

**TENNESSEE TECH UNIVERSITY**  
**OFFICE OF RESEARCH AND ECONOMIC**  
**DEVELOPMENT | ANNUAL REPORT**

2020-2021

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# 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 Tennessee Technological University, and supports activities that promote economic development.

The ORED 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 Tennessee Tech, 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

The bullets below summarize some of the key results from fiscal year 2020-21:

- Total external funding in the amount of \$22,770,651 was received for the 2021 Fiscal Year (July 1, 2020 – June 30, 2021). This represents a 14% increase from the total amount of external funding received in Fiscal Year 2020 (\$20,051,317).
- State appropriations totaling \$4,347,200 were received by the three Centers of Excellence and CEROC with an additional \$80,332 received through Center testing accounts, representing 19% and 0.4% of total external funding received, respectively.
- Grants and contracts externally funded numbered 172 with a value of \$18,343,119, representing 81% of total external funding.
- Grants and contracts sponsored by private entities, including industry and foundations, numbered 19 with a value of \$494,229.
- The top funding agencies were the U.S. Department of Transportation (\$2,580,162), National Science Foundation (\$2,519,577), U.S. Department of Defense (\$2,048,140), U.S. Department of the Interior (\$1,594,447), and U.S. Department of Energy (\$1,225,347).
- Proposals submitted for external funding numbered 215 with a value of \$83,620,080.
- Intellectual Property: one scholarly work was copyrighted, three inventions were disclosed, two provisional applications were filed, and three non-provisional applications were published.
- Internal funds were provided in the amount of \$128,740 for small grants to support faculty research. Three Track I proposals were funded for a total of \$9,000, and 12 Track II proposals were funded for a total of \$119,740.

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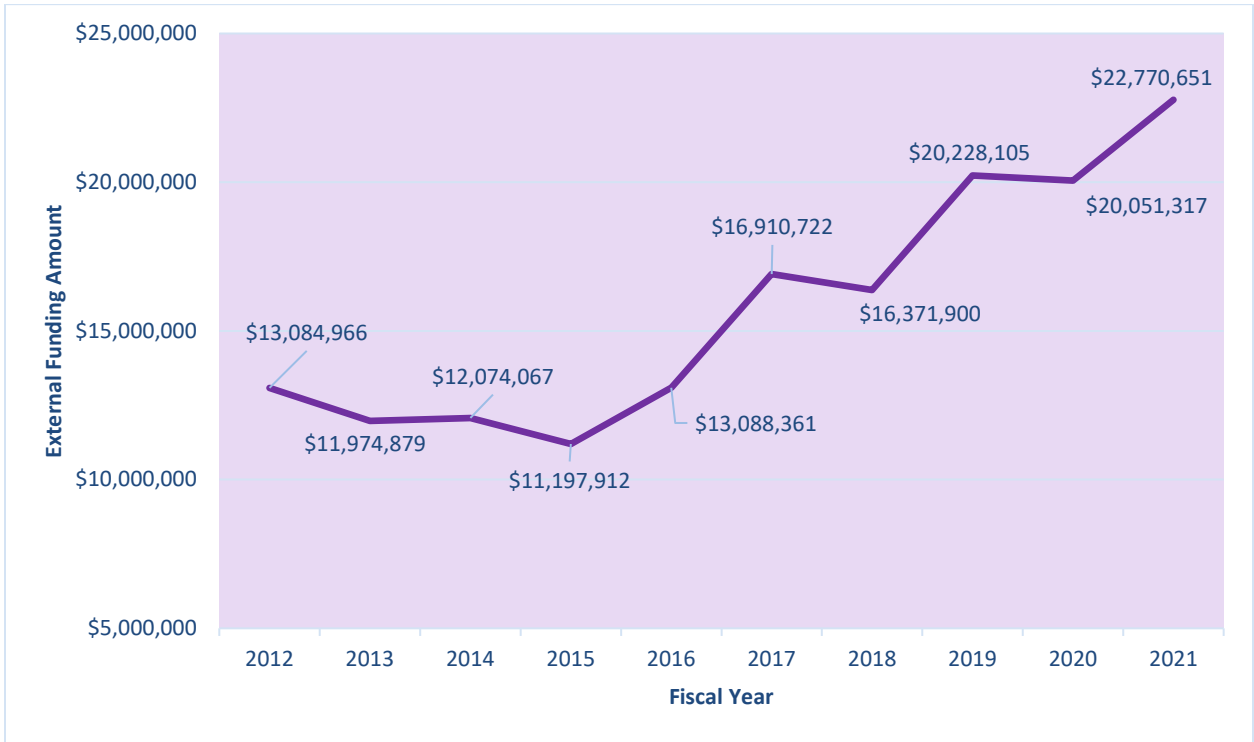
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# NOTES

The tables and figures on the following pages show the proposals and activations for FY 2021 (July 1, 2020 – June 30, 2021) 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.
- Note that classification of project type and category may change between the proposal and activation phase due to additional information becoming available during the contract/agreement phase.



**Figure 1**  
**Total External Funding Received Historical (FY 2012-2021)**

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

<i>PI's College</i>	<i>PI's Department, Center, Unit</i>	<i>Energy Center</i>	<i>Manufacturing Center</i>	<i>Water Center</i>	<i>STEM Center</i>	<i>CEROC</i>	<i>Department/ Other Units</i>	<i>Total</i>
<b>Agriculture and Human Ecology</b>	Agriculture						\$328,479	\$328,479
	Human Ecology						\$753,569	\$753,569
	Subtotal						<b>\$1,082,048</b>	<b>\$1,082,048</b>
<b>Arts and Sciences</b>	Biology			\$1,001,909			\$237,545	\$1,239,454
	Chemistry			\$255,218			\$168,370	\$423,588
	Cooperative Fisheries Research Unit			\$927,906			\$30,000	\$957,906
	Physics	\$187,342			\$40,899		\$164,333	\$392,574
	Sociology and Political Science						\$77,300	\$77,300
	Subtotal	<b>\$187,342</b>			<b>\$2,185,033</b>	<b>\$40,899</b>		<b>\$677,548</b>
<b>Business</b>	iCube						\$2,930,875	\$2,930,875
	Decision Sciences and Management						\$247,272	\$247,272
	Subtotal						<b>\$3,178,147</b>	<b>\$3,178,147</b>
<b>Education</b>	Counseling and Psychology						\$49,428	\$49,428
	Curriculum and Instruction				\$270,058		\$2,073,766	\$2,343,824
	Dean's Office				\$152,646		\$130,490	\$283,136
	STEM Center				\$130,437			\$130,437
	Subtotal				<b>\$553,141</b>		<b>\$2,253,684</b>	<b>\$2,806,825</b>
<b>Engineering</b>	Basic Engineering						\$133,973	\$133,973
	Chemical Engineering	\$112,605	\$30,000		\$50,000			\$192,605
	Civil and Environmental Engineering	\$553,186		\$190,805				\$743,991
	Computer Science	\$279,427				\$673,423	\$49,960	\$1,002,810
	CEROC		\$620,601			\$878,871		\$1,499,472
	CESR	\$74,210						\$74,210
	CMR		\$220,177					\$220,177
	Dean's Office	\$26,100					\$42,766	\$68,866
	Electrical and Computer Engineering	\$120,099	\$347,467					\$467,566
	Manufacturing & Engineering Tech		\$408,065					\$408,065
	Mechanical Engineering	\$627,763	\$745,429					\$1,373,192
Subtotal	<b>\$1,793,390</b>	<b>\$2,371,739</b>		<b>\$190,805</b>	<b>\$50,000</b>	<b>\$1,552,294</b>	<b>\$226,699</b>	<b>\$6,184,927</b>
<b>Fine Arts</b>	Appalachian Center for Craft						\$10,510	\$10,510
	Music						\$2,650	\$2,650
	Subtotal						<b>\$13,160</b>	<b>\$13,160</b>
<b>Interdisciplinary Studies</b>	Dean's Office						\$97,216	\$97,216
	Environmental Studies			\$67,132			\$5,000	\$72,132
	Subtotal			<b>\$67,132</b>			<b>\$102,216</b>	<b>\$169,348</b>
<b>Nursing</b>	Nursing						\$752,743	\$752,743
	Subtotal						<b>\$752,743</b>	<b>\$752,743</b>
<b>Other</b>	Multicultural Affairs						\$50,000	\$50,000
	Sustainability Office						\$10,000	\$10,000
	TN Center for Rural Innovation						\$298,012	\$298,012
	Vice Pres for Planning and Finance						\$670,925	\$670,925
	Water Center			\$36,162				\$36,162
	Subtotal			<b>\$36,162</b>				<b>\$1,028,937</b>
<b>Centers of Excellence State Appropriations and Testing Accounts</b>	CEROC Appropriation					\$500,000		\$500,000
	Energy Center Appropriation	\$1,002,200						\$1,002,200
	Energy Center Testing	\$5,562						\$5,562
	Manufacturing Center Appropriation		\$1,613,400					\$1,613,400
	Manufacturing Center Testing		\$12,354					\$12,354
	Water Center Appropriation			\$1,231,600				\$1,231,600
	Water Center Testing			\$62,416				\$62,416
	Subtotal	<b>\$1,007,762</b>	<b>\$1,625,754</b>		<b>\$1,294,016</b>		<b>\$500,000</b>	
<b>Total</b>	<b>All Units</b>	<b>\$2,988,494</b>	<b>\$3,997,493</b>	<b>\$3,773,148</b>	<b>\$644,040</b>	<b>\$2,052,294</b>	<b>\$9,315,182</b>	<b>\$22,770,651</b>

**Table II: Proposals and Activations by University Unit**

<i>University Unit</i>	<i># of Proposals</i>	<i>Amount Requested</i>	<i># of Activations</i>	<i>Amount Activated</i>
Agriculture	9	\$692,380	5	\$328,479
Biology	14	\$2,359,674	15	\$1,239,454
Chemical Engineering	6	\$1,692,094	4	\$192,605
Chemistry	4	\$743,298	2	\$423,588
Civil and Environmental Engineering	12	\$1,104,021	13	\$743,991
Center for Energy Systems Research (CESR)	4	\$449,205	2	\$74,210
Center for Manufacturing Research (CMR)	5	\$5,274,994	2	\$220,177
Center for Rural Innovation (TCRI)	2	\$146,416	2	\$298,012
Computer Science	26	\$7,578,747	16	\$1,002,810
Cooperative Fishery Research Unit	6	\$935,655	15	\$957,906
Counseling and Psychology	2	\$42,464	1	\$49,428
Craft Center	4	\$24,500	3	\$10,510
Curriculum and Instruction	9	\$3,642,616	12	\$2,343,824
Cybersecurity Education, Research and Outreach	8	\$5,658,126	6	\$1,499,472
Dean's Office: Education	11	\$1,005,386	3	\$283,136
Dean's Office: Engineering	3	\$211,152	2	\$68,866
Dean's Office: Interdisciplinary Studies	0	\$0	1	\$97,216
Decision Sciences and Management	1	\$91,772	2	\$247,272
Earth Sciences	2	\$1,099,525	0	\$0
Economics, Finance and Marketing	1	\$155,500	0	\$0
Electrical and Computer Engineering	19	\$5,039,156	6	\$467,566
Environmental Studies	2	\$105,000	4	\$72,132
Exercise Science, Physical Education & Wellness	1	\$49,975	0	\$0
General and Basic Engineering	2	\$408,019	1	\$133,973
Graduate Studies	1	\$99,984		
Human Ecology	1	\$738,569	3	\$753,569
iCube	2	\$342,000	6	\$2,930,875
Information Technology Services	1	\$988,702	0	\$0
Interdisciplinary Studies	2	\$127,216	0	\$0
Library	1	\$4,800	0	\$0
Manufacturing and Engineering Technology	13	\$3,991,140	6	\$408,065
Mathematics	1	\$1,492,568	0	\$0
Mechanical Engineering	23	\$8,620,382	16	\$1,373,192
Multicultural Affairs Office	0	\$0	1	\$50,000
Music	0	\$0	1	\$2,650
Nursing	6	\$1,560,714	6	\$752,743
Physics	2	\$141,459	8	\$392,574
Sociology and Political Science	3	\$457,762	2	\$77,300
Sustainability Office	0	\$0	1	\$10,000
STEM Center	4	\$25,784,917	3	\$130,437
Vice President for Planning and Finance	1	\$670,925	1	\$670,925
Water Center	1	\$89,267	1	\$36,162
<b>Subtotal</b>	<b>215</b>	<b>83,620,080</b>	<b>172</b>	<b>\$18,343,119</b>
CESR State Appropriation/Testing	---	---	---	\$1,007,762
CMR State Appropriation/Testing	---	---	---	\$1,625,754
Water Center State Appropriation/Testing	---	---	---	\$1,294,016
CEROC State Appropriation	---	---	---	\$500,000
<b>Total</b>	<b>215</b>	<b>83,620,080</b>	<b>172</b>	<b>\$22,770,651</b>

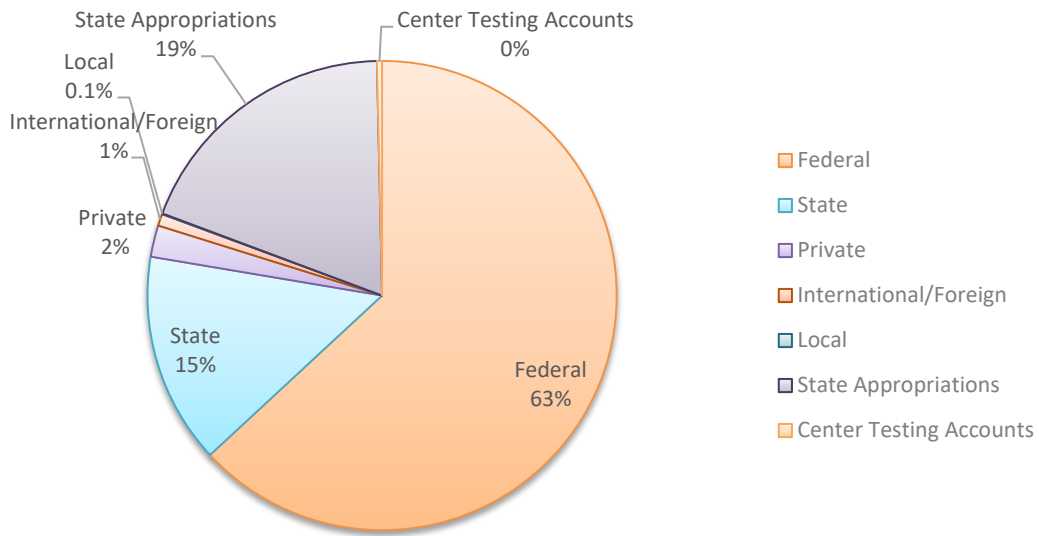


**Table III: Proposals Submitted and Activations  
Administered Through Centers**

<i>University Unit</i>	<i># of Proposals</i>	<i>Amount Requested</i>	<i># of Activations</i>	<i>Amount Activated</i>
<b>CEROC</b>				
CEROC	8	\$5,658,126	4	\$878,871
Computer Science	12	\$3,776,742	8	\$673,423
Curriculum and	1	\$153,454	0	\$0
ITS: Systems Support	1	\$988,702	0	\$0
State Appropriation	---	---	---	\$500,000
<i>Total</i>	22	\$10,577,024	12	\$2,052,294
<b>Craft Center</b>				
Appalachian Center	4	\$24,500	3	\$10,510
<i>Total</i>	4	\$24,500	3	\$10,510
<b>Energy Center</b>				
CESR	4	\$449,205	2	\$74,210
Chemical Engineering	5	\$1,292,097	2	\$112,605
Civil and	9	\$1,069,216	7	\$553,186
Computer Science	12	\$2,976,776	7	\$279,427
Electrical and	11	\$2,388,417	3	\$120,099
Mechanical	14	\$5,555,529	5	\$627,763
Physics	0	\$0	3	\$187,342
Dean's Office:	1	\$104,400	1	\$26,100
State Appropriation	---	---	---	\$1,002,200
Center Testing	---	---	---	\$5,562
<i>Total</i>	56	\$13,835,640	30	\$2,988,494
<b>iCube</b>				
iCube	2	\$342,000	6	\$2,930,875
<i>Total</i>	2	\$342,000	6	\$2,930,875
<b>Manufacturing Center</b>				
CMR	5	\$5,274,994	2	\$220,177
CEROC	0	\$0	2	\$620,601
Chemical Engineering	1	\$399,997	1	\$30,000
Computer Science	2	\$825,229	0	\$0
Electrical and	7	\$2,645,739	3	\$347,467
General and Basic	1	\$274,046	0	\$0
Manufacturing and	13	\$3,991,140	6	\$408,065
Mechanical	8	\$2,993,327	11	\$745,429
State Appropriation	---	---	---	\$1,613,400
Center Testing	---	---	---	\$12,354
<i>Total</i>	37	\$16,404,472	25	\$3,997,493
<b>STEM Center</b>				
Chemical Engineering	0	\$0	1	\$50,000
Curriculum and	3	\$649,912	4	\$270,058
Dean's Office:	5	\$500,000	1	\$152,646
Exercise Science	1	\$49,975		
Physics	0	\$0	1	\$40,899
STEM Center	4	\$25,784,917	3	\$130,437
<i>Total</i>	13	\$26,984,804	10	\$644,040
<b>Water Center</b>				
Agriculture	1	\$34,878	0	\$0
Biology	8	\$1,116,995	9	\$1,001,909
Chemistry	0	\$0	1	\$255,218
Civil and	3	\$34,805	6	\$190,805
Cooperative Fisheries	5	\$867,409	14	\$927,906
Earth Sciences	1	\$336,997	0	\$0
Environmental	1	\$100,000	3	\$67,132
Mechanical	1	\$71,526	0	\$0
Water Center	1	\$89,267	1	\$36,162
State Appropriation	---	---	---	\$1,231,600
Center Testing	---	---	---	\$62,416
<i>Total</i>	21	\$2,651,877	34	\$3,773,148

**Table IV: Proposals and Activations by Funder Classification**

<i>Classification</i>	<i># of Proposals</i>	<i>Amount Requested</i>	<i># of Activations</i>	<i>Amount Activated</i>
Federal	152	\$75,921,290	122	\$14,344,525
State	27	\$5,952,442	26	\$3,306,830
Private	31	\$1,274,589	19	\$494,229
International Foreign	4	\$446,808	4	\$185,363
Local	1	\$24,951	1	\$12,172
State Appropriations	---	---	---	\$4,347,200
Center Testing Accounts	---	---	---	\$80,332
<b>Total</b>	<b>215</b>	<b>\$83,620,080</b>	<b>172</b>	<b>\$22,770,651</b>



**Figure 2**  
**Percentage of Total Activation Amount by Funder Classification**

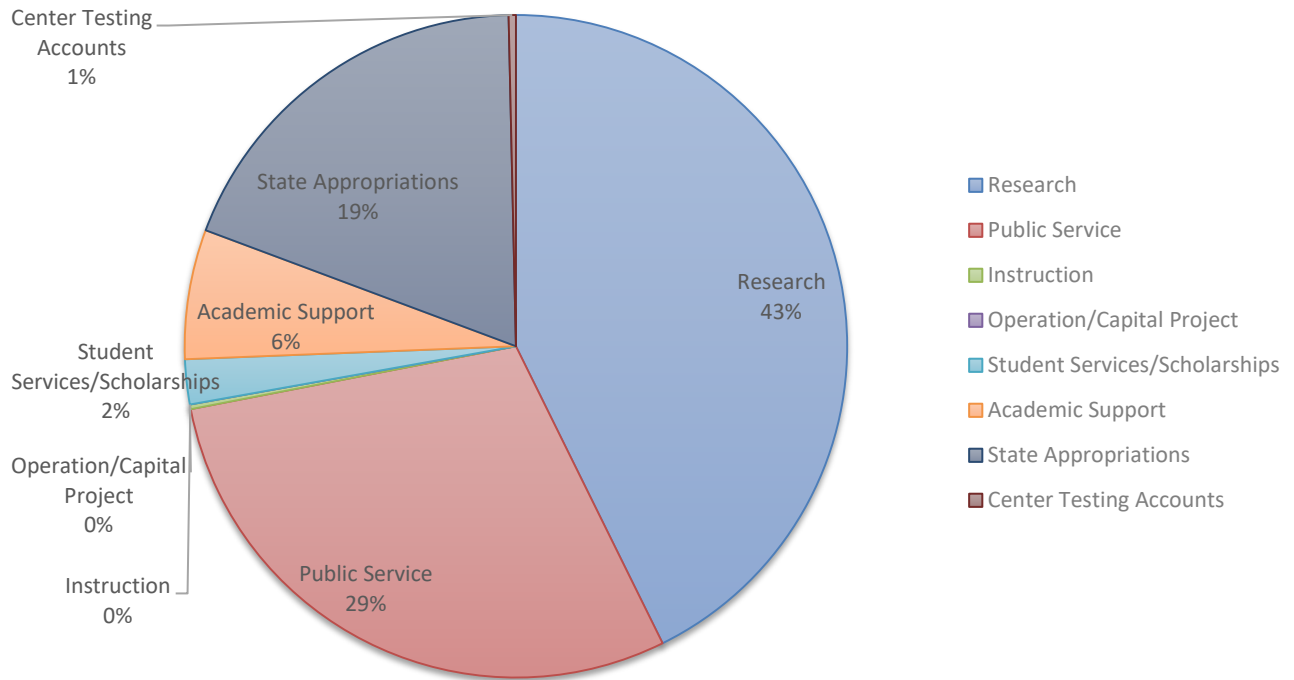
**Table V: Federal Activations by Agency\***

<i>Federal Agency</i>	<i># of</i>	<i>Amount</i>
<b>U.S. Department of Transportation</b>	<b>6</b>	<b>\$2,580,162</b>
<i>National Highway Traffic Safety Administration</i>	3	\$2,528,675
<i>Southeastern Transportation, Research, Innovation, Development and</i>	3	\$51,487
<b>National Science Foundation</b>	<b>29</b>	<b>\$2,519,577</b>
<b>U.S. Department of Interior</b>	<b>23</b>	<b>\$1,594,447</b>
<i>U.S. Fish and Wildlife Service</i>	14	\$1,287,133
<i>U.S. Geological Survey</i>	7	\$259,990
<i>National Park Service</i>	2	\$47,324
<b>U.S. Department of Energy</b>	<b>18</b>	<b>\$1,225,347</b>
<i>Advanced Research Projects Agency – Energy</i>	1	\$45,420
<i>Oak Ridge National Laboratory</i>	7	\$172,505
<i>Office of Energy Efficiency &amp; Renewable Energy</i>	5	\$390,322
<i>Office of Fossil Energy</i>	2	\$313,730
<i>Office of Science</i>	3	\$303,370
<b>U.S. Department of Defense</b>	<b>14</b>	<b>\$2,048,140</b>
<i>Air Force Research Laboratory</i>	2	\$93,080
<i>Battelle Memorial Institute</i>	4	\$270,058
<i>National Security Agency</i>	4	\$919,634
<i>Naval Facilities Engineering Systems Command</i>	1	\$460,367
<i>Office of Naval Research</i>	1	\$125,001
<i>U.S. Air Force</i>	1	\$150,000
<i>U.S. Navy</i>	1	\$30,000
<b>U.S. Department of Education</b>	<b>6</b>	<b>\$994,561</b>
<b>U.S. Department of Treasury</b>	<b>1</b>	<b>\$670,925</b>
<b>U.S. Department of Agriculture</b>	<b>2</b>	<b>\$519,031</b>
<i>National Resources Conservation Service</i>	1	\$457,503
<i>National Institute of Food and Agriculture</i>	1	\$61,528
<b>Tennessee Valley Authority</b>	<b>4</b>	<b>\$393,000</b>
<b>Appalachian Regional Commission</b>	<b>2</b>	<b>\$300,000</b>
<b>U.S. Department of Commerce</b>	<b>2</b>	<b>\$298,012</b>
<i>Economic Development Administration</i>	2	\$298,012
<b>U.S. Department of Health and Human Services</b>	<b>6</b>	<b>\$545,490</b>
<i>Centers for Disease Control and Prevention</i>	2	\$317,000
<i>National Institutes of Health</i>	3	\$198,490
<i>Substance Abuse and Mental Health Services Administration</i>	1	\$30,000
<b>National Aeronautics and Space Administration</b>	<b>3</b>	<b>\$185,357</b>
<b>U.S. Department of Justice</b>	<b>2</b>	<b>\$182,595</b>
<i>Office of Justice Programs</i>	2	\$182,595
<b>Small Business Administration</b>	<b>1</b>	<b>\$155,500</b>
<b>Institute of Museum and Library Services</b>	<b>1</b>	<b>\$65,576</b>
<b>Environmental Protection Agency</b>	<b>1</b>	<b>\$40,000</b>
<b>U. S. Department of State</b>	<b>1</b>	<b>\$26,805</b>
<b>Total</b>	<b>122</b>	<b>\$14,344,525</b>

\*Note: Some of these funds come to Tennessee Tech via flow through from state agencies/entities which are not reflected in this table.

**Table VI: Proposals and Activations by Activity**

Activity	# of Proposals	Amount Requested	# of Activations	Amount Activated
Academic Support	3	\$260,300	6	\$1,436,632
Capital Project/Operation/Maintenance	1	\$174,375	0	\$0
Institutional Support	1	\$670,925	0	\$0
Instruction	13	\$1,074,886	3	\$51,666
Public Service	20	\$8,417,947	28	\$6,651,091
Research	167	\$71,447,078	130	\$9,706,094
Student Services/Scholarship/Fellowships	10	\$1,574,569	5	\$497,636
State Appropriations	---	---	---	\$4,347,200
Center Testing Accounts	---	---	---	\$80,332
<b>Total</b>	<b>215</b>	<b>\$83,620,080</b>	<b>172</b>	<b>\$22,770,651</b>



**Figure 3**  
**Percentage of Total Activation Amount by Activity**

**Table VII: Proposals and Activations: FY 2017 - 2021**

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
<i>Proposals</i>					
Number of proposals submitted	198	180	168	194	215
Number of unique individuals who served as PI on a proposal	101	82	94	96	100
Amount requested	\$48,773,168	\$50,570,708	\$49,340,424	\$40,117,231	\$83,620,080*
Number of unique individuals (PIs and Co-PIs) involved in these proposals	147	117	124	137	163
Funded	82 (41%)	79 (44%)	96 (57%)	105 (54%)	78 (36%)
Not Funded	116 (59%)	101 (56%)	72 (43%)	89 (46%)	137** (64%)
<i>Activations</i>					
Number of project activations***	146	162	149	154	172
Amount of project activations***	\$13,261,077	\$12,611,134	\$15,934,931	\$15,711,287	\$18,343,119
Number of unique individuals (PIs and Co-PIs) involved in these activated projects	94	106	107	108	131
State Appropriations/Center Testing Accounts	\$3,649,645	\$3,760,766	\$4,293,174	\$4,340,030	\$4,427,532
Total amount of external funding	\$16,910,722	\$16,371,900	\$20,228,105	\$20,051,317	\$22,770,651

\* Note that the proposal amount requested includes a \$22.8M GEAR UP proposal to the U.S. Department of Education. Without the proposal, amount requested totals \$60,828,080.

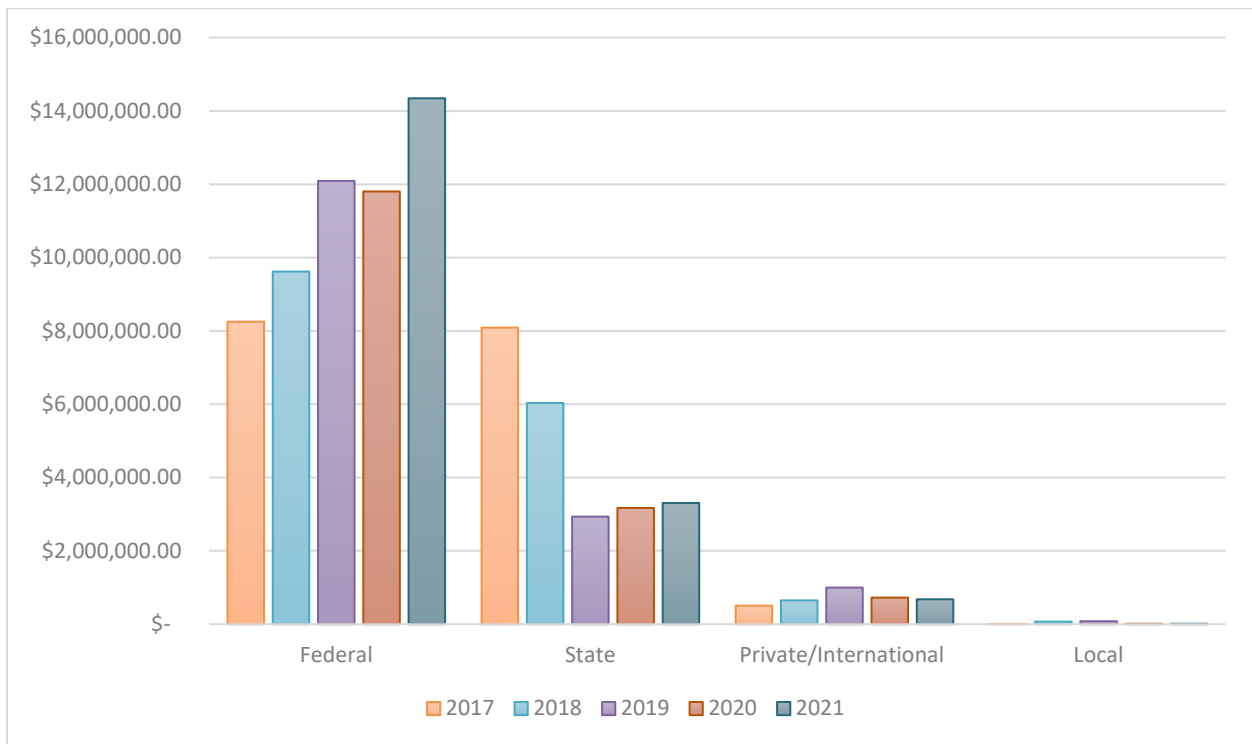
\*\* For FY 2021, the number included in the Not Funded row includes 74 pending proposals as of 8/6/2021.

\*\*\* State appropriation and center testing account number/amounts are not included in these rows.

## Table VIII: Activation Amounts By Classification FY 2017-21

Fiscal Year	Federal		State		Private		International Foreign*		Local		State Appropriation /Testing Accounts
	#	Activation Amount	#	Activation Amount	#	Activation Amount	#		#	Activation Amount	Activation Amount
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
2020	98	\$11,803,424	27	\$3,170,659	21	\$530,222	7	\$194,929	1	\$12,063	\$4,340,030
2021	122	\$14,344,525	26	\$3,306,830	19	\$494,229	4	\$185,363	1	\$12,172	\$4,427,532

\*A separate category for International Foreign was created in 2020. Prior to that, activations from international funders were coded as private.



**Figure 4**  
**Awards Received by Classification**

**Table IX: Activation Amounts By Activity Type  
FY 2017-21**

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
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
2020	102	\$7,644,644	39	\$7,213,406	5	\$97,445	3	\$88,792	3	\$307,000	2	\$360,000	\$4,340,030
2021	130	\$9,706,094	28	\$6,651,091	3	\$51,666	6	\$1,436,632	5	\$497,636	0	\$0	\$4,427,532

# RESEARCH AND CREATIVE INQUIRY DAY

Research and Creative Inquiry Day is an annual event designed to promote student research and creative inquiry and provide a venue for presenting that work. This event is open to undergraduate and graduate students from all departments who want to display their research and creative projects. Research projects and literature-based reviews follow the standard poster format while submissions from the English department utilize a paper format. While typically an in-person event, due to the ongoing pandemic, FY2021 event activities utilized a digital/virtual format. Event activities included poster and paper submission, student/judge interaction, submission of judge scores and a virtual award ceremony on Tuesday, April 20 at 11 a.m.

A breakdown of all student participants by department is provided in the table below. Sixty-eight judges, including faculty and staff from across campus and industry partners, also participated.

2021 Breakdown of Student Participants by Department						
Departments	Submitted Abstract			Developed Poster/Paper		
	UG	G	Total	UG	G	Total
Accounting	2	7	9	2	7	9
Agriculture (School of)	1	0	1	1	0	1
Human Ecology (School of)	36	0	36	34	0	34
Biology	5	6	11	5	6	11
Chemistry	18	5	23	18	5	23
Earth Sciences	9	0	9	9	0	9
English	2	3	5	2	3	5
Foreign Languages	12	0	12	12	0	12
Physics	9	0	9	6	0	6
Sociology and Political Science	1	0	1	1	0	1
Counseling and Psychology	1	5	6	1	5	6
Curriculum and Instruction	0	5	5	0	4	4
Exercise Science	1	0	1	1	0	1
Chemical Engineering	13	15	28	12	14	26
Civil and Environmental Engineering	2	0	2	2	0	2
Computer Science	16	8	24	14	7	21
Electrical and Computer Engineering	2	11	13	2	11	13
Manufacturing and Engineering	1	7	8	1	5	6
Mechanical Engineering	2	10	12	2	7	9
Environmental Studies (School of)	4	0	4	4	0	4
Nursing	1	0	1	1	0	1
Women's and Gender Studies	2	0	2	1	0	1
	140	82	222	131	74	205

The number of abstract submissions has remained steady at 222 for the last three years and has increased by 258% (from 62 to 222) since the inaugural event in 2005.



# RESEARCH 101 WORKSHOP SERIES

In collaboration with the Center for Advancing Faculty Excellence's (CAFÉ's) new faculty orientation, the Office of Research offered the following Research 101 sessions during the 2020-21 academic year:

- Research 101: Sponsored Projects Overview – September 17, 2020
- Research 101: Assistance with Finding Funding Opportunities – October 22, 2020
- Research 101: Best Practices in Proposal Development – November 5, 2020
- Research 101: Subrecipient Monitoring – February 4, 2021
- Research 101: Post Award Management – February 25, 2021
- Research 101: Responsible Conduct of Research – March 11, 2021

# **RESEARCH COMPLIANCE AND GENERAL COMPLIANCE SUPPORT**

## **Research Compliance**

The ORED 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 ORED, 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 ORED. 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 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 ORED.

# 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. Chris Brown, Biology
- Mr. Brent Carter, Administrative
- Dr. Bruce Greene, Agriculture
- Dr. Steve Hayslette, Biology (Chair)
- Ms. Tammy Howard, Nursing
- Dr. Jessica Oswalt, College of Engineering
- Dr. Tyler Verble, Veterinarian
- Mr. Joe Weatherly, Ethicist
- Dr. Kit Wheeler, Biology
- Dr. Francis Otuonye, Executive Officer

## ➤ **Committee Actions**

- *Laboratory Inspections*  
Inspections of Tennessee Tech 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 Sept. 25, 2020, and spring laboratory inspections were completed by mid-April 2021. Inspection of the Shipley Farm also was completed by mid-April 2021. Reports of these inspections are kept on file in the ORED; copies are sent to supervisors of the respective animal laboratories.

- *Research Proposal Evaluation*  
Thirteen applications to use animals in research have been received, considered, and approved by the committee so far during the 2020-2021 academic year. These are listed below:
  - a. Comparison of Technologies to Determine Home Range Size of Virginia Opossums for WFS 4670 – Wild Mammal Ecology (Dr. Rob Kissell, Biology)
  - b. Teaching Laboratory Sections – Instruction of Fish Sampling Methods, Diversity Sampling, and Fish Health Surveys (Dr. Brad Cook, Biology)
  - c. The Ecological Role of Migratory Redhorses in Brasstown Creek, GA (Dr. Kit Wheeler, Biology)
  - d. Cumberland Plateau Fish and Aquatic Invertebrate IBIs (Shawna Fix and Bernie Kuhajda, Tennessee Aquarium Conservation Institute)
  - e. Determining Biological Barriers to Reintroduction of the Federally Endangered Laurel Dace (Shawna Fix, Bernie Kuhajda, Meredith Harris, Dr. Chris Keller, and Dr. Salvatore Frasca, Jr., Tennessee Aquarium Conservation Institute)
  - f. Monitoring Status of Bridled Darters and Assessing Threats to Blue Shiners (Shawna Fix and Bernie Kuhajda, Tennessee Aquarium Conservation Institute)
  - g. Identifying Mallard Response to Backpack-Style GPS Transmitters (Dr. Brad Cohen – Modification)
  - h. Effect of Coded Wire Tag on Detection of Live Prey by Juvenile Lake Sturgeon (Meredith Harris, Tennessee Aquarium Conservation Institute)
  - i. Surveys for Federally Endangered Laurel Dace (Shawna Fix and Bernie Kuhajda, Tennessee Aquarium Conservation Institute)
  - j. Turtles All the Way Down: Top-Down and Bottom-Up Effects of Turtles in Freshwater Ponds (Josh Ennen and Jon Davenport, Tennessee Aquarium Conservation Institute)
  - k. Can Microplastic Pollution Transfer up the Food Chain in Freshwater Ecosystems? (Josh Ennen, Jon Davenport, and Dawn Richards, Tennessee Aquarium Conservation Institute)
  - l. Understanding Ecological Processes that Drive Headwater Stream Community Structure and Dynamics (Josh Ennen and Shawna Fix, Tennessee Aquarium Conservation Institute)
  - m. Species Interactions Between Sunfish and Tennessee Dace (Shawna Fix, Tennessee Aquarium Conservation Institute)

➤ **Committee Meeting Dates**

- June 18, 2020; July 21, 2020 (virtual); Sept. 17, 2020 (virtual); Feb. 11, 2021 (virtual)

# INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS

The Tennessee Tech Institutional Review Board (IRB) for the Protection of Human Subjects is a standing University committee operating through the ORED and reporting to the Administrative Council.

In accordance with 45CFR46, the Tennessee Tech 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 Tennessee Tech 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 Tech 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 with the ORED. 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. Queen Ogbomo, Department of Curriculum and Instruction
- Dr. Susan Piras, Whitson-Hester School of Nursing
- Dr. Beth Powell, College of Engineering
- Dr. Chad Rezsnyak, Department of Chemistry
- Mr. James Rogers, Community Representative
- Dr. Francis Otuonye, Executive Officer

➤ **Committee Actions**

- Since the last annual report submitted on March 26, 2020, the ORED processed 89 applications, which is 70 fewer than reported in the 2019-20 report. Of those, 79 were approved for Exempt Status, 10 were approved through Expedited Review, and one was reviewed through a Full Board Review. Of the 10 applications reviewed through an Expedited Review process, nine were approved (one with minor changes), and one was returned to the investigator to revise and resubmit. The application reviewed through a Full Board Review was approved. Additionally, 13 continuation/change applications were reviewed and approved.
- During the September 14, 2020, meeting, the IRB approved COVID-19 recommendations for research involving human subjects and approved minor revisions to the IRB application. No changes to policy or procedures were approved at the November 2, 2020, meeting.
- No incidences of non-compliance were reported to the IRB during this period.

➤ **Committee Meeting Dates**

- September 10, 2020; November 2, 2020; January 25, 2021 (meeting was cancelled due to a lack of agenda items); April 5, 2021

# INTELLECTUAL PROPERTY ADVISORY COMMITTEE

Tennessee Tech 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 Adduci, Music
- Mr. Michael Aikens, I&E director
- Dr. Michael Allen, Mathematics (Chair)
- Dr. Sean Alley, Economics, Finance and Marketing
- Dr. Ali Alouani, Electrical and Computer Engineering
- Dr. Michael Best, Agriculture
- Dr. Alice Camuti, Graduate Studies
- Dr. Steve Frye, Interdisciplinary Studies
- Ms. Sharon Holderman, Library
- Dr. Emily Lee, Nursing
- Mr. Mark Lynam, Administrative
- Ms. Ann Manginelli, Library
- Dr. Tony Michael, Counseling and Psychology
- Dr. Manuel Villalba, Foreign Languages
- Ms. Emmery Mealer, Student
- Ms. Kinsey Potter, Graduate Student
- Dr. Francis Otuonye, Executive Officer



➤ **Committee Actions**

➤ Invention Disclosures Received:

1. Novel Layered Double Dee Coil for Wireless Power Transfer Applications – Dr. Bhattacharya and Muhammed Nima
2. Method and Apparatus for Generating Electrical Based Solition Waves in Natural Terrestrial Environments – Dr. Charles VanNeste
3. Antimicrobial Peptides and Their Derivatives as Novel Therapeutics to Treat Viral Related Illnesses – Dr. Liqun Zhang

➤ Copyrightable Work Disclosure Received:

1. Dr. Stephen Robinson disclosed his work on a set of research-based curriculum materials as part of an NSF grant with South Dakota State University (SDSU). Royalty share was discussed by the Committee and turned over to Attorney Bahou for review. In the next meeting, Attorney Bahou ascertained that the material created by Dr. Robinson in conjunction with SDSU was copyrightable, and a co-license would need to be created with SDSU so that Tennessee Tech can share in any profits. Attorney Bahou was to follow up on this item.

➤ Provisional Patent Applications Filed:

1. Novel Layered Dee Coil for Wireless Power Transfer Applications – Dr. Bhattacharya and Muhammed Nima
2. Method and Apparatus for Generating Electrical Based Solition Waves in Natural Terrestrial Environments – Dr. Charles VanNeste

➤ Abandon/Return to Inventor:

1. Handheld Device to Detect Troponin Levels
2. Supportive Incontinence Protection Pads
3. Skin to Skin Simulation for Micropreemies

Drs. Andy Pardue and Robby Sanders spoke on behalf of these student-led inventions. Since the filing of the original provisional patents for these inventions, Drs. Pardue and Sanders indicated the faculty involvement on these inventions were minimal, and no new contributions have been made by the students towards getting utility patents. The committee agreed to allow the expiration of the provisional patents and recommended full invention ownership be granted to the students.

➤ **Committee Meeting Dates**

- September 8, 2020; November 3, 2020; January 26, 2021. The meetings scheduled for February 23, 2021, and March 30, 2021, were cancelled due to the lack of agenda items and/or invention disclosures. Considering the seasonality of the cancelled meetings in the last three years, it is recommended IPAC reduce its number of meetings per academic year to three, two in the fall and one in the spring with the policy that further meetings would be scheduled as needed.

# 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) establish and administer policies and standards in connection with faculty research funds, from which assistance may be provided to faculty members who wish to undertake research projects; and (3) assist in the dissemination of information developed in faculty research projects through the publication of research bulletins and through other appropriate media of information dissemination available to the Committee. The research program provides support for investigations of new research areas for the faculty members involved. 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. Stephen Canfield, Mechanical Engineering
- Dr. Brad Cook, Biology
- Dr. Allen Driggers, History
- Dr. Steven Frye, Interdisciplinary Studies
- Dr. Catherine Godes, Music
- Dr. Rachel Hall, Nursing (Chair)
- Dr. Cara Sisk, Human Ecology
- Dr. Matt Smith, Curriculum and Instruction
- Dr. Jennifer Taylor, Executive Officer

➤ **Committee Actions**

- A complete listing of the Faculty Research Awards for 2020-21 is provided in Appendix C.

➤ **Committee Meeting Dates**

- November 18, 2020; March 12, 2021

# 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. Greg Danner, Music
- Dr. Dennis Duncan, Agriculture
- Dr. Ismail Fidan, Manufacturing and Engineering Technology (Chair)
- Mr. Stuart Gaetjens, Library
- Dr. Melissa Geist, Nursing
- Dr. Tor Guimaraes, Decision Sciences and Management/Business
- Dr. David Hajdik, Environmental Studies
- Dr. Joseph Ojo, Electrical Engineering
- 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. Satish Mahajan for the 2020-2021 fiscal year.

## ➤ **Committee Dates**

- October 6, 2020; March 8, 2021

# 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 Tennessee Tech.
- 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. Steven Anton, Mechanical Engineering
- Dr. Jason Beach, Curriculum and Instruction
- Ms. Kelly Bell, Undergraduate Student
- Dr. Jeremy Blair, Art, Craft and Design
- Dr. Jeff Boles, Chemistry (Chair)
- Ms. Julie Brewer, iCube
- Dr. Tania Datta, Civil and Environmental Engineering
- Dr. Kristen Deiter, English
- Ms. Debbie Gernt, Grant Accounting
- Mr. Cody Godwin, Graduate Student
- 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. Terry Saltsman, Chief Government Affairs Officer
- Dr. Mark Stephens, Provost's Office
- Dr. Jennifer Taylor, VP for Research, Executive Officer

➤ **Committee Actions**

*Building Research Capacity at Tennessee Tech:* Discussion concerning the President's goal of doubling sponsored research to \$40 million by 2025 continues. Return on investment of indirect cost utilization that supports faculty research grants was often discussed. URAC is preparing recommendations to the University in this area that should lead to improved assessment of current strategies utilizing these funds to not only support University research, but also increase indirect cost returns to Tech, which grows this program. Strategies to double sponsored research at Tech were often central to the discussions.

*Cornerstone:* The Cornerstone Government Affairs Group assists in the building of relationships with funding agencies on behalf of Tech. URAC desired to more fully understand this process and how the Committee could serve as advocates to help leverage available resources. Discussions have continued with the assistance of Terry Saltsman, who meets regularly with Dr. Marty Fuller, Mr. Will Smith and Mr. Will Todd of Cornerstone. Cornerstone offers a review of and a summary of the current funding environment. Dr. Saltsman informs URAC of important timelines and opportunities that position the University for funding success. URAC assists with the submission of white papers via a template provided by the Tech ORED.

*Research Awards:* The Annual Scholastic Research Award is given to two faculty (one tenured and one tenured-track). The total amount for each awardee is \$1,500, and they are typically recognized at the Spring University Awards Reception. The Committee recently reviewed applications submitted and is currently in the process of selecting awardees. Each will be notified when the process is complete.

➤ **Committee Meeting Dates**

- October 7, 2020; October 21, 2020; November 11, 2020; February 4, 2021, April 15, 2021

# 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), funding agency, and 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 represented by College and Department, with Principal Investigator, Project Title, Funding Agency, Center, Funding Amount, and Co-PIs Listed

## **College of Agriculture and Human Ecology**

**Total: \$1,082,048**

### *School of Agriculture*

#### **Dennis Duncan**

- Camp Clements  
Tennessee Department of Education  
Amount: \$174,375
- Camp Clements  
Tennessee Department of Education  
Amount: \$58,125
- Soil, Animal, Food, and Economic (SAFE) Research, Education and Outreach  
U.S. Department of Agriculture via Middle Tennessee State University  
Amount: \$61,528  
Co-PI(s): Michael Natrass
- Supplement for Camp Clements FY20  
Private  
Amount: \$30,000

#### **Dennis Fennewald**

- Effect of Plant and Bird Size on Tenderness of Chicken Tenderloin  
Private  
Amount: \$4,451

### *School of Human Ecology*

#### **Melinda Anderson**

- Tennessee Early Childhood Training Alliance  
Tennessee Department of Human Services via Tennessee State University  
Amount: \$534,569



- Tennessee Early Childhood Training Alliance Scholarships  
Tennessee Department of Human Services via Tennessee State University  
Amount: \$204,000
- Tennessee Early Childhood Training Alliance Scholarships  
Tennessee Department of Human Services via Tennessee State University  
Amount: \$15,000

## **College of Arts and Sciences**

**Total: \$3,090,822**

### ***Biology***

#### **Bradley Cohen**

- Delineation of Harvest Management Units for White-tailed Deer in Tennessee  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: ORED  
Amount: \$9,760
- Factors Affecting Sanctuary Use by Mallards  
U.S. Department of the Interior/USFWS  
Center: Water  
Amount: \$27,867
- Mallard Use of Tennessee Westlands  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$431,125  
Co-PI(s): Dan Combs
- Using Structured Decision Making to Develop a Robust Population Model for White-tailed Deer in Tennessee  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Amount: \$118,300  
Co-PI(s): Robert Kissell

### **John Gunderson**

- Trafficking of Two Novel Intracellular Bacteria in Eukaryotic Cells  
National Institutes of Health via Middle Tennessee State University  
Center: ORED  
Amount: \$9,772

### **Steven Hayslette**

- Collection of Biological Data at Deer Check Stations  
Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$2,000

### **Carla Hurt**

- Assessing Biodiversity in Stream-Dwelling Crayfish (*Faxonius durelli/forceps* complex) from the Cumberland Tennessee Watersheds  
Tennessee Valley Authority  
Center: Water  
Amount: \$15,000
- Chestnut Biodiversity Initiative  
Private  
Center: Water  
Amount: \$12,104  
Co-PI(s): Steven Hayslette, Shawn Zeringue-Krosnick, Christopher Wheeler
- Collaborative Research: SG: Phylogenomics and Diversification of the Snapping Shrimp Genus *Alpheus*  
National Science Foundation  
Center: Water  
Amount: \$24,762

### **Robert Kissell**

- Understanding the State of Curl-Leaf Mountain Mahogany (*Cercocarpus ledifolius*) and Utah Juniper (*Juniperus osteosperma*) Cover with a Focus on Bighorn Sheet (*Ovis Canadensis*) Habitat  
U.S. Department of the Interior/NPS  
Center: ORED  
Amount: \$22,349

### **Justin Murdock**

- Assessing the Restoration Success of WRP Easements in Tennessee and Kentucky  
U.S. Department of Agriculture via Nature Conservancy  
Center: Water  
Amount: \$457,503  
Co-PI(s): Alfred Kalyanapu

### **Christopher Wheeler**

- Population Status, Demographic History and Genetic Health of the Striated Darter (*Etheostoma striatulum*) in the Duck River Drainage, Tennessee  
U.S. Department of the Interior/USFWS via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$11,548  
Co-PI(s): Carla Hurt
- River Chubs as Keystone Species in the Little Tennessee River Basin  
Tennessee Valley Authority  
Center: Water  
Amount: \$20,000

### **Shawn Zeringue-Krosnick**

- Examining Pollination, Reproductive Success, and Life History Traits in Short's Bladderpod (*Physaria globosa*, *Brassicaceae*)  
U.S. Department of the Interior/USGS  
Amount: \$11,788  
Co-PI(s): Robert Paine
- Rooting Students in Their Botanical History  
National Endowment for the Humanities via Institute of Museum and Library Services  
Amount: \$65,576  
Co-PI(s): Kelly Moore

### ***Chemistry***

#### **Jeff Boles**

- Project Inspire STEM Teacher Residency  
National Science Foundation  
Center: Water  
Amount: \$255,218  
Co-PI(s): Jeremy Wendt

### **Jesse Carrick**

- Separations Convergent Synergies for Actinide Separations  
U.S. Department of Energy  
Amount: \$168,370

### ***Physics***

### **Sakir Ayik**

- Studies of Heavy-Ion Collisions in Stochastic Mean-Field Approach  
U.S. Department of Energy  
Amount: \$44,000

### **Mary Kidd**

- Creation of a Women in Physics Group at Tennessee Tech  
Private  
Amount: \$1,000  
Co-PI(s): Kaitlyn Kidwell, Emma Mitchell, Halle Ford
- National Space Grant College and Fellowship Program  
National Aeronautics and Space Administration (NASA) via Vanderbilt University  
Center: STEM  
Amount: \$40,899
- PIRE: Advanced Germanium Detectors and Technologies for Underground Physics  
National Science Foundation via University of South Dakota  
Amount: \$40,330

### **Mustafa Rajabali**

- MRI: Development of a High-Resolution Neutron Detector for Decay and Reaction Studies with Exotic Nuclei  
National Science Foundation via University of Tennessee Knoxville  
Center: CESR  
Amount: \$48,368
- MRI: Development of a High-Resolution Neutron Detector for Decay and Reaction Studies with Exotic Nuclei  
National Science Foundation via University of Tennessee Knoxville  
Center: CESR  
Amount: \$47,974
- The Structure of Neutron-rich Deformed Nuclei Studied via Beta Decay  
U.S. Department of Energy  
Center: CESR  
Amount: \$91,000

### **Stephen Robinson**

- A Model of Educational Transformation: Developing a Community of Faculty Implementing Next Generation  
National Science Foundation via California State University San Marcos  
Amount: \$79,003  
Co-PI(s): Paula Engelhardt

### ***Sociology and Political Science***

### **Steven Seiler**

- Prescription Drug Diversion Awareness and Prevention within the Tennessee and Southeastern Animal Care Community  
Private via Power of Putnam  
Amount: \$47,300  
Co-PI(s): Mark Loftis, Lachelle Norris, Paula Hinton
- Tri-County Collaborative SPF-PFS Project  
U.S. Department of Health and Human Services via Power of Putnam  
Center: ORED  
Amount: \$30,000  
Co-PI(s): Mark Anthony Loftis, Gwendolyn Lachelle Norris

### ***Tennessee Cooperative Fishery Research Unit***

### **Mark Rogers**

- Assessing Asian Carp Controls in the TN-Cumberland River Sub-basin of the Ohio  
U.S. Department of the Interior/USGS  
Center: Water  
Amount: \$66,000
- Evaluating Sport Fisheries  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$40,000
- Evaluating Stocked Fisheries  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$66,000
- Evaluation of Asian Carp Populations in the Tennessee and Cumberland Rivers  
U.S. Department of the Interior/USFWS via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$439,500

- Fishery Research Unit Base 2016-2021  
Tennessee Wildlife Resources Agency  
Amount: \$30,000  
Co-PI(s): Amanda Rosenberger
- Quantitative Assessment and Population-level Modeling of Bighead and Silver Carp Population Dynamics Across the Mississippi River Sub-basins  
U.S. Department of the Interior/USGS  
Center: Water  
Amount: \$94,000

**Amanda Rosenberger**

- Analysis of Habitat Use and Suitability of Abrams Creek for Reintroduction of the Blotchside Logperch Project  
U.S. Department of Interior/National Park Service  
Center: Water  
Amount: \$24,975
- A Re-Survey of the Mussel Fauna and a Habitat Assessment of the Wolf River, TN  
U.S. Department of the Interior/USGS  
Center: Water  
Amount: \$20,755
- Completion of a Species Status Assessment Report for the Slabside Pearlymussel  
U.S. Department of the Interior/USGS  
Center: Water  
Amount: \$33,315
- Duck River Mussel Surveys  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$31,193
- Duck River Mussel Surveys 2  
U.S. Department of the Interior/USFWS  
Center: Water  
Amount: \$29,678
- Life History, Habitat Use, and Genetic Uniqueness of the Longnose Darter *Percina nasuta* (S1) in Missouri  
Missouri Department of Conservation  
Center: Water  
Amount: \$48,300

- Tennessee Heelsplitter (*Lasmigona holstonia*) Distribution and Habitat Use  
U.S. Geological Survey  
Center: Water  
Amount: \$3,000
- Validation and Transferability of Fundamental Niche Models of Mussel Communities and Assessment of Risks to Mussel Population in Ozark River Drainages  
Missouri Department of Conservation  
Center: Water  
Amount: \$21,190
- Water Quality Assessment for Cumberland River Aquatic Center  
U.S. Department of the Interior/USFWS  
Center: Water  
Amount: \$10,000

**College of Business Administration**

**Total: \$3,178,147**

***Decision Sciences and Management***

**Julie Pharr**

- Tennessee Small Business Administration 2020  
U.S. Small Business Administration via Middle Tennessee State University  
Center: COB  
Amount: \$155,500

**Susan Wells**

- Governor's School for Innovation and Entrepreneurship  
Tennessee Department of Education  
Amount: \$91,772

***iCube***

**Kevin Liska**

- Integrated Marketing Communications System  
U.S. Department of Transportation  
Center: iCube  
Amount: \$1,425,075

- National Digital Car Seat Check Form  
U.S. Department of Transportation/National Highway Traffic Safety Administration  
via National Safety Council  
Center: iCube  
Amount: \$95,000  
Co-PI(s): Julie Brewer, Joseph Powell
- TN Traffic Safety Resources and Occupant Protection  
U.S. Department of Transportation/National Highway Traffic Safety Administration via  
Tennessee Highway Safety Office  
Center: iCube  
Amount: \$1,008,600
- VR ED Solution to Opioid Abuse (TNTogether.com) Year 4 Implementation  
U.S. Department of Health and Human Services via Tennessee Department of Health  
Center: iCube  
Amount: \$142,000

**Amanda Powell**

- Opioid Education Virtual Reality Game  
U.S. Department of Justice via Tennessee Bureau of Investigations  
Center: iCube  
Amount: \$85,200  
Co-PI(s): Kevin Liska
- Technical Support and Marketing of a Substance Use Treatment Navigator Website  
U.S. Department of Health and Human Services via Tennessee Department of Health  
Center: iCube  
Amount: \$175,000  
Co-PI(s): Kevin Liska

**College of Education**

**Total: \$2,806,825**

***Associate Dean College of Education***

**Julie Baker**

- Mentor Matters Initiative  
U.S. Department of Education via Tennessee Department of Education  
Amount: \$5,500
- Tennessee Tech Grow Your Own (GYO) Project (Eled 1)  
U.S. Department of Education via Tennessee Department of Education  
Center: STEM  
Amount: \$152,646



- Tennessee Tech SPED Add-On Endorsement Grant  
U.S. Department of Education via Tennessee Department of Education  
Center:  
Amount: \$124,990  
Co-PI(s): Lisa Zagumny, Jeremy Wendt, Amy Brown

***Counseling and Psychology***

**Chad Luke**

- Student Engagement, Retention, and Success (SERS) First-Generation Resilience Project  
Tennessee Board of Regents  
Amount: \$49,428  
Co-PI(s): Kathryn Kozak

***Curriculum and Instruction Office***

**Martha Howard**

- Bridges EIRA Assessment Vendor FY20-FY24  
U.S. Department of Education via Tennessee Department of Education  
Amount: \$12,000
- Bridges EIRA Assessment Vendor State Portion  
Tennessee Department of Education  
Amount: \$13,000
- Bridges EIRA (TEIS) Federal  
U.S. Department of Education via Tennessee Department of Education  
Amount: \$139,425
- Bridges EIRA (TEIS) State  
Tennessee Department of Education  
Amount: \$376,964
- Childcare Tennessee Emergency and Recovery Grant - COVID 19 Relief for Loss of Income  
Private  
Amount: \$44,840
- Tennessee Early Childhood Preschool Program 20/21/ FY  
Putnam County Schools  
Amount: \$87,537

- Tennessee's Early Intervention System (TEIS) Eligibility Evaluation Grant - State Portion  
Tennessee Department of Education  
Center: ORED  
Amount: \$840,000  
Co-PI(s): Amy Callender
- Tennessee's Early Intervention System (TEIS) Evaluation Grant - Federal portion  
U.S. Department of Education via Tennessee Department of Education  
Center: ORED  
Amount: \$560,000  
Co-PI(s): Amy Callender

**Jennifer Meadows**

- Army Education Outreach Program Consortium  
U.S. Department of Defense via Battelle Memorial Institute  
Center: STEM  
Amount: \$117,351
- Army Education Outreach Program Consortium  
U.S. Department of Defense via Battelle Memorial Institute  
Center: STEM  
Amount: \$52,896
- Army Education Outreach Program Consortium  
U.S. Department of Defense via Battelle Memorial Institute  
Center: STEM  
Amount: \$18,982
- Army Education Outreach Program Consortium  
U.S. Department of Defense (DOD) via Battelle Memorial Institute  
Center: STEM  
Amount: \$80,829

***STEM Operating***

**Carlos Galindo**

- Student Engagement, Retention, and Success (SERS) TNTech Science Olympiad Collegiate Scholars (SOCS)  
Tennessee Board of Regents  
Center: STEM  
Amount: \$50,000  
Co-PI(s): Stephanie Jorgensen, Andrea Arce-Trigatti

### **Darek Potter**

- Hub Operations & Innovative Educator Workshop  
U.S. Department of Defense via Battelle Memorial Institute  
Center: STEM  
Amount: \$30,562
- Student Engagement, Retention, and Success (SERS) Oakley STEM Ambassador Program  
Tennessee Board of Regents  
Center: STEM  
Amount: \$49,875  
Co-PI(s): Julie Baker

### **College of Engineering**

**Total: \$6,184,927**

#### ***Center for Energy Systems Research***

### **Satish Mahajan**

- Simulation of HF Inverter Circuits for High-Power Wireless Charging  
Oak Ridge National Laboratory  
Center: CESR  
Amount: \$24,210
- Typhoon Technology Transfer to TTU  
Appalachian Regional Commission via Upper Cumberland Development District  
Center: CESR  
Amount: \$50,000  
Co-PI(s): Michael Rogers

### ***CEROC***

### **Ambareen Siraj**

- 2020 Cyber Scholarship Program  
U.S. Department of Defense/National Security Agency  
Center: CEROC  
Amount: \$516,022  
Co-PI(s): Eric Brown
- 2020 GenCyber Student Camp at Tennessee Tech  
U.S. Department of Defense via National Security Agency/National Science Foundation  
Center: CEROC  
Amount: \$129,243

- Coalition Participation by Tennessee Tech  
U.S. Department of Defense/National Security Agency via Fordham University  
Center: CEROC  
Amount: \$124,376  
Co-PI(s): Eric Brown
- Junior Reserve Officer Training Corps (JROTC) Cyber Academy Pilot Program  
National Science Foundation via Whatcomm Community College  
Center: CEROC  
Amount: \$109,230  
Co-PI(s): Eric Brown
- Tennessee Cybercorps: A Hybrid Program in Cybersecurity  
National Science Foundation  
Center: CMR  
Amount: \$40,761  
Co-PI(s): Doug Talbert
- Tennessee Cybercorps: A Hybrid Program in Cybersecurity  
National Science Foundation  
Center: CMR  
Amount: \$579,840  
Co-PI(s): Doug Talbert

### ***Chemical Engineering***

#### **Pedro Arce**

- Biofoundry Design: Leveraging Biomimicry to Advance Environmental and Social Sustainability Innovation in Prototypes Developed in Foundry-Guided Undergraduate Chemical Engineering Courses  
Private  
Center: CMR  
Amount: \$30,000  
Co-PI(s): Robby Sanders, Stephanie Jorgensen, Andrea Arce-Trigatti

#### **Joe Biernacki**

- IUUSE/EHR: Improving Undergraduate Success Through Effective Critical Thinking (iUSE-CT)  
National Science Foundation  
Center: CESR  
Amount: \$107,605  
Co-PI(s): Barry Stein, George Chitiyo, Elizabeth Lisic, Indranil Bhattacharya

### **Stephanie Jorgensen**

- Student Engagement, Retention, and Success (SERS) Holistic Foundry Undergraduate Engaged Learners (FUEL)  
Tennessee Board of Regents  
Center: STEM  
Amount: \$50,000  
Co-PI(s): Pedro Arce, Robby Sanders, Michael Aikens, Stephanie Jorgensen

### **Liqun Zhang**

- Advanced Metal Anode with Artificial Solid Electrolyte Interphase (SEI) for Rechargeable Lithium Metal Batteries  
National Science Foundation via LiBama  
Center: CESR  
Amount: \$5,000

### ***Civil and Environmental Engineering***

#### **Steven Click**

- Southeastern Transportation, Research, Innovation, Development and Education Center  
U.S. Department of Transportation via University of Florida  
Center: CESR  
Amount: \$4,185  
Co-PI(s): Shirin Noei
- Southeastern Transportation, Research, Innovation, Development and Education Center  
U.S. Department of Transportation via University of Florida  
Center: CESR  
Amount: \$21,294  
Co-PI(s): Darrek Potter
- Southeastern Transportation, Research, Innovation, Development and Education Center  
U.S. Department of Transportation via University of Florida  
Center: CESR  
Amount: \$26,008  
Co-PI(s): Darrek Potter

#### **L.K. Crouch**

- Going Beyond ACI 332: Commercial/Residential Enhanced Durability Concrete: Phase III  
Private  
Center: CESR  
Amount: \$6,332

### **Tania Datta**

- An Interdisciplinary Approach to Understanding the Presence of Antibiotic Resistances and Antibiotic Resistant Bacteria in Urban Karst Groundwater Systems  
Private  
Center: Water  
Amount: \$3,000
- Assessing the Water Quality of the Shatt Al-Arab River in Basra Governorate and Developing Potential Mitigation Measures Through Student Driven Research  
U.S. Department of State via IREX  
Center: Water  
Amount: \$26,805
- Compilation and Analysis of Long-Term Nitrogen and Phosphorus Monitoring Data in TN  
U.S. Environmental Protection Agency (EPA) via Tennessee Department of Environment and Conservation  
Center: Water  
Amount: \$40,000

### **Alfred Kalyanapu**

- Development and Improvement of High-Resolution Flood2D-GPU Modeling for Titan HPC Environment  
Oak Ridge National Laboratory  
Center: Water  
Amount: \$37,500  
Co-PI(s): Sheikh Ghafoor
- Development and Improvement of High-Resolution Flood2D-GPU Modeling for Titan HPC Environment  
U.S. Department of Defense via Oak Ridge National Laboratory  
Center: Water  
Amount: \$37,500  
Co-PI(s): Sheikh Ghafoor
- Graduate Research Fellowship Program Evaluation of Nonlinear Interactions Between Tropical Cyclone Storm Surge and Rainfall-Runoff - John Brackins  
National Science Foundation  
Center: Water  
Amount: \$46,000  
Co-PI(s): John Brackins, Alice Camuti

### **Daniel VandenBerge**

- Academic Review and Rewrite of NACFAC-DM 7.02  
U.S. Department of Defense via National Institute of Building Sciences  
Center: CESR  
Amount: \$460,367
- Building Critical Thinking Skills Through Geotechnical Assignments  
Private  
Center: CESR  
Amount: \$5,000
- Update of UFC 3-220-10N Soil Mechanics (DM7.1)  
U.S. Department of Defense/U.S. Navy via Virginia Tech University  
Center: CESR  
Amount: \$30,000

### ***Computer Science***

#### **Gerald Gannod**

- Student Engagement, Retention and Success (SERS) Computer Science Academic Redshirt Program  
Tennessee Board of Regents  
Center: ORED  
Amount: \$49,960

#### **Sheikh Ghafoor**

- 2020 TTU NCAE-C Research - XiveNet: An Extensible, Innovative, and Open Architecture Testbed for In-Vehicle Network Security Research  
U.S. Department of Defense via National Security Agency  
Center: CEROC  
Amount: \$149,993  
Co-PI(s): Ambareen Siraj
- CC\* CRIA: Planning a Regional Research Network Infrastructure for Central Tennessee  
National Science Foundation via University of Tennessee Chattanooga  
Center: CESR  
Amount: \$71,728
- Collaborative Research: CyberTraining: Pilot: Semi-Automatic Assessment of Parallel Programs in Training of Students and Faculty  
National Science Foundation  
Center: CESR  
Amount: \$42,119  
Co-PI(s): Ada Haynes

- Collaborative Research: CyberTraining: Implementation: Medium: Broadening Adoption of Parallel and Distributed Computing in Undergraduate Computer Science and Engineering Curricula  
National Science Foundation  
Center: CESR  
Amount: \$23,789
- From Can't to Can: Attack Prevention & in-situ detection of Advanced Attacks on Controller Area Networks  
Oak Ridge National Laboratory  
Center: CESR  
Amount: \$11,978
- From Can't to Can: Attack Prevention & in-situ detection of Advanced Attacks on Controller Area Networks  
Oak Ridge National Laboratory  
Center: CESR  
Amount: \$10,888
- TRacking WAtER Storage in Lakes: Citizens and Satellites Implementation Phase  
National Aeronautics and Space Administration (NASA) via The University of North Carolina at Chapel Hill  
Center: CESR  
Amount: \$84,053

#### **Maanak Gupta**

- Collaborative Research: SaTC: EDU: Collaborative: Artificial Intelligence Assisted Malware Analysis  
National Science Foundation  
Center: CEROC  
Amount: \$60,292  
Co-PI(s): Sheikh K Ghafoor
- Collaborative Research: SaTC: EDU: Collaborative: Artificial Intelligence Assisted Malware Analysis  
National Science Foundation  
Center: CEROC  
Amount: \$16,000

#### **Muhammad Ismail**

- Enabling Efficient Integration of Electric Vehicles in Qatar's Smart Grid: Planning, Operation, and Cybersecurity  
International Foreign via Texas A&M Engineering Research Station at Qatar  
Center: CESR  
Amount: \$34,872



### **Akond Ashfaqe Ur Rahman**

- Collaborative Research: SaTC: TTP: Small: eSLIC: Enhanced Security for Static Analysis for Detecting Insecure Configuration Scripts  
National Science Foundation  
Center: CEROC  
Amount: \$76,275

### **Susmit Shannigrahi**

- CC\* Integration-Small: Error Free File Transfer for Big Science  
National Science Foundation via Colorado State University  
Center: CEROC  
Amount: \$69,121
- CC\* Integration-Large: N-DISE: NDC for Data Intensive Science Experiments  
National Science Foundation  
Center: CEROC  
Amount: \$35,636
- CC\* Networking Infrastructure: Creation of a Science DMZ and 10Gb/s Connection to Internet2 for Tennessee Tech University  
National Science Foundation  
Center: CEROC  
Amount: \$259,112  
Co-PI(s): Michael Rogers
- CCRI: Planning: Collaborative Research: Low-Latency for Augmented Reality Interactive Systems (LLARIS)  
National Science Foundation via Colorado State University  
Center: CEROC  
Amount: \$6,994

### ***Dean of Engineering Administration Office***

#### **Jessica Oswalt**

- Tennessee Louis Stokes Alliance for Minority Participation  
National Science Foundation via Tennessee State University  
Center: CESR  
Amount: \$26,100

#### **Joseph Slater**

- C&I Engineering Grant  
Tennessee Board of Architectural and Engineering Examiners  
Amount: \$42,766

## ***Manufacturing & Engineering Technology***

### **Ismail Fidan**

- Mobile Additive Manufacturing Platform for the 21st Century STEM Workforce Enhancement  
National Science Foundation via Sommerset Community College  
Center: CMR  
Amount: \$91,751
- SMART2: Smart Manufacturing for America's Revolutionizing Technological Transformation  
National Science Foundation via Motlow State Community College  
Center: CMR  
Amount: \$72,982

### **Duckbong Kim**

- Information and Communications Technology Promotion Development of Hybrid Learning-Driven Predictive Inspection-Metrology and Control Methods for Quality Assurance in Additive Manufacturing  
International Foreign  
Center: CMR  
Amount: \$100,000
- Information and Communications Technology Promotion Development of Hybrid Learning-Driven Predictive Inspection-Metrology and Control Methods for Quality Assurance in Additive Manufacturing  
International Foreign  
Center: CMR  
Amount: \$20,227
- Investigations into the Design Rules for the Control of Wire Arc Additive Manufacturing  
National Science Foundation  
Center: CMR  
Amount: \$76,009

### **Fred Vondra**

- Tennessee Tech Printed Tool Project  
Private  
Center: CMR  
Amount: \$47,096  
Co-PI(s): Ismail Fidan

## ***Electrical and Computer Engineering***

### **Ali Alouani**

- Intelligent Robot for TVA Substation Inspection  
Tennessee Valley Authority  
Center: CMR  
Amount: \$173,000

### **Indranil Bhattacharya**

- Investigating Early Transition Metal Dopant Effects in Cobalt Free Lithium Ion Batteries  
Oak Ridge National Laboratory  
Center: CESR  
Amount: \$29,430

### **Syed Rafay Hasan**

- Towards Efficient Deployment of Large CNNs for Real-Time Object Detection in Full High Definition (FHD) Video Streams Using Xilinx Vitis-AI  
Private  
Center: CMR  
Amount: \$49,466

### **Mohamed Mahmoud**

- Enabling Efficient Integration of Electric Vehicles in Qatar's Smart Grid: Planning, Operation, and Cybersecurity  
International Foreign via Texas A&M Engineering Research Station at Qatar  
Center: CESR  
Amount: \$30,264

### **Joseph Ojo**

- Control of Modular Multi-Dual Active Bridge Converters for Integrated Ship-Board Power System  
U.S. Department of Defense/Office of Naval Research  
Center: CMR  
Amount: \$125,001

### **Charles VanNeste**

- Quasi-Wireless Capacitive (QWiC) Surface Power for Adaptive and Reconfigurable Sensor Elements on Space Infrastructure  
National Aeronautics and Space Administration (NASA)  
Center: CESR  
Amount: \$60,405  
Co-PI(s): Satish Mahajan, Denis Ulybyshev, Maanak Gupta

## ***General & Basic Engineering***

### **Christopher Wilson**

- Governor's School for Emerging Technologies  
Tennessee Department of Education  
Center:  
Amount: \$133,973

## ***Manufacturing Center***

### **Ying Zhang**

- Development of Corrosion and Erosion Resistant Coatings for Advanced Ultra-Supercritical Materials  
U.S. Department of Energy  
Center: CMR  
Amount: \$199,178  
Co-PI(s): Jiahong Zhu
- Pack Aluminide Coatings on Steel Coupons  
Oak Ridge National Laboratory  
Center: CMR  
Amount: \$20,999

## ***Mechanical Engineering***

### **Mohammad Albakri**

- Cyber-Physical System Integrity and Security with Impedance Signatures  
National Science Foundation via Virginia Tech University  
Center: CMR  
Amount: \$26,714
- Cyber-Physical System Integrity and Security with Impedance Signatures  
National Science Foundation via Virginia Tech University  
Center: CMR  
Amount: \$31,929

### **Pingen Chen**

- Education Program for Connected and Automated Electric Vehicles (CAEVs)  
Private  
Center: CMR  
Amount: \$157,964  
Co-PI(s): Stephen Canfield, Syed Rafay Hasan, Steven Anton, Mohan Rao, Vahid Motevalli, Denis Ulybyshev

- Efficiency & Renewable Energy Developing an EV Demonstration Testbed in the Upper Cumberland Region of Tennessee, an Economy Distressed Rural Region  
U.S. Department of Energy  
Center: CMR  
Amount: \$155,133  
Co-PI(s): Stephen Canfield, Joseph Ojo, Indranil Bhattacharya, Vahid Motevalli
- Medium-Duty e-Truck: Pilot Electrified Fleets in Urban and Regional Applications  
U.S. Department of Energy via University of Texas Austin  
Center: CMR  
Amount: \$86,319  
Co-PI(s): Stephen Canfield

### **Jie Cui**

- Resiliency Tester "Bouncer" for Private Funder  
Private  
Center: CESR  
Amount: \$29,276  
Co-PI(s): Stephen Idem

### **Glenn Cunningham**

- Public-Private Partnership to Promote Efficient Manufacturing and Workforce Development  
U.S. Department of Energy  
Center: CMR  
Amount: \$84,585  
Co-PI(s): Ethan Languri
- Public-Private Partnership to Promote Efficient Manufacturing and Workforce Development  
U.S. Department of Energy  
Center: CMR  
Amount: \$25,000  
Co-PI(s): Ethan Languri

### **Stephen Idem**

- Standardized Test Method and Calculation Protocol for Determining and Reporting Annual Heat Rate for Coal-Fueled EGUs  
U.S. Department of Energy via McHale and Associates  
Center: CESR  
Amount: \$114,552

### **Ethan Languri**

- Southeast Combined Heat & Power Technical Assistance Partnership (CHP TAP)  
U.S. Department of Energy  
Center: CMR  
Amount: \$39,285  
Co-PI(s): Glenn Cunningham

### **Andy Pardue**

- University Design Challenge  
U.S. Department of Defense/U.S. Air Force Research Laboratory via DZYNE Technologies  
Center: CMR  
Amount: \$25,000

### **Rory Roberts**

- Atmosphere Independent Bipropellant Consuming Additively Manufactured Solid Oxide Fuel Cells (SOFCs) for Assured On-Orbit Space Power  
U.S. Department of Defense via Southwestern Ohio Council for Higher Education  
Center: CMR  
Amount: \$68,080
- Cryo Thermal Management of High Power Density Motors and Drives  
U.S. Department of Energy via Hyper-Tech  
Center: CMR  
Amount: \$45,420
- Hypersonic Onboard Power and Thermal Management System  
U.S. Department of Defense via Special Power Sources  
Center: CESR  
Amount: \$150,000

### **Arman Sargolzaei**

- MRI: Hardware/Vehicle-in-the-Loop Environment for Verification of Connected and Autonomous Vehicles  
National Science Foundation via Florida Polytechnic University  
Center: CESR  
Amount: \$148,935

### **Ahmadreza Vasselbehagh**

- Development of a Laser-Based System for Maintenance of Ice Condensers  
Tennessee Valley Authority  
Center: CESR  
Amount: \$185,000  
Co-PI(s): Satish Mahajan

## College of Fine Arts

Total: \$13,160

### *Craft Center Workshops*

#### Gail Gentry

- Celebration of Craft  
Tennessee Arts Commission via Upper Cumberland Development District  
Center: Craft Center  
Amount: \$1,760
- Celebration of Craft  
Private  
Center: Craft Center  
Amount: \$2,500
- Empowering High School Art Educators to Lead Craft Lessons in the Classroom  
Private  
  
Center: Craft Center  
Amount: \$6,250  
Co-PI(s): Jeremy Blair

### *Music*

#### Daniel Allcott

- National String Project Site  
Private  
Amount: \$2,650  
Co-PI(s): Mia Hagarty

## College of Interdisciplinary Studies

Total: \$169,348

### *Dean College of Interdisciplinary Studies*

#### Mike Gotcher

- Bridging the Digital Divide: Connecting Rural Students  
Tennessee Board of Regents  
Amount: \$97,216  
Co-PI(s): Ferdinand DiFurio, Yolunda Nabors

### *Environmental Studies Undergraduate*

#### Tammy Boles

- Creating a Novel Method for Determining PMI with Use of Raman Spectroscopy  
Private  
Amount: \$5,000  
Co-PI(s): Bethann Oberlander

**Hayden Mattingly**

- Life History Study of Brawley's Fork Crayfish  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$15,000
- Range-wide Population for the Striated Darter  
U.S. Fish and Wildlife Service via Tennessee Wildlife Resources Agency  
Center: Water  
Amount: \$21,000  
Co-PI(s): Christopher Wheeler
- Species Status Assessments for Two Tennessee Crayfishes Proposed for Federal Listing under the U.S. Endangered Species Act, 6/16/2020  
U.S. Department of the Interior/USGS  
Center: Water  
Amount: \$31,132

**Office of the President**

**Total: \$50,000**

***Multicultural Affairs***

**Charria Campbell**

- Student Engagement, Retention, and Success (SERS) R.A.C.E. Plus  
Tennessee Board of Regents  
Amount: \$50,000  
Co-PI(s): Elizabeth Powell

**Planning & Finance**

**Total: \$680,925**

***Sustainability Office***

**DeLayne Miller**

- Purple Pride Going Green  
Private  
Amount: \$10,000

***Vice President for Planning and Finance***

**Claire Stinson**

- THEC Coronavirus Relief Fund  
U.S. Department of the Treasury (TREAS) via Tennessee Higher Education Commission  
Amount: \$670,925  
Co-PI(s): Emily Wheeler



## **Research & Economic Development**

**Total: \$334,174**

### ***Office of VP Research & Economic Development***

#### **Michael Aikens**

- Tennessee Center for Rural Innovation (TCRI)  
U.S. Department of Commerce via EDA  
Center: ORED  
Amount: \$118,000
- TCRI CARES: EDA CARES Act Recovery Assistance Invitation to University Centers  
U.S. Department of Commerce via EDA  
Center: ORED  
Amount: \$180,012

### ***Water Center***

#### **Jeffrey Schaeffer**

- Analysis of Road-Stream Crossings in the Elk River Watershed, AL/TN to Address Threats to Listed and At-Risk Species  
U.S. Fish and Wildlife Service  
Center: Water  
Amount: \$36,162

## **Whitson Hester School of Nursing**

**Total: \$752,743**

### ***Nursing Instruction***

#### **Mary Fornehed**

- The Effectiveness of Concurrent Hospice Care to Improve Pediatric and Family Outcomes at End of Life  
National Institutes of Health via University of Tennessee Knoxville  
Amount: \$95,222
- The Effectiveness of Concurrent Hospice Care to Improve Pediatric and Family Outcomes at End of Life  
National Institutes of Health via University of Tennessee Knoxville  
Amount: \$93,496

#### **Ann Hellman**

- Tech ASPIRES (Advocacy and SANE Practice In a Rural Educational Setting)  
U.S. Department of Justice  
Center: ORED  
Amount: \$97,395  
Co-PI(s): Shelia PHurley

### **Shelia Hurley**

- Project to Improve Quality of Life and/or Quality of Care for Tennessee Nursing Home Residents  
Tennessee Department of Health  
Center: ORED  
Amount: \$204,458  
Co-PI(s): Ann Hellman

### **Barbara Jared**

- New Simulation Equipment for Whitson-Hester School of Nursing, Center for Clinical Simulation at Tennessee Technological University  
Appalachian Regional Commission  
Amount: \$250,000  
Co-PI(s): Kim Hanna, Jason Hurley

### **Susan Piras**

- TTU: CRMC Nursing Research Collaboration  
Cookeville Regional Medical Center  
Amount: \$12,172

## **State Appropriations/Center Testing Accounts**

### ***Center for Energy Systems Research***

- State Appropriation: \$1,002,200
- Center Testing Account: \$5,562

### ***Center for Manufacturing Research***

- State Appropriation: \$1,613,400
- Center Testing Account: \$12,354

### ***Center for the Management, Utilization and Protection of Water Resources***

- State Appropriation: \$1,231,600
- Center Testing Account: \$62,416

### ***Cybersecurity Education, Research and Outreach Center***

- State Appropriation: \$500,000

# APPENDIX B

## Intellectual Property Activity 2020-21

### Invention disclosures received

- Novel Layered Double Dee Coil for Wireless Power Transfer Applications – Dr. Bhattacharya and Muhammed Nima
- Method and Apparatus for Generating Electrical Based Solition Waves in Natural Terrestrial Environments – Dr. Charles VanNeste
- Antimicrobial Peptides and Their Derivatives as Novel Therapeutics to Treat Viral Related Illnesses – Dr. Liqun Zhang

### Copyrightable work disclosure received

- Dr. Stephen Robinson disclosed his work on a set of research-based curriculum materials as part of an NSF grant with South Dakota State University. Royalty share was discussed by the committee and turned over to Attorney Bahou for review. In the next meeting, Attorney Bahou ascertained that the material created by Dr. Robinson in conjunction with SDSU was copyrightable, and a co-license would need to be created with SDSU so that Tennessee Tech can share in any profits. Attorney Bahou was to follow up on this item.

### Provisional patent applications filed

- Novel Layered Double Dee Coil for Wireless Power Transfer Applications – Dr. Bhattacharya and Muhammed Nima
- Method and Apparatus for Generating Electrical Based Solition Waves in Natural Terrestrial Environments – Dr. Charles VanNeste

### Abandon/return to inventor

- Handheld Device to Detect Troponin Levels
- Supportive Incontinence Protection Pads
- Skin to Skin Simulation for Micropreemies

**INTELLECTUAL PROPERTY PORTFOLIO**

as of June 29, 2021

<b>Title</b>	<b>Country Code</b>	<b>Status</b>	<b>Application Number</b>	<b>Filing Date</b>	<b>Patent Number</b>	<b>Issue Date</b>
Thermoresponsive Microparticle Composite Hydrogels for Electrophoresis	US	Issued	12/275,253	11/21/2008	8,177,950	5/15/2012
Apparatus and Method for Monitoring and Evaluating Greensand Molds	US	Issued	12/569,083	9/29/2009	8,205,663	6/26/2012
Wind Aeolipile	US	Issued	12/592,119	11/19/2009	8,591,174	11/26/2013
Tracked Climbing Machine with Compliant Suspension Apparatus	US	Issued	12/657,962	1/29/2010	8,567,536	10/29/2013
Differential Sand Compaction Sensor	US	Issued	13/204,677	8/6/2011	8,890,549	11/18/2014
Tracked Climbing Machine with Compliant Suspension Apparatus	US	Issued	14/061,369	10/23/2013	10,232,896	3/19/2019
Wind Aeolipile	US	Issued	14/090,280	11/26/2013	9,765,755	9/19/2017
Differential Sand Compaction Sensor	US	Issued	14/547,114	11/18/2014	10,816,496	10/27/2020
Fluidic System for High Throughput Preparation of Microparticles and Nanoparticles	US	Issued	15/312,569	11/18/2016	10,449,150	10/22/2019
Advanced Selectively Gas Permeable Anode Flow Field Design for Efficient Removal of Carbon Dioxide in a Direct Formic Acid Fuel Cell	US	File Non-Provisional	62/462,970	2/24/2017		
Wind Aeolipile	US	Allowed	15/709,199	9/19/2017		

Apparatus, System, and Method for Integrated Real Time Low Cost Automatic Load Disaggregation Remove Monitoring, and Control	US	Issued	15/827,036	11/30/2017	10,770,918	9/8/2020
Advanced Selectively Gas Permeable Anode Flow Field Design for Efficient Removal of Carbon Dioxide in a Direct Formic Acid Fuel Cell	US	Allowed	15/905,573	2/26/2018		
Tracked Climbing Machine with Compliance Suspension Apparatus	US	Published	16/358,551	3/19/2019		
Apparatus Used for Producing Coatings	US	File Non-Provisional	62/921,968	7/18/2019		
Modifying Hydrogels by Applied Electrical Field	US	Closed	62/973,295	9/27/2019		
Reduced-Temperature Sintering of Spinel-Type Coatings and Layers with Metallic Alloy Powder Precursors	US	File Non-Provisional	62/911,734	10/7/2019		
Advanced Selectively Gas Permeable Anode Flow Field Design for Efficient Removal of Carbon Dioxide in a Direct Formic Acid Fuel	US	Do Nothing	62/912,860	10/9/2019		
Omnidirectional, Electric Near-Field Distance Sensing Device	US	Published	16/839,015	4/2/2020		
Endotracheal Tubing Suction-Enabled Stylet	US	Closed	63/016,042	4/27/2020		
Apparatus and Process for Producing Coatings	US	Published	16/933,387	7/20/2020		
Apparatus, System, and Method for Integrated Real Time Low Cost Automatic Load Disaggregation, Remote Monitoring, and Control	US	Published	17/014,065	9/8/2020		
Reduced-Temperature Sintering of Spinel-Type Coatings and Layers with Metallic Alloy Powder Precursors	US	Published	17/065,158	10/7/2020		

Method and System for Generating Electric Based Non-Linear Waves in Natural Terrestrial Environments	US	Pending	63/107,575	10/30/2020		
Layered Double-D Coil for Wireless Power Transfer Systems	US	Pending	63/126,944	12/17/2020		
System and Method for Drug Assisted Wound Drainage Line	US	Pending	17/331,278	5/26/2021		

# APPENDIX C

## Faculty Research Grant Awards 2020-21 (to be implemented in 2021-2022)

### Track I

Author(s)	Title	Dept.	Amount
Michael Olsen	Teacher-Talk Database for L2 Spanish	Foreign Languages	\$3,000
Yi Peng	Consumer Animosity: The Moderating Roles of Brand Familiarity and Country-Brand Image Congruence	Economics, Finance & Marketing	\$3,000
Alexander Shibakov	Quantum Push-Down Machines and Their Classical Applications	Mathematics	\$3,000
<b>Total Track I</b>			<b>\$9,000</b>

### Track II

Author(s)	Title	Dept.	Amount
Indranil Bhattacharya	Investigating Effects of Smaller-Ionic Radius Vanadium Doping on Stability and Electrochemical Performance of Next Generation Sodium-Ion Batteries	Electrical and Computer Engineering	\$10,000
Jesse Carrick	Exploration of Resocrylic Acid Lactones as Sources of Potentially Novel Anticancer Chemotherapeutics	Chemistry	\$9,750
Tania Datta	Quantifying Microplastics from Tennessee's Wastewater Treatment Plants into Receiving Streams	Civil and Environmental Engineering	\$10,000
Wilson Gichuhi	A Deeper Look at Non-Born Oppenheimer Effects in the Negative Ion Photoelectron Spectra of Selected Polyaromatic Anions	Chemistry	\$9,995
Robert Henderson	Development of an Engineering Research Center for Construction and Building Information Modeling (CCBIM)	Civil and Environmental Engineering	\$10,000
Stephen Idem	Optimization of Biodiesel Production from Waste Vegetable Oil	Mechanical Engineering	\$10,000
Brian Leckie	Cover Crop Allelopathic Impacts on Subsequent Market Crops	Agriculture	\$10,000
Cynthia Rice	Selectively Gas Permeable Anode Flow Field for Direct Formic Acid Fuel Cells	Chemical Engineering	\$10,000
Arman Sargolzaei	Secure Design of Connected Automated Vehicles Under System Identification Attacks	Mechanical Engineering	\$10,000
Denis Ulybyshev	Mobile Navigation, Object Detection, Recommendation and Notification Software Assistant for Visually Impaired People in Campuses and Smart Cities	Computer Science	\$9,995
Ahmad Vasselbehagh	Understanding and Modeling of Thermal Transport Processes within Near-Ground Atmosphere Presence of Utility-Scale Solar Photovoltaics (PV) Plants	Mechanical Engineering	\$10,000
Liqun Zhang	Interactions of Human Beta Defensin and SARS-CoV-2 Spike RBD Natural Mutants	Chemical Engineering	\$10,000
<b>Total Track II</b>			<b>\$119,740</b>