

Tennessee Technological
University

**OFFICE OF RESEARCH
ANNUAL REPORT**

Fiscal Year 2004

Tennessee Technological University is one of 46 institutions in the Tennessee Board of Regents system, the seventh largest system of higher education in the nation. The Tennessee Board of Regents (TBR) is the governing board for this system which is comprised of 6 universities, 14 two-year colleges and 27 technology centers. The TBR system enrolls more than 80 percent of all Tennessee students attending post-secondary institutions.

ACKNOWLEDGMENT

Thanks to everyone who contributed
in any way to the completion of this Report.

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Office of Research Fact Sheet 2003-2004

The Mission of Tennessee Technological University pertains to broadening and enhancing its unique role as the only **Technological University in the State of Tennessee**. The University proposes to implement its mission through **strong emphasis on, and support of** the technological approach to its academic programs. The support and emphasis are executed mainly through the three facets of the mission **teaching, research** and **public service**.

The personnel of the Office of Research supports the University's mission by:

- Assisting faculty and administrators with proposal development; location of and guidance with funding sources; pre-award processing of proposals; and , post-award administration of grants;
- Seeking fellowship sources for graduate students based on research interests, experience and need; and
- Promoting, marketing and showcasing faculty research.

During fiscal year 2004 the Office of Research supported the Mission of the University as follows:

- Grants and Contracts externally funded numbered 159 with a monetary value of \$12,280,072.
- Proposals submitted for external funding numbered 193 with a monetary value of \$32,987,186.
- Proposals funded through the three Centers of Excellence numbered 115 with a monetary value of \$7,744,552, which represents 72.3% of all proposals funded and 63.1% of funds received.
- Proposals submitted through the Centers of Excellence numbered 150 with a monetary value of \$28,175,234, which is 77.7% of all proposals submitted and represents 85.4% of all funds requested.
- Proposals submitted to Federal Agencies numbered 88 with a monetary value of \$25,588,824, which is 45.6% of all proposals submitted, and 79.2% of all funds requested.
- Federal contracts numbered 60, which is 38.0% of all contracts received.
- Proposals submitted to the State numbered 47 with a monetary value of \$4,161,677 which is 24.3% of all proposals submitted and represents 12.9% of all funds requested.
- State contracts numbered 56 with a monetary value of \$6,895,156, which represents 35.4% of all contracts and 45.2% of all funds received
- University grants and contracts for FY '04 increased by approximately 5% over grants and contracts for FY '03.

- Internal funds in the amount of \$51,688 were provided as “matching funds” for various research activities.
- Participation in the development of the proposal to the National Science Foundation for designation of Tennessee as an eligible State for the Experimental Program to Stimulate Competitive Research (EPSCOR).

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*Roman Numerals = Tables
 Arabic Numerals = Figures

EXECUTIVE SUMMARY

This Report covers activities of the Research Division of the Office of Research and Graduate Studies for the fiscal year 2004, hereinafter referred to as the Office of Research.

There are four categories of service through which the Office of Research lends support to the “University Family”. These services include: *research opportunities and funding sources; proposal development and funding patterns; research compliance and general support; and, research leadership/guidance*. Each of these four categories will be described in the narrative section of the Report.

The University has three doctoral programs in operation. They are housed in the Colleges of Arts and Sciences, Education and Engineering. The Doctor of Philosophy Degree in Engineering is the oldest of the three programs. It is interdepartmental in nature under the guidance of advisory committees who are also interdepartmental. The areas of concentration available are **Chemical, Civil/Environmental, Electrical/Computer, Industrial, and Mechanical Engineering**.

The Doctor of Philosophy Degree in the College of Arts and Sciences is in **Environmental Science** with two areas of concentration--**Biology and Chemistry**. With emphasis on the solution of complex environmental problems, the course work required is somewhat interdisciplinary. The goal of the program is to prepare students for research careers in the chosen concentration that could be applied to management, government service, teaching, industry, and any area where there is a need for solution(s) to complex environmental problems.

The Doctoral Degree in the College of Education is in **Exceptional Learning** with concentrations in **Young Children and Families, Literacy, and Applied Behavior and Learning**. Its central focus is the study of **diverse** and **at-risk** populations. The program investigates the **characteristics, strengths, and educational needs** of individuals and groups whose learning potential and opportunities for success in life are frequently unrealized.

The programs described above, in addition to the research component of the master's level programs and the introduction to research in the baccalaureate level programs, place a strong emphasis and demand on **research performance**. The Research Office personnel stands ready and willing to give leadership and assistance in this endeavor.

The contributions of Ms. Sammie M. Sparks, Contract Compliance Assistant; Mr. Mark D. Lynam, Administrative Assistant; Mrs. B. Sue Smith, Executive Aide; and Ms. Sue Ann Smith, Secretary, to the smooth operation of the Office of Research are gratefully acknowledged with deep appreciation.

Francis O. Otuonye, Ph.D.
Associate Vice President

Rubye P. Torrey, Ph.D.*
Assistant Vice President

Fall, 2004

*Coordinator of the Annual Report

THE NARRATIVE

Introduction

The Annual Report 2004 describes the *research activities* of the Office of Research and Graduate Studies from July 1, 2003 through June 30, 2004. The activities of this office, involve interacting with agencies, universities, schools, industries, and individuals, literally all over the world. This serves as a constant reminder of the importance of research and the many areas in which research opportunities occur. The broad scope of research activities and where research is occurring, serve as motivational factors for one to stay abreast of the research “climate” and its direction. A research web page is maintained at <http://www.tntech.edu/research>.

The services and activities of the Research Division of the Office of Research and Graduate Studies will be described in the pages that follow according to the four main categories set forth in the Executive Summary.

Research Opportunities and Funding Sources

The Office of Research invites each faculty member and administrator to submit a Faculty Research Profile so their research interests can be "catered" to. Several thousands of dollars are invested annually for research support and funding sources access, either directly or indirectly, by the University. Faculty participation in research and making use of available funding sources will certainly contribute significantly toward the University making good on its investment.

The Community of Science (COS) database, the leading internet site for the global research community, is growing in popularity and use by our faculty. It is an excellent service, as most are finding out after use. The Office of Research, through the campus publication “Tech Times,” and its own webpage, publishes a wide range of funding sources received through literature subscriptions, organization subscriptions, memberships and other miscellaneous sources. Tech Times is offered online.

Tennessee Technological University is a member institution of Oak Ridge Associated Universities (ORAU) and the American Association of State Colleges and Universities (AASCU). Through ORAU, the Research Office provides several research opportunities and support.

Through the ORAU membership, the University faculty is provided many collaborative research opportunities. An annual meeting of ORAU members is held each spring.

The fact that Tennessee is now a State approved for the Experimental Programs to Stimulate Competitive Research (EPSCOR) by the National Science Foundation, opens the door to many additional research opportunities. Dr. Francis Otuonye serves as a member of the State EPSCOR Committee.

Proposal Development and Funding Patterns

Proposal development and funding patterns are the very nucleus of research activities. The nature of the proposal, the funding agencies, and the activities involved in implementing the proposal, dictate the level of compliance, the content of the contract and the scope of University services required to fulfill the plan that was funded.

Proposal Development

Proposal development is an ever-changing task that does not fit into a “set mold”. Certain information is essential to any and all proposals; however, there is a “custom” part to all proposals that makes each one different. If a solicitation is being responded to, the applicant is trying to meet the criteria requested. If one is writing an unsolicited proposal, effort is expended in the direction of trying to match the plan to the agency’s interest. Hence, writing a proposal is NOT a “one size fits all” activity.

The Research Office personnel lends assistance in all aspects of proposal development and submission. Two proposal development workshops are held each year, one in the fall and one in the spring. **Assistance is given to “interest groups” and individuals on a continuing basis.**

Proposals submitted during the fiscal year numbered 193 with a monetary value of \$32,987,186. Seventy-eight percent (78%) of the proposals were submitted through the Centers of Excellence.

Funding Patterns

The sources of funds for *faculty research* and *special projects* are quite varied. One must know the kinds of activities an agency is willing to fund. Many agencies who solicit proposals require a pre-proposal. This allows the agencies the opportunity to scrutinize the plan presented and decide whether or not it would be interested in funding it. This method is particularly true with federal agencies. Industries and foundations do less solicitation and hence operate a little differently. Proposals are submitted across the spectrum. Many of the proposals funded are by the State, which in many instances is “trickle-down” money from the federal government.

Grants and contracts received in fiscal year 2004 numbered 159 with a monetary value of \$12,280,072. Thirty five percent (35%) of all grants and contracts received was through the State of Tennessee, while thirty-eight percent (38%) was federal contracts.

Due to various agency deadlines for the submission of proposals and varying fiscal year dates, the proposals funded may, or may not, have been submitted during the University’s current fiscal year. Hence, **the number of proposals funded in fiscal year 2004 does NOT represent a percentage of the proposals submitted in fiscal year 2004.** **Proposal income for a given year is based on contracts signed and funds received during that year NOT when the request for funds was submitted.**

Comparisons are, therefore, made by years for income and/or funding; the same is true for proposal submissions.

Proposal submissions and funding activities for fiscal year 2004 are shown in Tables I through V and Figures 1 and 2.

Five Year Funding Pattern

Funding patterns do not change significantly from year to year as will be seen in Figure 3. The five-year span covered in this report is fiscal years 2000-2004. The grants and contracts for fiscal year 2003 are considerably less than those for fiscal year 2002; however, the funds realized were up by approximately 12.6%. For the entire five year period, there has been an increase each year with that for 2003 being the largest increase. In 2001 the increase was approximately 10.8%; in 2002 the increase was at 4.2%. In 2003, the increase was approximately 12.6%. For the final year 2004 the increase was approximately 4.5%. Even though the year 2003 showed the greatest increase, there has been an increase each year.

The ‘lion’s share’ of grants and contracts is designated for research. Those for instruction represent approximately twenty-two percent of those for research. Grants received for public service represent about thirty-six percent of funds received for research, an increase from fiscal year 2003.

Students come to a University with a thirst for knowledge. The faculties provide the stimuli and opportunities for the students to learn. Research contributes significantly to the quality of the learning experience(s) provided.

The five-year summaries are shown in Tables VI through XI and Figures 3 through 6.

To the faculty who submitted proposals through this Office, CONGRATULATIONS, a job well done!

TABLE I
Proposals Submitted and Proposals Funded
by
University Unit
FY 2004

University Unit	Proposals Submitted	Funds Requested	Proposals Funded	Funds Received
Agriculture & Human Ecology	7.0	\$942,209	9.0	\$967,642
Arts & Sciences*	8.0	860,099	12.0	274,679
Business Adm.*	1.0	91,000	1.0	91,000
Education*	17.5	2,547,660	13.5	1,991,064
Engineering*	5.5	267,356	2.5	50,611
Nursing	--	--	0.5	540,962
Administrative Offices	1.0	15,000	4.5	615,161
Craft Center	1.0	4,400	1.0	4,400
Information Technology Services	1.0	57,500	--	--
Student Services	1.0	26,728	--	--
C/E Electric Power Center**	34.0	2,860,533	26.5	1,590,767
C/E Manufacturing Center**	65.0	14,574,011	43.5	3,795,336
C/E Water Center**	51.0	10,740,690	45.0	2,358,450
TOTALS	193.0	\$32,987,186	159.0	\$12,280,072

* Without Centers of Excellence

** See Table II

TABLE II
Proposals Submitted and Proposals Funded
Through Centers of Excellence
By University Unit
FY 2004

Center/University Unit	Proposals Submitted	Funds Requested	Proposals Funded	Funds Received
<u>Electric Power</u>				
Center	11	748,979	9	\$984,400
Chemical Engineering	1.0	120,000		
Chemical Engineering / Mfg. & Ind. Tech	1	210,000		
Civil Engineering	4	225,451	2.0	22,500
Civil Engineering /Mechanical Engineering	1	30,016	2	120,016
Electrical Engineering	4	97,856	4.0	215,960
Mathematics	2.0	616,548		
Mechanical Engineering	8	307,470	4.0	115,930
Mechanical Engineering & Center	1	10,000	3	59,100
Center, Chemical Engineering, Civil and Environmental Engineering and Mechanical Engineering	1.0	55,032	2	60,032
Civil and Environmental Engineering and Mechanical Engineering	1.0	30,016		
Office of Research			.5	12,830
TOTALS	33	\$2,366,320	26.5	\$1,590,768
<u>Manufacturing Research</u>				
Center	13.0	\$2,235,068	15	\$1,954,339
Center & Business Administration	2.0	77,211	2.0	77,211
Center and Chemical Engineering			1	24,000
Center and Chemistry	--	--	1.0	24,000
Center, Civil and Environmental Engineering, Earth Sciences and Mechanical Engineering	--	--	1.0	304,143
Center, Computer Science, Electrical Engineering and Water Center	--	--	0.5	64,000
Center & Electrical Engineering	1.0	58,342	2.0	248,000
Center and Mechanical Engineering	1.0	21,000	2	41,000
Chemical Engineering	11	4,399,632	4	114,075
Chemical Engineering & Chemistry	1.0	49,716	--	--
Civil & Environmental Engineering	2	995,051	--	--
Computer Science	4	286,732	2.0	31,174
Computer Science, Electrical Engineering, Manufacturing Center & Water Center			.5	64,000
English and Manufacturing Industrial Technology	1.0	21,250	1.0	21,250
Electrical Engineering	6	3,649,029	3.0	93,983
Industrial Engineering	2	284,657	2	58,351

Manufacturing & Industrial Technology	1	21,800		
Mechanical Engineering	10	2,474,523	8.0	763,810
TOTALS	55	\$14,574,011	43.5	\$3,795,336
<u>Management, Utilization, and Protection of Water Resources</u>				
Biology	17.0	\$483,518	11	\$370,277
Biology/CFRU	2.0	108,000	2	44,000
Biology, Center & Electrical Engineering	1.0	249,548		
Biology / Civil & Environmental Engineering	1	179,704		
Center	11.0	\$1,598,000	8.0	\$1,314,552
Center & Biology	7.0	359,445	1	15,000
Center, Biology, and Civil & Environmental Engineering	1.0	155,281		
Center & Civil and Environmental Engineering	2	340,034		
Center, Civil and Environmental Engineering, Earth Sciences and Economics	1.0	171,128		
Center, Computer Science, Electrical Engineering, Manufacturing Center			.5	64,000
Chemical Engineering	1.0	726,437		
Chemistry	1.0	50,000	2.0	35,000
Civil and Environmental Engineering	1.0	5,000	2.0	34,936
Computer Science, Electrical & Computer Engineering & Mechanical Engineering			.5	128,000
CFRU			8	261,152
CFRU & Center			1	45,000
CFRU / Civil & Environmental Engineering	1.0	210,000	1.0	70,000
Earth Sciences	2.0	131,467		
Education, Physic & Research Office	1.0	6,103,803		
English	2.0	24,606	4	66,873
Physics, Research Office, Rural Education	1	6,103,803		
Research & Graduate Studies			1.5	37,660
<u>TOTALS</u>	51.0	\$10,740,690	42	\$2,358,450
GRAND TOTALS	139	\$27,681,021	112	\$7,744,553

TABLE III

**Funds Requested and Received by
Funding Agency Classification
FY 2004**

Funding Agency Classification	Proposals Submitted	Funds Requested	Proposals Funded	Funds Received
Federal	88	\$26,761,593	60	\$4,174,244
State	47	4,161,677	56	6,895,156
Industry	33	1,041,339	31	774,565
Foundations	5	109,652	3	35,945
Other	20	912,925	9	400,162
TOTALS	193	\$32,987,186	159	\$12,280,072

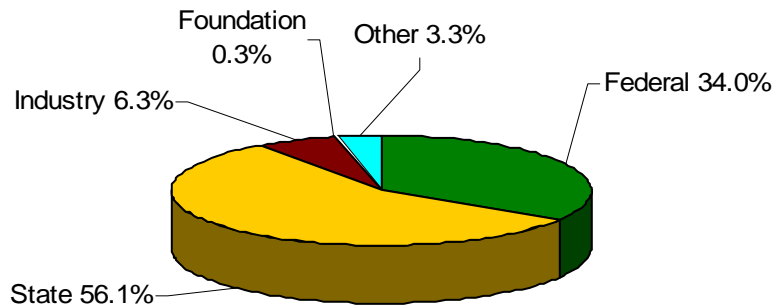


Figure 1. Percentage Funding of Proposals by Agency
FY 2004

TABLE IV
Federal Funding Received by Agency
FY 2004

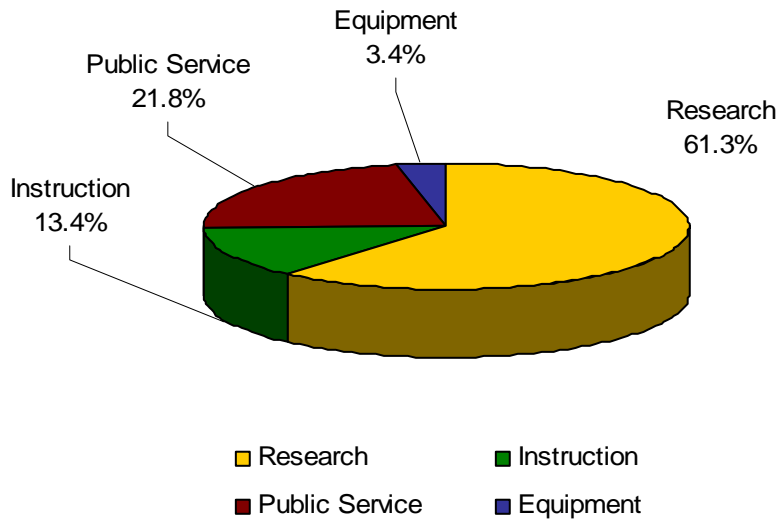
Federal Agency	Funds Received FY 2004
Health and Human Services	\$1,081,924
National Aeronautics and Space Administration	393,000
National Endowment for the Humanities	1,300
National Science Foundation	822,620
Oak Ridge National Laboratory	109,300
Tennessee Valley Authority	101,056
United States Department of Agriculture (Forest Service)	30,000
United States Department of Defense	175,121
United States Department of Energy	386,000
United States Department of Interior (National Park Service)	332,581
United States Fish & Wildlife	15,000
United States Geological Survey	248,471
<u>TOTAL</u>	\$3,696,373

Federal funding for FY2004 exceeded that of FY2003 by 16.7%

TABLE V

**Proposals Submitted and Proposals Funded
By Type of Activity
FY 2004**

Activity Classification	Proposals Submitted	Funds Requested	Proposals Funded	Funds Received
Research	153.5	\$24,157,041	119.5	\$7,530,479
Instruction	10.0	6,037,834	8.5	1,647,836
Public Service	25.5	2,466,044	26.0	2,678,234
Equipment	4.0	326,267	5.0	423,523
TOTALS	193.0	\$32,987,186	159.0	\$12,280,072



**Figure 2. Percentage Funding of Proposals
by Type of Activity
FY 2004**

**TABLE VI
Proposals Submitted and Funded
FY2000-FY2004**

Fiscal Year	Proposals Submitted	Funds Requested	Proposals Funded	Funds Received
2000	165	\$18,928,400	180	\$9,023,292
2001	171	18,069,496	209	9,998,365
2002	177	23,483,871	191	10,414,221
2003	193	63,490,117	160	11,722,689
2004	193	32,987,186	159	12,280,072

Funds in Millions

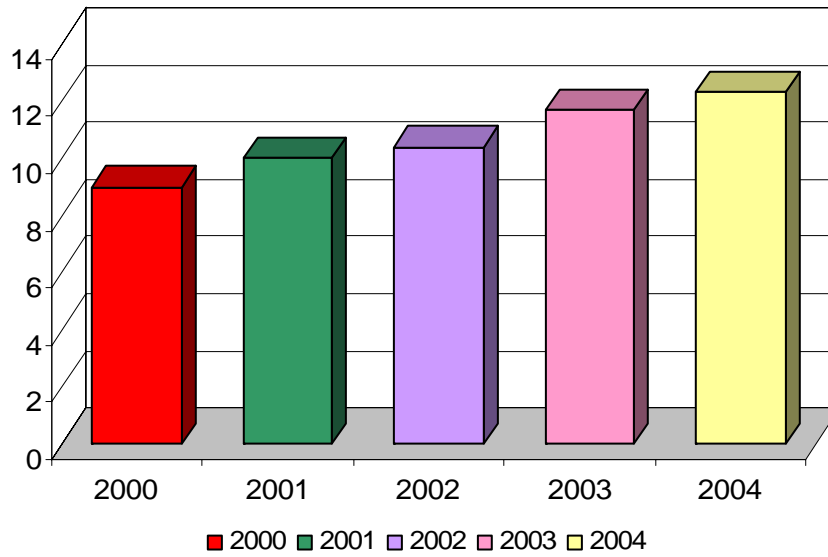


Figure 3. External Funds Received
FY 2000- FY 2004

**Table VII
Proposals Funded
By Agency Classification
FY2000-FY2004**

Fiscal Year	Federal	State	Industry	Foundation	Other	TOTAL
2000	35	58	66	7	14	180
2001	42	59	91	3	14	209
2002	46	57	67	4	17	191
2003	43	59	41	-	17	160
2004	60	56	31	3	9	159

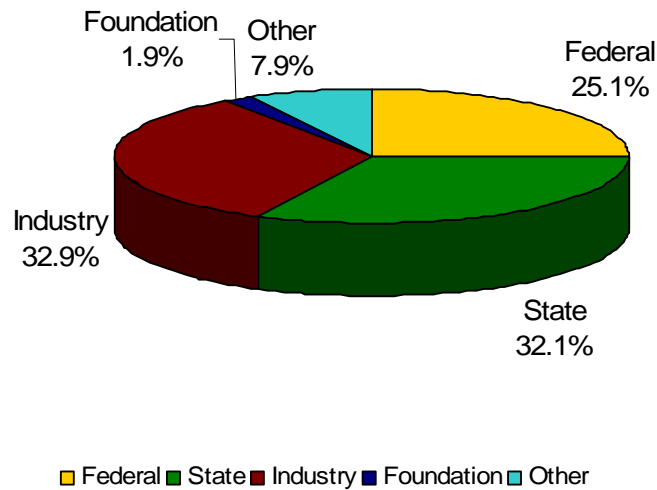


Figure 4. Average Percentage of Funding by Agency Classification FY2000-FY2004

TABLE VIII**Proposals Funded and Funds Received
By Agency Classification FY2000-FY2004**

Fiscal Year	Federal		State		Industry		Foundation		Other		TOTALS	
	No.	Funds Received	No.	Funds Received	No.	Funds Received	No.	Funds Received	No.	Funds Received	No.	Funds Received
2000	35	\$1,761,983	58	\$5,959,115	66	\$999,657	7	\$50,685	14	\$251,852	180	\$9,023,292
2001	42	2,156,353	59	6,661,019	91	835,186	3	52,567	14	293,240	209	9,998,365
2002	46	2,159,598	57	7,300,126	67	536,926	4	46,625	17	370,946	191	10,414,221
2003	43	3,167,670	59	7,497,635	41	699,434	-	-	17	357,950	160	11,722,689
2004	60	4,174,244	56	6,895,156	31	774,565	3	35,945	9	400,162	159	12,280,072

TABLE IX

**Total Proposals Funded
By Agency Classification
FY2000-FY2004**

Classification Of Agency	Total Proposals Funded	Total Funds Received	Percentage of Funds Received
Federal	226	\$13,419,848	25.1%
State	289	34,313,051	64.2%
Industry	296	3,845,768	7.2%
Foundations	17	185,822	0.4%
Other	71	1,674,150	3.1%

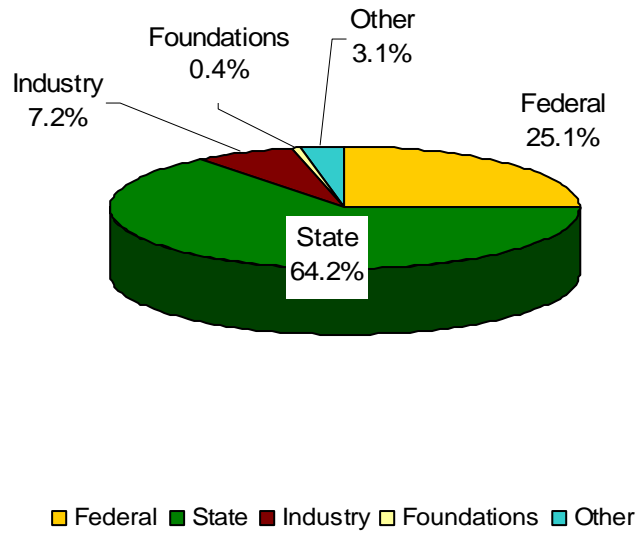


Figure 5. Percentage of Funding by Agency Classification FY2000-FY2004

TABLE X

**Funds Received By Type of Activity
FY2000-FY2004**

Fiscal Year	Research		Instruction		Public Service		Equipment		TOTALS	
	No.	Funds Received	No.	Funds Received	No.	Funds Received	No.	Funds Received	No.	Funds Received
2000	130	\$6,916,220	21	\$1,000,293	27	\$1,055,786	2	\$50,993	180	\$9,023,292
2001	168	7,304,489	14	758,279	26	1,881,097	1	54,500	209	9,998,365
2002	150	6,978,439	12	747,230	27	2,410,820	2	277,732	191	10,414,221
2003	124	7,131,095	12	2,499,765	23	2,062,875	1	28,954	160	11,722,689
2004	119.5	7,530,479	8.5	1,647,836	26.0	2,678,234	5.0	423,523	159.0	12,280,072

TABLE XI
Proposals Funded
By Type of Activity
FY2000-FY2004

Fiscal Year	Research	Instruction	Public Service	Equipment	TOTAL
2000	130	21	27	2	180
2001	168	14	26	1	209
2002	150	12	27	2	191
2003	124	12	23	1	160
2004	119.5	8.5	26.0	5.0	159

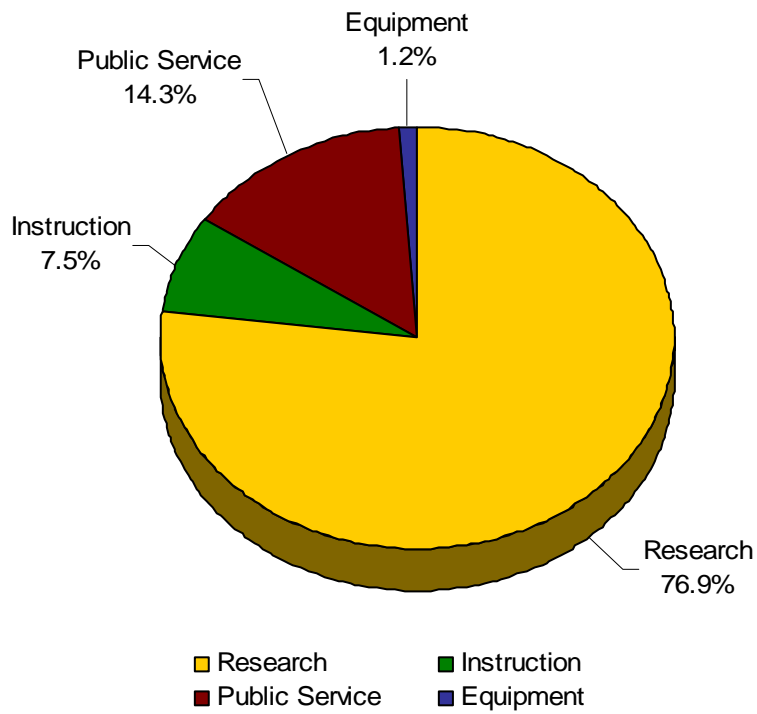


Figure 6. Average Percentage of Funding
By Type of Activity
FY2000-FY2004

Research Compliance and General Support

Research Compliance

In research, compliance is always a factor. For every type agency that is a source of funds, there are compliances to be considered. It is the responsibility of the Research Office personnel to make sure these compliances are adhered to by the investigator(s) involved in the research. A research contract may involve both Federal and State compliances in addition to those required by the funding agency, which could be private.

Occasionally, a contracting agency will submit a contract that cannot be endorsed by the University under existing Federal and/or State regulations. At this point, it becomes the duty of the Research Office personnel to “negotiate” a contract. This means simply to use terms and conditions in the contract that will be acceptable to all parties involved and stay within the guidelines set down by the State and/or the Federal Government.

General Support

Several University Standing Committees are regulated federally and must meet certain compliance criteria, as well as other special committees. These committees are, in general, research related and are associated with the Office of Research. The Associate or Assistant Vice President serves as the Executive Officer for these committees which include: The Institutional Committee for the Care and Use of Laboratory Animals in Experimentation, The Institutional Review Committee for the Protection of Human Subjects, The Patent and Copyrights Committee, The Faculty Research Committee and the Caplenor Research Award Committee. The Annual Report of each of these Committees is on file in the Office of Research and Graduate Studies.

Research Leadership and Guidance

Leadership and guidance have been executed through on-going assistance to faculty in the preparation and processing of proposals and contracts as well as steps necessary for assisting faculty with getting their discoveries to the market place. Intellectual Property activities are summarized in Appendix C.

Professional scholarly activities for fiscal year 2004 are summarized below:

Dr. Otuonye:

- a) Provided leadership and assistance to faculty in developing the proposal for funding the High Performance Network Connection (Internet 2)
- b) Was appointed as a member of the State Committee for the Experimental Programs to Stimulate Cooperative Research (EPSCOR)
- c) Continues to serve as : Principal Investigator of the “Earth Science Institute” in collaboration with Michigan Technological University; the “ US-Brazil Consortium in Mineral Technology and the Environment”; and, as a member of The Advisory Board of the National Institute for Occupational Safety and Health
- d) Serves as the current President of the Tennessee Council of Graduate Schools.

Dr. Torrey:

- a) Continues to serve on external review panels for the Federal Government.
- b) Was invited to serve on the Fellowship Committee for Post-Doctoral and Doctoral Degree Recipients for the National Academies..
- c) Serves on the Committee for Chemical Safety of the American Chemical Society
- d) Serves as chair of the Ethics in Science and Technology Section of the Tennessee Academy of Science.
- e) Served as Secretary-Treasurer for the Campus Chapter of Sigma Xi, The Research Honor Society for the years 2001-2004.

Appendices

Appendix A shows the external funds brought into the University by College/Area and by Departments/Units. The gift from the Tennessee Higher Education Commission (THEC) to the three accomplished Centers of Excellence is included in the external funding which makes up approximately twenty-eight percent (28%) of the total external funding. Twenty-seven departments/units contributed approximately seventy-two percent (72%) brought into the University through proposals written by faculty and administrators.

Appendix B gives the total amount of funding brought into the University from external sources by college/area, departments/units within a given college, the faculty/administrators responsible for writing the proposal(s), the funding agency and the amount of funding received.

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

Appendix A

**Externally Funded Research
by College/Area, Department and Funding Amount
Fiscal Year 2004**

ADMINISTRATION		\$151,167
Academic Affairs	\$15,000	
Disability Services	57,899	
Engineering	27,779	
Research and Graduate Studies	50,489	
AGRICULTURE & HUMAN ECOLOGY		\$967,642
Agriculture	\$99,722	
Human Ecology	867,920	
ARTS & SCIENCES		\$1,300,421
Biology	\$276,356	
Biology/CFRU	24,000	
CFRU	448,073	
CFRU/Civil Engineering	70,000	
Chemistry	40,000	
Computer Science	31,174	
Computer Science, Electrical Engineering and Mechanical Engineering	128,000	
English	66,873	
Physics	159,945	
Upper Cumberland Institute	34,000	
Water Center/Biology	22,000	
BUSINESS ADMINISTRATION		\$168,211
Administration	\$77,211	
Decision Science and Management	91,000	

CRAFT CENTER		\$4,400
Center	\$4,400	
EDUCATION		\$2,049,294
Curriculum & Instruction	\$1,832,835	
Curriculum & Instruction, English and History	72,968	
Curriculum & Instruction/Mathematics	8,500	
Curriculum & Instruction/Mechanical Engineering	34,991	
Health and Physical Education	100,000	
ENGINEERING		\$6,555,713
Chemical Engineering	\$138,075	
Civil & Environmental Engineering	57,436	
Civil & Environmental Engineering/ Mechanical Engineering	120,016	
Civil & Environmental Engineering/ Mechanical Engineering, Chemical Engineering, Electric Power Center	60,032	
Electrical & Computer Engineering	314,943	
Electrical & Computer Engineering / Manufacturing Center	243,000	
Industrial & Systems Engineering	5,336	
Manufacturing & Industrial Technology	58,351	
Mechanical Engineering	1,012,228	
Mechanical Engineering/Electric Power Center	49,100	
Manufacturing & Industrial Technology /English	21,250	
Mechanical Engineering/Civil and Environmental Engineering/Earth Sciences	304,143	
Electric Power Center	994,400	
Manufacturing Center	1,862,851	
Water Resources Center	1,314,552	

LIBRARY		\$1,300
Media	\$1,300	
NURSING		\$1,081,924
Nursing/Facilities and Business Services	\$1,081,924	

Appendix B

**Externally Funded Research
by College/Area, Department, Investigator(s),
Project Funding Agency and Amount of Funding
Fiscal Year 2004**
(Principal Investigator is Named First)

ADMINISTRATION: 8 projects; 7 administrators; \$1,234,391				
Academic Affairs	Leo McGee	Geier Incentive Funds for Faculty/Administration Recruitment & Retention	Tennessee Board of Regents	\$15,000
Disability Services	Sammie Young	Learning Disabilities Program	Tennessee Department of Human Services-Rehabilitation Services	57,899
Engineering	Glen Johnson	College of Engineering Equipment Grant Fund	State of Tennessee Department of Commerce and Insurance	27,779
Library	Patricia McGee	The Sixties: America's Decade of Crisis and Change	National Endowment of the Humanities	1,000
		The Sixties: American's Decade of Crisis and Change	National Video Resources in conjunction with NEH funding	300
Nursing/ Facilities and Business Services	Marilyn Musacchio/ Glenn Binkley	New Nursing and Health Services Building	Department of Health and Human Services	1,081,924
Research & Graduate Studies	Francis Otuonye	Earth Science Institute	National Science Foundation	25,659
		U.S.-Brazil Higher Education Consortia Program	New Mexico Institute of Mining and Technology	24,830
AGRICULTURE & HUMAN ECOLOGY 9 projects; 3 researchers; \$967,642				
Agriculture	Douglas Airhart	2004 Tennessee Urban Forestry Directory	Tennessee Department of Agriculture	10,430

Agriculture cont'd.	Douglas Airhart	Evaluation of Trunk Flare Planting Depth of Field-Grown Trees from TN Nurseries	Tree Fund	\$6,975
	Ben Byler	Agriculture Education Inservice Program	Tennessee Department of Education	13,827
		Tennessee Association FFA Camp Clements Leadership Grant	Tennessee Department of Education	68,490
Human Ecology	Sue Bailey	Upper Cumberland Child Care Resources and Referral Center	Department of Human Services via Signal Centers of Chattanooga	287,456
		Tennessee Early Childhood Training Alliance	Department of Human Services via TSU	218,227
		Upper Cumberland Child Care Resource Center-Assessment Unit	Tennessee Department of Human Services	257,824
		Health and Wellness of Children	State Attorney General's Office	100,000
		Family and Consumer Sciences Teacher Education Contract	Tennessee Department of Education	4,413
ARTS & SCIENCES 47 projects; 27 researchers; \$1,300,421				
Biology	Bradford Cook	Biological Monitoring, Greenbrier Road Project, Great Smokey Mountains National Park	Great Smokey Mountains National Park Service	\$15,000
	Michael Harvey	Endangered Bats of Arkansas: Distribution, Status and Ecology	The Arkansas Game and Fish Commission	15,000
		Bat Ecosystem Management	U.S. Department of Agriculture	10,000
	Steven Hayslette	Biotechnology Resource Group: A Framework for Innovative Partnerships	Middle Tennessee State University	5,000
	Tom Roberts	Deer Check Stations	Tennessee Wildlife Resources Agency	2,250
		Deer Check Stations	Tennessee Wildlife Resources Agency	750

Biology cont'd	Bradford Cook/ Daniel Combs/ Ginger Ensor/ Hayden Mattingly	Assessment of Stream Habitat and Biological Communities Associated with Bridges and Culverts in Tennessee	Tennessee Department of Transportation	\$94,300
	Dennis George/ Bradford Cook	A Comparative Study of the Historical and Present Ecological State of the Emory River Watershed	U.S. Fish and Wildlife Service	15,000
	Thomas Roberts & Kenneth Morgan	Development of a Geo- Referenced Database to Identify and Inventory Wetlands	National Park Service	109,056
	Thomas Roberts/ Kenneth Morgan	Monitoring Groundwater Hydrology and Selected Plant Communities at the Black Swamp Greentree Reservoir Project	Tennessee Wildlife Resources Agency	10,000
Biology/ CFRU	John Gunderson/ James Layzer	Gene Flow Among Seemingly Isolated Populations of the Endangered Bluemask Darter in the Upper Caney Fork River Drainage	Tennessee Wildlife Resources Agency	24,000
CFRU	Phillip Bettoli	The Recreational Fishery of the North Fork of the Holston River	Tennessee Wildlife Resources Agency	14,200
		Assess Paddlefish Stocks and the Commercial Fishery for Paddlefish Caviar in Tennessee and Mississippi Rivers	U.s. Fish and Wildlife Service	15,000
		Bycatch in a commercial Paddlefish Fishery	U.S. Geological Survey	45,000
	James Layzer	Status of the Mussel Fauna in the Green River within the Mammoth Cave national Park	U.S. Geological Survey	15,000
	James Layzer	Effects of Stream Regulation on Freshwater Mussels	U.S. Geological Survey	37,914

CFRU cont'd.	James Layzer	Propagating Mussels at TTU and Culturing Juveniles at Mammoth Cave National Park	U.S. Department of Interior	\$97,188
		Recruitment of Mussels in a Regulated River	U.S. Geological Survey	10,000
		Maintenance of Captive Populations of Endangered Freshwater Mussels	Tennessee Wildlife Resources Agency	6,000
		Status of the Mussel Fauna in the Green River within the Mammoth Cave National Park	U.s. Geological Survey	7,500
		Propagating Mussels at TTU and Culturing Juveniles at Mammoth Cave National Park	U.S. Department of Interior	59,464
		Recovery of the Endangered Ringpink <i>Obovaria retusa</i>	U.S. Geological Survey	18,957
		TWRA-Base Funds	Tennessee Wildlife Resources Agency	20,000
		Fishery Unit-Base Funds	Tennessee Wildlife Resources Agency	10,000
		Development of Techniques to Propagate Freshwater Mussels Utilizing Fish Hatcheries	U.S. Geological Survey	50,000
	Phillip Bettoli/ Hayden Mattingly	Evaluating Reintroductions of the Barrens Topminnow	Tennessee Wildlife Resources Agency	20,000
	Phillip Bettoli/ Melissa Sandrene	Tournament Mortality of Smallmouth Bass and Largemouth Bass in Tennessee Reservoirs	Tennessee Wildlife Resources Agency	21,850

CFRU/Civil Engineering	Phillip Bettoli/ Vince Neary	Assessing the Biological, Sociological, and Economic Characteristics of Tailwater Trout Fisheries in Tennessee	Tennessee Wildlife Resources Agency	\$70,000
Chemistry	Titus Albu	Theoretical Study of the Electrochemical Processes in Fuel Cells	Oak Ridge Associated Universities	5,000
	Hong Zhang	Global Biogeochemical Cycling of Trace Metals: Transport, Transformation, and Fate of Mercury in Watershed	U.S. Department of Agriculture	20,000
		Assessment of Natural Sources (Geological and Vegetation) Mercury Emissions: Specialization, Mechanisms and Significance	University of Nevada at Reno	15,000
Computer Science	Doug Talbert	Website Development for NextRoof Realtors	NextRoof Realtors	14,262
		On-Going Software Development	Wesley Hooper	16,912
Computer Science/Electrical and Computer Engineering/ Mechanical Engineering	Doug Talbert/ Dennis George/ Xubin He/ Michael Rogers/ Kwun-Lon Ting	High Performance Network Connection for Tennessee Technological University	National Science Foundation	128,000
English	Stedman, Stephen/ Barbara Stedman	Bird Inventory for Appalachian Highlands and Cumberland Piedmont Networks	National Park Service	19,015

English, cont'd.	Stedman, Stephen/ Barbara Stedman	Bird Inventory for Appalachian Highlands and Cumberland Piedmont Networks	National Park Service	\$1,132
		Inventory the Birdlife in a National Park Service Unit	National Park Service-Southeast Region	12,000
		Bird Inventory for Appalachian Highlands and Cumberland Piedmont Networks	National Park Service	34,726
Physics	Sakir Ayik	Studies of fluctuation Processes in Nuclear Collisions	Department of Energy	33,000
	R.L. Kozub	Nuclear Physics with Radioactive Ion Beams	Department of Energy	50,000
	Stephen Robinson	Professional Development Materials for CPU Among Elementary Teachers	SDSU Foundation	25,692
		Professional Development Materials for CPU Among Elementary Teachers	SDSU Foundation	5,253
	John Shriner	Proton Resonance Spectroscopy	U.S. Department of Energy	46,000
Upper Cumberland Institute	Homer Kemp	Architectural Survey, 2004-2005	Tennessee Historical Commission	19,000
		Computerization Project, 2004-2005	Tennessee Historical Commission	15,000
Water Center/ Biology	Dennis George/ Bradford Cook	A Comparative Study of the Historical and Present Ecological State of the Emory River	Tennessee Wildlife Resources Agency	15,000
		Collect and Analyze Water Quality Samples from the Emory River Watershed	Tennessee Valley Authority	7,000

BUSINESS ADMINISTRATION 3 projects; 3 researchers; \$168,211				
Administration	Virginia Moore and Kenneth Currie	Small Business Development Center (SBDC) 2003-2004	Tennessee SBDC	\$56,207
		Small Business Development Center (SBDC) 2003-2004 ECD Matching Funds	Tennessee Department of Economic & Community Development	21,004
Decision Science and Management	Curtis Armstrong	Governor's School for IT Leadership	State of Tennessee	91,000
CRAFT CENTER 1 project; 1 researcher; \$4,400				
Craft Center	Gail Gentry	Hands-on Art/Craft Experience for Elementary School Students	Tennessee Arts Commission	\$4,400
EDUCATION 15 projects; 12 researchers; \$2,049,294				
Administration	John Wheeler	Make A Difference Project	Tennessee Department of Education	\$143,451
Curriculum & Instruction	Kristin Pennycuff	Tennessee Early Childhood Education Pilot Program	Tennessee Department of Education	65,000
	Dean Richey	Healthy Start for Upper Cumberland Families and Young Children	Stephens Center	12,876
		Tennessee's Early Intervention System (TEIS) Upper Cumberland Plus: Federal	Tennessee Department of Education	673,747
		Tennessee's Early Intervention System	State Department of Education	100,000
		Pathways to Family Empowerment	Tennessee Department of Education	64,791
		Tennessee's Early Intervention System Upper Cumberland Plus: State	State Department of Education	432,000
		Tennessee's Early Intervention System Upper Cumberland Plus: Public Awareness	State Department of Education	82,365

Curriculum & Instruction cont'd.	Thomas Willis	TDE Special Education Institute-Strand I	Tennessee Department of Education	\$169,298
		TDE Special Education Institute-Strand II	Tennessee Department of Education	68,307
	Shelley Painter & Kristin Pennycuff	Child and Adult Care Food Program	Department of Human Services	21,000
Curriculum and Instruction/ English/ History	Margaret Phelps/Suellen Alfred/ Homer Kemp/Michael Birdwell	Teaching Reading Across Literature and Social Studies	Tennessee Higher Education Commission	72,968
Curriculum and Instruction/ Mathematics	Margaret Phelps/Rafal Ablamowicz	Upper Cumberland Middle Grades Math Partnership	Tennessee Department of Education/ Putnam County Schools	8,500
Curriculum and Instruction/ Mechanical Engineering	Dean Richey/ Stephen Canfield	Enabling Families, Infants, Toddlers and Preschoolers through Technology Projects	State Department of Education-Special Education	34,991
Health and Physical Education	Steve Sanders	Health and Wellness of Children	State Attorney General's Office	100,000
ENGINEERING 75 Projects, 47 Researchers, \$6,555,713				
Chemical Engineering	Joseph Biernacki	RUI: Micro and Meso-Scale Strain Measurements in Cement-Based Materials	National Science Foundation	\$88,969
		Buckeye Experimentation of Cement with and without Fibers	Buckeye Technologies, Inc.	10,354
		Supplement to Micro and Meso-Scale Strain Measurements in Cement-Based Materials	National Science Foundation	6,000
		INTERNATIONAL: Indo-U.S. Workshop on High Performance Cement Based Concrete Composites	National Science Foundation	24,000

Chemical Engineering cont'd.	Donald Visco	UTSI-TTU Graduate Program Collaboration	University of Tennessee Space Institute	\$8,752
Civil & Environmental Engineering	Daniel Badoe	Development of Tennessee Travel Demand Model Users' Group	University of Tennessee-Knoxville	6,500
	Srilaxmi Dosapati	Ivanhoe Fellowship	The Ivanhoe Foundation	5,000
	Guillermo Ramirez	Intergovernmental Personnel Act Agreement (#4)	Naval Postgraduate School	16,000
	Vincent Neary	Trap Efficiency of StormTech™ SC-740 Isolator Row	StormTech, LLC	29,936
Civil & Environmental Engineering/ Mechanical Engineering	Vincent Neary/ Jie Cui	Performance Evaluation of Aqua Swirl Concentrator	Aquashield	30,016
	George Buchanan/John Peddieson	Solid-State Friction Stir Welding	National Center for Advanced Manufacturing	90,000
Electric Power Center	Sastry Munukutla	Center for Electric Power	Tennessee Higher Education Commission	849,800
		Center for Electric Power	Tennessee Higher Education Commission	1,000
		Boiler Cleanliness Model at Homer City	Clyde Bergemann	10,000
		Boiler Cleanliness Model at Vicksburg ISB	Clyde Bergemann	10,000
		Study of Power Electronic Converters	Yaskawa Electric America	21,600
		Installation of CO ₂ Monitor and the Incorporation of Generated Data into the Performance Monitoring Software at NTPC-DADRI	Energy and Environmental Solutions, LLC	37,000

Electric Power Center, cont'd.	Sastry Munukutla, cont'd.	Advanced Control Design and Implementation Support	Electric Power Research Institute (EPRI) via Taft Engineering	\$5,000
	Sastry Munukutla/ Stephen Idem	Boiler Cleanliness Model at Cumberland Station	Clyde Bergemann	10,000
	Sastry Munukutla/ Robert Craven	Real-Time Heat Rate Monitoring	Dominion Generation / Clover Station	40,000
		Inclusion of Moisture Sensor data with Real-Time Heat Rate Calculations	Tennessee Valley Authority	10,000
Electric Power Center/ Chemical Engineering/ Civil and Environmental Engineering/ Mechanical Engineering	Sastry Munukutla/ L.K. Crouch/ Corinne Darvennes/ Stephen Canfield/ Jamie Beard/ Sally Pardue/ Venkat Subramanian	Power-Test-Service Account Projects	Various	55,032
		Power-Test-Service Account Projects-2	Various	5,000
Electrical and Computer Engineering	Nasir Ghani	Unified End-to-End Provisioning in Multi-Domain Metro-Core Networks	University of Houston	47,466
	Xubin He	High Performance and Reliable Storage Support for Clusters (Collaborative-ORNL)	Oak Ridge Associated Universities-Powe Award	5,000
	Satish Mahajan	Explosive Vapor Detection Using Microcantilevers	Oak Ridge National Laboratory/ UT-Battelle, LLC	7,300
		A Robust and Flexible AC Current Transformer	Tennessee Valley Authority	39,935
	Wagdy Mahmoud	International Collaboration for the Development of Evolvable Hardware Design Methodology	National Science Foundation	12,000

Electrical and Computer Engineering cont'd.	Joseph Ojo	Fault Tolerance and High Performance Control of Generators and Induction Motor Drives in Shipboard Power Systems –Year 3	Office of Naval Research	\$124,604
	Ghadir Radman	Proposed Collaborative Research Between TVA and TTU and Graduate Student Support	Tennessee Valley Authority	44,121
	P.K. Rajan	Shipboard Wireless Networking Techniques	Naval Surface Warfare Center	34,517
Electrical and Computer Engineering/ Manufacturing Center	Mohamed Abdelrahman/ Kenneth Currie	In-Situ Real Time Monitoring and Control of Mold Making and Filling Processes	Department of Energy	243,000
Industrial and Manufacturing Engineering	Jessica Matson	Independent Analysis of Cost Saving Projects for the Reindustrialization, Facilities, and Materials Reuse Program	Bechtel Jacobs Company, LLC	5,336
Manufacturing and Industrial Technology	Ismail Fidan	Computer-Aided Knowledge-Based Process Planning for Surface Mount Rework-Phase II	National Science Foundation/ ANESA	8,000
	Ismail Fidan/ Ahmed Elsayy	Integrating Rapid Prototyping Technology into TTU's Manufacturing and Industrial Technology Curriculum	National Science Foundation	50,351
Manufacturing and Industrial Technology/ English	Ismail Fidan/Robert Clougherty	Cutting-Edge Enhancement of TTU's Virtual Manufacturing Practices – SOFTWARE GRANT	3DATUM, Inc	21,250
Manufacturing Center	Kenneth Currie	Testing and Design	Various	1,949
		General Work Study	Various	56,088

Manufacturing Center, cont'd.	Kenneth Currie, cont'd.	ARM Finite Element Analysis services through the Center for Mfg. Research-TTU	ArvinMeritor, Inc.	\$33,718
		General Work Study	Various	157,203
		Testing and Design	Various	20,374
		Center for Manufacturing Research	Tennessee Higher Education Commission	1,434,600
		Fleetguard Work Study	Fleetguard, Inc.	2,634
		Fleetguard Work Study	Fleetguard, Inc.	5,519
		Fleetguard Work Study	Fleetguard, Inc	6,899
		UT-CIS Contract for Employee Services 2003-04	The University of Tennessee Center for Industrial Services	50,000
		APVS Checkweigher System	TechWerks, LLC	12,500
		Manufacturing Center Workshop Agency Account	Various	6,200
	Chunsheng Wang	Advanced Lithium Ion Polymer Batteries for Aerospace Applications	Texas A&M University (via NASA)	26,500
Advanced Lithium Ion Polymer Batteries for Aerospace Applications		Texas A&M	48,667	
Mechanical Engineering	Stephen Canfield	Developing Scale Models for Solar Sails and Assessments of the Required Measurement and Model Resolution	Universities Space Research Association	40,750
		Developing Scale Models for Solar Sails and Assessments of the Required Measurement and Model Resolution	Universities Space Research Association	20,180
		Capture Concepts and Model Development for MXER Tether Systems w/Model Development	National Aeronautics Space Administration	369,000

Mechanical Engineering, cont'd.	Glenn Cunningham	Energy Star Certification Program	Tennessee Small Business Development Center-The University of Memphis	\$15,000
	Sally Pardue	Fleetguard Graduate Research Project-Mert Sasoglu	Fleetguard Corporation	19,526
	Chris Wilson	Effects of Porosity and Low-Velocity Impact Damage on Residual Strength of GFRP Laminates	National Aeronautics and Space Administration	24,000
	Jiahong Zhu	Alloying Effects on Alloy Preparation and Microstructural Features in TbFe ₂	U.S. Department of Energy-Oak Ridge National Laboratory	40,000
	John Zhu	CAREER: Novel Conductive Oxide Coatings on Metallic Interconnect for Intermediate-Temperature SC Year 2	National Science Foundation	78,410
	Jiahong Zhu	REU Supplement to NSF Grant DMR-0238113 Novel Conductive Oxide Coatings	National Science Foundation	5,600
	Ying Zhang	Aluminide Coatings for Power-Generation Applications-Renewal	Oak Ridge National Laboratory	78,000
	Jie Cui/ Stephen Idem	Burner Secondary Air Flow Measurement and CFD Studies	Electric Power Research Institute	40,000
	Chris Wilson and Sally Pardue	Understanding the Service Life of Composites-Phase 3	National Center for Advanced Manufacturing	169,274
	Kwon-Lon Ting	Theory and Practice of Point Line Kinematics	National Science Foundation	91,488
Dale Wilson/ Ken Currie	Titanium Welded Bellows-Material and Process Science-PO 3677	Flexial Corporation	21,000	

Mechanical Engineering/ Civil and Environmental Engineering/ Earth Sciences	Kwon-Lon Ting/ Mark Jackson/ Darrell Hoy/ Jane Liu/ Peter Li	Acquisition of Research and Education Equipment for Geometric Design and Manufacturing Integration	National Science Foundation	\$304,143
Mechanical Engineering/ Electric Power Center	Stephen Canfield/James Beard	Development of Prototype Robot for Pendant Section Inspections	ARF, Inc./EPRI I&C Center	34,500
		NDE Testing Boiler Water Wall Inspection Robot	ARF, Inc./EPRI I&C Center	14,600
Water Center	Yvette Clark	Development of a GIS Template for the Kanawha and Monongahela Rivers	West Virginia Division of Natural Resources	5,000
	Dennis George	Center for the Management, Utilization and Protection of Water Resources	State of Tennessee	1,500
		Water Center Analytical and Computer Services	Various Industries	51,816
		Center for the Management, Utilization and Protection of Water Resources	Tennessee Higher Education Commission	1,129,900
	Amy Knox	Family Fishing Lakes Trout Identification Cards Publication Assistance	Tennessee Wildlife Resources Agency	9,500
	Kim Stearman & Dennis George	Peat Application to Constructed Wetlands for Pesticide Cleanup at a Nursery	Tennessee Department of Agriculture-NPS Program	46,836
	Martha Wells	An Assessment of the Occurrence of Chemicals Causing Endocrine Disruption in Fish in the South Branch of the Potomac River	U.S. Geological Survey	65,000
		Ohio River Fish Passage and Winter Habitat Needs: Fatty Acid Profiles of Selected Fish Species	West Virginia Department of Natural Resources	5,000

**Appendix C
Intellectual Property Activity
FY 2004**

Invention Disclosures & Status							
Disclosure Number	Filing Date	Title	First Named Inventor	Other Inventors	Provisional Patent Filed?	USPTO Application Number	Date of Filing
FY 2004							
04-001-ID	7/28/2003	Automatic Prescription Verification System	Alouani, Ali	Currie, Kenneth	Yes	60/516,176	11/3/2003
04-002-ID	7/29/2003	Multi-Layer Distributed Ip Storage (Mds-Ips)	He, Xubin		Yes	60/583,026	6/28/2004
04-003-ID	11/11/2003	A Compliant Parallel-Gravity Suspension System For A Tracked, Climbing Robot	Canfield, Stephen	Beard, Jamie	Yes	60/583,686	6/30/2004
04-004-ID	11/4/2003	Digital Smith Predictor	Dunn, Alex		No		
04-005-ID	12/3/2003	Wear Compensation Of Machine Tools Using Neural Image Processing To Measure Changes In Tool Geometry	Hyde, Luke	Rhodes, Richard; Jackson, Mark	Yes	60/572,350	5/19/2004
04-006-ID	1/21/2004	Pulsed Water Jet Machining Center	Jackson, Mark	Hyde, Luke; Robinson, Grant	No		
04-007-ID	3/9/2004	Micro Air-Powered Precision Cutting Tool	Khalili, Seyed	Jackson, Mark; Peddieson, John	Yes	60/583,027	6/28/2004
04-008-ID	4/13/2004	A Method And Device For Measurement Of The Profile Of Void Space Distribution In Foam Materials	Abdelrahman, Mohamed	Currie, Kenneth; Walford, Graham	Yes	60/580,636	6/18/2004
COPYRIGHT APPLICATIONS							
Disclosure Number	Effective Date of Registration	Title of Work	Author		Registration Number		
04-001-C	10/24/2003	CAT (Critical Thinking Assessment Test)	Stein, Barry		TXu1-147-004		
04-002-C	12/31/2003	CAT (Critical Thinking Assessment Test) Version 3.2	Stein, Barry		TXu1-178-117		

NOTES