

2019

Sponsored
Program
Activities



Introduction

Worcester Polytechnic Institute (WPI) was founded in 1865 to create and convey the latest science and engineering knowledge in ways that are most beneficial to society.

WPI's 14 academic departments offer more than 50 undergraduate and graduate degree programs in science, engineering, technology, business, the social sciences, and the humanities and arts, leading to bachelor's, master's, and doctoral degrees.

WPI faculty members and students are engaged in advanced, interdisciplinary research across a broad range of fields including cutting-edge work in tissue engineering and regenerative medicine, explorations of the technological and policy issues surrounding cybersecurity, pioneering new technologies for student learning and advancing robotics for medical and transportation applications.

For the fourth year in succession, WPI saw its research awards grow. In fiscal year (FY) 2019, WPI received \$36.8 million in sponsored projects funding – an 11 percent increase from FY2018 – and had \$33.6 million in expenditures.

Solid growth in sponsored projects starts with the submission of proposals. This fiscal year saw 387 proposals submitted (\$235 million in proposed projects) with the shift from small single investigator proposals to larger consortia continuing. While federal agency funding continues to grow strongly there are still areas of opportunity for further growth in projects with industry and other partners.

The Office of Sponsored Programs (OSP) at WPI is responsible for proposal preparation and submission, negotiations, non-financial award management and award compliance for projects funded by federal and state agencies, and other public and private sources. OSP is part of the Research Enterprise under the Vice Provost for Research. We work closely with Sponsored Programs Accounting (SPA) which oversees the post-award financial administration of sponsored projects under the Office of the Controller.

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*Bogdan M. Vernescu,
Vice Provost for Research*



Awards



Expenditures



Proposals Submitted

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4 Year Summary

Awards

WPI received \$36.8 million in new awards in FY2019 – an all-time record. Awards are funds which have been fully obligated and released by the sponsor. Some grants are funded in yearly increments, subject to satisfactory progress and/or availability of funds. In such cases, only those increments received by WPI are counted as awards.



Ted Clancy, professor of electrical and computer engineering, is working with Todd Farrell, director of research at Liberating Technologies, Inc. (LTI) of Holliston, Mass., and Debra Latour, an assistant professor of occupational therapy in the Division of Occupational Therapy program at Western New England University to develop wireless sensors for a new prosthetics device. For this research, Clancy received a two-year, \$400,000 subaward from LTI, which received funding from the Department of Defense.

Awards by School



\$16M

**Arts &
Sciences**

\$18.7M

Engineering

\$659K

Business

\$75K

IGSD

\$1.3M

Other

Awards



WPI researchers received a three-year, \$25 million award from the U.S. Army Combat Capabilities Development Command Army Research Laboratory to further develop a 3D printing technique that could be used to repair vehicles and other technology out on the battlefield.

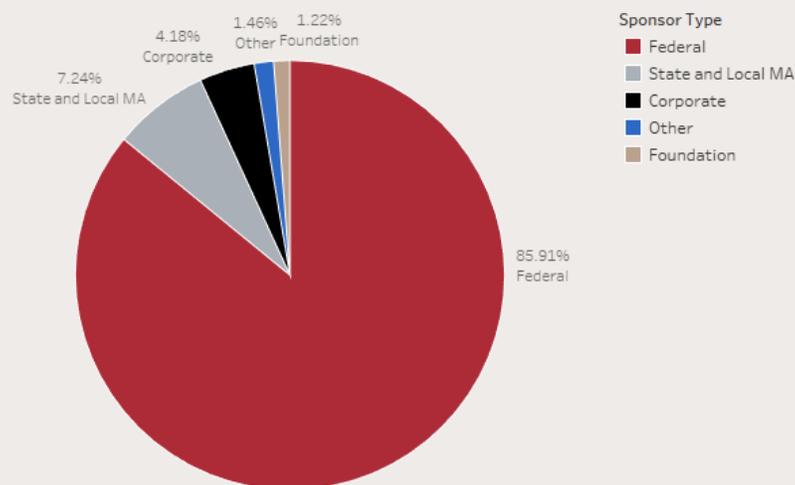
Awards by School and Department

		FY 2019		FY 2018		FY 2017		FY 2016	
		No.	Amount	No.	Amount	No.	Amount	No.	Amount
Arts & Sciences	BBT	9	\$655,028	39	\$3,051,221	23	\$1,067,222	33	\$1,213,770
	CBC	3	\$821,680	6	\$1,471,733	8	\$1,604,628	9	\$1,573,880
	CS	43	\$9,984,257	26	\$4,143,102	20	\$3,729,980	32	\$3,896,366
	HUA			3	\$313,937	3	\$388,935	3	\$199,988
	MA	12	\$1,162,181	15	\$1,434,785	11	\$825,620	16	\$1,057,195
	PH	5	\$1,093,973	8	\$5,384,219	2	\$116,493	5	\$610,200
	SSPS	4	\$2,285,847	4	\$1,166,001	5	\$2,085,881	6	\$79,740
	Total	76	\$16,002,966	101	\$16,964,998	72	\$9,818,759	104	\$8,631,139
Business	FBS	10	\$659,530	6	\$219,895	10	\$365,835	22	\$575,950
	Total	10	\$659,530	6	\$219,895	10	\$365,835	22	\$575,950
Engineering	BME	18	\$1,707,437	17	\$2,576,545	15	\$2,391,854	21	\$3,700,807
	CEE	3	\$83,250	7	\$447,064	5	\$554,322	8	\$113,536
	ChE	15	\$3,970,306	10	\$1,254,479	10	\$1,114,167	22	\$1,498,354
	ECE	11	\$1,556,514	14	\$995,325	22	\$2,522,295	37	\$1,858,977
	FPE	4	\$868,403	7	\$268,626	8	\$385,359	9	\$1,432,039
	ME	48	\$10,597,340	50	\$8,598,634	42	\$6,568,925	34	\$4,619,070
	Total	99	\$18,783,250	105	\$14,140,673	102	\$13,536,922	131	\$13,222,783
IGSD	IGSD	1	\$75,175	1	\$68,448			1	\$61,214
	Total	1	\$75,175	1	\$68,448			1	\$61,214
Other	Other	10	\$1,331,251	15	\$1,641,047	15	\$1,880,367	10	\$670,863
	Total	10	\$1,331,251	15	\$1,641,047	15	\$1,880,367	10	\$670,863
Grand Total		196	\$36,852,172	228	\$33,035,061	199	\$25,601,882	268	\$23,161,949

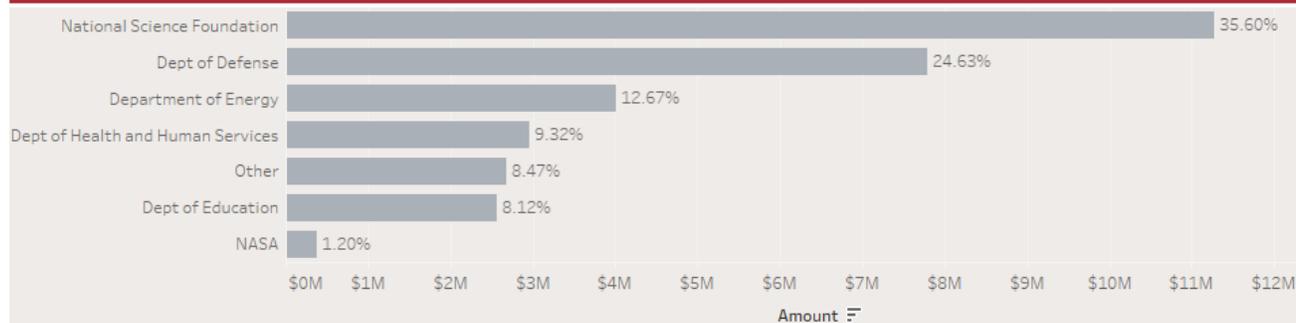
Fiscal Year 2019

Awards by Sponsor

Awards by Sponsor Type



Awards by Top Federal Sponsors



DOE
\$3.25M

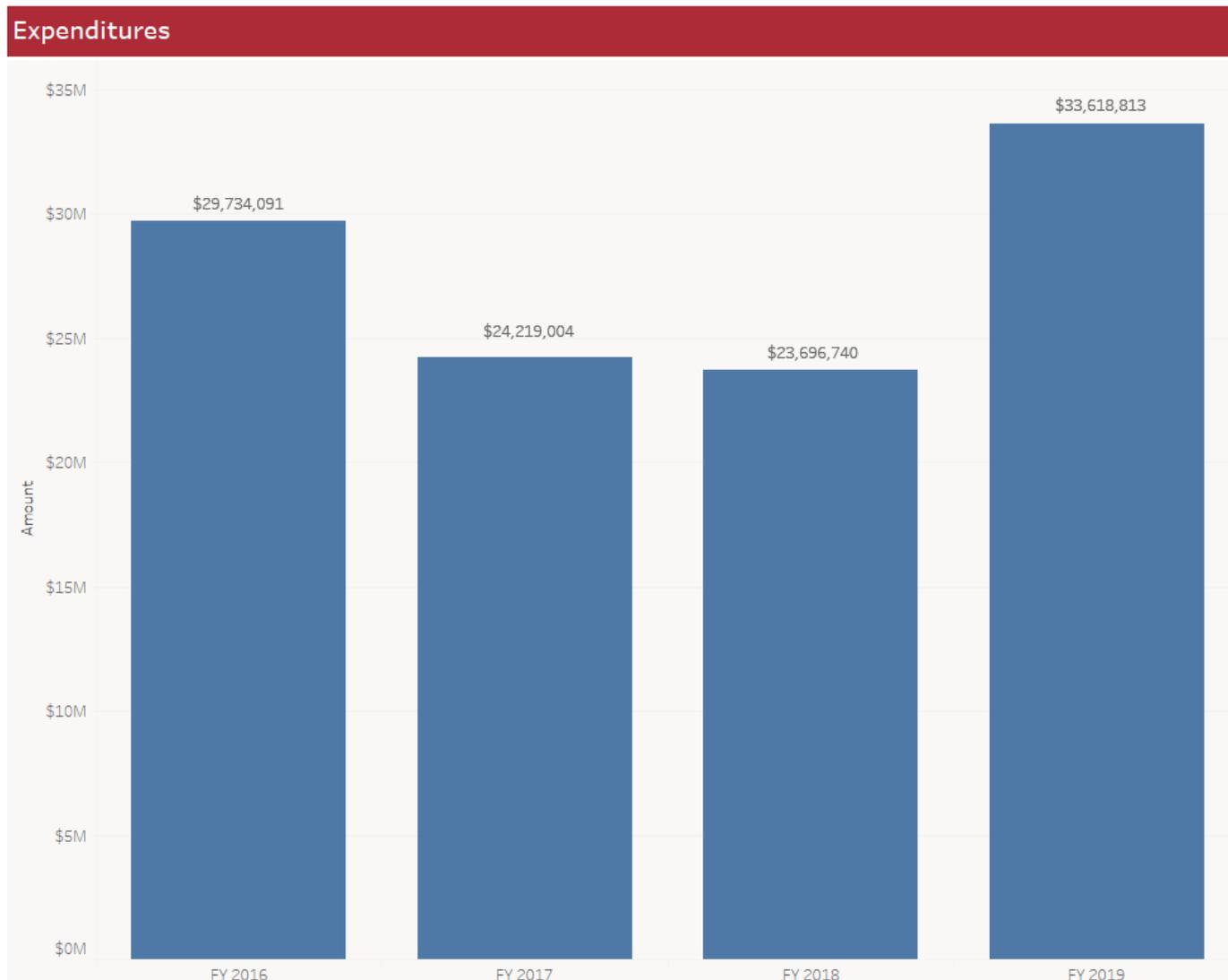
Funding Spotlight Materials and Manufacturing

Within the Materials and Manufacturing area, the Energy Research Group conducts energy research focusing on secure and sustainable production, conversion, delivery, and use of energy by developing novel materials and processes for the global energy future. The collaborative approach integrates research in the basic and applied sciences to span the complete spectrum between initial discovery and large-scale manufacturing. The year 2019 saw a rapid expansion of funding for this group including three Department of Energy (DOE) awards. Professor Mike Timko led a multi-institutional cross-sector group to an award of \$2 million for the project entitled A Catalytic Process to Convert Municipal Solid Waste Components to Energy, in addition to awards to Professors Adam Powell for \$750,000 and Yu Zhong for \$500,000.

4 Year Summary

Expenditures

Expenditures are the actual costs paid for by WPI's external funding in a given year. These costs are recorded in real-time as the research is taking place, unlike awards which are recorded as a lump sum. As such, expenditures provide the most consistent year-over-year measure of funded research activity at WPI.



Nikhil Karanjgaokar is conducting wave motion research to one day create a bulletproof vest that not only will sense the speed, angle of approach, and size of an incoming bullet, but the material inside the vest will instantly change properties to provide greater shock protection at the exact point of impact. The pioneering work is being funded by a five-year, \$500,000 award from the National Science Foundation.

Fiscal Year 2019

Expenditures

Expenditures by School and Department

		Compensation & Benefits	Equipment, Materials, & Suppl...	Indirect Costs	Other Direct Costs	Subrecipient	Travel	Total
Arts & Sciences	Biology and Biotechnology	\$603,293	\$66,770.85	\$372,184	\$196,082	\$0	\$12,886	\$1,251,216
	Chemistry and Biochemistry	\$606,289	\$156,455.14	\$439,368	\$146,199	\$124,575	\$7,787	\$1,480,672
	Computer Science	\$2,014,567	\$237,684.13	\$1,057,708	\$1,982,768	\$354,749	\$76,517	\$5,723,993
	Humanities	\$46,362	\$421.44	\$23,873	(\$11,707)	\$0	\$30,988	\$89,938
	Mathematics	\$522,260	\$3,396.88	\$243,538	\$168,318	\$0	\$49,463	\$986,975
	Physics	\$386,054	\$2,467,030.44	\$100,040	\$143,681	\$553	\$6,249	\$3,103,606
	Social Science	\$569,163	\$16,224.05	\$304,170	\$160,973	\$290,738	\$7,384	\$1,348,652
Business	School of Business	\$141,140	\$0.00	\$83,404	\$51,992	\$25,799	\$10,017	\$312,352
Engineering	Biomedical Engineering	\$1,309,233	\$290,458.65	\$576,819	\$280,220	\$108,986	\$59,671	\$2,625,387
	Chemical Engineering	\$580,891	\$343,610.84	\$354,747	\$183,540	\$0	\$13,209	\$1,475,997
	Civil Engineering	\$128,372	\$1,860.51	\$26,325	\$55,048	\$0	\$15,855	\$227,460
	Electrical and Computer Engineering	\$714,053	\$19,378.78	\$340,749	\$179,244	\$25,326	\$26,877	\$1,305,627
	Fire Protection Engineering	\$190,857	\$37,688.66	\$115,059	\$10,722	\$0	\$2,569	\$356,896
	Mechanical Engineering	\$2,939,228	\$4,513,905.93	\$1,897,678	\$1,047,822	\$1,467,743	\$175,944	\$12,042,320
Other	Other	\$469,469	\$32,182.06	\$170,393	\$511,331	\$67,337	\$37,010	\$1,287,722
Grand Total		\$11,221,228	\$8,187,068.36	\$6,106,054	\$5,106,231	\$2,465,806	\$532,426	\$33,618,813



DARPA
\$2.8M

NIH
\$3.5M

Funding Spotlight

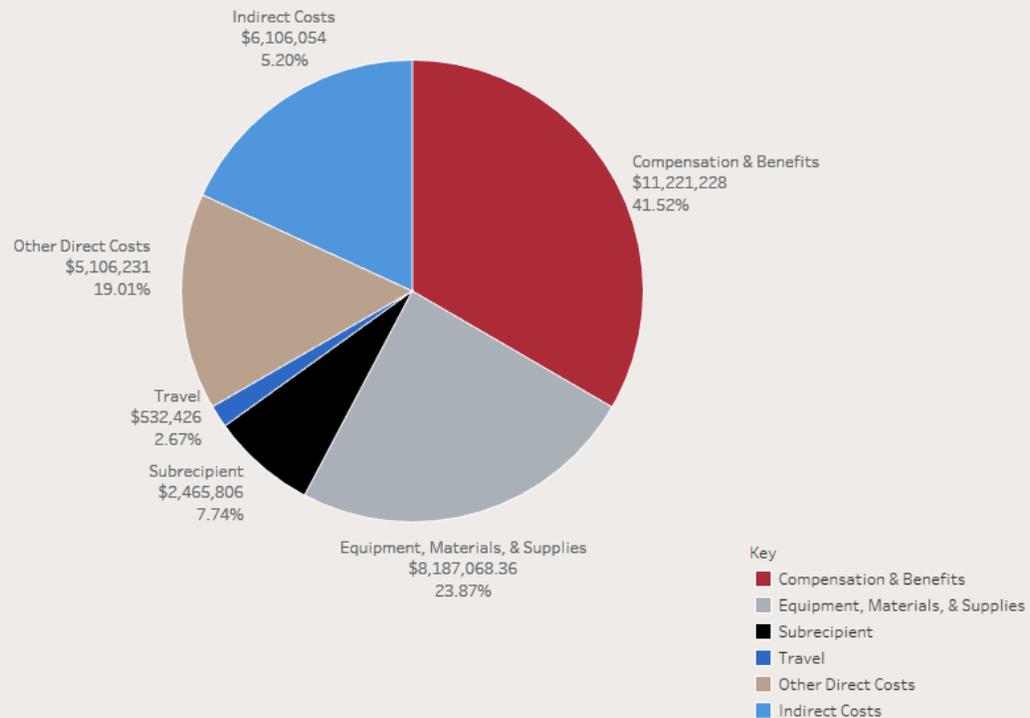
Bio-X

Computer science professors Emmanuel Agu and Elke Rundensteiner, with support from a four-year, \$2.8 million award from the Defense Advanced Research Projects Agency (DARPA) through its Warfighter Analytics using Smartphones for Health (WASH) program are developing a Smartphone App to Help Assess the Health of Soldiers. The project aims to use “smartphone biomarkers” and machine learning to create an early warning system for soldiers and veterans who may be suffering from traumatic brain injuries and infectious diseases

Gregory Fischer from Mechanical Engineering is leading a team which is developing a robotic system to treat brain tumors. This project funded by a five-year, \$3.5 million National Institutes of Health (NIH) grant, is an academic-industry partnership which will continue the development of an innovative robotic system that, operating within an MRI scanner, can deliver a minimally invasive probe into the brain to destroy metastatic brain tumors with high-intensity therapeutic ultrasound under real-time guidance.

Expenditures

Expenditure Breakdown



NSF
\$320K

Funding Spotlight Global Initiatives

Professor Andrew C. Trapp, from the Foisie Business School, received a \$320,000 National Science Foundation (NSF) grant to develop a computational tool to help humanitarian aid organizations significantly improve refugees' chances of successfully resettling and integrating into a new country.

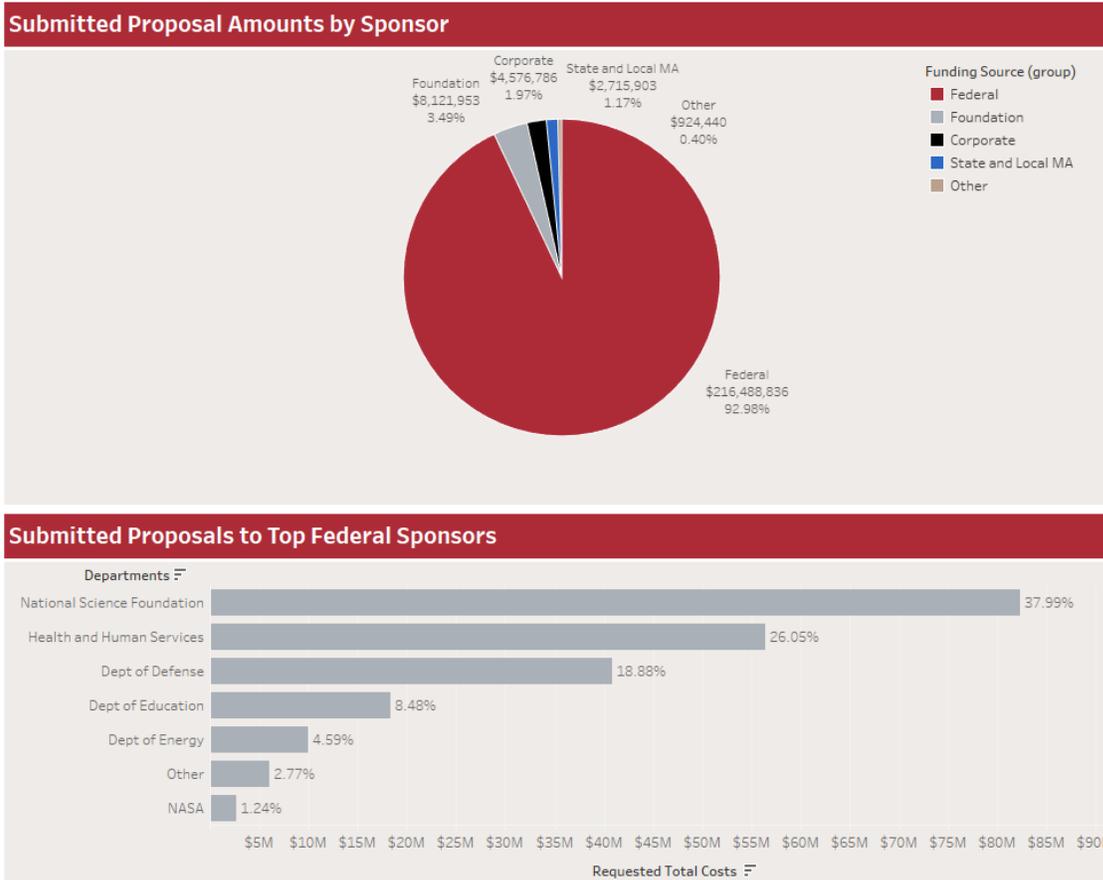
Each year, tens of thousands of refugees—many fleeing war, violence, and persecution—are resettled in dozens of host countries around the world. While there is growing evidence that the initial placement of refugee families profoundly affects their lifetime outcomes, there have been few attempts to use technology to optimize resettlement destinations.

The NSF-funded work will further develop a software program Trapp and colleagues created in an effort to improve resettlement outcomes. Based on the algorithms and data gleaned from prior placements, the program predicts the likelihood of employment for each working-age refugee. These predictions are then used to guide the search for the best way to match refugee families to host communities for resettlement workers.

4 Year Summary

Proposals

In Fiscal Year 2019, there were 387 proposals submitted, totalling a request of \$235 million. Almost 93 percent of the proposals were submitted to Federal sponsors, totalling \$216 million. Of the Federal sponsors, most proposals (almost 38 percent) were submitted to the National Science Foundation totalling \$82 million.



CZI
\$1M

NSF
\$1.5M

Funding Spotlight Smart World

Within the Smart World cluster the Learning Science and Technologies group funding continues to grow and diversify. In 2019 new awards of particular note include: Dr. Neil Heffernan's \$1 million grant from the Chan Zuckerberg Initiative (CZI) Foundation to support Working with teachers to develop QUICK-Comments in ASSISTments and to establish the ASSISTments Foundation at WPI.

In addition, Dr Anthony Botelho and Dr Jacob Whitehill received awards of \$750,000 each from NSF to support research in Using Machine Learning to Personalize Interactions with Students and Providing Automated feedback on Classroom Inter-personal Dynamics.

These add to ongoing projects led by Erin Ottmar and Ivon Arroyo funded through the US Department of Education and NSF.

These grants are actively shaping the future of the STEM field - changing the ways young learners are taught early STEM skills and supporting those working to become STEM professionals.

Proposals

Submitted Proposals by Department

School	Department	Submitted Date							
		FY 2019		FY 2018		FY 2017		FY 2016	
		No.	Amount	No.	Amount	No.	Amount	No.	Amount
Arts & Sciences	CS	79	\$67,047,056	72	\$55,780,679	68	\$64,578,645	64	\$91,081,859
	MA	29	\$6,625,154	31	\$10,847,099	30	\$12,443,081	31	\$7,138,020
	BBT	20	\$8,999,980	17	\$5,316,339	24	\$10,943,737	25	\$16,664,582
	CBC	19	\$22,009,080	21	\$15,164,667	24	\$15,441,695	23	\$14,031,454
	PH	17	\$6,404,719	15	\$11,223,643	20	\$7,507,363	15	\$6,972,843
	SSPS	11	\$3,488,695	17	\$10,307,868	10	\$5,648,375	19	\$9,874,384
	HUA	1	\$30,000	6	\$950,449	8	\$1,504,311	6	\$2,801,271
Business	FBS	5	\$1,404,014	17	\$6,415,282	9	\$7,795,124	11	\$2,737,718
Engineering	ME	72	\$59,428,719	73	\$41,725,321	58	\$41,005,082	68	\$23,943,163
	BME	49	\$34,232,381	35	\$17,464,934	37	\$16,139,455	37	\$20,916,371
	ECE	25	\$7,274,437	19	\$6,172,118	22	\$5,348,862	30	\$10,289,038
	ChE	22	\$7,522,696	38	\$13,342,931	21	\$9,573,181	29	\$7,359,639
	CEE	13	\$2,717,516	12	\$2,204,135	23	\$6,240,237	22	\$8,108,378
	FPE	12	\$5,391,897	7	\$3,251,568	19	\$7,579,254	5	\$627,926
IGSD	IGSD	2	\$372,371			2	\$221,955	1	\$91,000
Other	Other	11	\$2,054,068	14	\$2,583,290	13	\$2,562,483	6	\$1,831,781
Grand Total		387	\$235,002,783	394	\$202,750,323	388	\$214,532,840	392	\$224,469,427



NIIMBL
\$346K

MLSC
\$404K

Funding Spotlight Manufacturing USA

WPI is a team member on two National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) Workforce development projects that received funding this year. The SPIDER Project (Network for Automation Testing, Training and Standardization) led by Susan Roberts offered its first automation training for bio-tech and bio-pharm industry scientists in August of 2019.

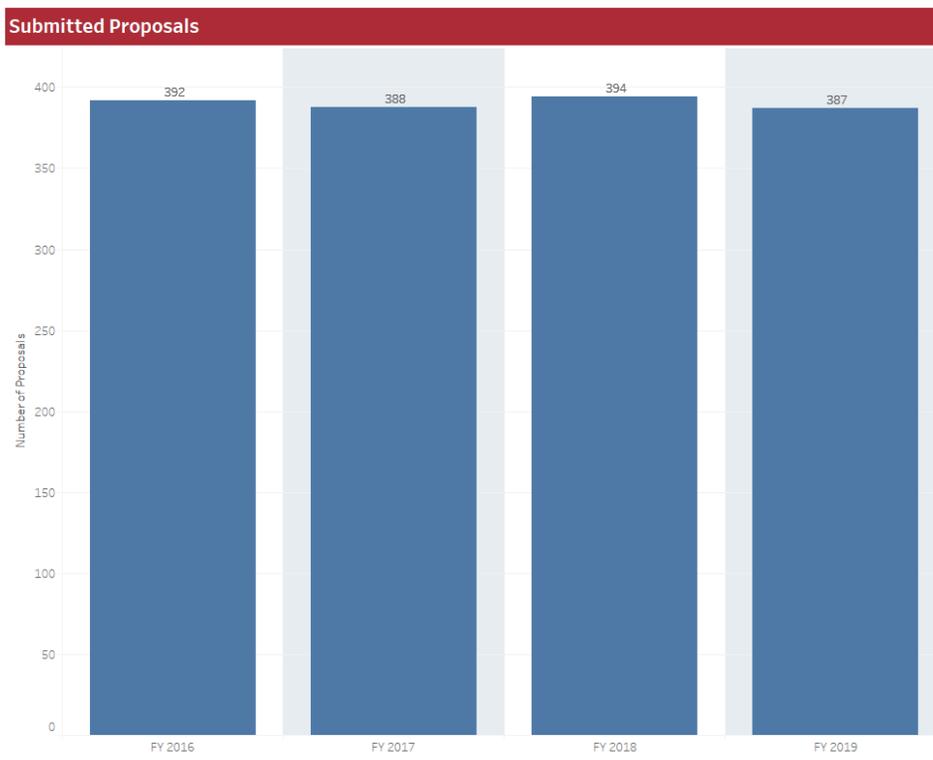
Individuals were encouraged to take several online modules hosted by the International Academy of Automation Engineering (IAAE) before hands-on training at one of the three sites (WPI, NC State, and University of Maryland).

The Blended Learning for Cell Therapy Manufacturing is led by Professors Marsha Rolle and Reeta Rao. The goal of this project is to create an online course on the fundamentals of cell therapy manufacturing that is coupled to a companion hands-on training component scheduled to pilot in May 2020.

Such a blended learning course does not currently exist anywhere for cell therapy manufacturing. MIT is leading this project along with partners from Celgene Corp, Unum Therapeutics Inc., and Vericel Corp, in addition to WPI.

With generous support from Massachusetts Life Sciences Center (MLSC), WPI purchased several pieces of equipment essential for delivery of the training program.

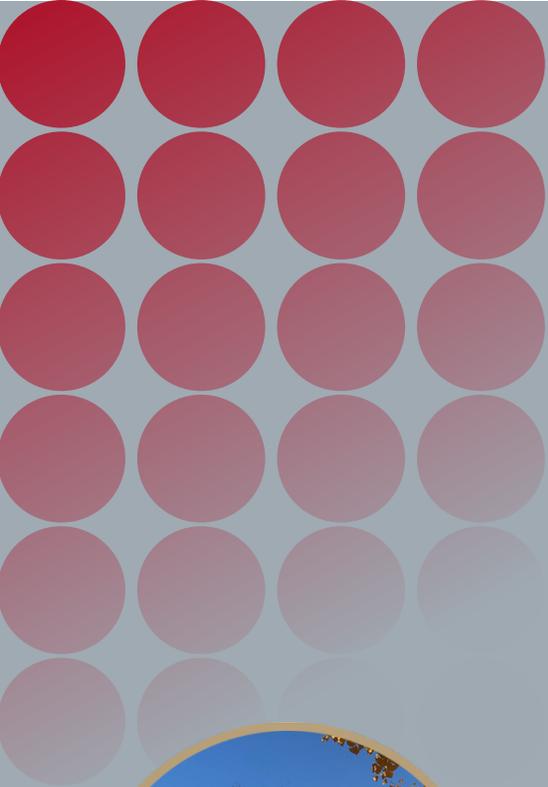
Proposals



Funding Spotlight **Undergraduate Research**

WPI has a longstanding commitment to engaging undergraduate students in research. As part of the Bachelor's degree requirement, every undergraduate at WPI must complete a Major Qualifying Project (MQP) which is a research or design project completed in the student's major field of study. In addition, WPI has been very successful in receiving funding from NSF and other agencies to support undergraduate research through REU Sites, REU Supplements, and directly on research programs. WPI currently has six active REU Sites, including a new site led by Professor Lyubov Titova in Clean Energy Science and Technology which opened in FY19. This most recent site offers chemistry, physics and engineering students from all over the U.S. the opportunity to pursue research projects in biomass conversion to fuels, solar energy materials and devices, photophysics of energy materials, and energy efficient devices for high bandwidth communications under the supervision of our WPI faculty. In addition to carrying out cutting-edge research, REU participants attend weekly professional development seminars and workshops. Over 25 additional students were supported to participate in research across the campus during the summer break through REU Supplements.

In 2019, WPI created the Office of Undergraduate Research (OUR) led by the Associate Dean of Undergraduate Studies, Professor Suzanne Weekes. The goals of the OUR are to support WPI faculty and students in the undergraduate research enterprise, to increase the impact, outcomes, and visibility of WPI student research, and to promote, cultivate and develop opportunities and partnerships that will enhance and broaden research opportunities at WPI.



This report, published annually by the Office of Sponsored programs, 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. We welcome your feedback on this report. Comments and suggestions can be submitted via email to Gabe Johnson, Associate Director, Post-Award & Compliance (gjohnson@wpi.edu).

