Corps
customer
interviews

➤ Genetic Sterilization of Plants

With increasing government regulation of genetically modified (GMO) plants, Dazhong Zhao's research could be of great interest to both the agriculture and biofuels industries. Zhao, associate professor of biological sciences, investigates the molecular mechanisms of plant reproduction. He was awarded a Catalyst Grant for his patent-pending method of creating both male and female sterile plants. It's essentially a genetic "sterility switch" that prevents the GMO plants from contaminating the genes of nearby unmodified plants. Completely abolishing both male and female fertility is the only fail-safe way to prevent genetic transfer between plants, but previous methods have been limited.

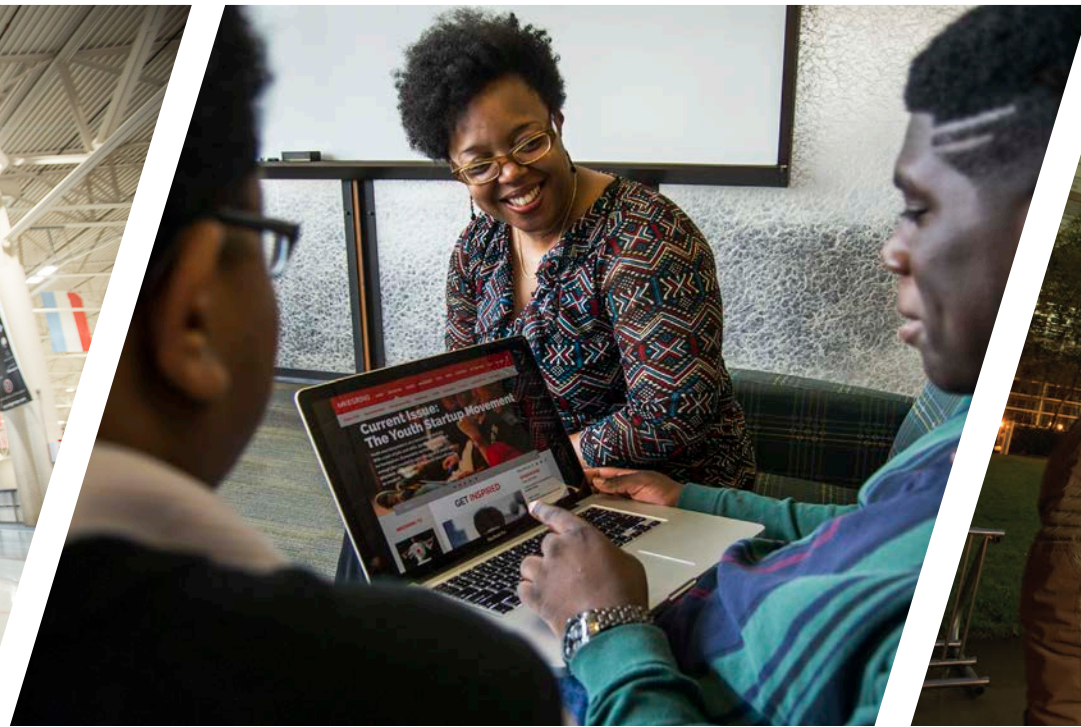


.....  **5** participating I-Corps institutions



➤ Zeolite Water Filter

Zeolite is a material commonly used in water filtration. Two UWM researchers have created an enhanced zeolite material with improved effectiveness in removing contaminants – particularly phosphorous – from wastewater, storm runoff and recirculating aquaculture systems. The technology, developed by Marcia Silva, researcher and manager of UWM's Water Technology Accelerator, and David Garman, associate vice chancellor for water technology, research & development, has been licensed by a Chinese company aiming to scale up production of the material.



IDEAS CHALLENGE

The UWM Lubar Entrepreneurship Center supports the development of new enterprises in the Milwaukee region and enhances the success of UWM graduates by equipping them with entrepreneurial skills. Through Ideas Challenge, students are offered “pop-up” workshops on innovation and last fall more than 40 of these, called “Fresh Ideas” pop-ups, reached 1,500 students. In addition, students have the opportunity to take eight Ideas Challenge courses that have been redesigned to use experiential learning models and entrepreneurial themes. These programs, along with the Milwaukee I-Corps, are making entrepreneurship an integral part of the UWM experience. Later this year, UWM will break ground on the Lubar Entrepreneurship Center & UWM Welcome Center, a 24,000-square-foot facility that will serve as a focal point for these activities and a resource to the Milwaukee community.



1,500 entrepreneurship connections



57 student startup challenge enterprises



➤ Student Startup Challenge

The Student Startup Challenge has evolved from a product-idea competition to a yearlong process that gives students the chance to take a promising idea from concept to reality. Within the Ideas Challenge ecosystem, students are linked to business competitions on campus. Currently 27 teams are participating in the program. During the Student I-Corps phase, teams learn the “lean launch” approach to entrepreneurship, collectively conducting hundreds of interviews. Teams progress through seven tracks specifically designed to help them advance their enterprises – product realization, web and mobile development, social innovation, health care, food industry, business operations and sports marketing. Student entrepreneurs receive valuable mentoring from faculty and staff throughout the year to ensure entrepreneurial growth and success.





INSPIRING DISCOVERY

The UMRWRF's mission is to foster research, innovation and entrepreneurship at UWM through intellectual property management, mentorship and corporate partnering. The UMRWRF is committed to providing UWM with the expertise to succeed. The accomplishments highlighted here are built on the hard work, dedication and talent of UWM faculty, staff and students. The UMRWRF team is honored to play a small part in those successes, and we are deeply grateful to the supporters and organizations who make this work possible.

 **51** issued/allowed patents since 2006

➤ Board Members

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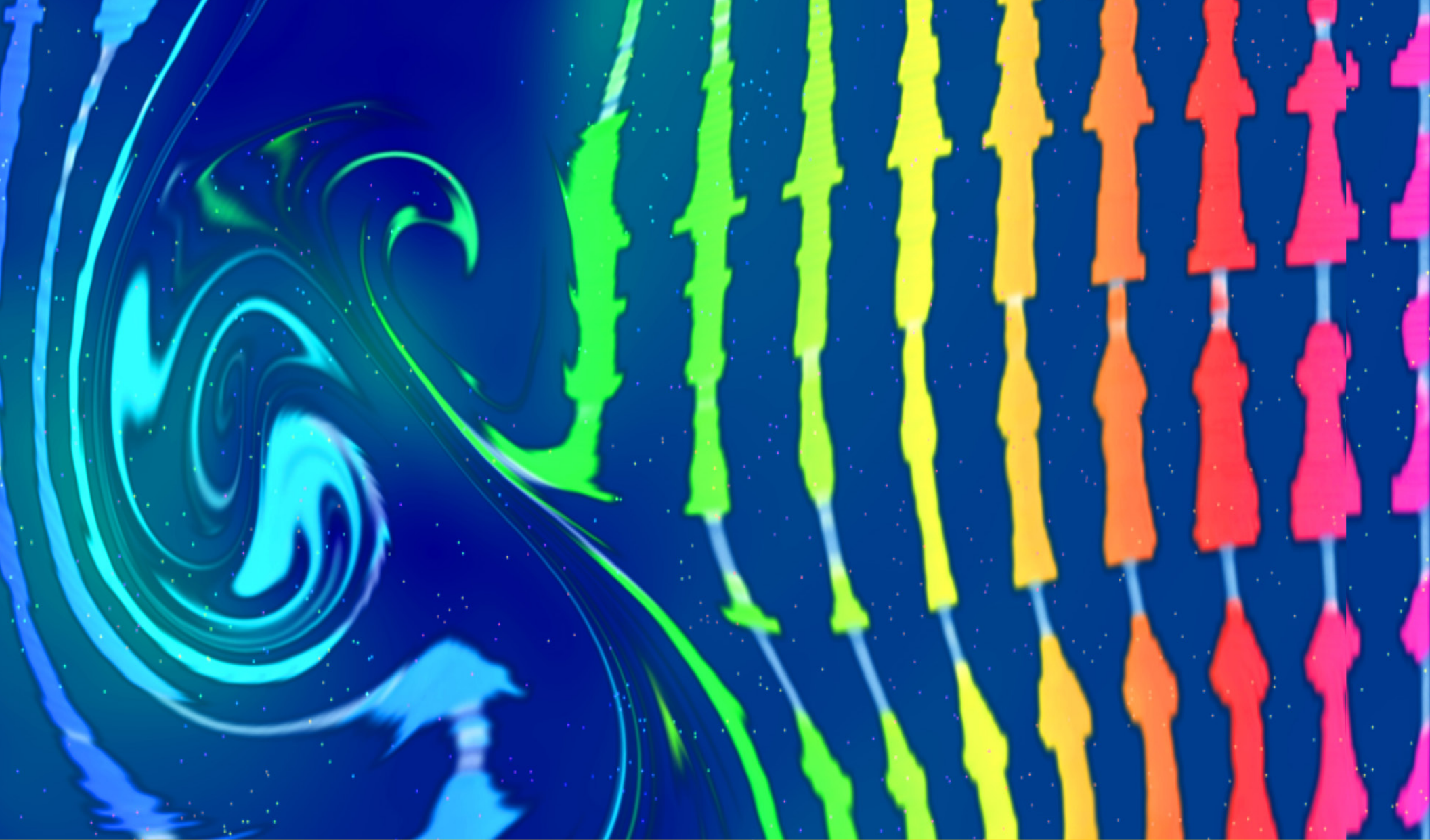
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POWERFUL
IDEAS

PROVEN
RESULTS