TENNESSEE TECH UNIVERSITY

OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT ANNUAL REPORT

2018-2019

TABLE OF CONTENTS

Page

VISION AND MISSION OF THE OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT

Vision: Tennessee Tech will emerge as a prominent technological university for research with national impact.

Mission: The Office of Research and Economic Development (ORED) provides support and assistance to administrators, faculty, staff, and students in their efforts to secure external funding for research and scholarly activities. ORED reviews, negotiates, approves, and provides administrative oversight of proposals and awards in compliance with applicable laws, policies, and regulations. Additionally, ORED facilitates the protection and commercialization of intellectual property developed by TTU, and supports activities that promote economic development.

The Office of Research provides the following services to assist faculty in their pursuit of research and other scholastic activities:

- Assist in identifying appropriate and relevant funding opportunities;
- Promote and support collaborative, transdisciplinary research and scholarly activities;
- Conduct proposal writing workshops;
- Assist with proposal and budget development;
- Provide editorial and graphic support on proposals;
- Review proposals to ensure sponsor's requirements are addressed;
- Coordinate the submission of proposals to external sponsors using sponsors' portals;
- Process all awards from external sponsors;
- Negotiate and execute sponsored agreements;
- Ensure sponsored activities are in compliance with TTU, state, sponsor, and federal regulations;
- Contribute to start-up packages;
- Provide faculty initiation grants; and
- Assist faculty in all matters regarding intellectual property protection and commercialization.

SUMMARY OF ACTIVITIES

During fiscal year 2018-19, the University's Mission was supported through the Office of Research in the following ways:

- Total external funding in the amount of $20,228,105 was received for the 2019 Fiscal Year (July 1, 2018 – June 30, 2019). This represents a 24% increase from the total amount of external funding received in Fiscal Year 2018 ($16,371,900).

- State appropriations totaling $4,186,000 were received by the Centers of Excellence and an additional $107,174 in funding was received through their testing accounts, which represents 21% and 1% of total external funding received, respectively.

- Grants and contracts externally funded numbered 149 with a value of $15,934,931, representing 80% of total external funding.

- Grants and contracts received through the three Centers of Excellence; the Cybersecurity Education, Research and Outreach Center; iCube; and the STEM Center numbered 105 with a value of $9,914,639, which represents 62% of total dollars and 70% of the total number of grants and contracts received.

- Grants and contracts received through federal agencies numbered 95 with a value of $11,757,420, which represents 64% of grants and contracts and 58% of total dollars received.

- Grants and contracts received through state agencies numbered 34 with a value of $3,073,033, which represents 23% of the total number of grants and contracts and 15% of total dollars received.

- Private contracts were at 18 with a value of $1,023,557, which represents 12% of the total number of grants and contracts and 5% of total dollars received.

- Local funding came in at 2 with a value of $80,921, which represents 1% of grants and contracts and 0.4% of total dollars received.

- Grants and contracts received for research numbered 107 with a value of $8,964,146, which represents 72% of the total number of grants and contracts and 44% of total dollars received.

- Grants and contracts received for public service numbered 27 with a value of $5,619,292, which represents 18% of all grants and contracts and 28% of dollars received.

- Instruction funding received numbered 6 with a value of $155,579, which represents 4% of total number of grants and contracts and 1% of total dollars received.

- Grants and contracts received for student services/scholarships numbered 4 with a value of $177,000, which represents 3% of the total number of grants and contracts and 1% of total dollars received.

- Academic Support funding accounted for 2 projects with a value of $501,995, which represents 1% of the total number of grants and contracts and 2% of total dollars received.

- Grants and contracts received for capital projects numbered 3 with a value of $516,919, which represents 2% of the total number of grants and contracts and 3% of total dollars received.

- Internal funds were provided in the amount of $155,651 for small grants to support faculty research. Three Track I proposals from 5 faculty were funded for a total of $7,433, and 15 Track II proposals from 23 faculty were funded for a total of $148,218.

- The top funding agencies were the National Science Foundation at $3,850,945; Tennessee Department of Education at $2,437,568; the Tennessee Department of Safety and Homeland Security at $1,195,075; and the U.S. Department of Energy at $809,985.

- Proposals submitted for external funding numbered 168 with a value of $49,340,424.

- Proposals submitted through the three Centers of Excellence; the Cybersecurity Education, Research and Outreach Center; iCube; and the STEM Center numbered 117 with a value of $36,872,460, which represents 70% of proposals submitted and 75% of funds requested.

- Proposals submitted to federal agencies numbered 101, requesting $36,965,838, which represents 60% of proposals submitted and 75% of dollars requested.

- Proposals submitted to state agencies numbered 36, requesting $8,428,408, which represents 21% of proposals submitted and 17% of dollars requested.

- Proposals submitted to private agencies numbered 29, requesting $3,865,257, which represents 17% of proposals submitted and 8% of dollars requested.

- Proposals submitted to local agencies numbered 2, requesting $80,921, which represents 1% of proposals submitted and 0.2% of dollars requested.

LIST OF TABLES

LIST OF FIGURES

NOTES

The tables and figures on the following pages show the proposals and activations for FY 2019 (July 1, 2018 – June 30, 2019) broken down in various ways. Please note the following:

- The amounts listed in the activation amount column of each table represent the amount activated and do not reflect actual project expenditures.
- The number of activations may be greater than the number of proposals submitted because proposals submitted in previous years could be activated in the current year. Similarly, the amount activated may be greater than the amount requested for any given category for the same reason.
- All breakdowns by College and Department use the College and Department of the project Principal Investigator.
- In cases where two Centers share responsibility for a project, the entire project amount is listed with the Center that has greater than 50% responsibility for the project.

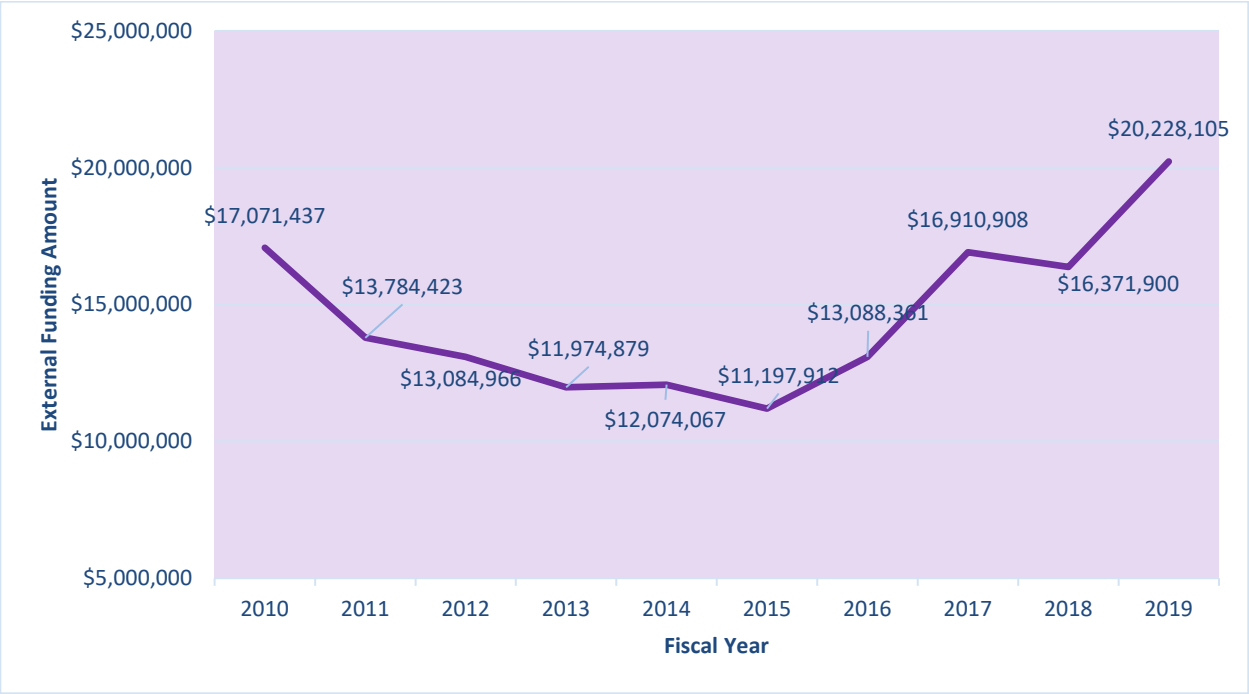

Figure 1
Total External Funding Received Historical (FY 2010-2019)

Table I: External Funding by College/University Unit/Center

PI's College	PI's Department, Center, or Unit	Energy Center	Manufacturing Center	Water Center	STEM Center	CEROC	Department/ Other Units	Total
Agriculture and Human Ecology	Agriculture						$786,842	$786,842
	Human Ecology						$597,995	$597,995
	Subtotal						**$1,384,837**	**$1,384,837**
Arts and Sciences	Biology			$697,253			$597,483	$1,294,736
	Chemistry						$94,430	$94,430
	Cooperative Fisheries Research Unit			$658,792			$30,000	$688,792
	Earth Sciences						$41,443	$41,443
	English						$15,000	$15,000
	Physics	$139,260			$40,000		$310,450	$489,710
	Subtotal	**$139,260**		**$1,356,045**	**$40,000**		**$1,088,806**	**$2,624,111**
Business	Business Media Center						$2,411,555	$2,411,555
	Decision Sciences and Management						$91,772	$91,772
	Small Business Development Center						$145,140	$145,140
	Subtotal						**$2,648,467**	**$2,648,467**
Education	Curriculum and Instruction						$2,012,764	$2,012,764
	Dean's Office						$33,264	$33,264
	STEM Center				$32,166			$32,166
	Subtotal				**$32,166**		**$2,046,028**	**$2,078,194**
Engineering	Basic Engineering						$133,973	$133,973
	Chemical Engineering	$109,288		$144,642			$5,000	$258,930
	Civil and Environmental Engineering	$179,927		$377,860				$557,787
	Computer Science	$493,757	$2,316,099			$278,699		$3,088,555
	CESR	$179,163						$179,163
	CMR		$44,278					$44,278
	Dean's Office						$35,000	$35,000
	Electrical and Computer Engineering	$328,737	$463,082					$791,819
	Manufacturing and Engineering Technology		$443,528				$50,000	$493,528
	Mechanical Engineering	$20,066	$1,091,210		$50,102			$1,161,378
	Student Success Center	$34,969						$34,969
	Subtotal	**$1,345,907**	**$4,358,197**	**$522,502**	**$50,102**	**$278,699**	**$223,973**	**$6,779,380**
Fine Arts	Appalachian Center for Craft						$9,600	$9,600
	Music						$6,650	$6,650
	Subtotal						**$16,250**	**$16,250**
Interdisciplinary Studies	Dean's Office						$24,960	$24,960
	Environmental Studies			$78,881				$78,881
	Subtotal			**$78,881**			**$24,960**	**$103,841**
Nursing	Nursing						$165,951	$165,951
	Subtotal						**$165,951**	**$165,951**
Other	Facilities						$15,900	$15,900
	TN Center for Rural Innovation						$118,000	$118,000
	Subtotal						**$133,900**	**$133,900**
Center State Appropriations and Testing Accounts	Energy Center Appropriation	$947,800						$947,800
	Energy Center Testing	$14,589						$14,589
	Manufacturing Center Appropriation		$1,543,400					$1,543,400
	Manufacturing Center Testing		$23,888					$23,888
	Water Center Appropriation			$1,194,800				$1,194,800
	Water Center Testing			$68,697				$68,697
	CEROC					$500,000		$500,000
	Subtotal	**$962,389**	**$1,567,288**	**$1,263,497**				**$4,293,174**
Total	**All Units**	**$2,447,556**	**$5,925,485**	**$3,220,925**	**$122,268**	**$278,699**	**$6,049,402**	**$20,228,105**

Table II: Proposals and Activations By University Unit				
University Unit	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Agriculture	3	$966,019	4	$786,842
Biology	9	$4,357,260	10	$1,294,736
Business Media Center/iCube	9	$6,106,470	9	$2,411,555
Chemical Engineering	17	$9,255,815	5	$258,930
Chemistry	8	$1,960,986	1	$94,430
Civil and Environmental Engineering	17	$1,243,689	15	$557,787
Center for Energy Systems Research (CESR)	5	$1,166,852	4	$179,163
Center for Manufacturing Research (CMR)	6	$2,564,713	2	$44,278
Computer Science	17	$3,126,598	18	$3,088,555
Cooperative Fisheries Research Unit	4	$300,448	11	$688,792
Counseling and Psychology	2	$36,450	0	$0
Craft Center	3	$24,000	2	$9,600
Curriculum and Instruction	5	$4,378,817	7	$2,012,764
Dean's Office: Education	1	$24,092	1	$33,264
Dean's Office: Engineering	1	$35,000	1	$35,000
Dean's Office: Interdisciplinary Studies	1	$25,000	1	$24,960
Decision Sciences and Management	1	$91,772	1	$91,772
Earth Sciences	1	$22,206	1	$41,443
Economics, Finance and Marketing	1	$35,000	0	$0
Electrical and Computer Engineering	13	$2,540,387	10	$791,819
English	1	$15,000	1	$15,000
Environmental Studies	1	$42,000	2	$78,881
Facilities	1	$10,000	1	$15,900
General and Basic Engineering	0	$0	1	$133,973
Human Ecology	2	$581,994	2	$597,995
Innovation & Entrepreneurship (ORED)	0	$0	1	$118,000
Manufacturing and Engineering Technology	7	$1,831,033	6	$493,528
Mechanical Engineering	20	$5,116,718	17	$1,161,378
Military and Veterans Affairs	1	$25,000	0	$0
Music	0	$0	1	$6,650
Nursing	3	$1,213,000	1	$165,951
Physics	6	$1,858,897	10	$489,710
Small Business Development Center	1	$145,140	1	$145,140
Sociology and Political Science	1	$240,068	0	$0
STEM Center	0	$0	1	$32,166
Student Success Center (Engineering)	0	$0	1	$34,969
Subtotal	**168**	**$49,340,424**	**149**	**$15,934,931**
CESR State Appropriation/Testing	---	---	---	$962,389
CMR State Appropriation/Testing	---	---	---	$1,567,288
Water Center State Appropriation/Testing	---	---	---	$1,263,497
CEROC State Appropriation	---	---	---	$500,000
Total	**168**	**$49,340,424**	**149**	**$20,228,105**

Table III: Proposals and Activations Through Centers by University Unit				
University Unit	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Energy Center				
CESR	5	$1,166,852	4	$179,163
Chemical Engineering	12	$7,523,911	2	$109,288
Civil and Environmental Engineering	11	$752,719	7	$179,927
Computer Science	8	$977,844	8	$493,757
Electrical and Computer Engineering	7	$1,169,405	7	$328,737
Mechanical Engineering	10	$3,056,723	2	$20,066
Physics	1	$157,584	3	$139,260
Engineering Student Success Center	0	$0	1	$34,969
State Appropriation	---	---	---	$947,800
Center Testing Account	---	---	---	$14,589
Total	*54*	*$14,805,038*	*34*	*$2,447,556*
Manufacturing Center				
Chemical Engineering	1	$750,000	0	$0
CMR	6	$2,564,713	2	$44,278
Computer Science	6	$1,346,510	8	$2,316,099
Electrical and Computer Engineering	6	$1,370,982	3	$463,082
Manufacturing and Engineering Technology	6	$1,781,033	5	$443,528
Mechanical Engineering	9	$1,926,022	12	$1,091,210
State Appropriation	---	---	---	$1,543,400
Center Testing Account	---	---	---	$23,888
Total	*34*	*$9,739,260*	*30*	*$5,925,485*
Water Center				
Biology	4	$3,731,341	5	$697,253
Chemical Engineering	1	$10,000	2	$144,642
Chemistry	1	$138,000	0	$0
Civil and Environmental Engineering	6	$490,970	8	$377,860
Cooperative Fisheries Research Unit	4	$300,448	10	$658,792
Environmental Studies	1	$42,000	2	$78,881
State Appropriation	---	---	---	$1,194,800
Center Testing Account	---	---	---	$68,697
Total	*17*	*$4,712,759*	*27*	*$3,220,925*
STEM Center				
Mechanical Engineering	0	$0	3	$50,102
Physics	2	$1,483,933	1	$40,000
STEM Center	0	$0	1	$32,166
Total	*2*	*$1,483,933*	*5*	*$122,268*
CEROC				
Computer Science	1	$25,000	2	$278,699
State Appropriation	---	---	---	$500,000
Total	---	---	---	*$500,000*

Table IV: Proposals and Activations By Funder Classification				
Classification	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Federal	101	$36,965,838	95	$11,757,420
State	36	$8,428,408	34	$3,073,033
Private	29	$3,865,257	18	$1,023,557
Local	2	$80,921	2	$80,921
State Appropriations	---	---	---	$4,186,000
Center Testing Accounts	---	---	---	$107,174
Total	**168**	**$49,340,424**	**149**	**$20,228,105**

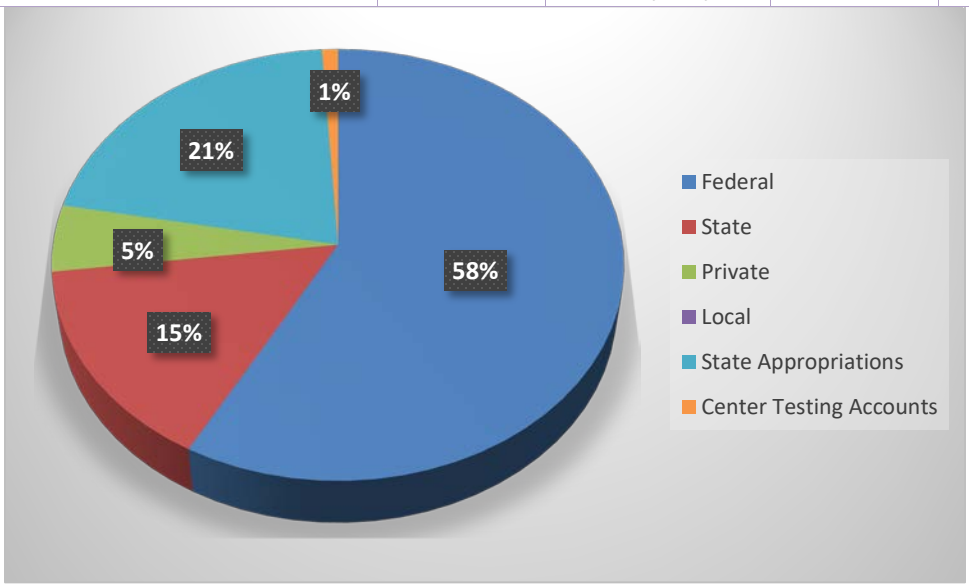

Figure 2
Percentage of Total Activation Amount by Funder Classification

Table V: Federal Activations By Agency		
*Agency**	*# of Activations*	*Amount Activated*
National Science Foundation	26	$3,850,945
Tennessee Department of Education	5	$1,555,890
Tennessee Department of Safety and Homeland Security	1	$1,175,075
U.S. Department of Energy	10	$809,985
Tennessee Highway Safety Office	2	$698,675
U.S. Army Corps of Engineers	1	$448,120
Oak Ridge National Laboratory	9	$355,023
MIT Lincoln Laboratory	1	$300,000
U.S. Department of Defense	2	$282,784
Appalachian Regional Commission	1	$281,019
Tennessee Wildlife Resources Agency	6	$276,967
National Institutes of Health	2	$183,590
U.S. Department of Agriculture	4	$175,957
National Aeronautics and Space Administration	3	$169,398
U.S. Small Business Administration	1	$145,140
National Science Foundation/National Security Agency	1	$134,925
Air Force Office of Scientific Research	1	$120,000
Economic Development Administration	1	$118,000
American Lightweight Manufacturing Innovation Institute	1	$105,000
Tennessee Valley Authority	2	$100,000
UT-Battelle, LLC	1	$87,788
U.S. Fish and Wildlife Service	2	$78,881
U.S. Geological Society	1	$62,000
Southeastern Transportation Research, Innovation, Development, and Education (STRIDE) Center	2	$53,254
Battelle Memorial Institute	3	$50,102
U.S. DOE Southwest CHP Technical Assistance Partnership	1	$37,702
American Ordinance, LLC (Government Prime Contract)	1	$31,547
United States Air Force Research Laboratory	1	$25,000
U.S. Navy	1	$22,653
National Writing Project	1	$15,000
Tennessee Department of Transportation	1	$7,000
Total	**95**	**$11,757,420**

*In some cases a state agency serves as a pass through for federal dollars and in those cases the projects are included in this table. For example, five of the ten projects funded by the Tennessee Department of Education utilize federal funding and are included in this table.

Table VI: Proposals and Activations By Activity				
Activity	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Academic Support	4	$99,092	2	$501,995
Capital Project/Operation/Maintenance	3	$816,019	3	$516,919
Instruction	6	$1,355,000	6	$155,579
Public Service	24	$11,959,766	27	$5,619,292
Research	123	$32,956,056	107	$8,964,146
Student Services/Scholarship/Fellowships	8	$2,154,491	4	$177,000
State Appropriations	---	---	---	$4,186,000
Center Testing Accounts	---	---	---	$107,174
Total	**168**	**$49,340,424**	**149**	**$20,228,105**

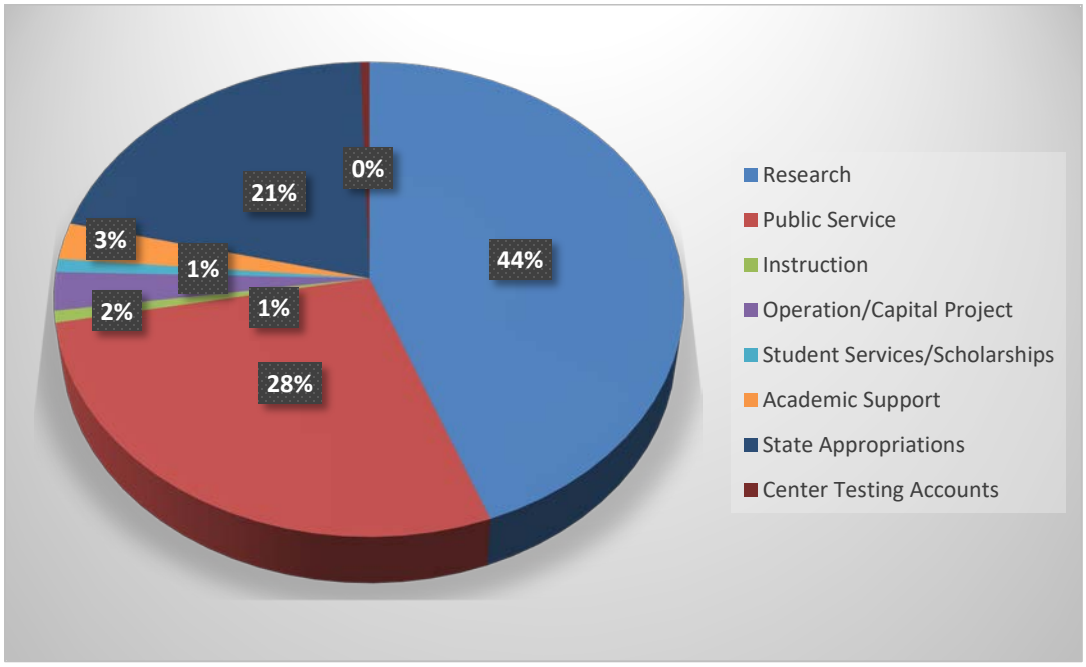

Figure 3
Percentage of Total Activation Amount by Activity

.

Table VII: Proposals and Activations: FY 2015 - 2019					
	FY 2015	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**
Proposals					
Number of proposals submitted	157	213	198	180	168
Number of unique individuals who served as PI on a proposal	86	104	101	82	94
Amount requested	$42,283,966	$58,565,666	$48,773,168	$50,570,708	$49,340,424
Number of unique individuals (PIs and Co-PIs) involved in these proposals	127	160	147	117	124
Funded	62 (39%)	95 (45%)	82 (41%)	79 (44%)	54 (32%)
Not Funded	95 (61%)	118 (55%)	116 (59%)	101 (56%)	114* (68%)
Activations					
Number of project activations**	100	131	146	162	149
Amount of project activations**	$7,480,507	$9,438,222	$13,261,077	$12,611,134	$15,934,931
Number of unique individuals (PIs and Co-PIs) involved in these activated projects	80	102	94	106	107
State Appropriations/Center Testing Accounts	$3,717,405	$3,650,139	$3,649,645	$3,760,766	$4,293,174
Total amount of external funding	$11,197,912	$13,088,361	$16,910,722	$16,371,900	$20,228,105

*For FY 2019, the number included in the Not Funded row includes 92 pending proposals.

**State appropriation and center testing account numbers and amounts are not included in these rows.

Table VIII: Activation Amounts By Classification FY 2015-19

Fiscal Year	*Federal*		*State*		*Private*		*Local*		*State Appropriation /Testing Accounts*
	#	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*Activation Amount*
2015	71	$5,427,437	21	$1,868,622	8	$184,448	0	$0	$3,717,405
2016	91	$7,399,496	22	$1,694,496	15	$320,730	3	$23,500	$3,650,139
2017	88	$8,251,229	40	$4,629,794	17	$373,437	1	$6,617	$3,649,645
2018	100	$9,618,095	40	$2,447,751	22	$545,288	0	$0	$3,760,766
2019	95	$11,757,420	34	$3,073,033	18	$1,023,557	2	$80,921	$4,293,174

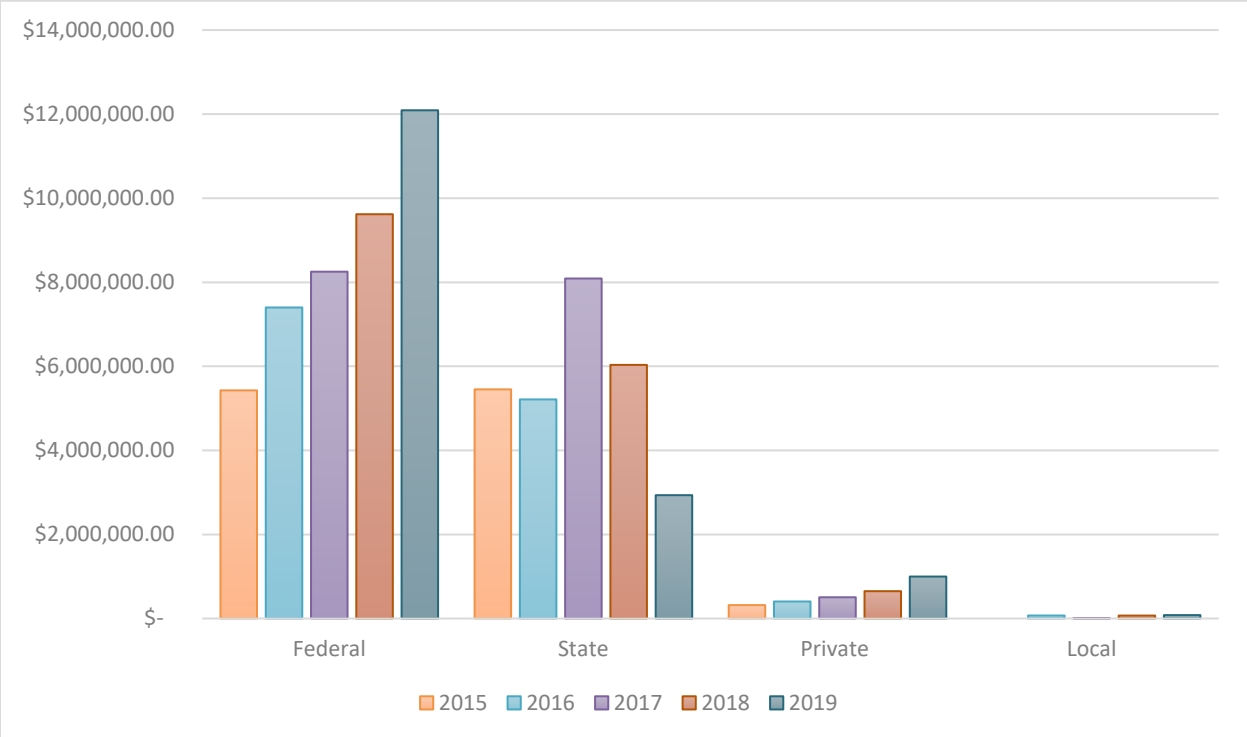

Figure 4
Awards Received by Classification

Table IX: Activation Amounts By Activity Type FY 2015-19

Fiscal Year	*Research*		*Public Service*		*Instruction*		*Academic Support*		*Fellowships/ Scholarships/ Student Services*		*Capital Project/Operation /Maintenance*		*State Appropriation /Testing Accounts*
	#	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*#*	*Activation Amount*	*Activation Amount*
2015	56	$3,350,100	26	$2,463,574	8	$906,837	4	$200,728	6	$559,268	0	$0	$3,717,405
2016	81	$3,350,100	26	$2,230,963	10	$1,608,639	7	$624,314	2	$54,999	5	$180,467	$3,650,139
2017	91	$4,738,840	30	$3,369,442	8	$1,192,717	4	$209,147	9	$415,033	3	$2,137,847	$3,649,645
2018	105	$8,320,752	35	$4,232,364	11	$1,042,921	4	$217,898	7	$337,709	0	$0	$3,760,766
2019	107	$8,964,146	27	$5,619,292	6	$155,579	2	$501,995	4	$177,000	3	$516,919	$4,293,174

RESEARCH COMPLIANCE AND GENERAL COMPLIANCE SUPPORT

Research Compliance

The Office of Research is responsible for monitoring compliance with the federal policies that regulate research activities in the following areas: responsible conduct of research, research ethics, human subjects research, the humane care of laboratory animals used in research and experimentation, the management of conflicts of interest in research, research integrity, export laws, and other areas of oversight.

Ultimately, it is the responsibility of the individual investigators, assisted by the Office of Research, to comply with all applicable federal, state, and funding agency guidelines in implementing their grants and contracts.

General Compliance Support

Several University Standing Committees, as well as other special committees, are regulated federally and must meet certain compliance criteria. These committees are, in general, research-related and are associated with the Office of Research. The Associate Vice President for Research serves as the Executive Officer for the Institutional Animal Care and Use Committee, the Institutional Review Board for the Protection of Human Subjects, the Intellectual Property Advisory Committee, the Scholar Mentor and the Caplenor Faculty Research Award Committee. The Vice President for Research and Economic Development is the Executive Officer for the Faculty Research Committee and the University Research Advisory Committee. The Annual Report of each of these Committees is on file in the Office of Research.

INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

The Institutional Animal Care and Use Committee provides for and protects the welfare of laboratory animals used for research and pedagogy as set forth by the University and in accordance with the Public Health Service Act (PHS Act) mandated by the Health Research Extension Act of 1985, Public Law 99-158, and its amendments from the U.S. Department of Agriculture, 9 CFR 9, Parts 1-3. The committee membership includes faculty, administrators, a veterinarian, and a community representative. The Committee reports to the Administrative Council.

- **Committee Members**

  - Dr. Jim Baier, Agriculture
  - Dr. Chris Brown, Biology
  - Ms. Sarah DeFurio, Environmental Health and Safety
  - Dr. Steve Hayslette, Biology (Chair)
  - Dr. Tammy Howard, Nursing
  - Dr. Chris Murray, Biology
  - Dr. Jessica Oswalt, College of Engineering
  - Dr. Tyler Verble, Veterinarian
  - Mr. Joe Weatherly, Ethicist
  - Dr. Francis Otuonye, Executive Officer

- **Committee Actions**

  - *Laboratory Inspections*
    Inspections of TTU lab facilities housing animals for research or teaching purposes are conducted twice annually, in accordance with national and institutional guidelines. Fall laboratory inspections were conducted on September 28, 2018, and inspection of the Shipley Farm was conducted on December 7, 2018. Spring lab inspections will be completed by mid-April 2019. Reports of these inspections are kept on file in the Office of Research and Economic Development; copies are sent to supervisors of the respective animal laboratories.

- *Research Proposal Evaluation*
  Six applications to use animals in research were received, considered, and approved by the committee during the 2018-2019 academic reporting year. These are listed below:

  a. Innovative Canine Orthopedic Devices (Dr. Nikki Panter, Biology)

  b. Canada Goose Banding Effort (Dr. Dan Combs and Mr. Richard Pirkle, Biology)

  c. Caudal Autonomy and Performance: Does a Dropped Tail Do More than Distract a Predator? (Dr. Chris Murray, Biology)

  d. Validation of Age and Endoscopy Techniques on a Large-bodied Darter Species, *Percina caprodes* (Dr. Amanda Rosenberger – Biology, USGS Fisheries Co-op Unit)

  e. Bat Surveys for Midwest AFCEC Installations (Dr. Brian Carver – Biology)

  f. Evaluation of Aquatic Resources to Support Bat Foraging Habitat at AEDC, Arnold Air Force Base, with an Emphasis on Rare, Threatened, and Endangered Aquatic Species (Dr. Kit Wheeler – Biology)

- *Farm Inspections*
  Inclusion of TTU's Shipley Farm and Waters Farm in IACUC inspections was discussed and approved during Fall 2018 meetings. The first farm inspection took place in December (see above).

- *Researcher Safety – IACUC Application Form*
  During Fall 2018 meetings, the committee discussed the issue of IACUC's role in the safety of researchers working with animals. As a result of these discussions, the IACUC application form was revised to include a section on researcher safety. An applicant must disclose in this new section any safety concerns in interactions between researchers and study animals.

➢ **Committee Meeting Dates**

- September 20, 2018; October 18, 2018; November 15, 2018; January 17, 2019; March 28, 2019

INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS

The Tennessee Tech University (TTU) Institutional Review Board for the Protection of Human Subjects (IRB) is a Standing University Committee operating through the Office of Research and Economic Development and reporting to the Administrative Council.

In accordance with 45CFR46, the TTU IRB is registered with the U.S. Department of Health and Human Services (DHHS)(Federal Wide Assurance #: FWA00011357; IRB Organization #: IRB00005901). It is responsible for reviewing, approving, and providing oversight for research conducted by TTU students, staff, and faculty.

The IRB develops and recommends policy to the university, in synchronization with federal regulations, on matters pertaining to the welfare of human subjects used in research, and implements those policies when approved. The main task of the IRB is to review research proposals involving human subjects, assess potential risks to those subjects, and ensure compliance with federal and TTU regulations regarding the protection of human subjects. Risks may involve physical, psychological, social, economic, or legal consequences, as well as violations of privacy and confidentiality.

Proposals classified as exempt are those that have been determined to pose no more than minimal risk to the participants. A certified Department Reviewer determines whether or not an application requires expedited or full board review or qualifies for exempt status. Exempt proposals are forwarded to and filed in the Office of Research and Economic Development. Proposals eligible for expedited review present some risk to the participants, so subcommittees consisting of three members of the IRB review them. The IRB has formulated standard, uniform guidelines for classifying proposals for expedited review. Proposals that require review by the full IRB present a high level of risk. Each member of the IRB receives and examines a copy of a proposal for full review, and the full IRB deliberates and makes a decision at one of its regular meetings.

- **Committee Members**

  - Dr. Steven Seiler, Department of Sociology and Political Science (Chair)
  - Dr. Melinda Anderson, College of Agriculture and Human Ecology
  - Dr. Meral Anitsal, Department of Economics and Marketing
  - Dr. Megan Atkinson, Library Archives
  - Dr. Chris Burgin, Department of Counseling and Psychology
  - Mr. Michael Clark, Community Representative
  - Dr. Jann Cupp, Department of Counseling and Psychology
  - Dr. Paula Engelhardt, Department of Physics
  - Dr. Steven Frye, College of Interdisciplinary Studies
  - Dr. Paula Greathouse, Department of Curriculum and Instruction
  - Dr. Terry Guo, Center for Manufacturing Research
  - Dr. Seth King, Department of Curriculum and Instruction
  - Dr. Susan Piras, Whitson-Hester School of Nursing
  - Dr. Chad Rezsnyak, Department of Chemistry
  - Mr. James Rogers, Community Representative
  - Dr. Francis Otuonye, Executive Officer

- **Committee Actions**

  - The IRB processed 154 applications. Of those, 130 were approved for Exempt Status, 24 were reviewed through Expedited Review, and one was reviewed through a Full Board Review. Of the 24 applications reviewed through an Expedited Review process, 17 were approved; four were returned to the investigator to revise and resubmit; and two were withdrawn by the PI. The application reviewed through a Full Board Review was approved. Additionally, 27 continuation/change applications were reviewed and approved.
  - During the September 10, 2018, meeting, two changes to IRB policy and procedures were made. First, the IRB modified its procedures for reviewing studies using TTU data to include the TTU FERPA Officer in the notification of approval process and to clarify that only the TTU FERPA Officer is authorized to release TTU student data for research purposes. The new procedure requires all studies involving TTU student data to be reviewed through an expedited review process. Second, the IRB policy for reviewing studies involving prisoners was modified to comply with 45CFR46 Subpart C. Specifically, the policy was revised to clarify that only studies in which prisoners are “engaged” in the research process must comply with 45CFR46 Subpart C, which excludes studies using secondary prisoner data.
  - On March 14, 2018, the Office of Research and Economic Development initiated a Memorandum of Understanding between the ETSU and TTU IRBs for the ETSU-TTU Doctorate of Nursing program. The operational procedures are still being drafted by ETSU.

- One incident of non-compliance was reported to the IRB. Accordingly, the study was suspended pending an audit by the IRB Chair. An issue of non-compliance was identified during the audit, and in accordance with TTU IRB policy, the study was ended immediately. No participants were harmed, and the issue pertaining to non-compliance did not place participants at any greater risk of harm. Other than permanent suspension of the study, no additional corrective actions were deemed necessary.

- **Committee Meeting Dates**

  - September 10, 2018; January 28, 2019 (The November 5, 2018 meeting was cancelled due to lack of agenda items.)

INTELLECTUAL PROPERTY ADVISORY COMMITTEE

Tennessee Tech University acknowledges that the faculty and staff may from time to time conceive of an idea or discover a process that could lead to the development of a patent or the production of copyrightable materials. The University encourages such activities by the faculty and staff and recognizes its responsibility to see that ideas and discoveries are administered for the best interest of all parties concerned, including the public. The University has established an Intellectual Property Advisory Committee for the purpose of advising the President on all matters involving patents and copyrights. Membership is composed of faculty and staff experienced in research, innovation, and the production of copyrightable materials. A majority of the membership is from the faculty.

- **Committee Members**

  - Dr. Michael Allen, Mathematics (Chair)
  - Dr. Sean Alley, Economics, Finance and Marketing
  - Dr. Ali Alouani, Electrical and Computer Engineering
  - Dr. Michael Best, Agriculture
  - Ms. Brenna Edgemon, Student
  - Dr. Sherrie Foster, Counseling and Psychology
  - Dr. Steve Frye, Interdisciplinary Studies
  - Ms. Sharon Holderman, Library
  - Dr. Emily Lee, Nursing
  - Mr. Mark Lynam, Administrative
  - Ms. Ann Manginelli, Library
  - Mr. Justin Medley, Student
  - Dr. Manuel Villalba, Foreign Languages
  - Dr. Francis Otuonye, Executive Officer

- **Committee Actions**

  - Dr. Otuonye advised that with the retirement of the TBR Attorney, Louis Svendsen, the Attorney General's Office is the only approver for outside counsel to handle the filing of patents. Ms. Kae Carpenter, on behalf of TTU, will recommend a firm/patent attorney to the Attorney General's Office to handle the filling of patents if the need arises. Identifying the appropriate patent attorney will require input from the inventor and the Office of Research and Economic Development.

- IPAC advised that the University should consider hiring or contracting with a technology transfer firm with the responsibility to assess the commercial potential of the invention disclosures and patents in the University's intellectual property portfolio, and guide technology transfer and commercialization efforts.
- The Committee granted a request by student inventors, Collins, Monroe, and Materi, to release ownership of the invention titled "Genomics Lane Cutter" to them because the work was carried out on their own time without significant University resources.
- Dr. Allen, Dr. Otuonye, and Ms. Holderman met with Provost Bruce to discuss the Intellectual Property Policy No. 732 in light of comments by the Faculty Senate.

➢ **Committee Meeting Dates**

- November 13, 2018; January 22, 2019; February 19, 2019 (Meetings scheduled for September 4, 2018, and October 2, 2018, were cancelled due to lack of agenda items.)

FACULTY RESEARCH COMMITTEE

The Faculty Research Program was established in the fall quarter of 1963 to: (1) stimulate interest in research on the part of the faculty; (2) provide institutional assistance to faculty members who wish to undertake research projects; and (3) assist in the dissemination of information developed in faculty research projects. The research program provides support for investigations of new research areas for the faculty members involved. The results of such support are expected to be publications or other dissemination of results and, where appropriate, proposals for external funding. It is anticipated that the results of faculty research will filter downward into the classroom, particularly to graduate courses. The Faculty Research Program is coordinated by the Faculty Research Committee. This committee consists of 10 faculty members with the Vice President of Research and Economic Development serving as Executive Officer.

- **Committee Members**

  - Dr. Curtis Armstrong, Decision Sciences and Management
  - Dr. Joseph Biernacki, Chemical Engineering
  - Dr. Brad Cook, Biology
  - Dr. Allen Driggers, History
  - Dr. Steven Frye, Interdisciplinary Studies
  - Dr. Catherine Godes, Music
  - Dr. Rachel Hall, Nursing (Chair)
  - Dr. Seth King, Curriculum and Instruction
  - Dr. Melinda Swafford, Human Ecology
  - Dr. Harvill Eaton, Executive Officer

- **Committee Actions**

  - A complete listing of the Faculty Research Awards for 2018-19 is provided in Appendix C.
  - The Committee also made the following changes to the proposal guidelines and grant policies in the Handbook:

    - ✓ Removed the one-page limit on references, allowing as many pages as necessary in the future;
    - ✓ Removed the double-spacing requirement for the reference page(s), to align with current APA, MLA, and other standardized citation styles;

- ✓ Decided that proposals will no longer be automatically disqualified for formatting of the reference page(s); and
- ✓ Addressed the restriction on international travel, allowing travel outside of the U.S. to be considered in future proposals when justified.
- ✓ Added the following statement:
  The Faculty Research Committee will consider travel outside the United States if the travel significantly contributes to the purpose of the research. Justification must be provided for this travel on an additional page (in addition to the four page limit).

➢ **Committee Meeting Dates**

- October 11, 2018; February 7, 2019; February 21, 2019; March 14, 2019

CAPLENOR FACULTY RESEARCH AWARD COMMITTEE

The Caplenor Faculty Research Award, established in 1984 in honor of the late Dr. Charles Donald Caplenor, former Associate Vice President for Research and Dean of Instructional Development, is awarded annually to one member of the faculty of Tennessee Tech University for outstanding research accomplished while employed at the University.

- **Committee Members**

  - Dr. Deborah Barnard, Foreign Languages
  - Dr. Joe Biernacki, Chemical Engineering
  - Dr. Michael Birdwell, History (Co-Chair)
  - Dr. Greg Danner, Music
  - Dr. Dennis Duncan, Agriculture
  - Mr. Stuart Gaetjens, Library
  - Dr. Melissa Geist, Nursing (Co-Chair)
  - Dr. Stephen Isbell, Economics, Finance and Marketing
  - Dr. Joseph Ojo, Electrical Engineering
  - Dr. Steven Sharp, Environmental Sciences
  - Dr. Sandi J. W. Smith-Andrews, Curriculum and Instruction
  - Dr. Francis Otuonye, Executive Officer

- **Committee Actions**

  - The Caplenor Faculty Research Award was awarded to Dr. Tor Guimaraes for the 2018-19 fiscal year.

- **Committee Dates**

  September 24, 2018; March 13, 2019

UNIVERSITY RESEARCH ADVISORY COMMITTEE

The University Research Advisory Committee (URAC) advises the President and Provost on strategies to stimulate growth in research and externally funded scholarly activities within the University community and on the development of a comprehensive structure and network of activities to foster externally funded scholarly activities. The Committee reports directly to either the Academic Council or Administrative Council or both, depending on the matter at hand. In carrying out its function, the Committee will:

A. Identify strengths, weaknesses, opportunities and challenges to research growth and externally funded scholarly activities at TTU.
B. Identify emerging research opportunities anticipated across the academic discipline.
C. Make recommendations regarding intellectual and infrastructure needs required to capitalize on major research opportunities.
D. Develop plans and make recommendations for accessing, supporting and sustaining existing and emerging research thrust areas.
E. Review current practices in research administration and recommend strategies to foster research growth.
F. Make recommendations regarding the commercialization of research and intellectual property issues.

- **Committee Members**

  - Dr. Michael Adduci, Music
  - Dr. Steven Anton, Mechanical Engineering
  - Dr. Debbie Barnard, Foreign Languages (Chair)
  - Dr. Jason Beach, Curriculum and Instruction
  - Dr. Jeff Boles, Chemistry
  - Ms. Alexia Dorris, Student
  - Dr. Sheikh Ghafoor, Computer Science
  - Dr. Adam Holley, Physics
  - Dr. Shelia Hurley, Nursing
  - Dr. Brian Leckie, Agriculture
  - Dr. Satish Mahajan, Energy Center
  - Dr. Hayden Mattingly, Environmental Studies
  - Dr. Ramachandran Natarajan, Business
  - Dr. Mark Stephens, Provost's Office
  - Mr. Jackson Williams, Student

- Dr. Harvill Eaton, Executive Officer

➢ **Committee Actions**

- *Revising procedures for the URAC:* The URAC is reviewing and revising its procedures to make sure that they reflect the strategic goals and align with the priority actions of Tennessee Tech's new Strategic Plan. Other URAC procedures for review also include:
  --Representation of all faculty research areas: The committee will change its procedures to stipulate that one of the two faculty representatives from the College of Arts and Sciences be from the humanities.
  --Preserving continuity of action by staggering terms of office: URAC faculty members currently all serve three-year terms that all expire at the same time. Staggering the terms of office for current members will ensure continuity of action from one year to the next, and make it easier for the URAC to accomplish its goals and objectives.
- *Continuing initiatives:* In Spring 2018, the URAC formed a subcommittee to review the Faculty Research Awards application and review processes, and to determine if changes in these processes have been successful in promoting an increase in overall faculty scholarly activity. The subcommittee presented its findings at the November meeting, and recommended that there be an assessment of the application, review, and awards processes for the 2019-2020 award cycle. Based on the subcommittee's recommendations, the Vice President for Research and Economic Development agreed to review the Faculty Research Awards process, and to report his findings to the URAC. The URAC also submitted a request to the President to include a faculty representative from the humanities or social sciences on the search committee for the new Vice President for Research and Economic Development.
- *Research Awards:* A subcommittee streamlined the Annual Scholastic Research Award application for ease of submission and review. The URAC received three applications for the award, all in the tenured faculty category. Since the committee received no applications from tenure-track faculty, it gave no award in that category; Prof. Dan Alcott won the award in the tenured faculty category.

➢ **Committee Meeting Dates**

- October 12, 2018; November 9, 2018; February 7, 2019; March 21, 2019; April 11, 2019

APPENDICES

Appendix A gives the total amount of research funds brought into the University from external sources by college/ department/Center. The project title, investigator(s), the funding agency, and the amount of funding received are listed for each.

Appendix B summarizes the intellectual property activity in the areas of patents and copyrights.

Appendix C summarizes the Faculty Research Committee Awards.

APPENDIX A

Externally Funded Projects by College/Department/Principal Investigator
Project Title, Funding Agency, Center, Funding Amount, and Co-PIs Listed

Agriculture and Human Ecology — Total: $1,384,837

Agriculture

Michael Best

- Greenhouse Grant

  Tennessee Department of Agriculture

  Amount: $220,000

Dennis Duncan

- Administrative Staff for Camp Clements FFA Leadership Training Center 2015-19

  Tennessee Department of Education

  Amount: $55,604

- Camp Clements 2018-20

  Tennessee Department of Education

  Amount: $230,219

- Poultry Science Research Facility Equipment

  Appalachian Regional Commission

  Amount: $281,019

Human Ecology

Melinda Anderson

- Tennessee Early Childhood Training Alliance, TECTA 2018-19

  Tennessee Department of Human Services

  via Tennessee State University

  Amount: $486,995

- Tennessee Early Childhood Training Alliance, TECTA 2018-19

  Tennessee Department of Human Services

  via Tennessee State University

  Amount: $111,000

Arts and Sciences — Total: $2,624,111

Biology

Brian Carver

- Bat *(Chiroptera)* Surveys at Multiple Air Force Installations

  U.S. Army Corps of Engineers

  Amount: $448,120

- Ecological and Climatic Assessment of Flying Squirrels in East Tennessee

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $10,683

Brad Cohen

- Delineation of Harvest Management Units for White-tailed Deer in Tennessee

  Tennessee Wildlife Resources Agency

  Amount: $32,269

  Co-PI: Robert Kissell

John Gunderson

- Role of Protozoan Cysts in Protecting Pathogens of the Fresh Produce Industry

  U.S. Department of Agriculture

  via MTSU

  Amount: $37,518

- Trafficking of Two Novel Intracellular Bacteria in Eukaryolic Cells

  National Institute of Health

  via MTSU

  Amount: $48,029

Steve Hayslette

- Collection of Biological Data at Deer Check Stations 2016-21

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $2,000

Carla Hurt

- Conservation Genomics and Population Status of Streamside Salamanders *(Ambystoma Barbouri)*

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $13,834

Robert Kissell

- FY19 White-tailed Deer Assessment

  American Ordinance, LLC

  Amount: $31,547

Justin Murdock

- Assessing the Restoration Success of WRP Easements in the Lower Mississippi River Valley

  Private Funder

  Center: Water

  Amount: $660,736

  Co-PI: Alfred Kalyanapu

- Investigating Factors that Influence Hypoxia and Denitrification in Aquatic Agroecosystems

  U.S. Department of Agriculture

  Center: Water

  Amount: $10,000

Chemistry

Jesse Carrick

- Modular Approaches to "Click" Complexants for Chemoselective Minor Actinide Separations

  U.S. Department of Energy

  Amount: $94,430

  Co-PI: Cory Hawkins

Cooperative Fisheries Research Unit

Mark Rogers

- Evaluating Sport Fisheries 2017-22

  Tennessee Wildlife Resources Agency

  Center: Water

Amount: $40,000

- Evaluating Stocked Fisheries 2017-22

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $66,000

- Relative Population Densities, Movement and Spawning Success of Asian Carp

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $134,066

- Relative Population Densities, Movement and Spawning Success of Asian Carp

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $197,000

- TWRA FU Base 2016-21

  Tennessee Wildlife Resources Agency

  Amount: $30,000

Amanda Rosenberger

- Intern for Propagation of Freshwater Mussels and Fishes in Tennessee

  Tennessee Wildlife Resources Agency

  Center: Water

  Amount: $12,384

- Life History, Habitat Use and Genetic Uniqueness of the Longnose Darter *Percina nasuta* (S1) in Missouri

  Missouri Department of Conservation

  Center: Water

  Amount: $52,800

- A Spatial Assessment of the Status and Risk to Mussel Concentrations in the Meramec Drainage

  Missouri Department of Conservation

  Center: Water

  Amount: $30,742

- A Spatial Assessment of the Status and Risk to Mussel Concentrations in the Meramec Drainage

  Missouri Department of Conservation

  Center: Water

  Amount: $16,500

- Tennessee Heelsplitter *(Lasmigona holstonia)* Distribution and Habitat Use

  U.S. Geological Society

  Center: Water

  Amount: $62,000

- Validation and Transferability of Fundamental Niche Models of Mussel Communities and Assessment of Risks to Mussel Populations in Ozark River Drainages

  Missouri Department of Conservation

  Center: Water

  Amount: $47,300

Earth Sciences

Jeannette Wolak

- Geologic Mapping and Stratigraphic Analyses of Terraced Fan Deposits

  National Aeronautics and Space Administration

  Amount: $41,443

English

Anthony Baker

- Upper Cumberland Writing Project College, Career, and Community Writers Program

  National Writing Project

  Amount: $15,000

  Co-PI: Jane Baker

Physics

Sakir Ayik

- Studies of Heavy-ION Collisions in Stochastic Mean-Field Approach

  U.S. Department of Energy

  Amount: $44,000

Adam Holley

- CAREER: Investigation of Spin Evolution in Magnetic Ultracold Neutron Bottles Used to Measure the Free Neutron Lifetime

  National Science Foundation

  Amount: $95,000

Mary Kidd

- Investigation of Neutron-Induced Backgrounds on 134,136Xe for Large-Scale Neutrinoless Double Beta Decay

  National Science Foundation

  Amount: $39,849

- National Space Grant College and Fellowship Program (SPACE Grant)

  National Aeronautics and Space Administration

  via Vanderbilt University

  Center: STEM

  Amount: $40,000

- PIRE: A Global Collaboration for Advanced Germanium Detectors and Technology

  National Science Foundation

  via University of South Dakota

  Amount: $39,610

Mustafa Rajabali

- New High-Resolution Neutron Detector for the Studies of Exotic Nuclei-NEXT

  U.S. Department of Energy

  via University of Tennessee

  Center: Energy

  Amount: $54,260

- The Structure of Neutron-Rich Deformed Nuclei Studied via Beta Decay

  U.S. Department of Energy

  Center: Energy

  Amount: $29,000

- The Structure of Neutron-Rich Deformed Nuclei Studied via Beta Decay

  U.S. Department of Energy

Center: Energy

Amount: $56,000

Stephen Robinson

- A Model of Education Transformation: Developing a Community Implementing NGSS

  National Science Foundation

  via California State San Marcos

  Amount: $7,526

  Co-PI: Paula Engelhardt

- A Model of Education Transformation: Developing a Community Implementing NGSS

  National Science Foundation

  via California State San Marcos

  Amount: $84,465

  Co-PI: Paula Engelhardt

Business Total: $2,648,467

Business Media Center/iCube

Julie Brewer

- Ollie Otter, Booster Seat and Seat Belt Education

  Tennessee Highway Safety Office

  Amount: $167,001

  Co-PI: Kevin Liska

Kevin Liska

- Integrated Marketing Communications System

  Tennessee Department of Safety and Homeland Security

  Center: iCube

  Amount: $1,175,075

- MakerMinded 2018-19

  American Lightweight Manufacturing Innovation Institute

  Center: iCube

  Amount: $105,000

- National Child Passenger Safety System

National Safety Council

Center: iCube

Amount: $65,000

- Tennessee Safety Mobile APP

  Tennessee Department of Safety and Homeland Security

  Center: iCube

  Amount: $20,000

- Tennessee Soil Conservation District Training

  Tennessee Department of Agriculture

  Center: iCube

  Amount: $90,000

- Tennessee Traffic Safety Resource Service

  Tennessee Highway Safety Office

  Center: iCube

  Amount: $531,674

- Virtual Reality Education as a Solution for the Opioid Abuse Epidemic

  Tennessee Department of Health

  Center: iCube

  Amount: $207,805

- Workforce Development-Enhancing Banking Careers Statewide

  Private Funder

  Center: iCube

  Amount: $50,000

Decision Sciences and Management

Susan Wells

- 2019 Governor's School for Business, Innovation and Technology

  Tennessee Department of Education

  Amount: $91,772

Small Business Development Center

Jen Dangelo

- TSBDC-TTU/Online Center 2019

  U.S. Small Business Administration

  via Middle Tennessee State University

  Amount: $145,140

Education — Total: $2,078,194

Dean's Office: Education

Lisa Zagumny

- CACFP: Child and Adult Care Food Program 2018-19

  Tennessee Department of Human Services

  Amount: $33,264

Curriculum and Instruction

Martha Howard

- Bridges Early Intervention Resource Agency Assessment Vendor 2017-19

  Tennessee Department of Education

  Amount: $9,880

- Bridges Early Intervention Resource Agency Assessment Vendor 2017-19

  Tennessee Department of Education

  Amount: $9,120

- Tennessee Early Childhood Preschool Program 2018-19

  Putnam County Schools

  Amount: $86,764

- Tennessee's Early Intervention System Eligibility Evaluation Grant Contract-Middle TN Cost Proposal B

  Tennessee Department of Education

  Amount: $560,000

  Co-PI: Amy Callender

- Tennessee's Early Intervention System Eligibility Evaluation Grant Contract-Middle TN Cost Proposal B

  Tennessee Department of Education

Amount: $840,000

Co-PI: Amy Callender

- Tennessee Technological University - Bridges Program

  Tennessee Department of Education

  Amount: $136,890

- Tennessee Technological University - Bridges Program

  Tennessee Department of Education

  Amount: $370,110

STEM Center

Darek Potter

- HUB Operations and Innovative Educator Workshops

  Battelle Education

  Center: STEM

  Amount: $32,166

Engineering Total: $6,779,380

Dean's Office: Engineering

Darrell Hoy

- Board of Architectural and Engineering Examiners Grant

  Tennessee Board of Architectural and Engineering Examiners

  Amount: $35,000

Center for Manufacturing Research

Ying Zhang

- Electro-Codeposition of MCrAlY Coatings for Advanced Gas Turbine Applications

  AESF Foundation

  Center: Manufacturing

  Amount: $25,000

- Materials Research for DigitalClone Modeling

  Private Funder

  Center: Manufacturing

  Amount: $19,278

Co-PI: Earl Hawkins

Chemical Engineering

Laura Arias Chavez

- AWWA HDR Scholarship - Haley White

  Private Funder

  Center: Water

  Amount: $5,000

- GOALI: Reclaiming Valuable Resources from Industrial Wastewater

  National Science Foundation

  Center: Water

  Amount: $98,642

- Mixed Matrix Membranes for Broader Wastewater Reclamation - Haley White

  National Science Foundation

  Center: Water

  Amount: $46,000

- Nuclear Hybrid Energy Systems: Desalination Case Study

  UT-Battelle, LLC

  via Oak Ridge National Laboratory

  Center: Water

  Amount: $87,788

Liqun Zhang

- Advanced Metal Electronics for Lithium Metal Secondary Batteries

  U. S. Department of Defense

  via LiBama, LLC

  Center: Energy

  Amount: $21,500

Civil and Environmental Engineering

Daniel Badoe

- Development of Tennessee Travel Demand Model User's Group

  Tennessee Department of Transportation

via University of Tennessee

Center: Energy

Amount: $7,000

Steven Click

- Regional Transportation Center on Reducing Congestion (Vahid Motevalli – PI)

  Southeastern Transportation Research, Innovation, Development, and Education (STRIDE) Center

  Center: Energy

  Amount: $41,254

  Co-PI: Darek Potter

- Regional Transportation Center on Reducing Congestion (Vahid Motevalli – PI)

  Southeastern Transportation Research, Innovation, Development, and Education (STRIDE) Center

  Center: Energy

  Amount: $12,000

  Co-PI: Darek Potter

Tania Datta

- Elucidating Diversity and Function of Microbial Communities Involved in Simultaneous Biological Nitrogen and Phosphorus Removal Processes at City of Cookeville's Wastewater Treatment Plant

  City of Cookeville

  Center: Water

  Amount: $9,940

- Solid Waste Management Improvement in Iraq by US-Iraq Higher Education Partnership: Case Study in Al-Muthanna Province

  Private Funder

  Center: Water

  Amount: $3,945

- Stream Survey for Proposed New Discharge for Water Authority of Dickson County

  Water Authority of Dickson County

  Center: Water

  Amount: $70,981

  Co-PI: Alfred Kalyanapu

Alfred Kalyanapu

- Development and Improvement of High-Resolution Flood2D-GPU Modeling for Titan HPC Environment

  Oak Ridge National Laboratory

  Center: Water

  Amount: $74,000

  Co-PI: Sheikh Ghafoor

- Development and Improvement of High-Resolution Flood2D-GPU Modeling for Titan HPC Environment

  Oak Ridge National Laboratory

  Center: Water

  Amount: $74,096

  Co-PI: Sheikh Ghafoor

- Increasing the Resilience of Agricultural Production in the Tennessee and Cumberland River Basins through More Efficient Water Resource Use

  U.S. Department of Agriculture

  via University of Tennessee

  Center: Water

  Amount: $54,504

- Increasing the Resilience of Agricultural Production in the Tennessee and Cumberland River Basins through More Efficient Water Resource Use

  U.S. Department of Agriculture

  via University of Tennessee

  Center: Water

  Amount: $73,935

- Low-Cost, Real-Time Streamflow Network for Falling Water River Watershed

  U.S. Geological Society

  via University of Tennessee

  Center: Water

  Amount: $16,459

Jane Liu

- Development of Unified Duct Design Equations and Improvements to the Current FEA Model

Private Funder

Center: Energy

Amount: $82,999

Co-PI: Stephen Idem

- Understanding the Expected Deformation of Rectangular Ductwork

  Private Funder

  Center: Energy

  Amount: $9,761

  Co-PI: Stephen Idem

Daniel VandenBerge

- Rapid Distributed Sensing of Subsurface In-situ Stress

  Luna Innovations

  Center: Energy

  Amount: $4,260

- Update and Revisions to UFC 3-220-10N Soil Mechanics (DM7-01)

  U.S. Navy

  via Virginia Tech University

  Center: Energy

  Amount: $22,653

Computer Science

Gerald Gannod

- Incorporating the Preferences for Everyday Living Inventory into Ohio's Nursing Homes to Improve Resident Care

  Ohio Department of Medicaid

  via Miami University

  Center: Energy

  Amount: $61,911

- MIMIR/MEASUR: A Live Dashboard Project for Industrial Devices

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $5,000

Sheikh Ghafoor

- Black Box: Highly Secure Environment for Health Data Computation

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $46,820

  Co-PI: Michael Rogers

- Cyber Training: CDL: IPDC- Summer Institute for Integrating Parallel and Distributed Computing in Introductory Programming Classes

  National Science Foundation

  Center: Energy

  Amount: $177,377

  Co-PI: Michael Rogers

- Detection and Analysis of Malware in Critical Infrastructure

  Oak Ridge National Laboratory

  Center: Manufacturing

  Amount: $24,738

- Detection and Analysis of Malware in Critical Infrastructure

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $75,000

- Detection and Analysis of Malware in Critical Infrastructure

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $18,239

- From Can't to Can: Attack Prevention & In-Situ Detection of Advanced Attacks on Controller Area Networks

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $21,455

- Tracking Water Storage in Lakes: Citizens and Satellites

  National Aeronautics and Space Administration

via University of North Carolina

Center: Energy

Amount: $87,955

Ambareen Siraj

- 2019 GenCyber Student Camp at Tennessee Tech

  National Science Foundation/National Security Agency

  Center: Manufacturing

  Amount: $134,925

- CEROC/WiCyS Memorandum of Understanding

  Private Funder

  Center: CEROC

  Amount: $17,415

- Department of Defense Assurance Scholarship Program (IASP)-TTU

  U.S. Department of Defense

  Center: CEROC

  Amount: $261,284

  Co-PI: Eric Brown

- Supplement to Tennessee Cybercorps: A Hybrid Program in Cybersecurity-Community College Inclusion

  National Science Foundation

  Center: Manufacturing

  Amount: $52,693

- Supplement: Tennessee Cybercorps: A Hybrid Program in Cybersecurity

  National Science Foundation

  Center: Manufacturing

  Amount: $55,270

  Co-PI: Douglas Talbert

- Supplement to Tennessee Cybercorps: A Hybrid Program in Cybersecurity-Community College Inclusion

  National Science Foundation

  Center: Manufacturing

Amount: $56,213

- Supplement: Tennessee Cybercorps: A Hybrid Program in Cybersecurity

  National Science Foundation

  Center: Manufacturing

  Amount: $1,005,445

  Co-PI: Douglas Talbert

- Supplement: Tennessee Cybercorps: A Hybrid Program in Cybersecurity

  National Science Foundation

  Center: Manufacturing

  Amount: $917,561

  Co-PI: Douglas Talbert

- Supplement: Tennessee Cybercorps: A Hybrid Program in Cybersecurity

  National Science Foundation

  Center: Manufacturing

  Amount: $69,254

  Co-PI: Douglas Talbert

Electrical and Computer Engineering

Indranil Bhattacharya

- High-Energy Density Lithium/Sodium Ion Batteries for Grid Level Energy Storage - Phase 1

  Tennessee Valley Authority

  Center: Energy

  Amount: $50,000

- REU Site: Immersive Research in Energy Generation, Storage/Conversion, and Power Transmission

  National Science Foundation

  Center: Energy

  Amount: $107,249

  Co-PI: Joseph Biernacki

- REU Site: Immersive Research in Energy Generation, Storage/Conversion, and Power Transmission

  National Science Foundation

Center: Energy

Amount: $8,400

Co-PI: Joseph Biernacki

Syed Rafay Hasan

- Investigation of Effective Management of Energy Demand in Distribution Management Systems of Smart Grids using Formal Verification Methods

  Private Funder

  Center: Energy

  Amount: $9,074

R. Wayne Johnson

- Advancement of Cryogenic Electronics

  MIT Lincoln Laboratory

  Center: Manufacturing

  Amount: $300,000

  Co-PIs: Christopher Wilson, Satish Mahajan, Holly Stretz, and Jie Cui

Mohamed Mahmoud

- Efficient Energy Management System with Integrated Cybersecurity Measures in Qatar's Smart Grid

  Private Funder

  Center: Energy

  Amount: $29,988

- Hybrid AC/DC Islanded Micro-grids in Qatar: Planning, Operation, and Cyber Security

  Private Funder

  Center: Energy

  Amount: $28,645

- NeTS: Small: Collaborative Research: Towards Privacy Preserving Autonomous Vehicle Services

  National Science Foundation

  Center: Manufacturing

  Amount: $43,658

- REU Site: Secure and Privacy-Preserving Cyber Physical Systems: Software and Hardware Approaches

National Science Foundation

Center: Manufacturing

Amount: $119,424

Co-PI: Syed Rafay Hasan

- TWC: Small: Collaborative: Multi-Layer Approaches for Securing Enhanced AMI Networks Against Traffic Analysis Attacks

  National Science Foundation

  Center: Energy

  Amount: $95,381

  Co-PI: Robert Qiu

Energy Center

Satish Mahajan

- Simulation of HF Inverter Circuits for High-Power Wireless Charging

  Oak Ridge National Laboratory

  Center: Energy

  Amount: $15,675

Charles Van Neste

- EAGER: SitS: Collaborative Research: A Multi-Sensor Probe Network for Continuous Monitoring of the Soil Health

  National Science Foundation

  Center: Energy

  Amount: $100,988

  Co-PIs: Satish Mahajan and Brian Leckie

- Power Transmission Through an Optical Fiber

  Private Funder

  Center: Energy

  Amount: $12,500

- Single-Surface Wireless Dynamic Charging of Electric Vehicles

  Tennessee Valley Authority

  Center: Energy

  Amount: $50,000

  Co-PIs: Satish Mahajan and Vahid Motevalli

Engineering Student Success Center

Elizabeth Powell

- SERS: What do Engineers Do? Communicating the Diverse, Dynamic Field through Outreach

  Tennessee Board of Regents

  Center: Energy

  Amount: $34,969

  Co-PI: Harry Ingle

General and Basic Engineering

Chris Wilson

- Governor's School for Emerging Technologies

  Tennessee Department of Education

  Amount: $133,973

  Co-PI: Douglas Talbert

Manufacturing and Engineering Technology

Ahmed Elsawy

- Veteran Reconnect: Military Pathway Pilot Project

  Tennessee Higher Education Commission

  Amount: $50,000

  Co-PI: Mary Benedict

Ismail Fidan

- AM-WATCH: Additive Manufacturing - Workforce Advancement Training Coalition and Hub

  National Science Foundation

  Center: Manufacturing

  Amount: $278,234

- ATE-MANEUVER: Manufacturing Education Using Virtual Environment Resources

  National Science Foundation

  via Purdue University

  Center: Manufacturing

  Amount: $44,804

- ATE-MANEUVER: Manufacturing Education Using Virtual Environment Resources

National Science Foundation

via Purdue University

Center: Manufacturing

Amount: $45,300

- SMART2: Smart Manufacturing for America's Revolutionizing Technological Transformation

  National Science Foundation

  via Motlow State Community College

  Center: Manufacturing

  Amount: $62,690

  Co-PI: Yunbo Zhang

Duckbong Kim

- Establishment of Near-Optimal Process Parameters for Wire+Arc Additive Manufacturing Via Thermo-Mechanical Tests

  Private Funder

  Center: Manufacturing

  Amount: $12,500

Mechanical Engineering

Steven Anton

- Continuous Real-Time State Monitoring in Highly Dynamic Environments

  Air Force Office of Scientific Research

  Center: Manufacturing

  Amount: $120,000

- Self-Powered In Vivo Force and Implant Wear Sensing in Knee Anthroplasty

  National Institute of Health

  Center: Manufacturing

  Amount: $135,561

Stephen Canfield

- TTU-NSF Innovation Corps Sites

  National Science Foundation

  Center: Manufacturing

  Amount: $99,956

Co-PIs: Sally Pardue, Ismail Fidan, and Curtis Armstrong

- TTU-NSF Innovation Corps Sites

  National Science Foundation

  Center: Manufacturing

  Amount: $99,956

  Co-PIs: Sally Pardue, Ismail Fidan, and Curtis Armstrong

Pingen Chen

- "Power Into Motion Phase IV" Proposed Automotive Powertrain Program at Tennessee Tech

- Private Funder

  Center: Manufacturing

  Amount: $30,000

Glenn Cunningham

- Public Private Partnership to Promote Efficient Manufacturing and Workforce Development

  U.S. Department of Energy

  Center: Manufacturing

  Amount: $286,687

  Co-PI: Ethan Languri

- Public Private Partnership to Promote Efficient Manufacturing and Workforce Development

  U.S. Department of Energy

  Center: Manufacturing

  Amount: $60,000

  Co-PI: Ethan Languri

Stephen Idem

- Combustion Turbine Exhaust Duct, Silencer, and Stack Scale Modeling

  Private Funder

  Center: Energy

  Amount: $10,000

- Measurement of Unreinforced and Reinforced Spiral Flat Oval Duct Deformation Under Positive and Negative Pressure

  Private Funder

Center: Energy

Amount: $10,066

Co-PI: Jane Liu

Ethan Languri

- Southeast Combined Heat and Power Technical Assistance Partnership (CHP TAP)

  U.S. DOE Southwest CHP Technical Assistance Partnership

  via North Carolina State University

  Center: Manufacturing

  Amount: $37,702

  Co-PI: Glenn Cunningham

Sally Pardue

- AEOP Battelle Consortium

  Battelle Memorial Institute

  Center: STEM

  Amount: $4,970

- AEOP Battelle Consortium

  Battelle Memorial Institute

  Center: STEM

  Amount: $40,872

- AEOP Battelle Consortium

  Battelle Memorial Institute

  Center: STEM

  Amount: $4,260

Mohan Rao

- AFRL University Design Challenge

  Technology Service Corporation

  Center: Manufacturing

  Amount: $25,000

Meenakshi Sundaram

- UT-CIS CAPSTONE Contract - 2018-19

University of Tennessee Center for Industrial Services

Center: Manufacturing

Amount: $15,000

Jiahong Zhu

- Development and Validation of Low-Cost, Highly-Durable, Spinel-Based Contact Materials for SOFC Cathode-Side Contact Application

  U.S. Department of Energy

  Center: Manufacturing

  Amount: $145,139

- Development and Validation of Low-Cost, Highly-Durable, Spinel-Based Contact Materials for SOFC Cathode-Side Contact Application

  U.S. Department of Energy

  Center: Manufacturing

  Amount: $36,209

Fine Arts — Total: 16,250

Craft Center

Gail Gentry

- Developing Craft Workshops for the 5th to 12th Grade Classroom

  Tennessee Arts Commission

  Amount: $4,000

  Co-PI: Jeremy Blair

- Focus on Fine Craft for 8th-12th Grade Students Program

  Tennessee Arts Commission

  Amount: $5,600

  Co-PI: Michael Dyer

Music

Daniel Allcott

- National String Project Site

  Private Funder

  Amount: $6,650

Interdisciplinary Studies Total: $103,841

Dean's Office: Interdisciplinary Studies

Mike Gotcher

- SERS: We Care: Development of a Caregiving Certificate

  Tennessee Board of Regents

  Amount: $24,960

  Co-PIs: Kevin Liska, Jeannie Smith, and Tammy Keylon

Environmental Studies

Hayden Mattingly

- Evaluation of Aquatic Resources to Support Bat Foraging Habitat at Arnold Engineering Development Center, AAFB, with an Emphasis on Rare, Threatened and Endangered Aquatic Species

  U.S. Fish and Wildlife Service

  Center: Water

  Amount: $63,881

  Co-PIs: Justin Murdock and Christopher Wheeler

- Life History and Habitat Requirements of Brawleys Fork Crayfish, Cambarus williami

  U.S. Fish and Wildlife Service

  Center: Water

  Amount: $15,000

Whitson-Hester School of Nursing Total: $165,951

Kim Hanna

- Improvement of Quality of Life for Nursing Home Residents through the 'Music & Memory' Program

  Tennessee Department of Health

  Amount: $165,951

  Co-PIs: Shelia Hurley, Jason Hurley, Toni Roberts, Ann Hellman, Emily Lee, Barbara Jared, and George Chitiyo

Other Total: $133,900

Facilities

DeLayne Miller

- Tennessee Tech TAEP Community Tree Planting Grant

  Tennessee Department of Agriculture

  Amount: $15,900

Innovation and Entrepreneurship

Michael Aikens

- FY2017 EDA University Center Economic Development Program Competition

  Economic Development Administration

  Amount: $118,000

State Appropriations/Center Testing Accounts Total: $4,293,174

Center for Energy Research

- State Appropriation
  Amount: $947,800
- Center Testing Account
  Amount: $14,589

Center for Manufacturing Research

- State Appropriation
  Amount: $1,543,400
- Center Testing Account
  Amount: $23,888

Center for the Management, Utilization and Protection of Water Resources

- State Appropriation
  Amount: $1,194,800
- Center Testing Account
  Amount: $68,697

Cybersecurity Education, Research and Outreach Center

- State Appropriation
  Amount: $500,000

APPENDIX B

Intellectual Property Activity 2018-19

Copyrightable Work Disclosures

- Smart Manufacturing for Energy Conservation and Savings by Fidan and Terry

Invention Disclosures Presented for Filing of Provisional Application

- Omnidirectional, Electric Near-Field Distance Sensing Device by VanNeste
- TechBot – Mobile Multitasking 3D Printer by Fidan
- Additive Manufactured Universal Bottle Opener by Fidan

Provisional Applications Approved to be Filed

- Omnidirectional, Electric Near-Field Distance Sensing Device by VanNeste
- TechBot – Mobile Multitasking 3D Printer by Fidan
- Additive Manufactured Universal Bottle Opener by Fidan

APPENDIX C

Faculty Research Committee Awards 2018-19

Track I

Author(s)	Title	Dept.	Amt.
Edward Driggers	Improving Geology and Engineering Through Historical Case Studies	History	$1,433
Joshua Hauser, Chris McCormick, and Greg Danner	Christmas Brass: New Arrangements of Holiday Music for Brass	Music	$3,000
Matthew Zagumny	QUEST-20 Validation Among a Diverse Global Student Population	Counseling and Psychology	$3,000
			$7,433

APPENDIX C CONT'D

Faculty Research Committee Awards 2018-19

Track II

Author(s)	Title	Dept.	Amt.
Joseph Asante and Evan Hart	Monitoring Water Quality in Karst Systems: What Does Electrical Conductivity Measurement Mean?	Earth Sciences	$10,000
Indranil Bhattacharya	Cobalt Free High-Energy Density and Longer Life Cycle Next Generation Sodium Ion Batteries	Electrical and Computer Engineering	$10,000
Pingen Chen	Developing Advanced Non-Uniform Cylinder-to-Cylinder Combustion Strategies for Lean-Burn Gasoline Engine	Mechanical Engineering	$10,000
Janet Isbell and Amber Spears	Jere Whitson Freedom School Research	Teacher Education and Curriculum and Instruction	$10,000
Duckbong Kim	Multi-Scale and In-Situ Investigation of Microstructure Stability and Transformation of Bimetallic Additively Manufactured Structure	Manufacturing and Engineering Technology	$10,000
Christopher Murray, Carla Hurt, and Tammy Boles	Demographic Manifestations of Chronic Endocrine Disruptor Exposure: Do Environmental Estrogens and Androgens Yield Chryptic Bottleneck?	Biology, Biology and Environmental Studies	$10,000
Venkat Padmanabhan	Viscoelastic Behavior of Polyelectrolyte-Grafted Nanoparticle Networks for Membrane Separation: A Molecular Dynamics Study	Chemical Engineering	$10,000
Robby Sanders and Stephanie Jorgensen	Stages Towards Development of a Skin-on-a-Chip Model for Improved Wound Healing	Chemical Engineering	$10,000
Steven Seiler	Exploring Alcohol and Drug Addiction and Dependence on TTU Campus and Development of a Collegiate Recovery Program	Sociology and Political Science	$8,457
Indu Upadhyaya	Improving Intestinal Health and Productivity in Poultry Using Natural, Plant-Derived Compounds	Agriculture	$10,000
Daniel VandenBerge, Jennifer Meadows, Leslie Suters, and Sally Pardue	Collaborative Professional Learning: Peer-to-Peer Engineering and Education Framework	Civil and Environmental Engineering	$10,000
Christopher (Kit) Wheeler	Biodiversity-Ecosystem Function Links in Southern Appalachian Streams: Quantifying Nutrient Inputs from and Ecosystem Responses to Migratory Suckers in Spawning Tributaries	Biology	$10,000
Jeannette Wolak	The Alta Fjord-Head Delta: A Scandinavian Analog for Martian Deltaic Deposits	Earth Sciences	$9,761
Liqun Zhang	Investigating the Antibacterial Activity of Human Beta Defensins by a Comparative Study	Chemical Engineering	$10,000
Jiahong Zhu	Nanostructured Bifunctional Composite Catalysts for Rechargeable Metal-Air Battery Application	Mechanical Engineering	$10,000
			$148,218