

Tennessee Technological
University

**OFFICE OF RESEARCH
ANNUAL REPORT**

Fiscal Year 2005

Tennessee Technological University is one of the member institutions governed by the Tennessee Board of Regents. The forty-six institutions in this system include six (6) senior universities, thirteen (13) two-year community colleges and twenty-seven (27) technology centers. More than eighty percent (80%) of all Tennessee students attending post-secondary institutions are enrolled in the Tennessee Board of Regents (TBR) system.

ACKNOWLEDGMENT

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

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OFFICE OF RESEARCH FACT SHEET 2004-2005

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 through counseling; conducting professional workshops; locating and providing funding opportunities; and giving guidance through the total process of developing and submitting proposals;
- Assisting grant awardees with post-award guidance;
- Promoting and marketing faculty research; and
- Providing Fellowship sources for graduate students based on research interests, experience(s) and need.

During fiscal year 2005, the University's Mission was supported through the Office of Research in the following ways:

- Grants and Contracts externally funded numbered 154 with a pecuniary value of \$12,338,369.
- Grants and Contracts received through the three Centers of Excellence numbered 110 with a pecuniary value of \$8,385,885, which represents 68.3% of total research dollars and 71.4% grants and contracts received.
- Grants and contracts received through Federal agencies numbered 61 with a pecuniary value of \$3,486,617, which represents 39.6% of grants and contracts and 28.3% of total dollars received.
- Grants and contracts received through State Agencies numbered 65 with a pecuniary value of \$7,722,363 which represents 42.2% of all contracts and 62.6% of total contract dollars received.
- Industry contracts were third at 16 with a pecuniary value of \$854,373, which represents 10.4% of total contracts and 6.9% of total contract dollars.

- Various miscellaneous sources accounted for 11 contracts or 7.1% of total contracts with a pecuniary value of \$269,997 or 2.2% of contract dollars.
- Foundations continue as the least sought after financial source for research funding. There was only one Foundation contract with a pecuniary value of \$5,000 which represents only 0.04% of total grant income, and 0.6% of proposals submitted.
- Proposals submitted for external funding numbered 153 with a pecuniary value of \$37,713,825.
- Proposals submitted through the Centers of Excellence numbered 106 with a pecuniary value of \$29,194,197, which represents 69.3% of proposals submitted and 77.4% of funds requested.
- Proposals submitted to Federal Agencies numbered 89 requesting \$28,782,404, which represents 58.2% of proposals submitted and 76.3% of dollars requested.
- Proposals submitted to State agencies numbered 34 requesting \$7,428,120 which represents 22.2% of proposals submitted and 19.7% of dollars requested.
- Proposals submitted to Industry numbered 16 requesting \$734,766 which represents 10.5% of proposals submitted and 1.4% of dollars requested.
- Proposals submitted to miscellaneous sources numbered 12 requesting \$357,985 which represents 7.8% of proposals submitted and 0.9% of dollars requested.
- Only 2.0 proposals were submitted to Foundations requesting \$303,000 which represents 1.3% of proposals submitted and 0.8% of dollars requested.
- Internal funds were provided in the amount of \$122,100 for small grants to support faculty research in the form of ***research initiation and/or research development***. Twenty-eight projects involving thirty-three faculty members were supported. The average amount of support granted was approximately \$3,000 per faculty member. The amount of funds available is declared each year.
- Internal funds provided for contract matching was \$69,613, which included items such as equipment, faculty release time, student salaries and fees.

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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 fiscal year 2005, hereinafter referred to as the Office of Research.

Research is the *glue* that holds graduate programs together, and the *driving force* for making them grow.

There are approximately seventeen (17) graduate programs of study that provide the Master's degree distributed in five of the seven Colleges and Schools. At least four of these programs are "on-line" programs.

In the College of Education, there is an Education Specialist Degree (Ed.S.) offered. This program rests on a Master's degree requirement plus prescribed hours in special courses above the Master's degree requirement.

The University has three doctoral program areas currently in operation. These programs are housed in the following Colleges: Arts and Sciences, Education, and Engineering.

The Doctor of Philosophy Degree Program 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**, and **Mechanical** with several variations.

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

Students at the University are introduced to research at the baccalaureate level. Many undergraduate students have participated in research, presented papers at State, Regional and National Conferences, and have even been one of the authors of a publication by the time the baccalaureate degree is conferred. Over seventy (70) students participated in launching an Inaugural Student Research Day at the University during 2004-2005.

The Research Office personnel gives support to the faculty and other members of the “University Family” via the following services: **funding sources and research opportunities; proposal development; research compliance; and, research guidance and leadership.** Each of these four categories will be described in the narrative section of the Report.

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, 2005

*Coordinator of the Annual Report

THE NARRATIVE

Introduction

The Annual Report, 2005, describes the research activities of the Office of Research and Graduate Studies from July 1, 2004 through June 30, 2005. The research services and activities will be described according to the categories set forth in the Executive Summary.

Funding Sources and Research Opportunities

Several thousands of dollars are invested annually by the University for research support and funding sources access, either directly or indirectly. This investment is made to motivate and assist faculty in their research efforts.

The Community of Science (COS) database, to which the University subscribes, is the leading internet research site for the global community. Through the Community of Science database, faculty can collaborate with fellow-researchers and stay abreast of research opportunities all over the world. They can choose a colleague with whom to do collaborative research. These opportunities are as close as their desktop computer.

The Office of Research, through direct personal communication with faculty and maintaining a webpage at <http://www.tntech.edu/research>, keeps faculty apprised of a wide range of funding sources for research and Fellowships for their graduate students.

Tennessee Technological University is a member institution of Oak Ridge Associated Universities (ORAU) and the American Association of State Colleges and Universities (AASCU). The ORAU membership provides access to many collaborative research opportunities. Their annual meeting is held in the Spring.

Proposal Development and Funding Patterns

This area of service is at the very nucleus of research activities, for it is around these two areas that all other services revolve. Once funding sources have been identified proposals are developed; after submitting proposals, all hopes are turned to funding.

These activities - submitting proposals to the proper funding sources and the strong hope of satisfying the proposal criteria and getting funded, are the real “driving force” for Research Office Activities.

Proposal Development and Funding Patterns

Proposal Development is ever evolving and presenting a challenge. Developing proposals 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 individuals and “interest groups” on a continuing basis by appointment.

During fiscal year 2005, 153 proposals were submitted to various agencies requesting a total of \$37,713,825. There were 106 proposals submitted through the Centers of Excellence accounting for 69.3% of all proposals submitted. The funds requested through the Centers of Excellence was \$29,025,793 which accounted for 77.0% of all funds requested. The funds received via grants and contracts from external sources numbered 154 with a pecuniary value of \$12,338,369. Ninety one of the contracts received was through the Centers of Excellence with a pecuniary value of \$8,426,788, which accounted for 68.3% of all contract dollars received and 59.1% of total contracts.

The number of proposals funded or contracts received in a given year is not to be matched against, or thought of as a percentage of proposals submitted. Each category is independent. The grants and contracts are those received during the fiscal year in question independent of when the request for them was submitted. The proposals submitted and the grants/contracts received this fiscal year (2005) by University unit are shown in Table I. The proposals submitted and grants received through the Centers of Excellence by University Unit are shown in Table II. Funds requested and received by Agency classification along with the percentage of funding by each Agency are shown in Table III and Figure 1. Federal Agencies who funded grants received are shown in Table IV. Funds requested and received by type of Activity are shown in Table V along with the percentage of funding by activity in Figure 2. The type of activities for which funds are requested cover all facets of the Mission of the University; hence, the sources of funds are quite varied. Federal and State Agencies are by far the greatest receptors of grant requests.

Due to varying fiscal year dates and Agency deadlines, the number of proposals funded in a given fiscal year does NOT represent a percentage of proposals submitted in that same year. Grant income for a given year is based on contracts signed and funds received during 2004-2005.

When the proposal was submitted requesting the funds is irrelevant. Hence, comparative information is based on patterns observed over several years. Proposals submitted and grants awarded are compared on a five year pattern. Fiscal years 2001 through 2005 are shown in Tables VI through XI and figures 3 through 6.

Five-year Funding Patterns

Funding patterns do not change significantly from year to year as is shown in Table VI and Figure 3. In the five years shown, there is a slight increase each year with the greatest increase, 1.3 million dollars, in 2003. Statistically, there was no increase from 2004 to 2005, both would be considered 12.3 million dollars even though there are a few more dollars in 2005. The increases are approximately: from 2001 to 2002 ~ 0.4 million dollars; 2002 to 2003 approximately 1.3 million dollars which is the greatest increase in the five-year span; 2003 to 2004 approximately 0.6 million dollars and 2004 to 2005 the gain is less than 0.1 million dollars. There was a constant drop in the number of grants received, even though the dollars received increased.

TABLE I
Grants Requested and Grants Received
by
University Unit
FY 2005

University Unit	Grants Requested	Grant Value	Grants Received	Grant Value
Agriculture & Human Ecology	6	\$376,557	12	\$610,163
Arts & Sciences*	17	3,903,620	7	166,881
Business Adm.*	4	324,292	5	424,292
Education*	12	2,146,454	16	2,162,340
Engineering*	4	175,933	2	70,000
Nursing	--	--	1	492,080
Administrative Offices	1	493,222	--	--
University Library	1	1,300	--	--
Student Services	--	--	1	26,728
C/E Energy Systems Research **	35	5,356,371	27	1,857,966
C/E Manufacturing Research**	44	16,723,542	36	3,739,240
C/E Water Resources Research**	29	8,212,534	47	2,788,679
TOTALS	153	\$37,713,825	154	\$12,338,369

* Without Centers of Excellence

** See Table II

TABLE II
Grants Requested and Grants Received
Through Centers of Excellence
By Academic Unit
FY 2005

Center/Academic Unit	Grants Requested	Grant Funds Requested	Grants Received	Grant Value
<u>Energy Systems Research</u>				
Center	7	\$507,976	10	\$1,141,396
Chemical Engineering	8	2,173,874	-	-
Chemical Engineering / Mfg. & Ind. Tech	1	46,723	1	46,723
Civil & Environmental Engineering	6	467,453	3	115,311
Civil & Environmental Engineering/ Mechanical Engineering	1	60,000	-	-
Civil and Environmental Engineering/Mechanical Engineering & Center	1	21,837	-	-
Electrical & Computer Engineering	2	512,619	6	179,735
Electrical & Computer Engineering, Manufacturing & Industrial Technology	2	471,220	-	-
Mathematics	-	-	2	211,518
Mechanical Engineering	4	975,919	3	137,017
Mechanical Engineering and Center	1	10,000	-	-
Office of Research and Graduate Studies	-	-	1	26,266
TOTALS	33	\$5,258,121	26	\$1,857,966
<u>Manufacturing Research</u>				
The Center	12	\$3,047,964	11	\$2,038,543
Administrative Offices/ Curriculum & Instruction/Center	1	600,000	-	-
Business Administration and Center	1	56,664	2	62,716
Chemical Engineering	2	583,589	4	178,306
Chemical Engineering and Chemistry	1	2,688,104	1	49,716
Civil & Environmental Engineering	1	312,403	-	-
Computer Science	4	3,398,718	2	163,360
Electrical & Computer Engineering	11	2,628,479	4	279,020
Electrical & Computer Engineering/Industrial & Mfg. Engineering	-	-	1	336,014
Manufacturing & Industrial Technology	-	-	2	18,431

Center/Academic Unit	Grants Requested	Grant Funds Requested	Grants Received	Grant Value
Mechanical Engineering	7	1,147,228	8	\$602,072
Mechanical Engineering & Center	1	11,062	1	11,062
Mechanical Engineering/Chemical Engineering/Chemistry/Electrical & Computer Engineering and Center	1	500,000	-	-
Mechanical Engineering/Chemical Engineering/Curriculum & Instruction/Mathematics and Physics	1	999,336	-	-
Mechanical Engineering/Decision Sciences-Management	1	749,995	-	-
TOTALS	44	\$16,723,542	36	\$3,739,240
Water Resources Research				
The Center	8	\$2,356,403	11	\$1,444,999
Administrative Office	-	-	1	25,146
Biology	5	113,540	21	715,849
Biology and Center	-	-	3	35,000
Biology/Co-Op Fisheries Unit	3	208,856	2	31,850
Biology/Chemistry/Curriculum & Instruction/Mathematics	1	1,737,308	-	-
Chemical Engineering	1	250,000	1	50,000
Chemistry	-	-	3	40,000
Chemistry and Center	2	388,867	-	-
Chemistry, Mechanical Engineering and Center	1	400,000	-	-
Civil and Environmental Engineering	4	1,311,343	2	314,950
Civil & Environmental Engineering/Engineering Administration	1	846,221	-	-
Computer Science, Electrical & Computer Engineering & Mechanical Engineering and Center	-	-	1	72,000
Earth Sciences	-	-	1	16,000
Foreign Language and the Center	1	199,996	-	-
History and the Center	-	-	1	42,885
Mechanical Engineering and the Center	2	400,000	-	-
TOTALS	29	\$8,212,534	47	\$2,788,679
GRAND TOTALS	106	\$30,194,197	109	\$8,380,885

TABLE III
Grants Requested and Grants Received
by
Agency Classification
FY 2005

Agency Classification	Grants Requested	Grant Values	Grants Received	Grant Values
Federal	89	\$28,782,404	61	\$3,486,617
State	34	7,535,670	65	7,722,363
Industry	16	734,766	16	854,393
Other	12	357,985	11	269,997
Foundations	2	303,000	1	5,000
TOTALS	153	\$37,713,825	154	\$12,338,369

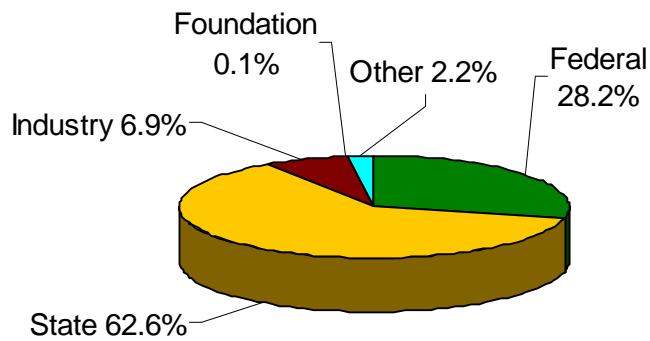


Figure 1. Percentage Funding of Proposals by Agency
FY 2005

TABLE IV
Federal Grants Received by Agency
FY 2005

Federal Agencies	Grant Value Received
Department of Health and Human Services	\$492,080
Great Smokey Mountains National Park	12,500
National Aeronautics and Space Administration	97,338
National Science Foundation	1,105,254
Oak Ridge National Laboratory	127,445
Office of Naval Research	112,290
Tennessee Valley Authority	113,728
United States Department of Agriculture	50,000
United States Department of Defense	90,247
United States Department of Interior	169,163
United States Fish & Wildlife Service	76,000
United States Geological Survey	82,038
<u>TOTAL Direct Federal Dollars</u>	\$3,249,679

TABLE V
Grants Requested and Grants Received
by
Activity/Use Classification
FY 2005

Activity/Use	Grants Requested	Grant Value	Grants Received	Grant Value
Research	119	\$32,885,193	113	\$8,213,657
Public Service	19	2,792,468	24	2,600,879
Instruction	8	1,537,615	12	1,015,064
Equipment	4	270,747	3	358,735
Proprietary	3	227,802	2	150,034
TOTALS	153	\$37,713,825	154	\$12,338,369

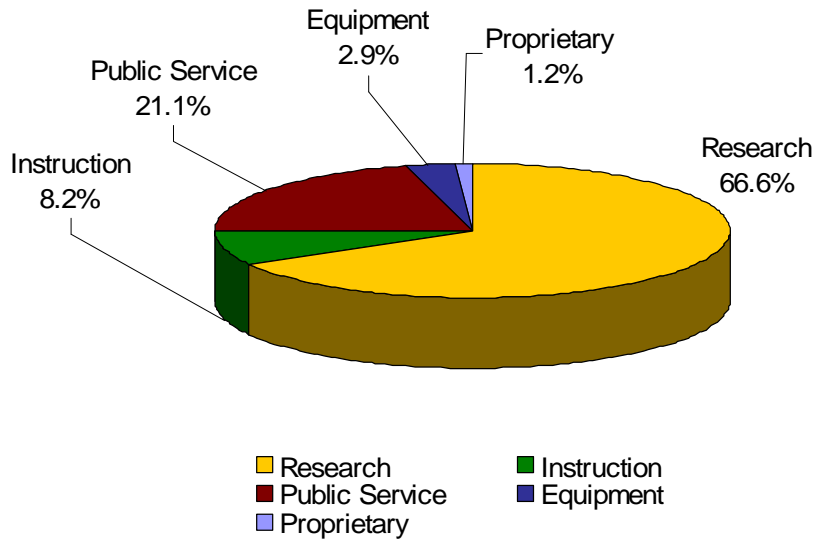


Figure 2. Percentage Funding of Grants
by Type of Activity
FY 2005

TABLE VI

**Grants Requested and Grants Received
FY2001-FY2005**

Fiscal Year	Grants Requested	Grant Value	Grants Received	Grant Value
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
2005	153	37,713,825	154	12,338,369

Funds in Millions

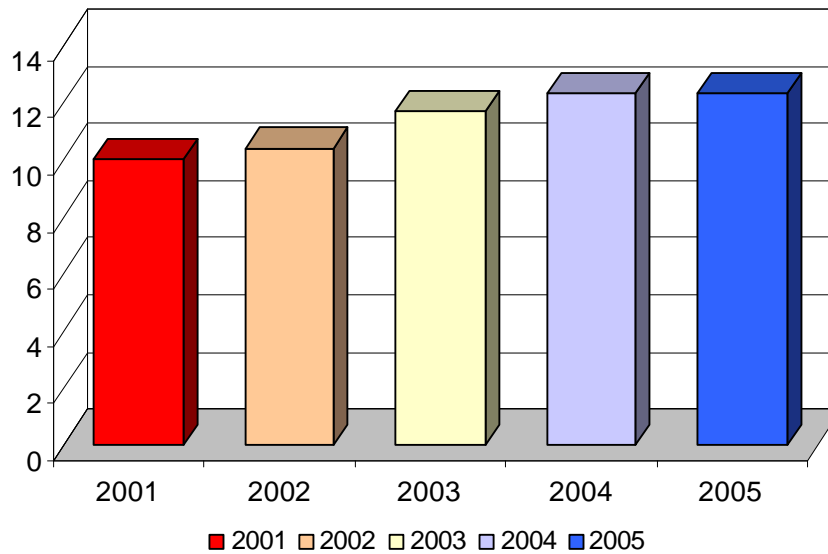


Figure 3. External Funds Received
FY 2001- FY 2005

TABLE VII

**Grants Received by Agency Classification
FY2001-FY2005**

Fiscal Year	Federal	State	Industry	Other	Foundation	TOTAL
2001	42	59	91	14	3	209
2002	46	57	67	17	4	191
2003	43	59	41	17	-	160
2004	60	56	31	9	3	159
2005	61	65	16	11	1	154
Totals	252	296	246	68	11	873

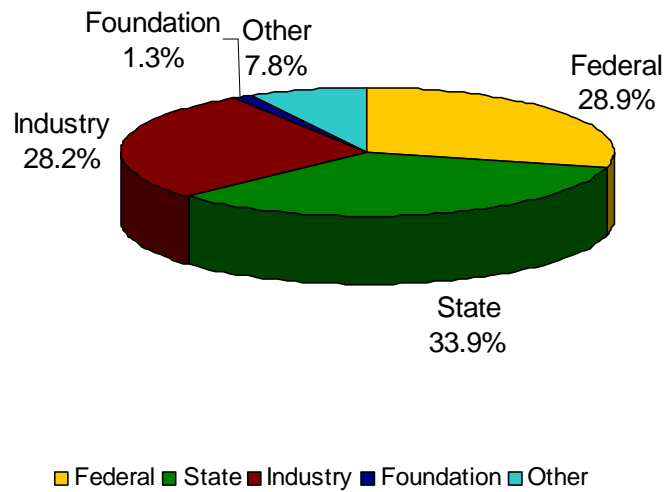


Figure 4. Average Percentage of Funding by Agency Classification FY2001-FY2005

TABLE VIII
Grants Received and Grant Values
by
Agency Classification
FY2001-FY2005

Fiscal Year	Federal Grants		State Grants		Industrial Grants		Other		Foundations	
	No.	Grant Value	No.	Grant Value	No.	Grant Value	No.	Grant Value	No.	Grant Value
2001	42	\$2,156,353	59	\$6,661,019	91	835,186	14	\$293,240	3	\$52,567
2002	46	2,159,598	57	7,300,126	67	536,926	17	370,946	4	46,625
2003	43	3,167,670	59	7,497,635	41	699,434	17	357,950	-	-
2004	60	4,174,244	56	6,895,156	31	774,565	9	400,162	3	35,945
2005	61	3,486,617	65	7,722,363	16	854,395	11	269,997	1	5,000
Totals	252	\$15,144,482	296	\$36,076,299	246	\$3,700,506	68	\$1,692,295	11	\$140,137

TABLE IX

**Grants Received by Agency Classification
FY2001-FY2005**

Agency Classification	Grants Received	Grant Value	Percentage of Grant Value
Federal	252	\$15,144,482	26.7%
State	296	36,076,299	63.6%
Industry	246	3,687,043	6.5%
Other	68	1,692,295	3.0%
Foundations	11	140,137	0.2%

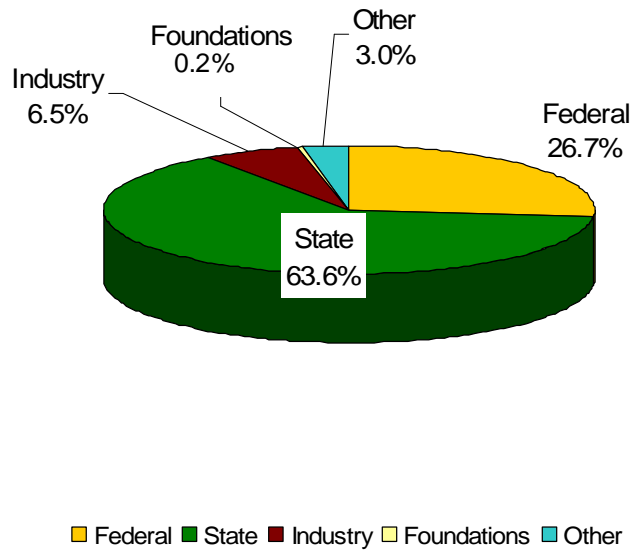


Figure 5. Percentage of Funding by Agency Classification FY2001-FY2005

TABLE X

**Value of
Grants Received by Type of Activity
FY2001-FY2005**

Fiscal Year	Research		Instruction		Public Service		Equipment		Proprietary	
	No.	Grant Value	No.	Grant Value	No.	Grant Value	No.	Grant Value	No.	Grant Value
2001	168.0	\$7,304,489	14.0	\$758,279	26.0	\$1,881,097	1.0	\$54,500	-	\$-
2002	150.0	6,978,439	12.0	747,230	27.0	2,410,820	2.0	277,732	-	-
2003	124.0	7,131,095	12.0	2,499,765	23.0	2,062,875	1.0	28,954	-	-
2004	119.5	7,530,479	8.5	1,647,836	26.0	2,678,234	5.0	423,523	-	-
2005	113.0	8,213,657	12.0	1,015,064	24.0	2,600,879	3.0	358,735	2.0	150,034
Totals	674.5	\$37,158,151	58.5	\$5,995,667	126	\$11,633,905	12.0	\$1,143,444	2.0	\$150,034

TABLE XI
Number of Grants Received by Type of Activity
FY2001-FY2005

Fiscal Year	Research	Instruction	Public Service	Equipment	TOTAL
2001	168.0	14.0	26.0	1.0	209
2002	150.0	12.0	27.0	2.0	191
2003	124.0	12.0	23.0	1.0	160
2004	119.5	8.5	26.0	5.0	159
2005	113.0	12.0	24.0	3.0	152
Totals	674.5	58.5	126	12.0	871

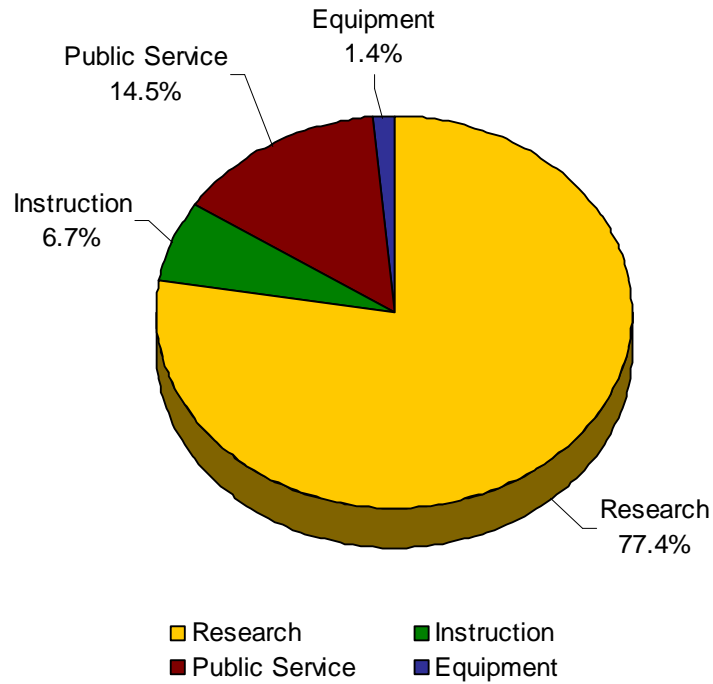


Figure 6. Average Percentage of Funding
By Type of Activity
FY2001-FY2005

Research Compliance and General Compliance 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 Compliance 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 Patents 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 of the Office of Research performed for fiscal year 2005 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 for 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) Served as the 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 of Science.
- c) Serves on the Committee for Chemical Safety of the American Chemical Society
- d) Served as chair of the Ethics in Science and Technology Section of the Tennessee Academy of Science.
- e) Created and gave leadership to the first ever campus wide Student Research Day at Tennessee Technology University held on April 22, 2005.

Appendices

Appendix A gives 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 funds received. Administrators, faculty and staff were responsible for approximately 8.8 million dollars, or the remaining 72% of the total grant income.

Appendix B gives the total amount of research funds brought into the University from external sources by college/area, departments/units within a given college, the faculty/administrators/staff 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, Academic Unit and Funding Amount Fiscal Year 2005

ADMINISTRATION		\$898,421
Business Administration	\$12,542	
Disability Services	26,728	
Engineering	315,659	
Nursing	492,080	
Research and Graduate Studies	51,412	
AGRICULTURE & HUMAN ECOLOGY		\$610,163
Agriculture	\$102,800	
Human Ecology	507,363	
ARTS & SCIENCES		\$1,417,458
Biology	\$125,849	
Chemistry	40,000	
Computer Science	235,360	
Co-Op Fisheries	61,850	
Earth Sciences	21,124	
Mathematics	211,518	
Physics	121,757	
BUSINESS ADMINISTRATION		\$474,466
Business Administration	\$62,716	
Decision Science and Management	411,750	

Appendix A – cont'd

EDUCATION		\$2,162,340
Counseling & Psychology	123,661	
Craft Center	5,000	
Curriculum & Instruction	2,033,679	
ENGINEERING		\$2,076,636
Chemical Engineering	\$324,745	
Civil & Environmental Engineering	164,602	
Electrical & Computer Engineering	794,769	
Manufacturing & Industrial Technology	18,431	
Mechanical Engineering	774,089	
RESEARCH CENTERS		\$4,698,885
Center for Energy Systems Research	\$1,141,396	
Center for Manufacturing Research	2,049,605	
Center for Management, Utilization and Protection of Water Resources Research	1,507,884	
Total Amount for Externally Funded Research		\$12,338,369

Appendix B
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Administration: 7 projects; 7 Administrators			\$898,421	
Business Administration	Virginia Moore	Leadership Upper Cumberland	Leadership Upper Cumberland	\$12,542
Disability Services	Sammie Young	Learning Disabilities Program	Tennessee Department of Human Services	\$26,728
Engineering	Glen Johnson	Equipment Grant Fund	Tennessee Department of Commerce and Insurance	\$35,000
	Roy Loutzenheiser	TTU/UC Partnership: Meeting 7-12 Math & Physical Science through Engineering Applications	Tennessee Department of Education	\$280,659
Nursing/ Facilities and Business Services	Marilyn Musacchio and Glenn Binkley	New Nursing and Health Services Building	Department of Health and Human Services	\$492,080
Research and Graduate Studies	Francis Otuonye	U.S.-Brazil Higher Education Consortium Program	New Mexico Institute of Mining and Technology	\$25,146
		Earth Sciences Institute	The National Science Foundation	\$26,266

Appendix B, cont'd
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Agriculture and Human Ecology: 4 Researchers, 9 Projects \$610,163				
Agriculture	Douglas Airhart	Professional Forums for City Foresters in Tennessee	Tennessee Department of Agriculture	\$12,150
	Ben Byler	Tennessee Association FFA Camp Clements Leadership Grant	Tennessee Department of Education	\$72,454
		Agricultural Education In-service Program		\$14,347
		Tennessee Department of Education Camp Clements-Lifeguards		\$2,349
	Jed Young	Weedy Ornamentals Cut Branch Research	The Tennessee Nursery and Landscape Association, Inc.	\$1,500
Human Ecology	Sue Bailey	Tennessee Early Childhood Training Alliance	Tennessee State University Center of Excellence for Research Policy and Basic Skills	\$146,918
		Upper Cumberland Child Care Resource and Referral	Department of Human Services via Signal Centers of Chattanooga	\$330,652
		Family and Consumer Sciences Teacher Education Contract	Tennessee Department of Education	\$9,793
		Tennessee Early Childhood Training Alliance	Southwest Tennessee Community College	\$20,000

Appendix B, cont'd
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Arts and Sciences: 30 Researchers, 36 Projects			\$1,417,458	
Biology	Sharon Berk	Microbial Ecology of Food-Borne Pathogens-Role of Protozoa in Pathogen Survival and Maintenance in the Environment	U. S. Department of Agriculture	\$50,000
	Sharon Berk and John Gunderson	Acquisition of a Confocal Microscope	The National Science Foundation	\$233,488
	Phillip Bettoli and James Layzer	Evaluating Reintroductions of the Barrens Topminnow	Tennessee Wildlife Resources Agency	\$20,000
	Phillip Bettoli and Vincent Neary	Tailwater Trout Investigation	Tennessee Wildlife Resources Agency	\$70,000
	Bradford Cook	Biological Monitoring, Greenbrier Road Project, Great Smokey Mountains National Park	Great Smokey Mountains National Park Services	\$12,500
	Bradford Cook, Daniel Combs, Ginger Ensor, and Hayden Mattingly	Assessment of Stream Habitat and Biological Communities Associated with Bridges and Culverts in Tennessee	Tennessee Department of Transportation	\$12,075
	John Gunderson and 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

Appendix B, cont'd
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Arts and Sciences, continued:				
Biology cont'd	Michael Harvey	Endangered Bats of Arkansas: Distribution, Status and Ecology	The Arkansas Game and Fish Commission	\$15,000
	Steven Hayslette	GEF-Grenada Dry Forest Biodiversity Conservation Project	World Bank	\$22,000
	James Layzer	Effects of Stream regulation on Freshwater Mussels	U. S. Geological Survey	\$37,914
		Refinement of Methods for Fish Hatchery Production of Juvenile Mussels and Translocation Success in the Cumberland and Tennessee River Systems	U. S. Department of the Interior	\$25,000
		Recruitment of Mussels in a Regulated River	U. S. Geological Survey	\$10,000
		Propagate and Restore Endangered Mussels in the Green River	U. S. Department of the Interior	\$43,000
	James Layzer and Melissa Sandrene	Present Status of the Threatened Snail Darter (<i>Percina tanasi</i>)	U. S. Geological Survey	\$56,872
	Hayden Mattingly	Conservation Status of the Threatened Blackside Dace in Selected Cumberland River Streams	U. S. Fish and Wildlife Service	\$11,000
		Distribution and Abundance of the Blackside Dace in Key Watersheds of the Upper Cumberland River System	U. S. Geological Survey	\$10,000

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Arts and Sciences, continued:				
Biology/Civil and Environmental Engineering	Hayden Mattingly and Vincent Neary	Conservation and Recovery of Barrens Topminnow Populations Exposed to Invasive Mosquitofish	U. S. Fish and Wildlife Service	\$50,000
Biology	Michael Redding	Conference: Student Travel Support for 6 th International Congress on Biology of Fish, Brazil, August 2004	The National Science Foundation	\$10,000
	Thomas Roberts	Deer Check Stations	Tennessee Wildlife Resources Agency	\$3,000
	Thomas Roberts and Kenneth Morgan	Monitoring Groundwater Hydrology and Selected Plant Communities at the Black Swamp Greentree Reservoir Project	Tennessee Wildlife Resources Agency	\$10,000
Co-op Fisheries Unit	Phillip Bettoli	Tournament Mortality of Smallmouth Bass and Largemouth Bass in Tennessee Reservoirs	Tennessee Wildlife Resources Agency	\$21,850
	James Layzer	Habitat Characterization and Distribution Surveys for Chucky Madtom in Tributaries to Little Chucky Creek	U. S. Geological Survey	\$10,000
		TWRA-Base Funds	Tennessee Wildlife Resources Agency	\$20,000
		Fishery Unit-Base Funds		\$10,000

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Arts and Sciences, continued:				
Chemistry	Dale Ensor	Separation Studies of /f/- Elements	Oak Ridge National Laboratory	\$20,000
	Hong Zhang	Assessment of Natural Sources (Geological and Vegetation) Mercury Emissions: Specification, Mechanisms, and Significance	University of Reno at Nevada	\$20,000
Computer Science	Srini Ramaswamy, Michael Rogers, and Douglas Talbert	National Institute of Standards and Technology ATP Project	InRAD	\$155,558
		Development with FiMatrix, Inc.	Financial Matrix, Inc.	\$7,802
Computer Science, Electrical and Computer Engineering, Mechanical Engineering, The Water Center	Douglas Talbert, Xubin He, Dennis George, Michael Rogers, and Kwun-Lon Ting	High Performance Network Connection for Tennessee Technological University	The National Science Foundation	\$72,000
Earth Sciences	Michael Harrison	Geologic Bedrock and Surficial Map of the Cookeville East Quadrangle, Tennessee	U. S. Geological Survey	\$5,124
	Hugh Mills	Surficial Geologic Map of the Grottoes 7.5-minute Quadrangle, Rockingham and Augusta Cos., VA	Virginia Division of Mining Minerals and Energy	\$16,000

Appendix B, cont'd
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Arts and Sciences, continued				
Mathematics	Sabine LeBorne	Hierarchical Matrices in Computational Fluid Dynamics	The National Science Foundation	\$117,026
		Theory and Application of Hierarchical Matrices in Multiscale Problems	U. S. Department of Energy	\$94,492
Physics	Sakir Ayik	Studies of Fluctuation Processes in Nuclear Collisions	U. S. Department of Energy	\$54,000
	Raymond Kozub	Nuclear Physics with Radioactive Ion Beams	U. S. Department of Energy	\$50,000
	Stephen Robinson	Professional Development Materials for Constructing Physics Understanding	San Diego State University	\$17,757

Business Administration: 4 Researchers, 6 Projects			\$474,466	
Decision Science and Management	Curtis Armstrong	Governor's School for IT Leadership	Tennessee Department of Education	\$113,750
	Kevin Liska	Regents' Online Degree Program Marketing Campaign	Tennessee Board of Regents	\$226,000
		Strategic Planning		\$72,000
TTU Small Business Development Center-2005	Virginia Moore and Kenneth Currie	TTU Small Business Development Center 2005	Tennessee Small Business Development Center	\$62,716

Appendix B, cont'd
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Education: 9 Researchers, 14 Projects			\$2,162,340	
Counseling and Psychology, Sociology and Political Science, and Biology	Barry Stein, Ada Haynes, and Michael Redding	Project CAT: Assessing Critical Thinking Skills	The National Science Foundation	\$123,661
The Craft Center	Gail Gentry	Hands-On Art/Craft Experience for Elementary School Students	Tennessee Arts Commission	\$5,000
Curriculum and Instruction	Susan Gore	Effective Mathematics Teaching Strategies	Tennessee Higher Education Commission	\$24,641
	Kristen Pennycuff	Child and Adult Care Food Program	Tennessee Department of Education	\$25,704
		Tennessee Early Childhood Education Pilot Program		\$65,000
	Dean Richey	Healthy Start for Upper Cumberland Families and Young Children	Stephens Center	\$12,876
		Pathways to Family Empowerment Project: An Evaluation of TEIS and the Impact of Family-Centered Service Delivery	Tennessee Department of Education	\$74,499
		Tennessee's Early Intervention System (TEIS) Upper Cumberland Plus		\$1,356,821
	John Wheeler	TTU Make A Difference Project	Tennessee Department of Education	\$146,203

Appendix B, cont'd
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Education continued:				
Curriculum and Instruction, cont'd	Thomas Willis	Tennessee Department of Education Special Education Institute-Strand I	Tennessee Department of Education	\$169,298
		TDE Special Education Institute-Strand II		\$67,589
		TTU Base-Tennessee Teaching Program		\$74,848
		TDE Special Education Institute-Strand I		\$16,200

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Engineering: 49 Researchers, 58 Projects			\$6,775,521	
Chemical Engineering	Joseph Biernacki	RUI: Micro and Meso-Scale Strain Measurements in Cement-Based Materials	The National Science Foundation	\$87,552
		Buckeye Experimentation of Cement With and Without Fibers	Buckeye Technologies	\$31,980
Chemical Engineering and Manufacturing and Industrial Technology	Joseph Biernacki and Ahmed ElSawy	Manufacturing of Lightweight Aggregate from Fly-Ash	Tennessee Valley Authority	\$46,723
Chemical Engineering	Donald Visco	Exploring the Effects of Self and Cross-Clustering on the Thermodynamics of Strongly Associating Systems	The American Chemical Society	\$58,774
		Developing Novel Scaffolds for Biological Molecules by Solving the I-QSAR Problem Using the Signature Molecular Descriptor	Sandia National Laboratory	\$50,000
Chemical Engineering and Chemistry	Donald Visco and Jeffrey Boles	TTU-Regional Undergraduate Research Center	The National Science Foundation	\$49,716
Civil and Environmental Engineering	Craig Henderson	Development of Code-Appropriate Methods for Predicting the Capacity of Masonry Infilled Frames Subjected to In-Plane Forces	National Concrete Masonry Association Education and Research Foundation	\$34,470
	David Huddleston	Professional Services for St. Louis Bay Estuary and Watershed Model Refinement and Calibration	Mississippi State University	\$35,000

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Engineering, continued:				
Civil and Environmental Engineering, cont'd	Sharon Huo	Efficient Evaluation and Rating of Tennessee Highway Bridges Using the AASHTO LFR and LRFR Specifications	Tennessee Department of Transportation	\$45,841
	Vincent Neary	Independent Technical Panel Review and Recommendations on Hydrodynamic and Water Quality Modeling	U. S. Department of the Interior	\$34,291
Civil and Environmental Engineering and Biology	Dennis George and 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
Electrical and Computer Engineering and Industrial and Manufacturing Engineering	Mohamed Abdelrahman and Ken Currie	In-Situ Real Time Monitoring and Control of Mold Making and Filling Processes	U. S. Department of Energy	\$336,014
Electrical and Computer Engineering	Nasir Ghani	Dynamic Multi-Domain/Multi-Granularity Network Provisioning	The National Science Foundation	\$86,629
		Unified End-to-End Provisioning in Multi-Domain Metro-Core Networks	University of Houston	\$2,500
	Xubin He	REU Site: Research Experience for Undergraduates in Network and Communication Systems	The National Science Foundation	\$99,644

Appendix B, cont'd
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Engineering, continued				
Electrical and Computer Engineering, cont'd	Satish Mahajan	Explosive Vapor Detection Using Microcantilevers	Oak Ridge National Laboratory	\$21,945
		A Robust and Flexible AC Current Transformer	Tennessee Valley Authority	\$35,000
Electrical and Computer Engineering and Mechanical Engineering	Satish Mahajan and Jie Cui	Flow Modeling of a Preconcentrator	Oak Ridge National Laboratory	\$10,500
Electrical and Computer Engineering	Joseph Ojo	Mixed-Winding, High Phase Order Induction Machines with Multi-Phase, Multi-Level Converters for High Power Drive and Generator Applications	Office of Naval Research	\$112,290
	Robert Qiu and P. K. Rajan	A General Purpose UWB Transceiver Testbed for Communications and Ranging-Equipment	U. S. Department of Defense	\$90,247
Electrical and Computer Engineering and The Water Resources Research Center	Prabha Manikya Mellacheruvu	Ivanhoe Fellowship	The Ivanhoe Foundation	\$5,000

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Engineering continued				
Manufacturing and Industrial Technology	Ahmed ElSawy	INTERNATIONAL: Innovative Technology for Improving Wear Resistance and Fracture Toughness of austempered ductile iron used for automotive industry by either thermomechanical or two-step austempering	The National Science Foundation	\$10,431
	Ismail Fidan and Sedar Tumkor	Computer-Aided Knowledge-Based Process Planning for Surface Mount Rework	The National Science Foundation	\$8,000
Mechanical Engineering	Stephen Canfield	Developing Scale Models for Solar Sails and Assessments of the Required Measurement and Model Resolution	Universities Space Research Association	\$28,197
		Capture Concepts and Model Development for MXER Tether Systems w/Model Development	National Aeronautics and Space Administration	\$45,141
Mechanical Engineering and Energy Systems Research Center	Stephen Canfield and James Beard	NDE Testing Boiler Water Wall Inspection Robot	ARF, Inc./EPRI	\$14,500
Mechanical Engineering and Curriculum and Instruction	Stephen Canfield and Dean Richey	Enabling Families, Infants, Toddlers, and Preschoolers through Technology: EIME Project	Tennessee Department of Education	\$35,000

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Engineering continued				
Mechanical Engineering	Glenn Cunningham	Industrial Technology Program Outreach and Facilitation 2005-06	Tennessee Department of Economic and Community Development	\$100,000
	Corinne Darvennes and Stephen Idem	Inlet Installation Effects on Small Propeller Fans, Air & Sound	ASHRAE	\$94,320
	Kwun-Lon Ting	Theory and Practice of Point Line Kinematics	The National Science Foundation	\$87,865
	Chris Wilson	Effects of Porosity and Low-Velocity Impact Damage on Residual Strength of GFRP Laminates	National Aeronautics and Space Administration	\$24,000
	Chris Wilson, Joseph Richardson, Sally Pardue, and Darrell Hoy	Understanding the Service Life of Composites	National Center for Advanced Manufacturing	\$65,000
	Jiahong Zhu	Tailoring Fe-Base Alloys for Intermediate-Temperature SOFC Interconnect Application	U. S. Department of Energy	\$187,090
		CAREER: Novel Conductive Oxide Coatings on Metallic Interconnect for Intermediate-Temperature SOFC Application	The National Science Foundation	\$92,976

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Engineering continued				
Energy Systems Research Center	Sastry Munukutla	Energy Systems Research Center	Tennessee Higher Education Commission	\$984,059
	Sastry Munukutla and James Beard	Perform Robotic Inspections of TVA Structures	Tennessee Valley Authority	\$25,000
	Sastry Munukutla and Robert Cravens	Real-Time Performance Monitoring and Coal Analysis Determination for Gaston Units 1&4 and Gadsden Units 1&2	Southern Company Services	\$50,000
		Real-Time Performance Monitoring for Monticello Units 1 and 2 and Big Brown Units 1 and 2	TXU Energy	\$18,000
		Installation of CO ₂ Monitor and the Incorporation of Generated Data into the Performance Monitoring Software at NTPC-DADRI	Energy and Environmental Solutions, LLC	\$12,500
		Real-Time Coal Quality and Performance Monitoring for Huntly Station	Huntly Power Station	\$30,000
	Energy Systems Research Center, Civil and Environmental Engineering, and Mechanical Engineering	Sastry Munukutla, L. K. Crouch, and Corinne Darvennes	Power-Test-Service Account Projects	Various Sources

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Engineering continued				
The Manufacturing Research Center	Kenneth Currie	The Center for Manufacturing Research	Tennessee Higher Education Commission	\$1,482,200
		Manufacturing Center - 2003-04 Carryover Budget	Tennessee Higher Education Commission	\$5,010
		UT-CIS Contract for Employee Services 2004-05	The University of Tennessee Center for Industrial Services	\$50,000
		Counter Gravity (Hitchiner) and Pressure Assisted Lost Foam Magnesium Casting	Oak Ridge National Laboratory	\$70,000
		ARM Finite Element Analysis Services through the Center for Mfg Research-TTU	ArvinMeritor	\$85,000
		Titanium Welded Bellows-Phase II	Flexial Corporation	\$142,232
		General Work Study (04-05)	various sources	\$119,440
		Testing and Design (04-05)	various sources	\$46,661
		Chunsheng Wang	T/J Technologies Battery Research-PROPRIETARY	T/J Technologies
	The Manufacturing Research Center and Mechanical Engineering	Kenneth Currie and Joe Richardson	ARM Finite Element Analysis Services #2 through the CMR	ArvinMeritor

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Engineering continued				
The Water Resources Research Center	Yvette Clark	Local Planning Assistance Office-Geographic Information System Improvement Proposal	Tennessee Department of Economic and Community Development	\$129,677
	Dennis George	Center for the Management, Utilization and Protection of Water Resources	Tennessee Higher Education Commission	\$1,165,300
		Water Resources Research Center - 2003-04 Carryover Budget	Tennessee Higher Education Commission	\$21,288
		Water Center Analytical and Computer Services	various sources	\$65,920
The Water Resources Research Center and Biology	Dennis George, Yvette Clark, and Bradford Cook	Collect and Analyze Water Quality Samples from the Emory River Watershed	Tennessee Valley Authority	\$7,000
		Environmental assessments for Emory Watershed pollution problems	Tennessee Department of Environment and Conservation	\$5,000
	Dennis George and Bradford Cook	A Comparative Study of the Historical and Present Ecological State of the Emory River	Tennessee Wildlife Resources Agency	\$15,000

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Engineering continued				
The Water Resources Research Center and History	Dennis George, Michael Birdwell, Yvette Clark, and Amy Knox	Development of an Annotated Bibliography Characterizing the Duck River Basin: Culture, History and Science	Tennessee Duck River Development Agency	\$42,885
The Water Resources Research Center	Kim Stearman and Yvette Clark	Pigeon Roost Creek Watershed Restoration Project: Storm Water Control Using Bioretention Filters and Long-Range Comprehensive Plan	Tennessee Department of Agriculture	\$41,814
	Martha Wells	An Assessment of the Occurrence of Chemicals Causing Endocrine Disruption in Fish in the South Branch of the Potomac River	West Virginia Department of Natural Resources	\$5,000
			U. S. Geological Survey	\$4,000

**Appendix C
Intellectual Property Activity
FY 2005**

Invention Disclosures & Status FY 2005					
Disclosure Number	Filing Date	Title	TTU or First Named Inventor	Other Inventors	Additional Information
05-001-ID	7/29/2004	A Flask And Methodology For Lost Foam Casting Under Controlled Environment	Abdelrahman, Mohamed	Walford, Graham; Currie, Ken; Renfro, Mike, Vondra, Fred	Provisional patent application filed 8/3/2004.
05-002-ID	9/15/2004	Air System For Vibration Testing (ASVT)	Pardue, Sally	Abdelrahman, Mohamed; Renfro, Mike; Baswell, Mike; Shaam, Naren	Provisional patent application filed 9/20/2004
05-003-ID	12/6/2004	Continuation-In-Parts Of The Automatic Prescription Verification System	Currie, Ken	Rhodes, Richard; Renfro, Mike	Continuation-in-parts application to existing patent application.
05-004-ID	11/2/2004	Trianex Metal Chelation Materials	Lisic, Edward		Provisional Patent filed 4/14/2005
05-005-ID	2/10/2005	A Novel All-Solid-State Micro (And/Or Nano)-Battery And Supercapacitor Architectures.	Wang, Chunsheng	Hong, Jian	Provisional Patent filed 4/14/2005
05-006-ID	3/18/2005	Non-Optical Explosive Sensor Based On Two-Tract Piezoresistive Microcantiliver	Yi, Dechang	Wage, Thundat, Pinnaduwege	Invention with three ORNL scientists as other inventors. Rights assigned to TTU.
05-007-ID	6/3/2005	Multi-Axle Robot For Climbing And Exploration Of Harsh Environments.	Canfield, Stephen	Beard, Jamie; White, Neal	
UTILITY PATENT APPLICATIONS					
Utility Patent applications have been filed in FY2005 for the following inventions:					
1) Non-Optical Explosive Sensor Based On Two-Tract Piezoresistive Microcantiliver. This patent application is being filed by ORNL, with rights assigned to TTU					
2) A Capacitance Based Device For Sand-Mold Characterization, Mohamed Abdelrahman, Inventor					
3) Compliant, Parallel Gravity Suspension System For Tracked, Climbing Robot, Stephen Canfield, Inventor					

NOTES