TENNESSEE TECH UNIVERSITY

OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT ANNUAL REPORT

2021-2022

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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 comply with Tennessee Tech, state, sponsor, and federal regulations
- Contribute to start-up packages
- Provide faculty initiation grants
- Assist faculty in all matters regarding intellectual property protection and commercialization

SUMMARY

The bullets below summarize some of the key results from fiscal year 2021-22:

- Total external funding in the amount of $23,647,427 was received for the 2022 Fiscal Year (July 1, 2021 – June 30, 2022). This represents a 4% increase from the total amount of external funding received in Fiscal Year 2021 ($22,770,651).

- State appropriations totaling $3,917,400 were received by the three Centers of Excellence and CEROC with an additional $87,017 received through Center testing accounts, representing 17% and 0.4% of total external funding received, respectively.

- Grants and contracts externally funded numbered 183 with a value of $23,560,410, representing 99% of total external funding.

- Grants and contracts sponsored by private entities, including industry and foundations, numbered 18 with a value of $788,811.

- The top funding agencies were the National Science Foundation ($3,174,265), U.S. Department of Education ($1,412,000), U.S. Department of Energy ($1,209,513), and Tennessee Wildlife Resources Agency ($1,219,611).

- Proposals submitted for external funding numbered 189 with a value of $77,518,411.

- Intellectual Property: two scholarly works were copyrighted, two inventions were disclosed, two provisional applications were filed, and there were no non-provisional applications published.

- Internal funds were provided in the amount of $100,638 for small grants to support faculty research. Three Track I proposals were funded for a total of $8,925, and four Track II proposals were funded for a total of $19,998. A new Track II was added this year, and there were four of those funded for a total of $71,715.

LIST OF TABLES

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NOTES

The tables and figures on the following pages show the proposals and activations for FY 2022 (July 1, 2021 – June 30, 2022) 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.

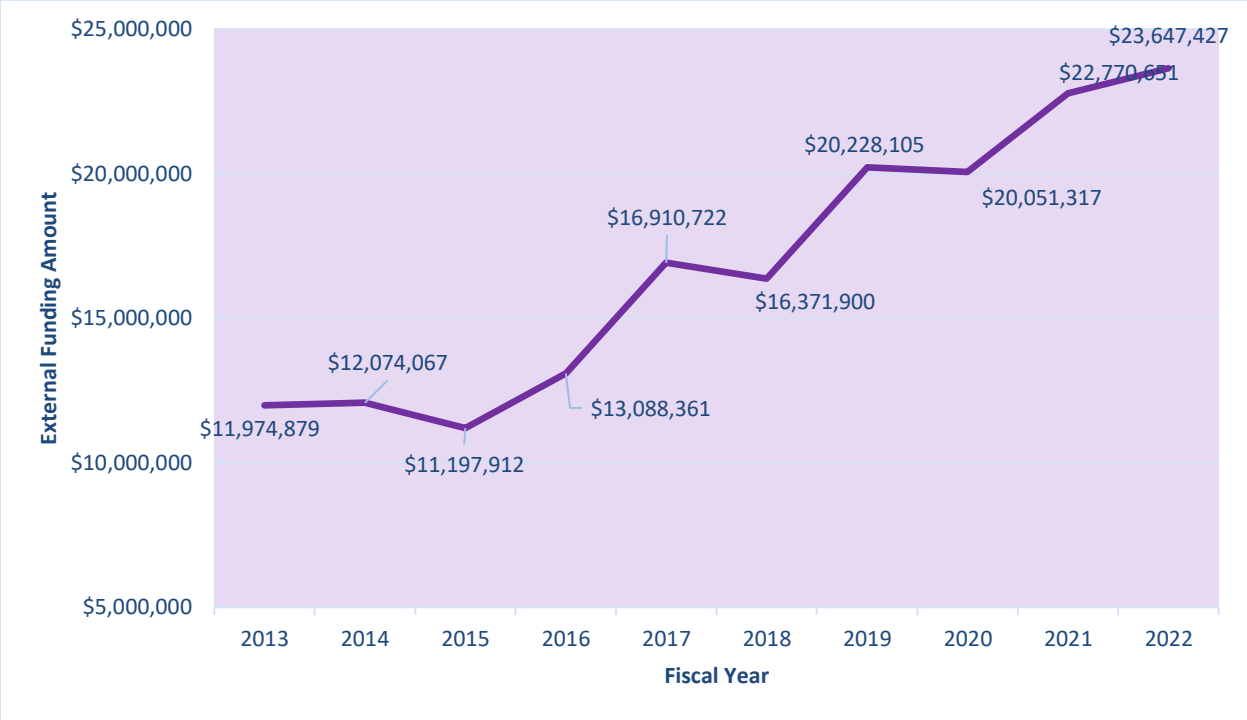

Figure 1
Total External Funding Received Historical (FY 2013-2022)

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

PI's College	*PI's Department, Center, Unit*	*Energy Center*	*Manufacturing Center*	*Water Center*	*STEM Center*	*CEROC*	*Department/ Other Units*	*Total*
Agriculture and Human Ecology	Agriculture			$25,000			$260,863	$285,863
	Human Ecology						$772,880	$772,880
	Subtotal			**$25,000**			**$1,033,743**	**$1,058,743**
Arts and Sciences	Biology			$1,030,884			$242,381	$1,273,265
	Chemistry						$325,554	$325,554
	Cooperative Fisheries Research			$972,565				$972,565
	Earth Sciences						$20,320	$20,320
	Physics	$82,000			$40,284		$69,407	$191,691
	Sociology and Political Science						$88,754	$88,754
	Subtotal	**$82,000**	**$0**	**$2,003,449**	**$40,284**	**$0**	**$746,416**	**$2,872,149**
Business	iCube						$2,510,430	$2,510,430
	Decision Sciences and						$161,772	$161,772
	Economics, Finance and						$179,656	$179,656
	Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$2,851,858**	**$2,851,858**
Education	Child Development Lab						$406,875	$406,875
	Counseling and Psychology						$39,909	$39,909
	Curriculum and Instruction				$74,363		$2,868,528	$2,942,891
	Dean's Office				$166,667			$166,667
	STEM Center				$35,000			$35,000
	Teacher Education						$2,970	$2,970
	Subtotal	**$0**	**$0**	**$0**	**$276,030**	**$0**	**$3,318,282**	**$3,594,312**
Engineering	Basic Engineering						$133,973	$133,973
	Chemical Engineering	$109,742	$75,051					$184,793
	Civil and Environmental	$187,668		$80,000			$2,450	$270,118
	Computer Science	$633,390				$877,862	$47,940	$1,559,192
	CEROC					$1,634,328		$1,634,328
	CESR	$436,190						$436,190
	CMR		$84,072					$84,072
	Dean's Office	$63,592					$140,000	$203,592
	Electrical and Computer	$207,452	$358,030					$565,482
	Manufacturing & Engineering		$465,067				$15,000	$480,067
	Mechanical Engineering	$1,177,307	$751,061				$51,262	$1,979,630
	Subtotal	**$2,815,341**	**$1,733,281**	**$80,000**	**$0**	**$2,512,190**	**$390,625**	**$7,531,437**
Fine Arts	Appalachian Center for Craft						$15,300	$15,300
	Music						$1,100	$1,100
	Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$16,400**	**$16,400**
Interdisciplinary Studies	Dean's Office							$0
	Environmental Studies			$13,929			$66,065	$79,994
	Interdisciplinary Studies						$30,000	$30,000
	Subtotal	**$0**	**$0**	**$13,929**	**$0**	**$0**	**$96,065**	**$109,994**
Nursing	Nursing						$1,085,426	$1,085,426
	Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,085,426**	**$1,085,426**
Other	Graduate Studies			$46,000				$46,000
	Library						$4,000	$4,000
	Multicultural Affairs							$0
	Office of Research and Economic Development						$15,000	$15,000
	TN Center for Rural Innovation						$404,586	$404,586
	Water Center			$53,105				$53,105
	Subtotal	**$0**	**$0**	**$99,105**	**$0**	**$0**	**$423,586**	**$522,691**
Centers of Excellence State Appropriations								
	Energy Center Appropriation	$1,030,800						$1,030,800
	Energy Center Testing	$0						$0
	Manufacturing Center		$1,638,100					$1,638,100

and Testing Accounts	Manufacturing Center Testing		$7,350					$7,350
	Water Center Appropriation			$1,248,500				$1,248,500
	Water Center Testing			$79,667				$79,667
	Subtotal	**$1,030,800**	**$1,645,450**	**$1,328,167**				**$4,004,417**
Total	**All Units**	**$3,928,141**	**$3,378,731**	**$3,549,650**	**$316,314**	**$2,512,190**	**$9,962,401**	**$23,647,427**

Table II: Proposals and Activations by University Unit

University Unit	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Agriculture	1	$400	3	$285,863
Basic Engineering	1	$133,973	1	$133,973
Biology	14	$3,234,751	21	$1,273,265
Chemical Engineering	6	$4,640,229	2	$184,793
Chemistry	2	$125,000	2	$325,554
Civil and Environmental Engineering	9	$1,109,958	8	$270,118
Center for Energy Systems Research (CESR)	2	$345,406	3	$436,190
Center for Manufacturing Research (CMR)	4	$10,779,693	2	$84,072
Center for Rural Innovation (TCRI)	3	$1,269,140	5	$404,586
Child Development Lab	1	$5,000	3	$406,875
Computer Science	28	$8,027,546	18	$1,559,192
Cooperative Fishery Research Unit	7	$1,291,534	10	$972,565
Counseling and Psychology	4	$455,369	4	$39,909
Craft Center	4	$28,999	4	$15,300
Curriculum and Instruction	7	$3,833,247	17	$2,942,891
Cybersecurity Education, Research and Outreach Center (CEROC)	1	$61,725	7	$1,634,328
Dean's Office: Education	0	$0	1	$166,667
Dean's Office: Engineering	4	$267,042	3	$203,592
Decision Sciences and Management	1	$91,772	2	$161,772
Earth Sciences	3	$536,171	1	$20,320
Economics, Finance and Marketing	1	$161,956	2	$179,656
Electrical and Computer Engineering	22	$15,893,723	7	$565,482
Environmental Studies	1	$15,000	2	$79,994
Graduate Studies	0	$0	1	$46,000
Human Ecology	3	$832,880	2	$772,880
iCube	3	$620,438	8	$2,510,430
Information Technology Services	1	$1,577,860	0	$0
Interdisciplinary Studies	3	$140,428	1	$30,000
Library	1	$5,000	1	$4,000
Manufacturing and Engineering Technology	14	$6,143,653	13	$480,067
Mathematics	1	$1,499,731	0	$0
Mechanical Engineering	25	$12,258,893	12	$1,979,630
Music	0	$0	1	$1,100
Nursing	4	$878,109	6	$1,085,426
Office of Research and Economic Development	2	$1,015,000	1	$15,000
Physics	0	$0	4	$191,691
Provost's Office	1	$41,151	0	$0
Sociology and Political Science	1	$58,754	2	$88,754
STEM Center	3	$135,000	1	$35,000
Teacher Education	1	$3,880	1	$2,970
Water Center	0	$0	1	$53,105
Subtotal	**189**	**$77,518,411**	**189**	**$19,260,764**
CESR State Appropriation/Testing	---	---	---	$1,030,800
CMR State Appropriation/Testing	---	---	---	$1,645,450
Water Center State Appropriation/Testing	---	---	---	$1,328,167
Total	**189**	**$77,518,411**	**189**	**$23,647,427**

Table III: Proposals Submitted and Activations Administered Through Centers

University Unit	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Cybersecurity Education, Research and Outreach Center				
CEROC	1	$501,418	6	$1,484,332
Computer Science	20	$5,508,830	10	$1,027,858
ITS: Systems Support	1	$1,577,860	0	$0
Total	*22*	*$10,577,024*	*16*	*$2,512,190*
Appalachian Center for Craft				
Appalachian Center for Craft	4	$28,999	4	$15,300
Total	*4*	*$28,999*	*4*	*$15,300*
Center for Energy Systems Research				
CESR	4	$457,131	3	$436,190
Chemical Engineering	3	$3,775,241	1	$109,742
Civil and Environmental Engineering	5	$910,433	5	$187,668
Computer Science	5	$1,372,814	8	$633,390
Electrical and Computer Engineering	13	$12,282,411	4	$207,452
Manufacturing and Engineering Technology	1	$36,834		
Mechanical Engineering	10	$2,505,719	4	$1,177,307
Physics	0	$0	1	$82,000
Dean's Office: Engineering	0	$0	2	$63,592
Student Success	1	$39,550		
State Appropriation	---	---	---	$1,030,800
Center Testing Account	---	---	---	$0
Total	42	*$21,380,133*	*28*	*$3,928,141*
iCube				
iCube	2	$445,438	8	$2,510,430
Total	*2*	*$445,438*	*8*	*$2,510,430*

Center for Manufacturing Research				
CMR	4	$10,779,693	2	$84,072
Chemical Engineering	2	$646,208	1	$75,051
Computer Science	2	$644,484	0	$0
Electrical and Computer Engineering	6	$3,137,022	3	$358,030
Manufacturing and Engineering Technology	13	$6,106,819	12	$465,067
Mechanical Engineering	14	$9,456,431	7	$751,061
State Appropriation	---	---	---	$1,638,100
Center Testing Account	---	---	---	$7,350
Total	*41*	*$30,770,657*	*25*	*$3,378,731*
STEM Center				
Curriculum and Instruction	3	$3,185,598	2	$74,363
Dean's Office: Education	0	$0	1	$166,667
Electrical and Computer Engineering	1	$198,290		
Exercise Science	0	$0		
Physics	0	$0	1	$40,284
STEM Center	3	$135,000	1	$35,000
Total	*7*	*$3,518,888*	*5*	*$316,314*
Tennessee Center for Rural Innovation				
Office of Research and Economic Development	1	$20,182	0	$0
Center for the Management, Utilization and Protection of Water Resources				
Agriculture	0	$0	1	$25,000
Biology	8	$3,021,359	9	$1,030,884
Civil and Environmental Engineering	3	$104,216	2	$80,000
Cooperative Fisheries Research Unit	5	$777,210	10	$972,565
Earth Sciences	2	$435,088	0	$0
Environmental Studies	1	$15,000	1	$13,929
Graduate Studies	0	0	1	$46,000
Water Center	0	$0	1	$53,105

State Appropriation	---	---	---	$1,248,500
Center Testing Account	---	---	---	$79,667
Total	*19*	*$4,352,873*	*25*	*$3,549,650*

Table IV: Proposals and Activations by Funder Classification				
Classification	*# of Proposals*	*Amount Requested*	*# of Activations*	*Amount Activated*
Federal	113	$67,187,373	125	$14,801,160
State	41	$7,878,349	26	$3,660,658
Private	29	$2,330,607	18	$788,811
International Foreign	3	$73,448	11	$345,673
Local	3	$48,634	3	$46,708
State Appropriations	---	---	---	$3,917,400
Center Testing Accounts	---	---	---	$87,017
Total	**189**	**$77,518,411**	**182**	**$23,647,427**

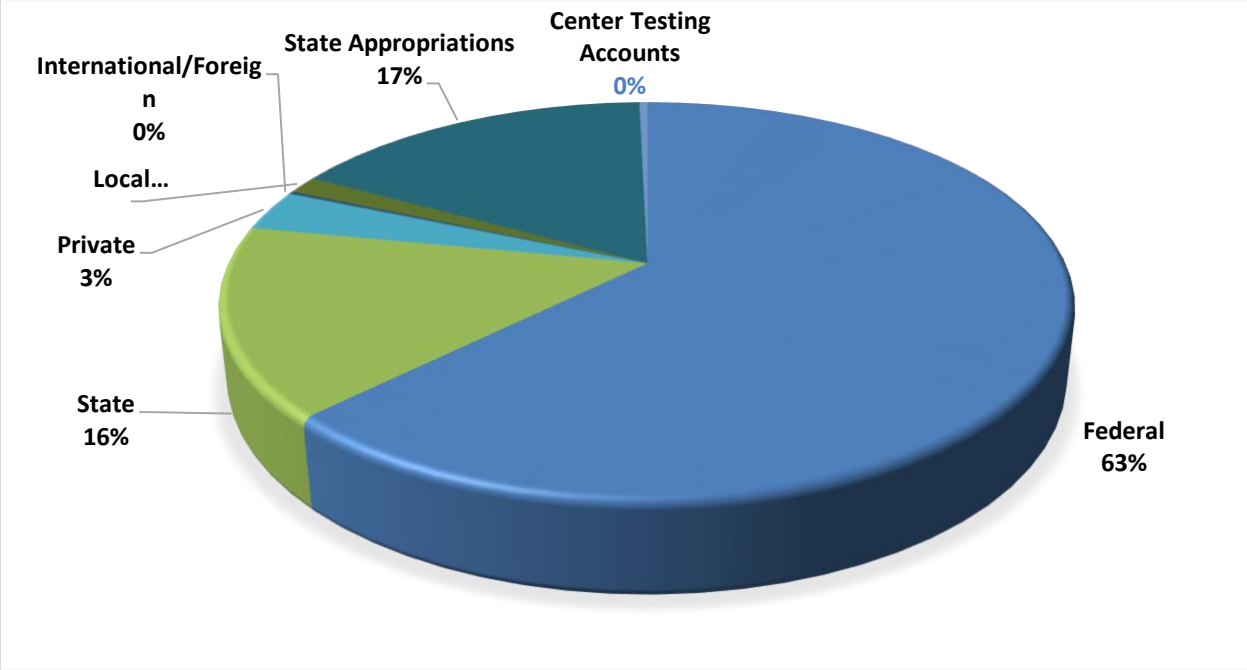

Figure 2
Percentage of Total Activation Amount by Funder Classification

Table V: Federal Activations by Agency*		
Federal Agency	*# of*	*Amount*
U.S. Department of Transportation	6	$1,012,552
National Highway Traffic Safety Administration	*1*	*$1,066,720*
National Science Foundation	25	$2,989,680
U.S. Department of Interior	22	$1,722,333
U.S. Fish and Wildlife Service	*13*	*$1,220,268*
U.S. Geological Survey	*6*	*$371,090*
National Park Service	*1*	*$24,975*
U.S. Department of Energy	8	$1,802,883
U.S. Environmental Protection Agency	1	$2,450
Appalachian Regional Commission	1	$345,465
Electric Power Research Institute	1	$43,665
Advanced Research Projects Agency-Energy	1	$51,262
U.S. Department of Defense	12	$532,930
Army Corps of Engineers	*1*	*$10,000*
Battelle Memorial Institute	*9*	*$350,890*
U.S. Department of Education	3	$738,667
National Safety Council	1	$75,000
U.S. Department of Agriculture	2	$96,416
Tennessee Valley Authority	1	$250,000
Institute of Museum and Library Services	1	$53,122
Federal Emergency Management Agency	2	$34,909
U.S. Department of Health and Human Services	6	$980,357
Centers for Disease Control and Prevention	*3*	*$384,733*
Substance Abuse and Mental Health Services Administration	*1*	*$30,000*
National Aeronautics and Space Administration	3	$125,603
Department of Intellectual and Developmental Disabilities	4	$755,950
U.S. Department of Justice	1	$201,202
Small Business Administration	6	$444,656
National Security Agency	6	$818,658
U.S. Fish and Wildlife Service	13	$1,220,268
Economic Development Agency	2	$237,988
Total	128	$14,536,016

*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	2	$42,492	3	$77,211
Capital Project/Operation/Maintenance	0	$0	0	$0
Institutional Support	0	$0	0	$0
Instruction	0	$0	4	$74,842
Public Service	15	$2,278,518	40	$7,894,358
Research	168	$74,784,815	132	$11,234,512
Student Services/Scholarship/Fellowships	4	$412,586	4	$362,087
State Appropriations	---	---	---	$3,917,400
Center Testing Accounts	---	---	---	$87,017
Total	**189**	**$77,518,411**	**183**	**$23,647,427**

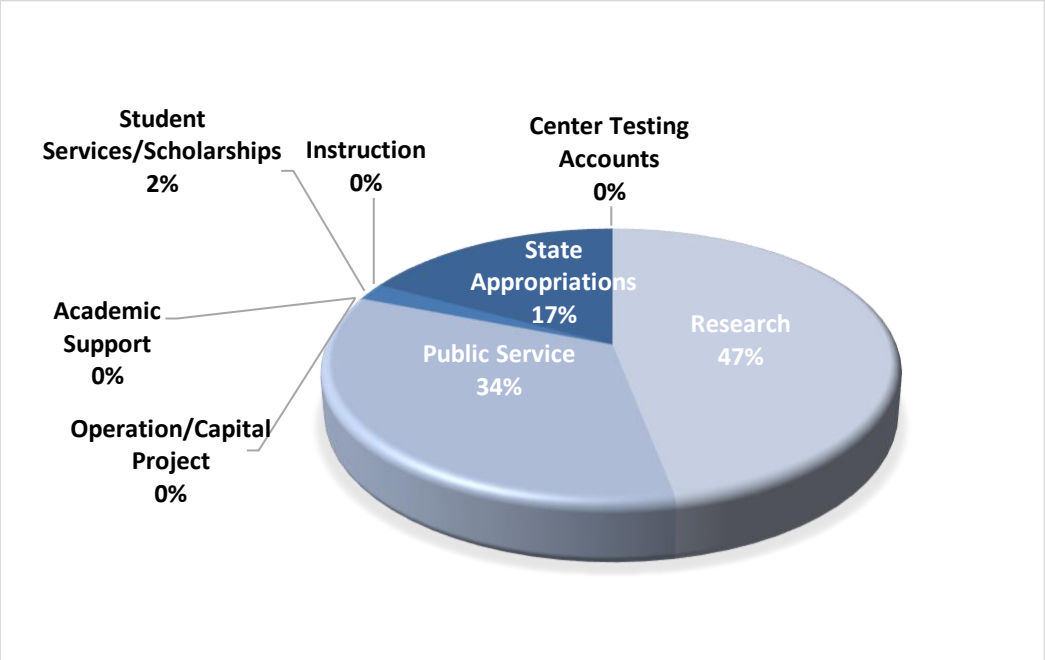

Figure 3
Percentage of Total Activation Amount by Activity

Table VII: Proposals and Activations: FY 2018 - 2022					
	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Number of proposals submitted	180	168	194	215	189***
Number of unique individuals who served as PI on a proposal	82	94	96	100	93
Amount requested	$50,570,708	$49,340,424	$40,117,231	$83,620,080	$77,518,411
Number of unique individuals (Co-PIs) involved in these proposals	117	124	137	163	106
Funded	79 (44%)	96 (57%)	105 (54%)	78 (36%)	47 (25%)
Not Funded	101 (56%)	72 (43%)	89 (46%)	137 (64%)	4 (2%)
Number of project activations	162	149	154	172	182***
Amount of project activations	$12,611,134	$15,934,931	$15,711,287	$18,343,119	$19,643,010***
Number of unique individuals who served as PI on an activation	106	107	108	131	78
State Appropriations/Center Testing Accounts	$3,760,766	$4,293,174	$4,340,030	$4,427,532	$4,004,417
Total amount of external funding	$16,371,900	$20,228,105	$20,051,317	$22,770,651	$23,647,427

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

Table VIII: Activation Amounts By Classification FY 2018-22

Fiscal Year	Federal		State		Private		International Foreign		Local	
	#	Activation Amount	#	Activation Amount	#	Activation Amount	#		#	Activation Amount
2018	100	$9,618,095	40	$2,447,751	22	$545,288	0	$0	0	$0
2019	95	$11,757,420	34	$3,073,033	18	$1,023,557	0	$0	2	$80,921
2020	98	$11,803,424	27	$3,170,659	21	$530,222	7	$194,929	1	$12,063
2021	122	$14,344,525	26	$3,306,830	19	$494,229	4	$185,363	1	$12,172
2022	125	$14,801,160	26	$3,660,658	18	$788,811	11	$345,673	3	$46,708

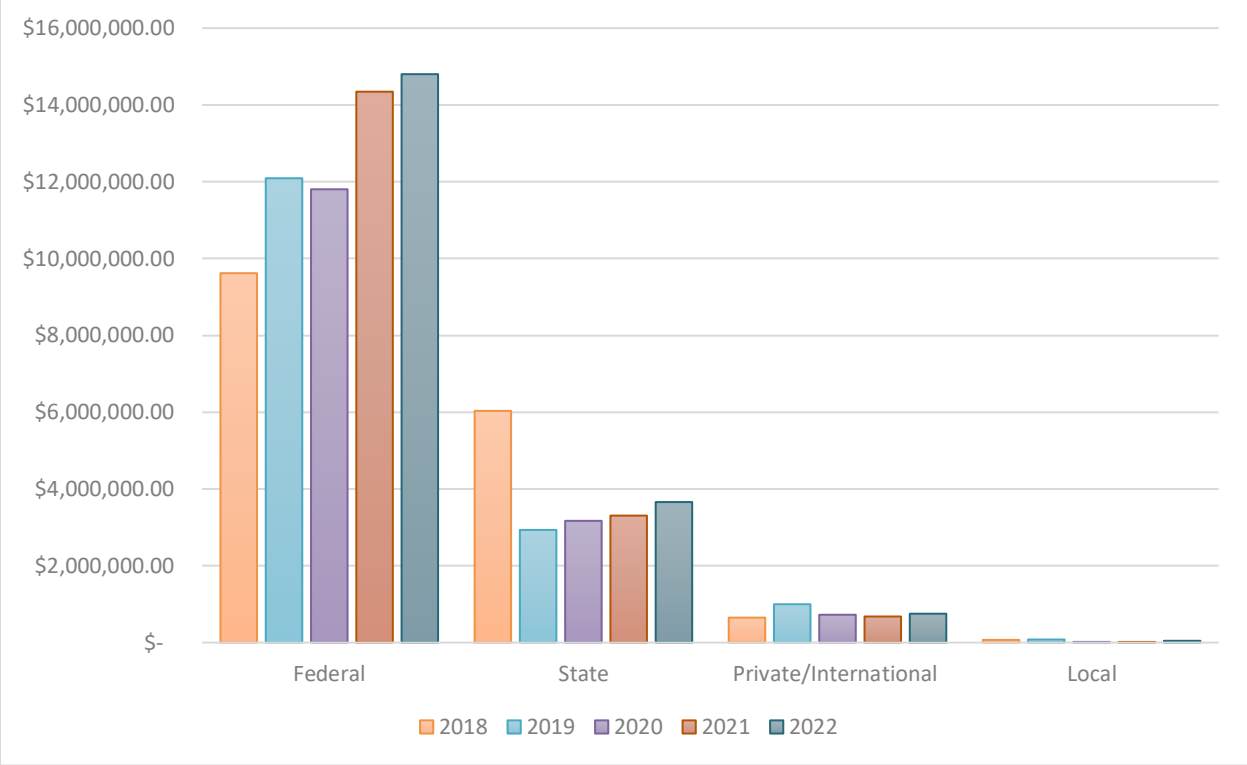

Figure 4
Awards Received by Classification

Table IX: Activation Amounts by Activity Type
FY 2018-22

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*
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
2022	132	$11,234,512	40	$7,894,358	4	$74,842	3	$77,211	4	$362,087	0	$0	$4,004,417

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. This year's event was the first in person since 2019 because of the COVID-19 pandemic. Students returned to the usual poster-display format in the Hooper Eblen Center, with a paper-presentation competition being held earlier on the first day of the event. An in-person ceremony culminated the event on Thursday, April 21 at 11 a.m. A breakdown of all student participants by department is provided in the table below. Eighty-seven judges, including faculty and staff from across campus and industry partners, also registered to participate in the event.

Breakdown of Participants by Department			
Departments	UG	G	Total
Agriculture (School of)	2	3	5
Human Ecology (School of)	23	0	23
Biology	11	2	13
Chemistry	36	9	45
Earth Sciences	3	1	4
English	3	4	7
Foreign Languages	6	0	6
History	2	0	2
Mathematics	0	1	1
Physics	4	0	4
Sociology and Political Science	1	0	1
Counseling and Psychology	3	6	9
Curriculum and Instruction	0	4	4
Exercise Science	1	0	1
Chemical Engineering	14	9	23
Civil and Environmental Engineering	1	3	4
Computer Science	16	31	47
Electrical and Computer Engineering	2	9	11
Manufacturing and Engineering Technology Technology	0	6	6
Mechanical Engineering	2	9	11
Music	1	0	1
Environmental Studies (School of)	5	0	5
Interdisciplinary Studies (School of)	1	0	1
Nursing	2	1	3
	139	98	237

The number of abstract submissions was at a record number 237 this year, which is an increase of 282% (from 62 to 237) 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 2021-22 academic year:

- Research 101: Sponsored Projects Overview – September 23, 2021
- Research 101: Assistance with Finding Funding Opportunities – October 21, 2021
- Research 101: Best Practices in Proposal Development – November 4, 2021
- Research 101: Subrecipient Monitoring – February 3, 2022
- Research 101: Post Award Management – February 24, 2022
- Research 101: Responsible Conduct of Research – March 10, 2022

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 Director of Sponsored Programs serves as the Executive Officer for the Institutional Animal Care and Use Committee, and the Intellectual Property Advisory Committee. The Vice President for Research is the Executive Officer for the Institutional Review Board for the Protection of Human Subjects, the Scholar Mentor Committee, Faculty Research Committee, the University Research Advisory Committee, and the Caplenor Faculty Research Award 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. Erik Callahan, Administrative
  - Dr. Bruce Greene, Agriculture
  - Dr. Steve Hayslette, Biology (Chair)
  - Ms. Tammy Howard, Nursing
  - Dr. Tyler Verble, Veterinarian
  - Mr. Joe Weatherly, Ethicist
  - Dr. Kit Wheeler, Biology
  - Ms. Mary Kathryn Karafonda, 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. Inspection of the Tennessee Aquarium Conservation Institute facilities was completed on May 21, 2021, and the Shipley Farm was inspected on June 17, 2021. These inspections took place during the 2020-2021 academic year, but they are included here because they could not be included in last year's report. Fall laboratory and farm inspections were conducted on October 1, 2021, and spring laboratory and farm inspections will be completed by mid-April 2022. 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*
  Four applications to use animals in research have been received, considered, and approved by the committee so far during the 2021-2022 academic year. These are listed below:

  a. Effect of Capture Technique on Nitrogen Excretion in Largescale Stonerollers (Dr. Kit Wheeler, Biology)

  b. SNAPS (Student Network for Amphibian Pathogen Surveillance) (Dr. Aubree Hill. Biology)

  c. Integrating Multiple Environmental Stressors to Understand Developmental Tolerance Under Predictions of Climate Change (Dr. Josh Hall, Biology)

  d. River Chub (*Nocomis micropogon*): A Potential Keystone Species in Southeastern Freshwater Ecosystems (Dr. Kit Wheeler, Biology)

➢ **Committee Meeting Dates**

- July 1, 2021 (virtual); September 16, 2021 (virtual); November 18, 2021 (virtual); February 10, 2022 (virtual); March 24, 2022 (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 decides at one of its regular meetings.

- **Committee Members**

  - Dr. Steven Seiler, Department of Sociology and Political Science (Chair)
  - Dr. Michael Adduci, Department of Music

- Dr. Melinda Anderson, School of Human Ecology
- Dr. Meral Anitsal, Department of Economics, Finance 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. 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. John Rust, Community Representative
- Dr. Jennifer Taylor, Executive Officer

➢ **Committee Actions**

- Since the last annual report submitted on March 28, 2021, the Office of Research and Economic Development processed 83 applications. Of those 81 were approved for Exempt Status, six were approved through Expedited Review. Both applications reviewed through a Fully Board Review were approved. Additionally, three multi-institutional studies were approved.
- Once incident of non-compliance was investigated. The IRB Chairperson identified evidence of non-compliance during the investigation. The case was submitted to the Vice President for Research and Economic Development for review.

➢ **Committee Meeting Dates**

- September 13, 2021; November 1, 2021 (cancelled for lack of agenda items); January 24, 2022; April 4, 2022

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. Michael Best, Agriculture
  - Dr. Alice Camuti, Graduate Studies
  - Dr. Stephen Canfield, Mechanical Engineering
  - 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
  - Mr. Elijah Tidwell, Student
  - Ms. Mary Kathryn Karafonda, Executive Officer

- **Committee Actions**

  - Licensure of Copyrighted Work:
    1. Drs. Barry Stein and Ada Haynes presented their contract with Elsevier for licensure of their critical thinking CAT instrument to nursing programs across the nation. Attorney Bahou was to continue negotiations.
    2. Mr. Bahou provided a summary on the negotiations with San Diego State University (SDSU) on royalty sharing with TTU and Dr. Stephen Robinson who is listed as a co-author on a copyrighted textbook with SDSU.

  - Invention Disclosures Received:
    1. Vulnerability Analysis and Cyber Risk Assessment for Computing Systems – Denis Ulybyshev
    2. Driverless Systems Using Virtual Roads – Dr. Ali Alouani

  - Provisional Patent Applications Filed:
    1. Vulnerability Analysis and Cyber Risk Assessment for Computing Systems – Denis Ulybyshev
    2. Driverless Systems Using Virtual Roads – Dr. Ali Alouani

  - Utility Patent Applications Filed:
    1. Method and Apparatus for Generating Electrical Based Soliton Waves in Natural Terrestrial Environments – Dr. Charles VanNeste

  Dr. Stephen Canfield requested a continuation filing for his previous patent, which would allow variations of the claims to be made to the patent.

- **Committee Meeting Dates**

  - The IPAC met on March 30, 2021 (it was not cancelled as mentioned in last year's report), September 9, 2021; October 5, 2021; and November 9, 2021. The meetings scheduled for January 25, 2022, and February 22, 2022, were cancelled due to the lack of voteable agenda items and/or invention disclosures. As mentioned in last year's report, 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 if 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 down 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 (Chair), 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. Rachel Hall, Nursing
  - Dr. Cara Sisk, Human Ecology
  - Dr. Matt Smith, Curriculum and Instruction
  - Dr. Judith Sullivan, Music
  - Dr. Jennifer Taylor, Executive Officer

- **Committee Actions**
  - A complete listing of the Faculty Research Awards for 2021-22 is provided in Appendix C.

- **Committee Meeting Dates**
  - December 14, 2021; April 22, 2022

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. Satish Mahajan, Center for Energy Systems Research
  - Dr. Joseph Ojo, Electrical Engineering
  - Dr. Sandi J. W. Smith-Andrews, Curriculum and Instruction
  - Dr. Jennifer Taylor, Executive Officer

- **Committee Actions**
  - The Caplenor Faculty Research Award was awarded to Dr. Holly Anthony for the 2021-2022 fiscal year.

- **Committee Dates**
  - October 5, 2021; March 11, 2022

UNIVERSITY RESEARCH ADVISORY COMMITTEE

The University Research Advisory Committee advises the President and President's cabinet members on strategies to stimulate growth in scholastic and externally funded research and innovative/creative activities within the university community. The Committee advises on the development of a comprehensive structure and network of programs to foster these activities in support of all four strategic goals set forth in the University's "Tech Tomorrow" strategic plan with the following objectives as deemed necessary by the committee:

- O1: Expand scholastic and externally funded research
- O2: Support faculty collaboration (both internal and external) and development
- O3: Promote cross-disciplinary and integrated programs and scholarship
- O4: Foster undergraduate research
- O5: Advocate for research related faculty and staff positions
- O6: Review and evaluate administrative processes related to research
- O7: Support technological and research related entrepreneurship

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 Tech;
b. Identify emerging research opportunities anticipated across the academic disciplines;
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; and
f. Make recommendations regarding the commercialization of research and intellectual property issues.

- **Committee Members**

  - Dr. Jason Beach, Curriculum and Instruction
  - 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
- Dr. Adam Holley, Physics
- Dr. Shelia Hurley, Nursing
- Dr. Brian Leckie, Agriculture
- Ms. Gail Ligon, Grant Accounting
- Dr. Satish Mahajan, Energy Center
- Dr. Hayden Mattingly, Environmental Studies
- Dr. Rory Roberts, Mechanical Engineering
- Dr. Terry Saltsman, Chief Government Affairs Officer
- Dr. Mark Stephens, Provost's Office
- Dr. Leslie Suters, Curriculum and Instruction
- Dr. Jennifer Taylor, VP for Research, Executive Officer
- Mr. Elijah Tidwell, Student
- Ms. Megan Wharton, Student

➢ **Committee Actions**

- URAC made a formal recommendation to President Oldham that the committee felt would substantially amplify the effectiveness of the *Faculty Research Committee Grant* Program by ensuring a unified strategic vision by providing a quantitative means for the assessment of a current strategy. URAC made recommendations related to self-assessment and reporting by the Faculty Research Committee. Assessment would involve tracking the outcomes of funded proposals (external proposals submitted using data generated by the TTU Research Grant, publications, presentations, etc.) and making changes to the program based on that assessment. URAC recommended quarterly updates (ongoing data collection). The assessment would be made available to the TTU community. URAC members felt this was important since in the past, when the distribution and level of funding were changed, no assessment of past procedures were carried out and reported to the campus. The tracking period on each funded grant was recommended as two years. URAC also recommended the committee begin providing feedback on proposal submissions. Also recommended was assessment data being made available to the TTU community, which could be through the generation of an annual report containing both assessment data and a discussion of proposed handbook changes based on discussion of collected assessment data. The current annual report, as posted on the website, has been restricted to a list of awardees each year.
- URAC members discussed the advantages of creating a "Chair Elect" that would assist and work alongside the committee chair in order to provide a smooth year-to-year transition in leadership. The members voted to create this position and modified their committee procedures. The procedural changes have been submitted to both Academic and Administrative Council for review. The responsibilities include 1) Preside at meetings when the Chairperson is unable to do so, 2) Serve as official representative of URAC at the request of the Chairperson, 3) Serve as Chairperson of the nominating committee, 4) Assist the Chairperson in the preparation of the

agenda for each meeting, 5) Assist the Chairperson in the preparation of the Annual Report of the committee's activities, and 6) Other, as dictated by needs of URAC.

- *Building Research Capacity at TTU*: Discussion concerning the President's goal of doubling sponsored research to $40 Million by 2025 continues to be a central theme of URAC. Return on investment of indirect cost utilization that supports faculty research continues to be discussed. URAC is preparing recommendations to the university that could increase indirect cost returns to TTU by increasing success in obtaining external funding.
- *Cornerstone*: Cornerstone Government Affairs Group assists in the building of relationships with funding agencies on behalf of TTU. URAC desired to more fully understand this process and how URAC could serve as advocates to help leverage available resources. Discussions have continued with Terry Saltsman, who meets regularly with 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.
- *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 $1500 and they are typically recognized at the Spring University Awards Reception. The committee recently reviewed applications and is currently in the process of selecting awardees. Each will be notified when the process is complete.
- *Creation of Focus Groups:* URAC created focus groups in 2021-2022. The focus group was charged with discussing ways to reduce administrative burden in research and hurdles to research success. Committee members agreed that this type of review would be worthwhile and could lead to more recommendations to Dr. Taylor and/or Dr. Oldham. Focus groups discussions have been disseminated and discussed at URAC meetings. Topics have included reinstating *articles on demand* at no cost for faculty, staff and graduate students, difficulties in generating competitive start-up packages for new faculty, differential work load assignments for those heavily engaged in research across campus and the ability to "bank" funds that likely otherwise may be lost.
- URAC elected Rory Roberts as the Chair for 2022-2023.

➢ **Committee Meeting Dates**

- October 14, 2021; November 18, 2021; February 8, 2022; April 12, 2022

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, Funding Agency, Center, and Funding Amount

PI First Name	Administering College	Department	Center	Total Amount Activated	Direct Sponsor	Prime Sponsor
Brian Leckie	Agriculture & Human Ecology	Agriculture	Water Center	$ 25,000	Tennessee Department of Agriculture	U.S. Department of Agriculture
Douglas Airhart	Agriculture & Human Ecology	Agriculture		$ 28,363	Horticultural Research Institute	
Dennis Duncan	Agriculture & Human Ecology	Agriculture		$ 232,500	State of Tennessee Department of Education	
Melinda Anderson	Agriculture & Human Ecology	Human Ecology		$ 568,380	Tennessee State University	Tennessee Department of Human Services
Melinda Anderson	Agriculture & Human Ecology	Human Ecology		$ 204,500	Tennessee State University	Tennessee Department of Human Services
Justin Murdock	Arts & Sciences	Biology	Water Center	$ 10,000	Marshall University Research Foundation	U.S. Army Corps of Engineer
Justin Murdock	Arts & Sciences	Biology	Water Center	$ 382,246	The Nature Conservancy	
Christopher Wheeler	Arts & Sciences	Biology	Water Center	$ 53,530	Tennessee Wildlife Resources Agency	
Carla Hurt	Arts & Sciences	Biology	Water Center	$ 63,725	National Science Foundation	
Bradley Cohen	Arts & Sciences	Biology	Water Center	$ 36,660	Kentucky Department of Fish and Wildlife Resources	U.S. Department of Transportation
Bradley Cohen	Arts & Sciences	Biology	Water Center	$ 434,282	Tennessee Wildlife Resources Agency	
Bradley Cohen	Arts & Sciences	Biology	Water Center	$ 27,867	U.S. Fish and Wildlife Service	

Shawn Krosnick	Arts & Sciences	Biology	Water Center	$	13,154	U.S. Fish and Wildlife Service	
Bradley Cohen	Arts & Sciences	Biology	Water Center	$	9,420	Ducks Unlimited	
Bradley Cohen	Arts & Sciences	Biology		$	118,299	Tennessee Wildlife Resources Agency	
Bradley Cohen	Arts & Sciences	Biology		$	19,500	Tennessee Wildlife Resources Agency	
Bradley Cohen	Arts & Sciences	Biology		$	21,067	U.S. Fish and Wildlife Service	
Steven Hayslette	Arts & Sciences	Biology		$	1,500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Steven Hayslette	Arts & Sciences	Biology		$	1,500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Carla Hurt	Arts & Sciences	Biology		$	4,500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Shawn Krosnick	Arts & Sciences	Biology		$	53,122	Institute of Museum and Library Services	
Carla Hurt	Arts & Sciences	Biology		$	2,500	Tennessee Wildlife Resources Agency	U.S. Department of the Interior
Christopher Wheeler	Arts & Sciences	Biology		$	17,893	The Sicklefin Redhorse Conservation Committee	
Steven Hayslette	Arts & Sciences	Biology		$	500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Steven Hayslette	Arts & Sciences	Biology		$	500	Tennessee Wildlife Resources Agency	
Carla Hurt	Arts & Sciences	Biology		$	1,500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Jesse Carrick	Arts & Sciences	Chemistry		$	157,184	U.S. Department of Energy	
Jesse Carrick	Arts & Sciences	Chemistry		$	168,370	U.S. Department of Energy	
Jeannette Luna	Arts & Sciences	Earth Sciences		$	20,320	Northern Arizona University	NASA

Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	445,500	Tennessee Wildlife Resources Agency	U.S. Fish and Wildlife Service
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	40,000	Tennessee Wildlife Resources Agency	Department of the Interior
Amanda Rosenberger	Arts & Sciences	Fisheries Unit	Water Center	$	24,975	National Park Service	
Amanda Rosenberger	Arts & Sciences	Fisheries Unit	Water Center	$	87,272	U.S. Geological Survey	
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	66,000	Tennessee Wildlife Resources Agency	U.S. Department of the Interior
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	80,000	U.S. Geological Survey	
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	80,000	U.S. Geological Survey	
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	28,674	U.S. Geological Survey	
Amanda Rosenberger	Arts & Sciences	Fisheries Unit	Water Center	$	90,144	U.S. Geological Survey	
Mark Rogers	Arts & Sciences	Fisheries Unit	Water Center	$	30,000	Tennessee Wildlife Resources Agency	
Mustafa Rajabali	Arts & Sciences	Physics	Center for Energy Systems Research	$	82,000	U.S. Department of Energy	
Mary Kidd	Arts & Sciences	Physics		$	40,707	National Science Foundation	
Stephen Robinson	Arts & Sciences	Physics		$	28,700	Cal State University San Marcos	National Science Foundation
Mary Kidd	Arts & Sciences	Physics / STEM		$	40,284	Vanderbilt University	NASA
Steven Seiler	Arts & Sciences	Sociology and Political Science		$	30,000	Power of Putnam	Substance Abuse and Mental Health Services
Steven Seiler	Arts & Sciences	Sociology and Political Science		$	58,754	Power of Putnam	The AmerisourceBergen Foundation
Ryan Matthews	Business	Decision Sciences & Management	iCube	$	50,000	Middle Tennessee State University	U.S. Small Business Administration
Ryan Matthews	Business	Decision Sciences & Management	iCube	$	70,000	Middle Tennessee State University	U.S. Small Business Administration
Ryan Matthews	Business	Decision Sciences & Management		$	70,000	Middle Tennessee State University	U.S. Small Business Administration
Susan Wells	Business	Decision Sciences & Management		$	91,772	State of Tennessee	

					Department of Education	
Julie Pharr	Business	Econ, Fin & Marketing		$ 17,700	Middle Tennessee State University	U.S. Small Business Administration
Julie Pharr	Business	Econ, Fin & Marketing		$ 161,956	Middle Tennessee State University	U.S. Small Business Administration
Kevin Liska	Business	iCube	iCube	$ 75,000	National Safety Council	
Kevin Liska	Business	iCube	iCube	$ 142,000	Tennessee Department of Health	
Kevin Liska	Business	iCube	iCube	$ 142,000	Tennessee Department of Health	
Kevin Liska	Business	iCube	iCube	$ 1,066,720	Tennessee Highway Safety Office	National Highway Traffic Safety Administration
Kevin Liska	Business	iCube	iCube	$ 789,710	Tennessee Department of Safety and Homeland Security	U.S. Department of Transportation
Amanda Powell	Business	iCube	iCube	$ 175,000	Tennessee Department of Health	Centers for Disease Control
Martha Howard	Education	Child Dev Lab		$ 311,624	Tennessee Department of Health	Health and Human Services
Martha Howard	Education	Child Dev Lab		$ 88,250	Putnam County Schools	
Angie Smith	Education	Child Dev Lab		$ 7,000	Community Foundation	
Derrick Edwards	Education	Counseling & Psych		$ 19,299	Rutgers	Federal Emergency Management Agency
Derrick Edwards	Education	Counseling & Psych		$ 15,610	Rutgers	Federal Emergency Management Agency
Angelica Galvan	Education	Counseling & Psych		$ 4,000	Association for Assessment and Research in Counseling	
Nicole Henniger	Education	Counseling and Education		$ 1,000	Psi Chi	Psi Chi
Jennifer Meadows	Education	Curriculum & Instruction	STEM	$ 9,190	Battelle Consortium	U.S. Army Educational Outreach Program
Martha Howard	Education	Curriculum & Instruction		$ 157,950	Tennessee Department of Intellectual and	

					Developmental Disabilities	
Martha Howard	Education	Curriculum & Instruction		$ 12,000	U.S. Department of Education	
Martha Howard	Education	Curriculum & Instruction		$ 560,000	U.S. Department of Education	
Jennifer Meadows	Education	Curriculum & Instruction		$ 53,892	Battelle	
Martha Howard	Education	Curriculum & Instruction		$ 4,000	Tennessee Department of Human Services	
Martha Howard	Education	Curriculum & Instruction		$ 427,050	Tennessee Department of Intellectual and Developmental Disabilities	
Martha Howard	Education	Curriculum & Instruction		$ 13,000	Tennessee Department of Education	
Martha Howard	Education	Curriculum & Instruction		$ 840,000	U.S. Department of Education	
Darek Potter	Education	Curriculum & Instruction		$ 50,000	Tennessee Board of Regents	
Martha Howard	Education	Curriculum & Instruction		$ 157,950	Tennessee Department of Intellectual and Developmental Disabilities	
Jennifer Meadows	Education	Curriculum & Instruction		$ 27,308	Battelle	U.S. Army
Jennifer Meadows	Education	Curriculum & Instruction		$ 32,833	Battelle	U.S. Army
Jennifer Meadows	Education	Curriculum & Instruction		$ 92,495	Battelle	U.S. Army
Martha Howard	Education	Curriculum & Instruction		$ 427,050	Tennessee Department of Intellectual and Developmental Disabilities	U.S. Army
Martha Howard	Education	Curriculum & Instruction		$ 13,000	Tennessee Department of Intellectual and Developmental Disabilities	
Julie Baker	Education	Deans Office	STEM	$ 166,667	Tennessee Department of Education	U.S. Department of Education

Darek Potter	Education	STEM	STEM	$	35,000	State of Tennessee via Battelle	
Janet Isbell	Education	Teacher Education		$	2,970	Dollar General Literacy Foundation	
Jennifer Meadows	Education	Curriculum & Instruction	STEM	$	65,173	Battelle	
Joe Biernacki	Engineering	Chemical Engineering	Center for Energy Systems Research	$	109,742	National Science Foundation	National Science Foundation
Holly Stretz	Engineering	Chemical Engineering	Center for Manufacturing Research	$	75,051	Fiber Reactor Extraction Simulation	
Steven Click	Engineering	Civil and Environmental Engineering	Center for Energy Systems Research	$	27,677	University of Florida Transportation Institute	U.S. Department of Transportation
Steven Click	Engineering	Civil and Environmental Engineering	Center for Energy Systems Research	$	16,780	University of Florida Southeastern Transportation Research, Innovation, Development & Education Center	U.S. Department of Transportation
Craig Henderson	Engineering	Civil and Environmental Engineering	Center for Energy Systems Research	$	80,000	Tennessee Department of Transportation	U.S. Department of Transportation
Daniel VandenBerge	Engineering	Civil and Environmental Engineering	Center for Energy Systems Research	$	43,211	Tennessee Board of Regents	
Craig Henderson	Engineering	Civil and Environmental Engineering	Center for Energy Systems Research	$	20,000	Tennessee Department of Transportation	
Tania Datta	Engineering	Civil and Environmental Engineering	Water Center	$	5,000	University of Tennessee Tennessee Water Resource Center	US Geological Survey
Alfred Kalyanapu	Engineering	Civil and Environmental Engineering	Water Center	$	75,000	University of Tennessee-Battelle, LLC	U.S. Department of Energy
Tania Datta	Engineering	Civil and Environmental Engineering		$	2,450	Tennessee Department of Environment and Conservation	Environmental Protection Agency

Terry Guo	Engineering	CMR	Center for Manufacturing Research	$	64,073	National Science Foundation	
Ying Zhang	Engineering	CMR	Center for Manufacturing Research	$	19,999	Oak Ridge National Laboratory UT-Battelle	
Sheikh Ghafoor	Engineering	Computer Science	Center for Energy Systems Research	$	20,043	National Science Foundation	
Sheikh Ghafoor	Engineering	Computer Science	Center for Energy Systems Research	$	64,999	University of North Carolina Chapel Hill	NASA
Sheikh Ghafoor	Engineering	Computer Science	Center for Energy Systems Research	$	11,235	University of Tennessee Chattanooga	National Science Foundation
Michael Rogers	Engineering	Computer Science	Center for Energy Systems Research	$	43,665	Electric Power Research Institute	
Michael Rogers	Engineering	Computer Science	Center for Energy Systems Research	$	381,296	National Science Foundation	
Muhammad Ismail	Engineering	Computer Science	Center for Energy Systems Research	$	34,996	Texas A&M	Private Funder
Muhammad Ismail	Engineering	Computer Science	Center for Energy Systems Research	$	49,199	Texas A&M	Private Funder
Michael Rogers	Engineering	Computer Science	Center for Energy Systems Research	$	27,958	Electric Power Research Institute	
Maanak Gupta	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	58,000	National Science Foundation	
Maanak Gupta	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	117,217	Whatcom Community College	National Science Foundation
Akond Rahman	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	83,209	National Science Foundation	

Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	72,295	Colorado State University	National Science Foundation
Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	16,000	National Science Foundation	
Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	1,210	National Science Foundation	
Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	24,000	National Science Foundation	
Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	51,863	Northeastern University	National Science Foundation
Susmit Shannigrahi	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	454,068	National Science Foundation	
Sheikh Ghafoor	Engineering	Computer Science	Cybersecurity Education, Research and Outreach Center	$	149,996	National Security Agency	
Muhammad Ismail	Engineering	Computer Science		$	47,940	Private Funder	
Kumar Yelamarthi	Engineering	Deans Office	Center for Energy Systems Research	$	37,492	Tennessee Department. of Commerce Board of Architectural and Engineering Examiners	
Kumar Yelamarthi	Engineering	Deans Office	Center for Energy Systems Research	$	26,100	Tennessee State University	National Science Foundation
Mohamed Mahmoud	Engineering	Electrical and Computer Engineering	Center for Energy Systems Research	$	30,000	University of Louisville	National Security Agency
Mohamed Mahmoud	Engineering	Electrical and Computer Engineering	Center for Energy Systems Research	$	51,744	Private Funder	Private Funder

Mohamed Mahmoud	Engineering	Electrical and Computer Engineering	Center for Energy Systems Research	$	96,213	Private Funder	Private Funder
Mohamed Mahmoud	Engineering	Electrical and Computer Engineering	Center for Energy Systems Research	$	29,495	Texas A&M	Private Funder
Ali Alouani	Engineering	Electrical and Computer Engineering	Center for Manufacturing Research	$	177,473	Tennessee Valley Authority	
Mohamed Mahmoud	Engineering	Electrical and Computer Engineering	Center for Manufacturing Research	$	130,557	National Science Foundation	
Olorunfemi Ojo	Engineering	Electrical and Computer Engineering	Center for Manufacturing Research	$	50,000	Office of Naval Research	
Chris Wilson	Engineering	General & Basic Engineering		$	133,973	Tennessee Department of Education	
Ismail Fidan	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	59,125	Somerset Community College	National Science Foundation
Ismail Fidan	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	49,196	Somerset Community College	National Science Foundation
Ismail Fidan	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	92,170	Somerset Community College	National Science Foundation
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	73,386	National Science Foundation	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	24,735	National Science Foundation	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	81,169	National Science Foundation	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	16,667	Chonnam University	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	144	Chonnam University	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	17,070	Gwangju University	

Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	33,333	Hanyang University	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	172	Hanyang University	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology	Center for Manufacturing Research	$	17,900	Private Funder	
Duckbong Kim	Engineering	Manufacturing and Engineering Technology		$	15,000	Oak Ridge National Laboratory UT-Battelle	
Rory Roberts	Engineering	Mechanical Engineering	Center for Energy Systems Research	$	822,342	U.S. Department of Energy	
Arman Sargolzaei	Engineering	Mechanical Engineering	Center for Energy Systems Research	$	21,065	Florida Polytechnic University	National Science Foundation
Arman Sargolzaei	Engineering	Mechanical Engineering	Center for Energy Systems Research	$	83,900	National Science Foundation	
Ahmad Vaselbehagh	Engineering	Mechanical Engineering	Center for Energy Systems Research	$	250,000	Tennessee Valley Authority	
Mohammed Albakri	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	16,302	Virginia Tech	National Science Foundation
Pingen Chen	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	147,987	U.S. Department of Energy	
Ethan Languri	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	220,000	U.S. Department of Energy	
Ethan Languri	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	130,000	U.S. Department of Energy	
Rory Roberts	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	34,040	Southwestern Ohio Council for Higher Education	U.S. Department of Defense
Rory Roberts	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	138,000	Southwestern Ohio Council for Higher Education	U.S. Department of Defense
Pingen Chen	Engineering	Mechanical Engineering	Center for Manufacturing Research	$	64,732	Cummins Advanced Engineering Controls	
Rory Roberts	Engineering	Mechanical Engineering		$	51,262	Private Funder	American Rescue Plan Act

Harry Ingle	Engineering	Student Success		$	140,000	Tennessee Higher Education Commission	
Satish Mahajan	Engineering		Center for Energy Systems Research	$	345,465	Upper Cumberland Development District	Appalachian Regional Commission
Shirin Noei	Engineering		Center for Energy Systems Research	$	61,725	University of Florida Transportation Institute	U.S. Department of Transportation
Ali Arzani	Engineering		Center for Energy Systems Research	$	29,000	Electric Power Research Institute	
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	90,806	Fordham	National Security Agency
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	48,409	University of South Florida Board of Trustees	National Security Agency
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	820,670	National Science Foundation	
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	350,434	National Security Agency	
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	149,013	National Security Agency	
Ambareen Siraj	Engineering		Cybersecurity Education, Research and Outreach Center	$	25,000	WiCyS, Inc.	
Gail Gentry	Fine Arts	Craft Center		$	1,575	Cookeville Arts Council	
Gail Gentry	Fine Arts	Craft Center		$	6,250	Community Foundation of Middle Tennessee	
Gail Gentry	Fine Arts	Craft Center		$	1,875	Tennessee Arts Commission	
Gail Gentry	Fine Arts	Craft Center		$	5,600	Tennessee Arts Commission	

Dan Allcott	Fine Arts	Music		$	1,100	National String Project Consortium	
Alice Camuti	Grad School		Water Center	$	46,000	National Science Foundation Graduate Research Fellowship Program	
Hayden Mattingly	Interdisciplinary Studies	Environmental Sciences	Water Center	$	13,929	U.S. Fish and Wildlife Service	
Hayden Mattingly	Interdisciplinary Studies	Environmental Sciences		$	66,065	U.S. Fish and Wildlife Service	
Michael Gotcher	Interdisciplinary Studies	Interdisciplinary Studies		$	30,000	Tennessee Board of Regents	
Megan Atkinson	Library	Archives		$	4,000	Tennessee Historical Publications and Records	
Melissa Geist	Nursing			$	68,591	American Association of Colleges of Nursing	Centers for Disease Control and Prevention
Melissa Geist	Nursing			$	141,142	Tennessee Department of Health	Centers for Disease Control and Prevention
Shelia Hurley	Nursing			$	413,161	South Carolina Department of Health and Environmental Control	
Susan Piras	Nursing			$	24,951	Cookeville Regional Medical Center	
Ann Hellman	Nursing			$	201,202	Office for Victims of Crime	U.S. Department of Justice
Shelia Hurley	Nursing			$	236,379	Tennessee Department of Health	
Michael Aikens		ORED		$	75,000	Middle Tennessee State University	U.S. Small Business Administration
Michael Aikens		ORED		$	119,988	Economic Development Agency	
Michael Aikens		ORED		$	118,000	Economic Development Agency	
Michael Aikens		ORED		$	71,416	U.S. Department of Agriculture	
Michael Aikens		ORED		$	20,182	Overton County Tennessee	

Jennifer Taylor		ORED		$	15,000		

State Appropriations/Center Testing Accounts

Center for Energy Systems Research

- State Appropriation: $1,030,800
- Center Testing Account: $0

Center for Manufacturing Research

- State Appropriation: $1,638,100
- Center Testing Account: $7,350

Center for the Management, Utilization and Protection of Water Resources

- State Appropriation: $1,248,500
- Center Testing Account: $79,667

Cybersecurity Education, Research and Outreach Center

- State Appropriation: $500,000

APPENDIX B

Intellectual Property Activity 2021-22

Licensure of Copyrighted Work:

- Drs. Barry Stein and Ada Haynes presented their contract with Elsevier for licensure of their critical thinking CAT instrument to nursing programs across the nation. Attorney Bahou was to continue negotiations.
- Mr. Bahou provided a summary on the negotiations with San Diego State University (SDSU) on royalty sharing with TTU and Dr. Stephen Robinson who is listed as a co-author on a copyrighted textbook with SDSU.

Invention Disclosures Received:

- Vulnerability Analysis and Cyber Risk Assessment for Computing Systems - Denis Ulybyshev
- Driverless Systems Using Virtual Roads - Dr. Ali Alouani

Provisional Patent Applications Filed:

- Vulnerability Analysis and Cyber Risk Assessment for Computing Systems - Denis Ulybyshev
- Driverless Systems Using Virtual Roads - Dr. Ali Alouani

Utility Patent Applications Filed:

- Method and Apparatus for Generating Electrical Based Soliton Waves in Natural Terrestrial Environments – Dr. Charles Van Neste

APPENDIX C

Faculty Research Grant Awards 2021-22

(to be implemented in 2022-2023)

Track I

Author(s)	Title	Dept.	Amount
Donadio, Andrew	Documentation and the Deposition	Nursing	$3,000
Greathouse, Paula	Preparing Preservice Teachers to Teach Online: A Mixed Methods Case Study	Curriculum and Instruction	$2,925
Shibakov, Alexander	Floating Point Conversions and the Partial Logarithm Problem	Mathematics	$3,000
Total Track I			$8,925

Track II

Author(s)	Title	Dept.	Amount
Hall, Joshua	Integrating Multiple Environmental Stressors to Assess Developmental Tolerance Under Prediction	Biology	$5,000
Nattrass, Michael	Unmanned Aerial Systems for Optimizing Forage Production Management Strategies	Agriculture	$4,998
Rizvi, Syed	A Stabilizing Reinforcement Learning Control Framework for Handling Real	Electrical and Computer Engineering	$5,000
Younglove, Matthew	Night Set: A Recording Project of Original Words for Saxophone and Piano	School of Music	$5,000
Total Track II			$19,998

Track III

Author(s)	Title	Dept.	Amount
Bhattacharya, Indranil	Low-Frequency Metamaterial for High-Efficiency and High Power Wireless Power Transfer	Electrical and Computer Engineering	$20,000
Hurt, Carla	Genomic Insights into Adaptive Potential to Inform Conservation of At-Risk Species	Biology	$14,260
Murdock, Justin	Tracking How Stream Polychlorinated Biphenyl (PCB) Pollution Moves Across the Aquatic/Terrestrial Boundary to Accumulate in Terrestrial Consumers	Biology	$20,000
Zeringue-Krosnick, Shawn	Bridging the Gap: Building Genomic Infrastructure in the Passionflowers	Biology	$17,455
Total Track III			$71,715