WPI
WORCESTER POLYTECHNIC INSTITUTE · 1865

2024
ANNUAL REPORT

Discovery and Innovation with a Purpose

Dear Colleagues and Partners,

I am pleased to present the FY2024 Annual Research Report, showcasing significant milestones and advancements achieved by our research community.

WPI has sustained a strong research portfolio, with new and continuing awards totaling almost sixty million dollars, an all-time high and a 41% increase over last year's total.

This achievement highlights the quality and creativity of our faculty, staff, and students collaborating across various disciplines. The impact of these projects is significant, leading to scientific and technological advancements that promote a more sustainable world, and advance health and well-being.
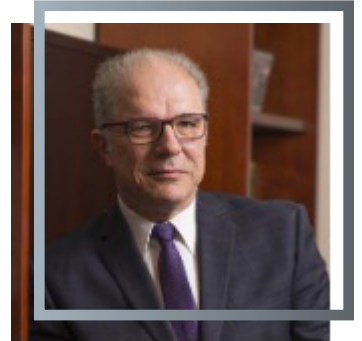
Our researchers are thus not only addressing some of the world's most pressing challenges, but also working towards meeting the needs of our region. We have been aligning our efforts with those of the Commonwealth by contributing to initiatives in areas such as clean energy, biotechnology, and the development of a workforce in biomanufacturing.

The Office of the Vice President for Research and Innovation is dedicated to supporting our community of researchers, innovators, and entrepreneurs as they expand the impact of WPI locally, nationally, and globally.

I would like to take a moment to express my gratitude to the teams that support our research initiatives. Their efforts play a crucial role in enabling the impactful research conducted by our colleagues.

I encourage you to explore our research described below and join us in developing new partnerships.

Bogdan Vernescu

Vice President & Vice Provost for Research and Innovation

AWARDS

WPI received $59.95M in awards in FY24 (Fig. 1). Awards are funds which have been fully obligated and released by the sponsor (Fig. 2). In cases where a grant is funded in yearly increments, only those increments received by WPI are counted as awards.
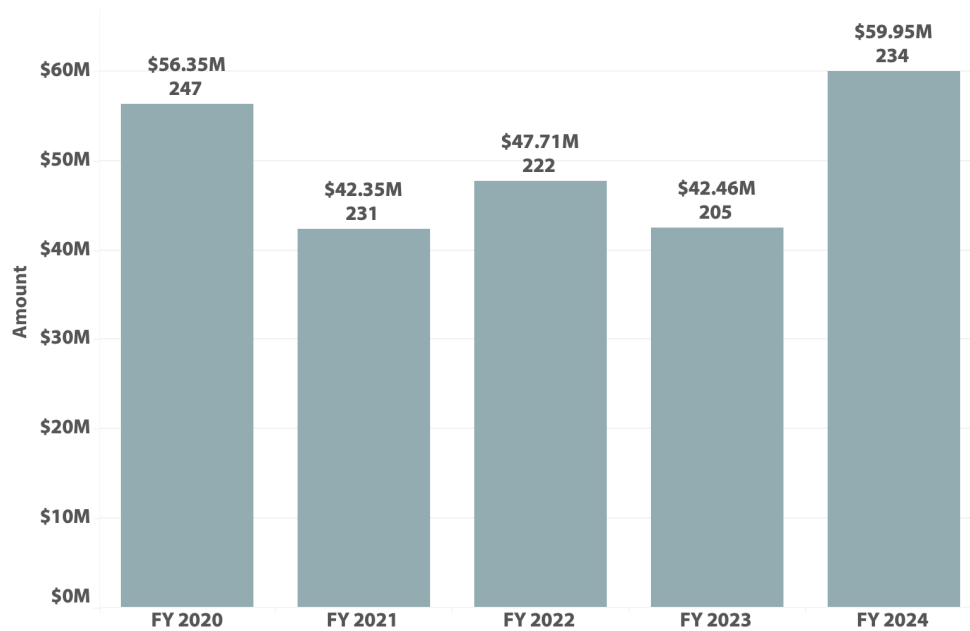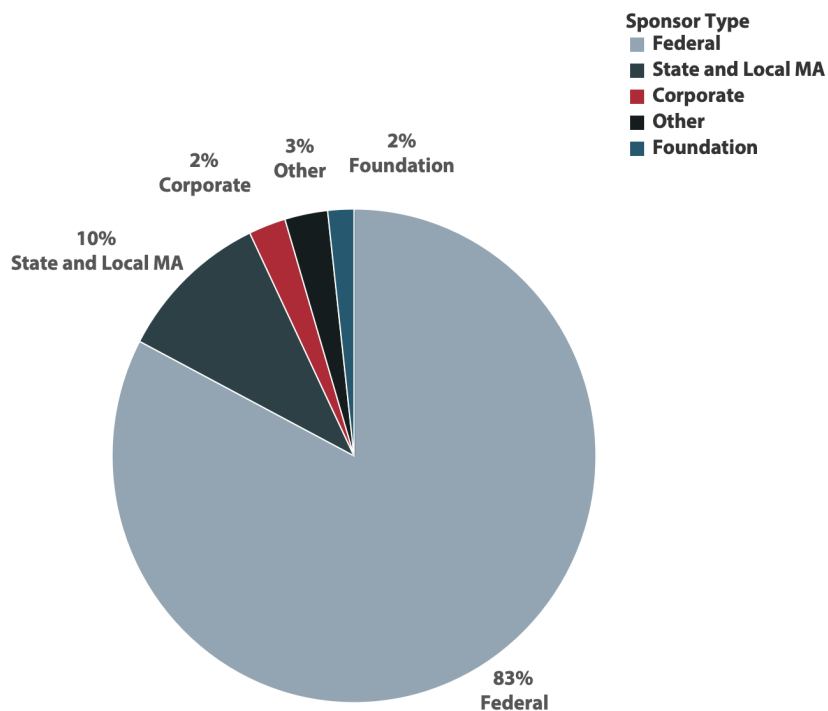

Fig. 1: Awards Overview.
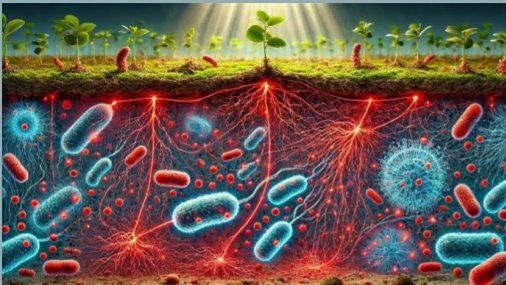

Fig. 2: Awards by Sponsor Type.

LIFE SCIENCES AND BIOTECHNOLOGY

Natalie Farny, Biology and Biotechnology, received an NSF CAREER award for her research in advancing the use of bacteria for environmental cleanups. Her research focuses on understanding how methylation affects gene expression in a soil bacteria used in industrial and environmental engineering. Knowledge gained from insights into cells and their environment could lead to advances in cleaning up soil to grow food for Earth's growing population, thus contributing to sustainable solutions for environmental challenges.

Advancing use of bacteria for enviornmental clean-ups.

Creating biological devices that harness the chemical communication between plants, bacteria, and fungi in the soil.

Natalie Farny also collaborates with **Eric Young**, Chemical Engineering, on a project funded by the DARPA CERES program. They are partnering with UC Riverside and a number of other universities to create a system for communication between plants and soil microbes to indicate soil contamination. This innovative approach aims to create a closed-loop system for monitoring and ensuring soil safety.

Kris Billiar, Biomedical Engineering, is leading a multidisciplinary team that received an NIH grant in support of the U-RISE@WPI program, which aims to recruit, train, and coach undergraduates, especially from underrepresented populations, for careers in biomedical research. The program seeks to foster innovation, equity, and competitiveness in the biomedical research workforce. The initiative involves 45 faculty members from nine departments and focuses on improving retention and graduation rates by creating small research teams with dedicated faculty coaches.

Z. Noble, a U-RISE Trainee, working on laboratory research.

J. King and research team members.

A team of WPI researchers led by **Jean King**, Dean of Arts and Sciences, in collaboration with Boston Medical Center and UMass Chan Medical School, has received funding from the NIH's HEAL initiative to support a clinical trial that will use artificial intelligence to help doctors guide chronic pain patients away from addictive opioids and towards mindfulness-based stress reduction (MBSR). The study will use machine learning to analyze patient data and identify those who would benefit most from MBSR. The goal is to provide healthcare providers with tools to help patients manage pain without resorting to opioids, potentially preventing addiction and overdose deaths.
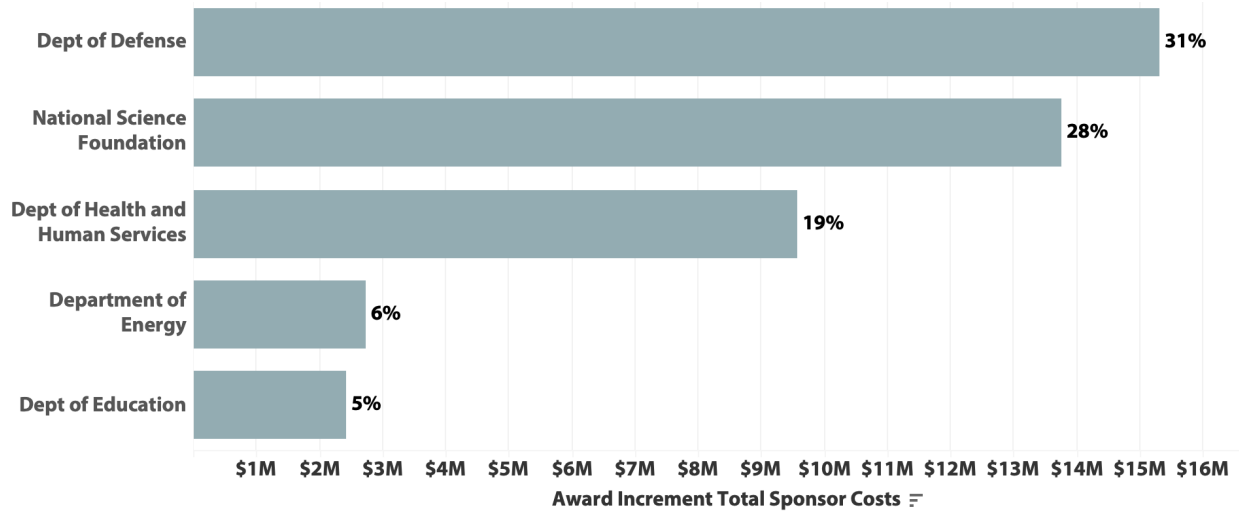
AWARDS

Fig. 3: Awards by Top Federal Sponsor.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Arts & Sciences	$23.4M	$19.1M	$14.1M	$16.3M	$18.8M
Business	$0.7M	$2.0M	$1.0M	$1.6M	$0.5M
Engineering	$30.6M	$19.6M	$30.5M	$22.6M	$34.5M
Global	$0.3M	$0.0M	$0.3M	$0.1M	$1.3M
Others	$1.5M	$1.7M	$1.8M	$1.8M	$4.9M
Grand Total	$56.4M	$42.4M	$47.7M	$42.5M	$60.0M

Fig. 4: Awards by School.

EXPENDITURES

Expenditures are actual costs for research and educational activities paid from WPI's external and internal funding each year. These costs are recorded in real-time as the research is taking place, unlike awards, which are recorded in total when received. As such, expenditures provide the most consistent year-over-year measure of funded research activity at WPI and partner institutions.

Figure 5 shows FY20 – FY23 expenditures appear as they have been reported to the NSF through the HERD survey. FY24 expenditures are an estimate.
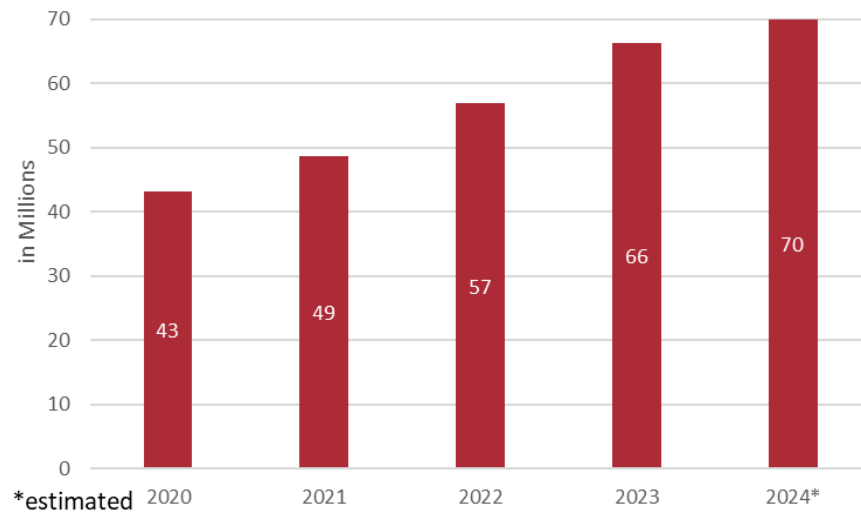
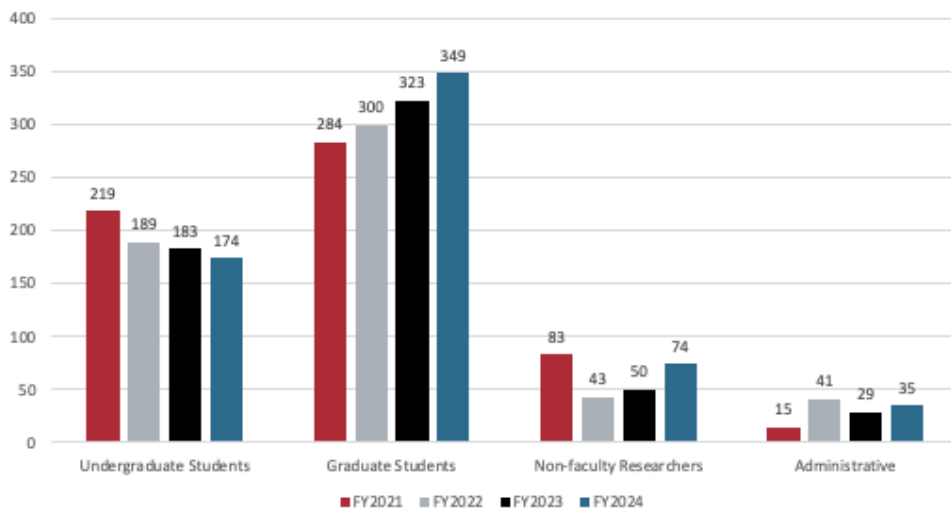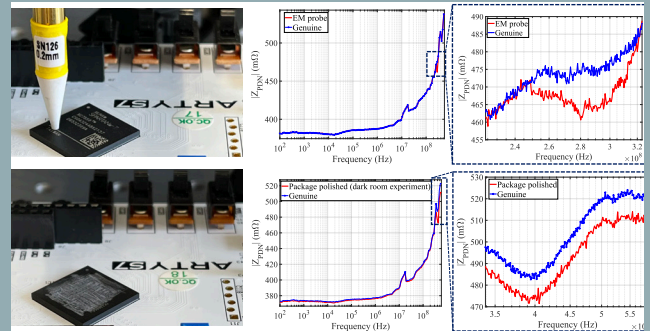*Fig. 5: Expenditures (in millions) based on HERD survey.*

Fig. 6: Students and Staff supported on grants FY21-24.

ARTIFICIAL INTELLIGENCE, CYBER, AND DATA

Shahin Tajik, Electrical and Computer Engineering, has been awarded an NSF CAREER award to develop new technologies to monitor and protect computer chips and other hardware from malicious attacks. The grant will allow him to expand his research into hardware security, a field that focuses on physical threats to computing systems that attackers can hijack by tampering with chips, motherboards, and other electronic components traveling through global supply chains.

Examples of tamper events on the system and their detection using on-chip sensors.

Rodica Neamtu, Computer Science, is leading a team of faculty, staff and students on an NSF S-STEM grant, whose goal is to boost the enrollment, retention, and graduation of computer science students from low-income backgrounds by providing scholarships, mentoring, and academic experiences that will empower students to complete their CS degrees in four years. The Path to Achieving Success and Sense of Belonging in Computer Science grant enables the creation of a suite of activities for academically talented incoming first-year students that will extend throughout their entire education at WPI.

R. Neamtu, faculty, staff, and stuents on the NSF S-STEM grant.

Neil Heffernan, Computer Science and Learning Sciences & Technology, has been awarded a grant from the U.S. Department of Education's Institute of Education Sciences to develop a Conversational AI Tutor (CAIT) for low-income middle-school math students. Central to the project, Heffernan's team will fine-tune an open-source LLM trained on ASSISTments data. Doing this will ensure an AI tutoring experience that is tailored to the students in a safe AI environment.
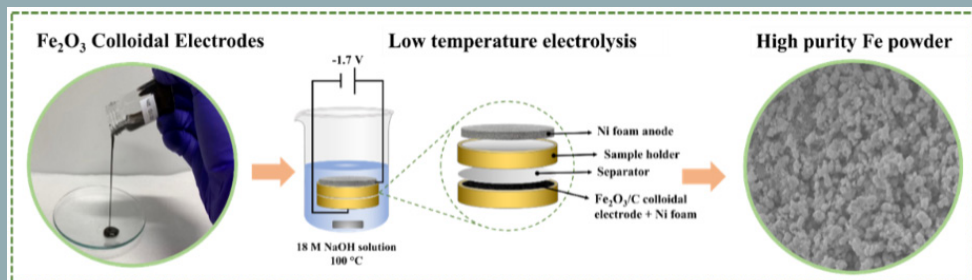

N. Heffernan, Computer Science and Learning Sciences & Technology.

ADVANCED SUSTAINABLE MATERIALS AND MANUFACTURING

Yan Wang, Mechanical and Materials Engineering, has received a grant from the Department of Energy to develop a new method for making low-carbon iron powder. This method uses a process called low-temperature electrolysis (LTE) to achieve high efficiency. The team will use copper smelter dust, which contains a lot of

Low-temperature electrolysis (LTE) process used to achieve high efficiency.

iron oxide, as the main material. This technology can also work with other materials like red mud or iron ore leftovers. They add special substances to prevent unwanted reactions during the process. The produced iron powder will then be tested for making electrical steel.

Mike Timko, Chemical Engineering, has been awarded a grant by MassTech (M2I2) to purchase equipment to develop a versatile and scalable process for converting mixed plastic waste streams and films into valuable aromatic chemicals, train undergraduate and graduate students on this equipment, and open up the use of this equipment to other labs at WPI and other local universities

M. Timko (right) and student in laboratory.

Carrick Eggleston, Civil, Environmental and Architectural Engineering, with co-Pi Prof. Mingjiang Tao, received an NSF award for a collaboration with UMass Amherst and three other universities that seeks to develop an eco-friendly alternative to concrete by utilizing natural minerals and innovative chemistry. Concrete is the most commonly used manufactured material on Earth by mass, but it has a significant environmental impact, contributing to approximately 10% of global annual CO2 emissions. This project aims to find a more sustainable way to create construction materials similar to concrete.

Diana Lados' Lab.

A WPI team led by **Diana Lados,** Mechanical and Materials Engineering, has been awarded a grant to help design the next generation of materials operating in increasingly aggressive environments. As part of this collaboration, the team will develop novel testing methodologies supported by advanced non-destructive evaluation, diagnostic, and characterization techniques to establish the fundamental understanding of the behavior and degradation mechanisms of the materials. The advancements emerging from this research will contribute to the basic science of manufacturing technologies and promote breakthroughs in the design of high-efficiency components for a sustainable future.
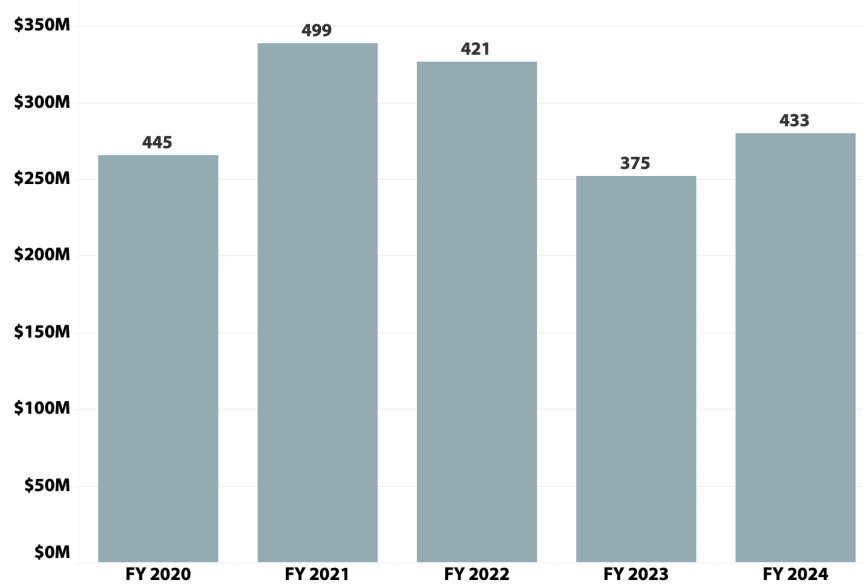
PROPOSALS

Fig. 7: Overview of Proposals Submitted. Number and size of proposals submitted in FY24 do not include Pre-Proposals.
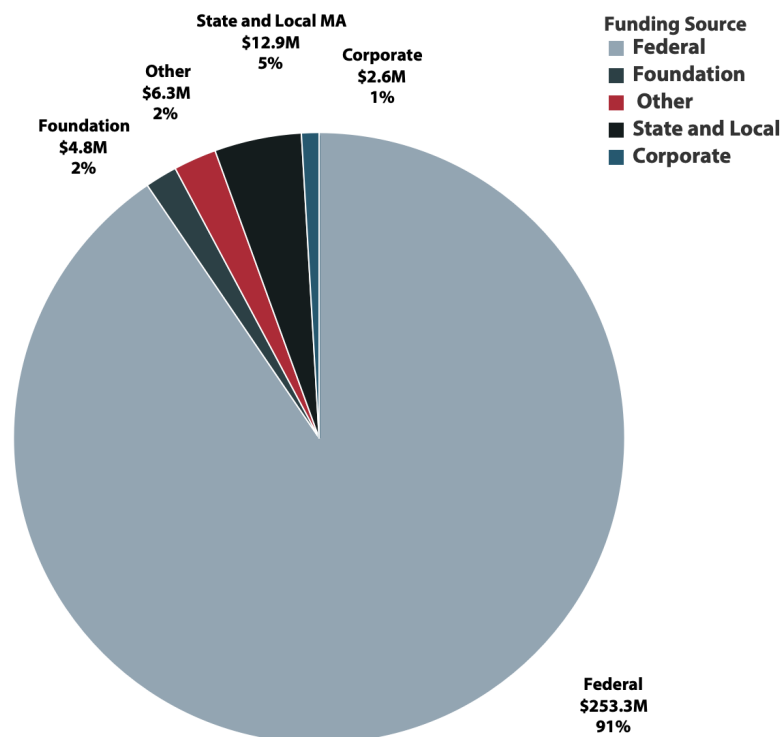
Fig. 8: Proposals Submitted by Sponsor Type.

PROPOSALS

School	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Arts & Sciences	$107.5M	$182.0M	$137.1M	$89.5M	$101.3M
Business	$5.1M	$4.1M	$4.9M	$7.3M	$13.6M
Engineering	$143.0M	$131.9M	$172.9M	$187.8M	$160.1M
Global	$0.9M	$1.1M	$3.8M	$3.9M	$0.2M
Other	$9.4M	$20.1M	$8.0M	$3.1M	$4.6M
Grand Total	$265.9M	$339.2M	$326.7M	$291.6M	$279.8M

Fig. 9: Proposals Submitted by School.

Fig. 10: Proposals Submitted by Top Federal Sponsor.

GLOBAL

Mimi Sheller, Dean of the Global School, has been awarded a grant by the National Oceanic & Atmospheric Administration for a partnership between one of the most well-established NOAA CAP/RISA's, Consortium for Climate Risk in the Urban Northeast (CCRUN)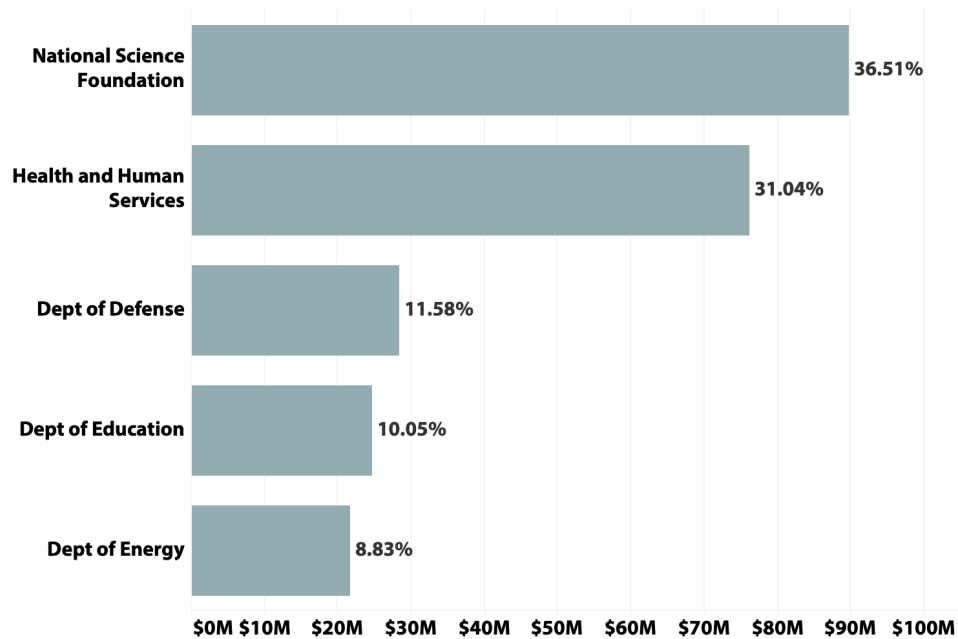, and one of the newest, Caribbean Climate Adaptation Network (CCAN). CCRUN conducts stakeholder-driven research that reduces climate-related vulnerability and advances opportunities for adaptation in the urban Northeast. CCAN aims to form a regional knowledge-action network of researchers and stakeholders to evaluate needs, provide technical-scientific expertise, facilitate communication, and build cross-regional connections and capacity in the US Caribbean. This project seeks to implement, compare, and evaluate the transferability of existing methods of community engagement and approaches for integrating social and interdisciplinary knowledge into climate adaptation planning for coastal flooding.
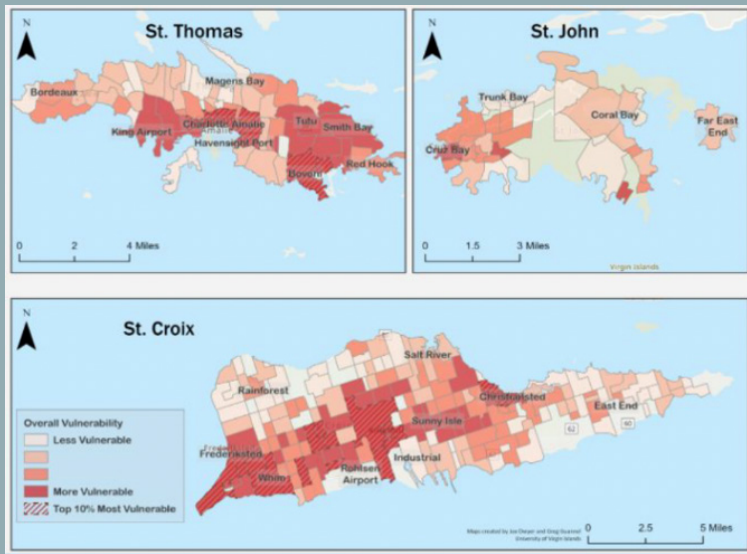
USVI Coastal Vulnerability Index.

Rob Krueger and his PhD student Zahra Zarei, Social Science and Policy Studies, have been awarded a grant from the Templeton World Charity Foundation, Inc. for a demonstration project that uses Artificial Intelligence to identify market opportunities in low- and middle-income communities. In this project they will use AI tools, such as machine learning, to examine poverty and market opportunities. Their contribution is to examine inductively collected data on multidimensional poverty using a dataset collected using the Poverty Stoplight Methodology (PSL). Since its beginning, the PSL has amassed data from over 470,000 families in 60 different countries.

Zahra Zarei Ardestani (left) and Esther Mao (right).

William San Martin, Global School, received an NSF award for a collaboration of biochemical and biomedical engineers, social scientists and international partners with the goal of co-producing knowledge, biotechnologies, and practices to enhance biological nitrogen fixation for sustainable agriculture. This project aims to enhance crops' natural nitrogen-fixing abilities, reduce synthetic fertilizer use, and promote sustainable agriculture through biochemical research and community engagement.

Tractor Mixing Compost at "Agroecological Lighthouse" at Chile's National Institute for Agricultural Research INIA-Quilamapu (Photo credit: William San Martín).

INTERNAL GRANT PROGRAMS

President's Research Catalyst grant competition to incentivize creation of new centers; funded three projects:

WPI Faculty PIs	Proposal Title
Eric Young, Sue Roberts, Andrew Teixeira	AI4BIO: Center for AI-Enabled Bioengineering
Mike Timko, Jeannine Coburn, Aaron Deskins, Ron Grimm, John Obayemi, Pratap Rao, Lyuba Titova	Hy-Matter: Hybrid Materials Advancements for Technology and Research
Elke Rundensteiner, Dmitry Korkin, Rich Lopez, Ben Nephew	Understanding and Preventing Adverse Effects of Social Media on Mental Health with AI

Gapontsev Family Foundation second round of seed grants awarded:

WPI Faculty PIs	Proposal Title
Loris Fichera, Andrea Arnold, Kai Zhang	Laser Tonsil Ablation: A New Incision-less Procedure for Tonsil Removal
Pratap Rao, Andrew Teixeira, Shawn Liu, Ceren Yilmaz Akkaya	Development of High-Temperature In-Situ Fiber Optical Raman Spectroscopy for Understanding Catalyst Deactivation during Methane Decomposition towards Clean Hydrogen Production and Carbon Nanotube Synthesis
Raisa Trubko, Shahin Tajik	Laser-Excited NV Diamond Magnetic Microscopy and Laser Voltage Probing for Security Analysis of Integrated Circuits

NEW RESEARCH CENTERS AND INSTITUTES

The Autonomous Vehicle Mobility Institute (AVMI)

Vladimir Vantsevich and **Lee Moradi,** MME, were awarded a grant from Massachusetts Technology Collaborative's Innovation Institute to help build a cutting-edge research and development laboratory facility focused on the design, production, and understanding of autonomous systems. This new Autonomous Systems Lab will serve as a testing ground for innovative autonomous technologies that are advancing future capabilities in the automotive, transportation, healthcare, robotics, and automation and manufacturing sectors. The digital infrastructure in the new facility will allow for hybrid modeling and simulation of human-machine integrated formations, using virtual reality and augmented reality tools.

Unmanned Ground Vehicle (UGV) for testing and simulation in off-road conditions.

Wildfire Interdisciplinary Research Center (WIRC)

Albert Simeoni, Fire Protection Engineering, is leading the newly added WPI site of the Wildfire Interdisciplinary Research Center (WIRC), a collaboration with San Jose State University funded by the National Science Foundation as an Industry University Research Center. Partners (members of the center) at the new site include Lockheed Martin and The Fire Safety Research Institute. Other faculty from the FPE, MME, CEE and RBE departments at WPI are participating in the center, bringing a large research background to cover multidisciplinary topics. WPI will build upon its longstanding expertise in fire protection and engineering in general, and work with San Jose State University to study new fire detection methods, robotics

Image from Wildfire Interdisciplinary Research Center.

solutions to enhance first responder safety, and fire suppression systems for wildfires.

Partnerships

Draper: WPI has become a participant in the Draper Scholars program, which provides opportunities for graduate students to conduct research under the collaborative supervision of a Draper scientist/engineer and a WPI faculty member. Collaborations focus on Draper's 14 strategic research areas, which include AI and machine learning, quantum sensors, space technology, and strategic systems. In this first round of applications, eight students on seven projects have been funded.

Honeywell: The WPI-Honeywell Clean Energy Research Center has successfully completed its second year, having cumulatively trained 3 PhD students and 25 undergraduates working toward the electrification of the aerospace industry through fundamental material science and engineering studies on clean hydrogen energy storage, conversion and utilization in UAVs. The effort, led by Andrew Teixeira, Chemical Engineering, and co-investigators Anthony Dixon, Chemical Engineering, and Ronald Grimm, Chemistry has made substantive strides toward achieving a clean hydrogen economy.

Central MA ClimateTech Hub: WPI is convening central Massachusetts partners to develop and build a ClimateTech Hub in Central MA, collaborating with the MassCEC (Mass Clean Energy Council) and aligning to the State's Economic Development Bill. The initial session in June 2024 convened over 50 academic, business, governmental, and legislative leaders to collaboratively chart a course for Central Massachusetts to spearhead the ClimateTech revolution.

TECHNOLOGY INNOVATION AND ENTREPRENEURSHIP

Terry Adams was appointed as the new Director of the Office of Technology Innovation and Entrepreneurship (OTIE) at WPI. Under Terry's leadership, OTIE is driving several key initiatives, including the implementation of a new intellectual property management system to streamline innovation processes. The office is also launching a new incubator program

focused on supporting faculty startups while continuing to foster the growth of alumni ventures. In parallel, Business School's I3 lab remains dedicated to nurturing student entrepreneurship, ensuring that WPI's innovation ecosystem supports its community at all levels.
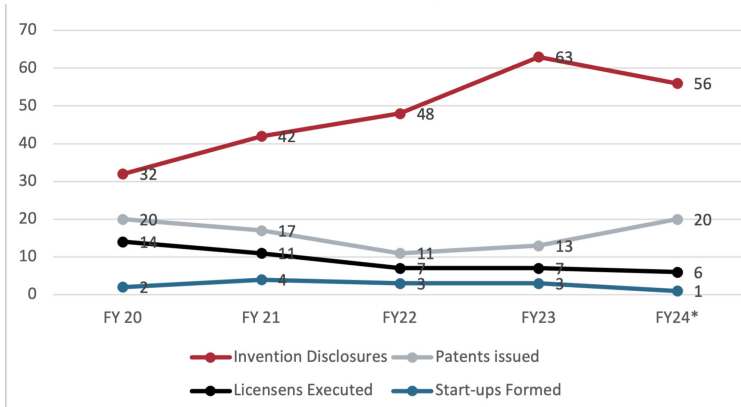

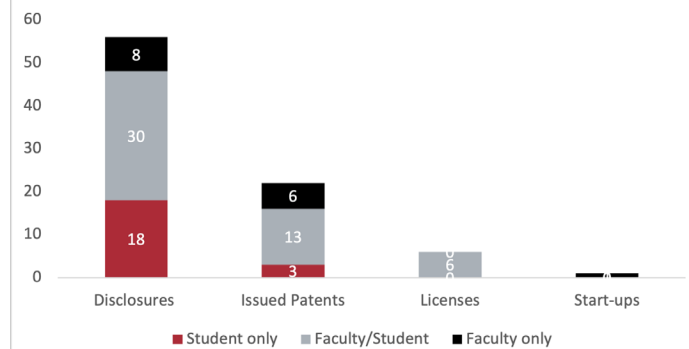*Fig. 11: Tech Transfer Activity FY20-24.*

Fig. 12: Tech Transfer Activity by Inventor Type.

New and Rising WPI Start-ups

WoundSys LLC, WPI's newest startup, is revolutionizing wound care under the leadership of founder Emmanuel Agu. This innovative AI-driven wound assessment, referral, and treatment recommendation system operates seamlessly on a nurse's smartphone, addressing critical challenges in chronic wound management, such as the shortage of specialized nursing expertise and the high costs associated with delayed referrals and amputations. By providing accurate wound assessments and personalized treatment recommendations, WoundSys empowers healthcare professionals to make informed decisions while improving patient outcomes. With a strong foundation in research and development, backed by grants and patents, WoundSys is poised to make a significant impact in the healthcare industry and enhance the quality of care for patients with chronic wounds.

E. Agu (second from right) and team.
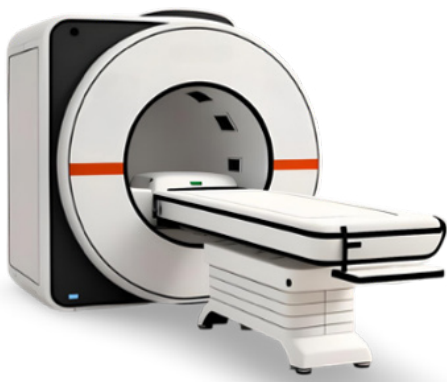
Transforming neurosurgery with innovative MRI-compatible robotic systems.

AiM Medical Robotics is a rising WPI startup co-founded by Greg Fischer, a Professor of Robotics Engineering at Worcester Polytechnic Institute (WPI), is transforming neurosurgery with its innovative MRI-compatible robotic systems. The startup's cutting-edge technology integrates real-time imaging with surgical robotics, allowing neurosurgeons to perform procedures with greater precision and efficiency. AiM's platform addresses key challenges in neurosurgery, such as brain shift during operations, ensuring more consistent and accurate outcomes. AiM Medical Robotics exemplifies WPI's commitment to fostering impactful research and entrepreneurship through OTIE. The company is poised to become a leader in medical robotics, offering hospitals and surgeons a powerful tool to enhance surgical outcomes worldwide.

AM Batteries, another WPI start-up co-founded by Yan Wang received a $2.2M award from the Mass Technology Collaborative (MTC) to build a pilot scale production line of its novel solvent-free, dry electrode manu-facturing technology that replaces the use of toxic solvents.

RESEARCH SOLUTIONS INSTITUTE (RSI)
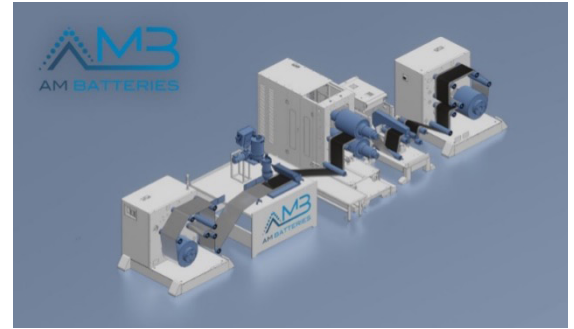
Dry Electrode Coating Equipment Developed by AM Batteries.

The **proposal development support** services (Planning, Review, and Graphics) offered by the RSI has been in high demand throughout FY24 and continues to see strong growth. In FY24, RSI assisted research faculty in a total of 136 proposals.
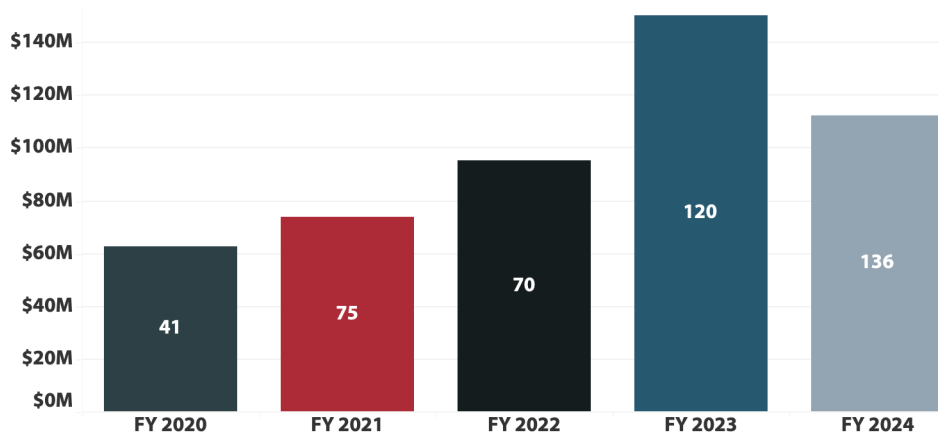
Fig. 13: Proposals developed with services from RSI.

RSI offers different levels of proposal development services from the Basic proof reading to Intensive project manage-ment, review, team facilitation etc. In FY24, ~ 40% of requests were for Intensive level of service including multiple in depth reviews of drafts for flow, narrative structure and content including alignment with funder objectives. Our efforts with assisting faculty, specifically early career faculty, has elicited enthusiastic feedback from faculty.

Apart from successful proposal development services, the RSI continues to provide a comprehensive set of training opportunities for diverse sets of faculty. In FY24, RSI organized four events targeted to early career faculty including the first ever grant writing workshop for faculty preparing proposals for the Department of Energy's Early Career Faculty Research program. Apart from this we organized a panel of experts on the NSF CAREER program that was very well at-tended. The RSI organized NSF Program Director site visit was in high demand and received positive feedback.

Overall, in FY24, RSI organized six events, four of which were targeted towards early career faculty, 2 federal program officer visits (one in person, one virtual) and 2 hands on workshops.

WPI

CONGRATULATIONS

PIs and Co-PIs who received initial awards in FY2024

Department	Principal Investigator	Sponsor	Project Title	Total Amount
Aerospace Engineering	John J Blandino	Department of the Air Force	Flexible Fuel Electron Source for Space Propulsion Systems (Phase 2)	$412,134.00
	Michael A Demetriou	Air Force Office of Scientific Research	Real-time optimal distributed estimation and control of spatiotemporal processes using multi-domain methods and optimally-guided mobile sensors	$392,374.00
	Raghvendra V Cowlagi	Draper Laboratory	Coupled Sensor Configuration and Planning (CSCP) in Contested Environments	$278,852.00
BETC	Floyd Brownewell	Department of Treasury	Scaling Capacity and Leveraging Employers Planning Grant (SCALE)	$29,966.00
		Massachusetts Life Sciences Center	Growing and Strengthening BETC Workforce Programming and Corporate Collaboration	$600,000.00
Biology & Biotechnology	Amity L Manning	National Institutes of Health/NIH/DHHS	Mechanisms of cell proliferation in whole-genome doubled cells	$108,173.00
	Inna Nechipurenko	National Institutes of Health/NIH/DHHS	Genetic analysis of signaling pathways in cilia assembly and remodeling	$1,890,960.00
	Jean A King	National Institutes of Health/NIH/DHHS	IMPACT: Integrative Mindfulness-Based Predictive Approach for Chronic low back pain Treatment	$1,643,228.00
	Longkuan Xiang	Solarea Bio, Inc.	Solarea Bio, Inc, Pichia fermentation and live cell preparation	$13,415.00
	Natalie Farny	National Science Foundation	CAREER: Epigenetic Regulation of Gene Expression in Engineered Prokaryotes	$1,225,970.00
	Reeta P Rao	Defense Health Agency/DOD	Multiplexed Diagnostic Platform for Invasive Fungal Infection	$51,105.00
Biomedical Engineering	Adam Lammert	American Tinnitus Association	Tinnitus Characterization Using Reverse Correlation With Applications to Habituation Therapies	$59,815.00
	Ajit Yoganathan	National Institutes of Health/NIH/DHHS	Development of a Percutaneous Double Lumen Cannula-Based Cavopulmonary Assist System Toward Clinical Application	$241,050.00
	Alan Z Wei	American Heart Association	Advancing Hemodynamic Assessment in Coarcted Aorta in Fetuses	$299,997.00
			The Development and Validation of a Patient-specific Data-driven Flow Model for TCPC Hemodynamics	$77,456.40
		Draper Laboratory	Bench Testing and Modeling for Pediatric Heart Valve (PHV)	$110,364.00

Department	Principal Investigator	Sponsor	Project Title	Total Amount
Biomedical Engineering	Alan Z. Wei	National Institutes of Health/NIH/DHHS	Quantification of Fontan Obstruction as a Marker for Quality of Life and Exercise Performance	$409,280.00
		Saving tiny Hearts Society (StHS)	A Personalized In Vitro Flow Model for 3D Hemodynamics in Fetal Aortas	$75,000.00
	Kristen Billiar	National Institutes of Health/NIH/DHHS	U-RISE at Worcester Polytechnic Institute (U-RISE@Wπ)	$137,662.00
	Songbai Ji	National Institutes of Health/NIH/DHHS	Biomechanical basis of sex differences in concussion and subconcussion	$183,402.00
	Yonghui Ding	National Institutes of Health/NIH/DHHS	3D Bioprinting of Strong Living Scaffolds	$464,556.00
Business School	Bengisu Tulu	National Institutes of Health/NIH/DHHS	PARCA (a digital tool) to improve Justice and Health	$117,663.00
			CAPES CATS Exploratory Project	$158,259.00
	Renata Konrad	National Science Foundation	D-ISN/RAPID: Data Collection for Human Trafficking Recruitment and Responses in Forced Migration	$50,006.00
	Sandhya Balasubramanian	Department of Treasury	Bridging the Small Business Digitization Gap by leveraging City of Worcester Ecosystem (tentative)	$50,000.00
Chemical Engineering	Aidin Panahi	Environmental Protection Agency	On the treatment and PFAS removal from wastewater using hydrothermal liquefaction	$32,999.00
	Alex Maag	Department of Defense	Tactical Microgrid Resilience through On-site Renewable Diesel Generation	$76,242.00
	Andrew R Teixeira	American Chemical Society	Overcoming light penetration challenges in photochemical reactions through a micro-LED packed bed reactor	$80,000.00
		Massachusetts CEC	MassCEC Cost Share Request for "Removing Physical and Chemical Bottlenecks for Hydrothermal Waste-to-Energy through Intensified Conditioning of Blended High Solid Waste Slurries"	$200,000.00
	Christina M. Bailey-Hytholt	National Science Foundation	BRC-BIO: Trophoblast invasiveness influencing exosome-mediated cell communication	$502,999.00
	Eric M Young	Department of the Interior	IRISS: Interkingdom soil safety sensors	$2,746,974.00
	Michael T Timko	Massachusetts Technology Collaborative	Workforce Development and Manufacturing Innovation for a Circular Economy in the Commonwealth of MA	$331,592.00
	Xiaowei Teng	National Science Foundation	Collaborative Research: Selective Extraction of Lithium from Seawater using Structurally Modified Metal Oxide Layered Materials	$376,885.00
Chemistry & Biochemistry	Carissa L Olsen	National Institutes of Health/NIH/DHHS	Alternative Splicing & Differential Expression of Lipases in Host-Microbe Interactions	$67,551.00

Department	Principal Investigator	Sponsor	Project Title	Total Amount
Civil, Environmental & Architectural Engineering	Carrick Eggleston	National Science Foundation	FMRG:Eco:Carbon-Inverted Manufacturing of Inverted Cements (CIMIC)	$583,765.00
Computer Science	Ali Yousefi	Defense Advanced Research Projects Agency	Fast, Reliable, Electrical Unconscious Detection (FREUD)	$421,563.00
	Craig A Shue	Department of Defense	2023 DOD CySP Worcester Polytechnic Institute - Cyber Scholarship Program 2023-2024	$69,878.00
	Dmitry Korkin	National Institutes of Health/NIH/DHHS	Systems Approaches to the Epidemiology, Genetics and Genomics of Lung Diseases	$53,496.00
	Elke A Rundensteiner	National Science Foundation	REU Site: Applied Artificial Intelligence for Advanced Applications	$461,597.00
	Erin Solovey	National Science Foundation	RET Site: Engineering for People and the Planet: Research Experiences for Teaching Integrated STEM (2024)	$599,919.00
	George T Heineman	Department of Defense	2023 Implementation of a WPI Project Center at MIT Lincoln Laboratory	$13,730.00
	Hanmeng Zhan	National Science Foundation	CRII: FET: Quantum Advantages through Discrete Quantum Walks	$174,420.00
	Jun Dai	National Science Foundation	SaTc: EDU: Collaborative: An Assessment Driven Approach to Self-Directed Learning in Secure Programming (SecTutor)	$10,689.00
		National Security Agency	National CAE-C Cybersecurity Workforce Development Program through Large-scale Secure Programming Training	$169,055.00
			Expanding the National Cybersecurity Teaching Academy (NCTA)	$210,490.00
			2022 GenCyber Grant Program - California State University Sacramento	$36,040.00
			National Cybersecurity Teaching Academy (NCTA)-UALR-WPI	$34,760.25
	Neil Heffernan	Institute of Education Sciences/ Department of Education	Talking Math: Improving Math Performance and Engagement Through AI-Enabled Conversational Tutoring	$3,749,600.00
	Rose Bohrer	National Science Foundation	SHF: Small: Game Logic Programming	$595,998.00
	Shariq Madha	National Institutes of Health/NIH/DHHS	Systems Approaches to the Epidemiology, Genetics and Genomics of Lung Diseases	$53,496.00
	Xiaoyan Sun	National Science Foundation	SaTC: EDU: Developing Ready-to-Use Hands-on Labs with Portable Operating Environments for Digital Forensics Education	$214,907.00
Controller's Office	Mary Jane Peck	Federal Emergency Management Agency	683958 - COVID Diagnostics Testing 2	$2,839,629.70

Department	Principal Investigator	Sponsor	Project Title	Total Amount
Electrical & Computer Engineering	Alexander Wyglinski	Department of Defense	AI-Optimized Spectrally Agile Cognitive Radar Design	$96,828.00
		Department of the Air Force	Enhancing 5G Security via Analysis of RF Hardware Characteristics and Spectral Behavior	$679,741.00
		National Aeronautics & Space Administration	5G-MOSAIC: 5G Mission-Critical Sidelink for Autonomous and Interoperable Communications in Lunar Networks	$29,999.00
	Bashima Islam	National Institutes of Health/NIH/DHHS	Validation of a Virtual Still Face Procedure and Deep Learning Algorithms to Assess Infant Emotion Regulation and Infant-Caregiver Interactions "in the Wild"	$157,917.00
		National Science Foundation	CRII: CNS: Opportunistic Computation Offloading for Battery-Free Computing Devices	$174,975.00
	Bo Tang	National Science Foundation	Collaborative Research: CCRI: New: Open AI Cellular (OAIC): Prototyping Artificial Intelligence-Enabled Control and Testing Systems for Cellular Communications Research	$141,882.00
		National Telecommunications & Information Admin./ Dept. of Commerce	A holistic cybersecurity testing framework for 5G radio access networks	$369,387.00
	Fatemeh Ganji	Cisco Systems, Inc.	Revisiting the IEEE P1735 Standard for In-house Semiconductor IP Protection	$75,002.00
	John A McNeill	University of Massachusetts Medical School	A Smart, Remotely Communicating, Wearable Sensor Systems for Pressure Wound Prevention	$75,000.00
	Patrick Schaumont	Draper Laboratory	Novel Modeling Techniques and Applications for Pre-silicon Side-channel Analysis	$110,208.00
		National Science Foundation	POSE: Phase I: An Open Source Approach to Measure and Analyze Embedded Systems Security	$299,697.00
	Sergey N Makaroff	National Institutes of Health/NIH/DHHS	Charge-Based Brain Modeling Engine with Boundary Element Fast Multipole Methold	$3,710,557.00
			CRCNS US-German Research Proposal: Development of EEG/MEG Source Reconstruction with Fast Multipole Method	$776,568.00
		Teradyne Inc	Teradyne Scanning Array- Student Research	$36,000.00
	Shahin Tajik	Draper Laboratory	Security Analysis of Integrated Circuits using Laser Voltage Probe Microscopy and NV Diamond Magnetic Microscopy	$569,776.00
		Electric Power Research Institute	ECHT: Electromagnetic and Thermal Testing for Hardware Verification	$125,617.00
		National Science Foundation	CAREER: Toward Power Delivery Network-aware Hardware Security	$594,081.00

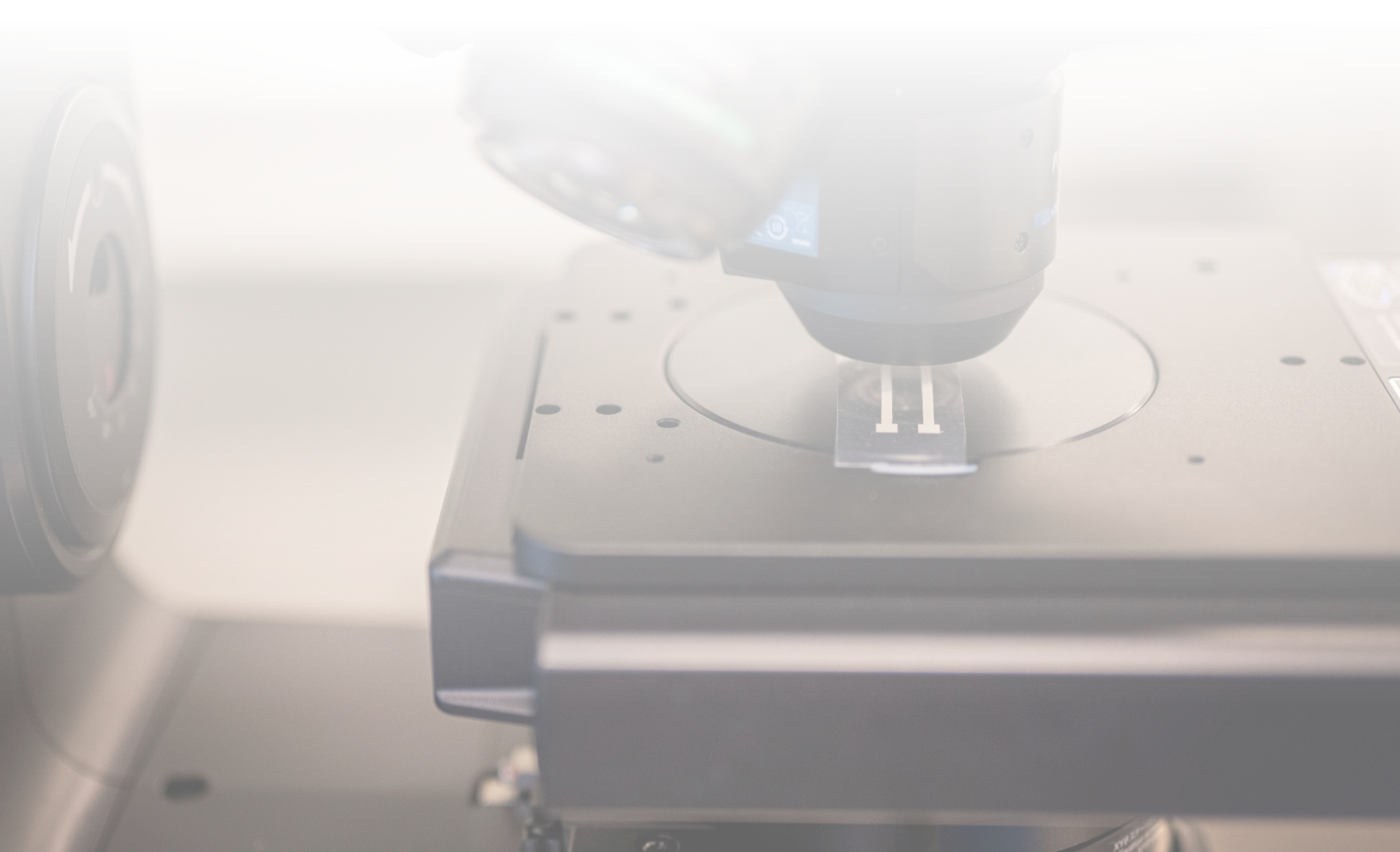| Department	Principal Investigator	Sponsor	Project Title	Total Amount
Electrical & Computer Engineering	Shahin Tajik	National Science Foundation	Travel: NSF Student Travel Grant for 2024 New England Hardware Security Day (NEHWS2024)	$7,500.00
	Shamsnaz V Bhada	Draper Laboratory	Technical Debt Tracking for Systems Engineering Decision Making using Artificial Intelligence	$124,698.00
	Suat Ay	National Institutes of Health/NIH/DHHS	SCH: Machine LEarning & MicrofluiDics for Multimodal Sensing of TiCk-bOrne Diseases(MEDICO)	$290,948.00
	Ulkuhan Guler	National Institutes of Health/NIH/DHHS	Collaborative Research: SCH: A Novel Bias-mitigated Multimodal Oxygen Monitor	$1,127,984.00
Fire Protection Engineering	Albert Simeoni	Department of Defense	The Effect of Fuel Characteristics and Fire Dynamics on Emissions, Dispersion, and Air Quality Impacts	$70,641.84
		Kidde Fire Systems	WPI Inert Gas Project Statement of Work: 2024	$140,000.00
		National Science Foundation	Center: IUCRC Site Addition WPI: Wildfire Interdisciplinary Research Center (WIRC)	$450,000.00
	James Urban	Factory Mutual Insurance Company	Quantifying wildland fire exposure to ground-mounted solar farms	$85,000.00
		National Science Foundation	NSF IUCRC WIRC: Developing a sub-model for spot fire growth in wildland fires	$39,497.00
Humanities & Arts	V J Manzo	Neilsen (Craig H.) Foundation	Adaptive Use Musical Instrument (AUMI) Development	$16,865.00
Integrative & Global Studies	Elisabeth A Stoddard	National Science Foundation	Broadening Participation Research Project: Investigating the Efficacy of Data Science Experiences using Project-Based Learning grounded in Environmental Justice for Improving Diversity in Environmental Science	$45,644.00
	Mimi Sheller	National Oceanic & Atmospheric Administration/Department of Commerce	Improving Engagement Methods for Coastal Resilience and Reducing Climate Risk: Bridging Learning Networks From the Urban Northeast (CCRUN) to the US Caribbean (BIL)	$499,836.00
	Sarah Stanlick	Aspen Institute	The Transformative Sustainability Project	$39,682.00
	William San Martin	National Science Foundation	URoL: ASC: Co-producing knowledge, bio-technologies, and practices to enhance biological nitrogen fixation for sustainable agriculture	$704,262.00
Mass Academy of Math & Science	Kevin Crowthers	Massachusetts Life Sciences Center	Improving Access to Science Research and Authentic Laboratory Experiences for Middle and High School Students	$113,940.00
Mathematical Sciences	Francesca Bernardi	Mathematical Association of America	Girls Talk Math at WPI 2024: Improving Students' attitude towards challenges and self-confidence through a math and media camp	$6,000.00
	Oren Rami Mangoubi	Renal Research Institute, LLC (RRI)	Research Services Agreement with RRI	$20,400.00

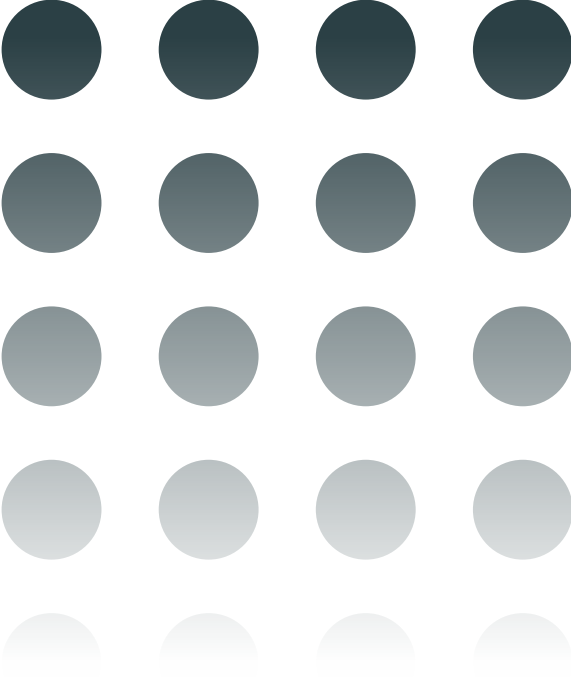| Department	Principal Investigator	Sponsor	Project Title	Total Amount
Mechanical and Materials Engineering	Aswin Gnanaskandan	National Science Foundation	Investigating the role of microbubbles and focused ultrasound in tissue temperature elevation	$274,975.00
		Office of Naval Research	Experimental Study and CFD Analysis of Fuel Cavitation	$119,736.00
	Brajendra Mishra	Korea Evaluation Institute of Industrial Technology	Development of Non-heat treatable Aluminum Alloys with High Strength/Elongation and High Thermal Conductivity for Semi-solid Casting	$306,754.00
	Danielle L Cote	Department of Defense	GVSC STTR Phase II	$349,990.00
			Additive Manufacturing and Advanced Materials Technology for Sustainment and Environment Compliance Phase II	$299,998.97
	Diana A Lados	Confidential	Novel testing methodologies supported by advanced non-destructive evaluation, diagnostic, and characterization techniques	$1,350,000.00
	Jamal Yagoobi	CARD Research Center	EHD Driven Heat Pump for Low/Moderate Temperature Drying - A Novel Drying Technology	$75,000.00
			Heating, Baking, Drying with Laser Technology for Food, Pulp and Paper, and Chemicals Industry Sectors	$50,000.00
		Massachusetts CEC	Novel Energy-Efficient Drying Technologies for Food, Pulp and Paper, and other Energy Intensive Manufacturing Industries	$150,000.00
		National Science Foundation	IUCRC Phase II Worcester Polytechnic Institute: Center for Advanced Research in Drying (CARD)	$207,590.00
	Lin Cheng	National Science Foundation	CDS&E/Collaborative Research: In-Situ Monitoring-Enabled Multiscale Modeling and Optimization for Environmental and Mechanical Performance of Advanced Manufactured Materials	$290,416.00
	Mehdi Mortazavi	Massachusetts CEC	Planning Workforce Development in electrifying building energy systems	$50,000.00
	Pratap M Rao	Environmental Protection Agency	3D-Printed Floating Photocatalyst Structures that Mimic Natural Objects to Combat Harmful Algal Blooms	$74,881.00
	Robert Hyers	Massachusetts Technology Collaborative	M2I2 Capital Matching Grant Agreement	$2,272,500.00
	Vladimir Vantsevich	Massachusetts Technology Collaborative	Metaverse Laboratory of Human and Off-Road Unmanned Ground Vehicle Teaming	$1,999,417.00
	Yan Wang	Department of Energy	Low-Carbon Iron Production and High Silicon Steel Manufacturing (LCIPHSSM)	$1,241,919.00

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Mechanical and Materials Engineering	Yan Wang	Massachusetts CEC	A Closed Loop Process for Solar Panels Waste	$75,000.00
		SES AI Corporation	Effective Recycling of Spent Lithium-Metal Batteries	$300,000.00
	Yu Zhong	Draper Laboratory	Strengthening Spacecraft Resilience against Atomic Oxygen Erosion through First Principles and Molecular Dynamics Simulations	$284,888.00
	Zhu Mao	Department of Energy	Structural Dynamics Modeling and State Awareness Enhanced by Deep Learning	$150,000.00
Physics	Benjamin Pollard	National Science Foundation	Collaborative Research: Evaluating Access: How a multi-institutional network promotes equity and cultural change through expanding student voice	$33,062.00
	Douglas T Petkie	Department of Defense	Year 2: Integrated Photonics for Sustained Operations	$299,998.00
		Office of Naval Research	Component Library and Support of Adoption of Advanced Manufacturing at AIM Photonics	$119,835.00
Robotics Engineering	Berk Calli	National Science Foundation	POSE: Phase II: Collaborative Open-source Manipulation Performance Assessment for Robotics Enhancement (COMPARE) Ecosystems	$106,653.00
	Kevin Leahy	Department of Defense	Assured aviation autonomy	$199,999.00
	Nitin Sanket	Draper Laboratory	Multirobot Autonomous Collaboration in Communication- Constrained Environments	$360,080.00
Social Science & Policy Studies	Erin R Ottmar	National Science Foundation	BCSER DCL: From Lab to Math Classroom:Utilizing eye gaze and cognitive control tasks to examine the effects of perceptual cues and structure on mathematical performance	$349,997.00
	Jeanine L Skorinko	National Science Foundation	Understanding the effect of individual decision-making strategies on collective decision outcomes - MIT Subaward	$112,427.00
	Ji-Eun Lee	National Science Foundation	Orchestrating Productive Collaboration Among Students in Mathematics with Multimodal Machine Learning	$78,941.00
	Michael J Radzicki	Takeda Development Center Americas, Inc.	Behavioral Modeling in Health Care: A Survey of the Literature and a Systems Thinking Interpretation Applied to Dynamic Simulations	$275,000.00
	Robert Krueger	Templeton World Charity Foundation, Inc.	Using Artificial Intelligence to Identify Market Opportunities in Low- and Middle-Income Communities: A demonstration project	$247,250.00
	Rodica Neamtu	National Science Foundation	Creating a Path to Achieving Success and Sense of Belonging in Computer Science	$2,500,000.00

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STEM Education Center	Mia Dubosarsky	Commonwealth of Massachusetts	FY23 - 24 STEM Week Design Challenge	$41,596.00
		Massachusetts Department of Elementary and Secondary Education	High School Science Leadership Academy	$123,480.00
Undergraduate Studies	Colleen M Shaver	Commonwealth of Massachusetts	FY24 STEM Week Design Challenge	$108,950.00

This report, published annually by the Office of the Vice President & Vice Provost for Research and Innovation, aims to provide a summary of key data related to WPI's extramural funding activities, including proposals submitted, awards received, and funds expended. As with prior years, this report includes only those proposals and awards administered by OSP. Gifts, internal funding, individual fellowships, and MQP/IQP project funding are not included here.