TEXAS TECH UNIVERSITY

Annual Report 2011

Office *of the* Vice President *for* Research

Contents

Letter from Vice President Eighmy

Dear colleagues, research partners, friends, benefactors and distinguished alumni of Texas Tech University:

Texas Tech University (TTU) has made measurable progress over the past two years in advancing its research mission. A major element guiding our progress is Strategic Priority 3 (Appendix 1) of *Making it possible…2010-2020 Strategic Plan*, adopted in 2010. This substantive progress is because of the great effort and dedication of the scholarly community here at TTU.

Since 2008 the number of proposals submitted and awards received have increased considerably. The number of proposals submitted has grown from 800 in FY08 to more than 1,000 in FY11. The number of awards received also has increased from 557 valued at $57.5 million in FY08 to almost 600 valued at $63.4 million in FY11. Our restricted research expenditures have increased about $23 million. Our total research expenditures have more than doubled.

Part of the impetus for this growth has been our push to earn National Research University Fund (NRUF) eligibility in Texas. A key benchmark in the criteria is exceeding $45 million in restricted research expenditures in each of two consecutive fiscal years. Texas Tech met that and at least four of the criteria necessary for NRUF funding in fiscal years 2010 and 2011, the first two years of NRUF benchmarking.

The additional funding from NRUF eligibility could initially be about $9 million annually beginning in FY13. These funds must be used strategically to support the research mission of Texas Tech. This is a remarkable opportunity for us. However, NRUF is only a starting point for the university. The goal is to achieve Association of American University-like characteristics—a goal that will take a decade or more to achieve.

I, and the Office of the Vice President for Research (OVPR), recognize that increased competitive sponsored research activity requires additional support. As our faculty members have made a commitment to increase their research, my office has committed to provide the support needed as they advance scholarship across all disciplines. We are providing support in many ways, including:

- Increasing the faculty mentoring process through the TIPS program
- Holding professional development seminars focused on grant submittals
- Providing professional assistance on grant proposal preparation and review
- Supporting faculty visits to federal funding agencies
- Specifically focusing on career awards from agencies, such as the NSF CAREER award
- Establishing a Transdisciplinary Research Academy to promote collaboration
- Establishing a “big idea” large proposal development team (the SOAR team)
- Providing grant editors to individual PIs
- Expanding grant submittal support offered by the Office of Research Services
- Increasing the opportunities to recognize and celebrate faculty scholarship through annual awards and discoveries.

Texas Tech had a great year in 2011. This publication shows our progress and highlights a few of the many, many dedicated researchers, scholars and artists who make up the Texas Tech scholarly community. I believe that Texas Tech University is truly on the verge of becoming one of the great public research universities in the country. Our motto is always apt “From here it’s possible.” To the faculty and students especially, thank you all for your wonderful efforts on behalf of Texas Tech.

Taylor Eighmy
Vice President for Research

Introduction

Texas Tech has laid out an ambitious plan with a goal of becoming a great public national research university. Guiding Texas Tech's progress over the next decade is *Making it possible… 2010-2020 Strategic Plan*. The plan was put together with input from across the campus and in its first year met or came near each of our goals. Strategic Priority 3 (Appendix 1) relates to the Office of the Vice President for Research.

> ***Expand and Enhance Research and Creative Scholarship:*** We will significantly increase the amount of public and private research dollars in order to advance knowledge, improve the quality of life in our state and nation, and enhance the state's economy and global competitiveness.

Texas Tech began making great strides immediately. Our research metrics show significant growth in three years. There are many ways to measure a university's research success. While we place great importance on the scholarship and creative activity on our campus, most of the accepted research metrics weigh heavily on funding that is not readily available to the humanities, some social sciences and the creative arts. To that end, we have chosen the following metrics to show Texas Tech's strength in 2011:

- Annual Institutional Research Metrics
- Annual Institutional Research Metrics for Federal Research Awards & Expenditures
- Annual Institutional Research Metrics for Research Expenditures
- Annual Institutional Federal R&D Agency Research Funding Activity
- Annual Institutional Metrics for Sponsored Program Activity by College

There is growth in virtually every category. The 2011 Annual Report of the Office of the Vice President for Research highlights the steadily increasing numbers and more importantly it showcases some of the outstanding funded research and unfunded scholarship and creative activity underway at Texas Tech.

Strategic Research Themes Areas/ Current Strategic Research Areas of Focus

Texas Tech has chosen eight broad research themes that will guide our program development and resource investment strategies. The eight themes were developed following external scans and a SWOT or strength, weakness, opportunity and threat analysis conducted as part of the university's strategic planning process. The OVPR worked closely with each college or school to develop the themes. Each theme was evaluated with respect to increasing support to the institution, advancing knowledge, improving quality of life, and enhancing global and economic competitiveness.

The eight strategic research themes are:

1. **Sustainable Society** - TTU is on the cutting edge of research involving energy, water, agriculture and the built environment, including focus areas in food safety and quality, sustainable energy and communities, water resources and law, and animal health and well-being.

2. **Innovative Education and Assessment** - Our researchers are finding new ways to educate and assess special needs and special education, bilingualism and ESL, STEM training and certification, and social issues and critical pedagogy in public schools.

3. **Computational and Theoretical Sciences and Visualization** - Our researchers work nationally and internationally studying high energy particle physics, molecular dynamical simulation, business intelligence, systems engineering and information systems.

4. **Advanced Electronics and Materials** - Providing immeasurable benefits to our state and nation both economically and defensively, Texas Tech is an innovator in advanced electronics and materials research including nanotechnology, nanophotonics and pulsed power.

5. **Integrative Biosciences** - Texas Tech research collaborations extend across departmental boundaries in areas of biodefense law, addiction and recovery, and cancer research.

6. **Culture and Communications** - From the study of military law and policy to the cognitive and social effects of new media, researchers at Texas Tech cover a broad area of culture, communication, entrepreneurship, and leadership.

7. **Community Health and Wellness** - Texas Tech is dedicated to research addressing the needs of rural West Texas community health issues, including family health and wellness, addiction and recovery, family outreach, health care law, and health care design.

8. **Creative Capital** - The university is invested in supporting and enhancing creative scholarship through arts and design technologies such as geospatial analysis and visualization, gaming and technology, and music perception and cognition.

CURRENT STRATEGIC INVESTMENT AREAS

The following areas of investment reflect both current and new initiatives to advance the 2010 Texas Tech University Strategic Priority 3 to increase research funding. Investments are meant to be very strategic in nature and typically include:

- senior hires
- significant start-up packages
- new or refurbished research space
- graduate student support
- strategic partnerships

Investment areas also are based on the pursuit of very large competitive funding opportunities from federal agencies, and to some degree, corporations and foundations that have been targeted by the *2010 TTU Strategic Plan for Research* (see http://www.ttu.edu/stratplan/docs/StratPlanResearch0410.pdf) or by more recent targeting efforts. These will include National Science Foundation (NSF), U.S. Department of Agriculture (USDA), U.S. Department of Energy (DOE); U.S. Department of Defense (DOD); U.S. Department of Education (DOEd); U.S. Department of Commerce (DOC); the National Institutes of Health (NIH); the U.S. Agency for International Development (USAID), and select corporations and foundations. These investments are frequently aligned with open endowed chairs or professorships in the science, technology, engineering and mathematics (STEM) disciplines that must be filled.

Investments presently have been or will be made in the five colleges with significant external competitive funding and where significant federal funding opportunities exist with the above-mentioned agencies. The five colleges are: Arts & Sciences, Agricultural Science and Natural Resources, Engineering, Human Sciences, and Education.

Areas of investments are always subject to change based, in part, on input that comes through the deans of the five colleges from their faculty. The 13 current investment areas and the corresponding strategic research themes from the 2010 Texas Tech strategic plan that they generally map to are as follows:

- Renewable energy (e.g., wind, solar) [1,3,4]
- Neuroimaging and neuroscience (e.g., autism spectrum disorders) [4,5,7]
- Bioinformatics and metabolomics [5]
- Food safety and security (including food quality and animal welfare) [1,7]
- Materials science (e.g., nanomaterials, soft materials and photoactive materials) [3,4,5]
- Cancer detection, treatment & prevention [5,6,7]
- Nutrition, obesity and diabetes [7]
- Climate, water and sustainable agriculture [2]
- Integration of biological and physical systems (e.g., nanobiology, biophysics, bioengineering, biotechnology and biopolymers) [3,4,5]
- Ecotoxicology [5,7]
- Addiction recovery [7]
- National security [3,4]
- STEM education and assessment (including university-school partnerships for P-20 education reform) [2]

Statistics

In the table shown below, our total research expenditures, as reported to the Texas Higher Education Coordinating Board (THECB), increased from $85,901,979 in FY09 to $142,762,792, an increase of more than 66% over the three year period. As the data in the table below show, much of the increase has come from all the accounting categories used: federal, state appropriations, state grants, institutional support, and private for profit sources especially.

Total research expenditures reported to the THECB are typically slightly lower than those reported to the U.S. National Science Foundation in their annual Higher Education R&D (HERD) surveys. Much of the difference is that NSF allows for the reporting of unrecovered F&A.

This is a remarkable increase over three short years and reflects many important efforts tied to increased federal competitive funding, philanthropic support of research and appropriate accounting for expenditures.

Institution Total Research Expenditures by Fiscal Year

(based on Texas Higher Education Coordinating Board criteria and annual research expenditure reporting)

Category	FY09	FY09 Category %	FY10	FY10 Category %	FY11	FY11 Category %
Federal	$25,645,008	29.9%	$36,154,168	28.7%	$35,190,904	24.7
State Appropriations	28,359,835	33.0	47,338,300	37.6	50,599,024	35.4
State Grant	6,735,257	7.8	4,147,432	3.3	7,004,711	4.9
Institutional	14,665,182	17.1	17,173,266	13.7	28,160,213	19.7
Private For Profit	4,202,989	4.9	9,941,773	7.9	11,370,519	8.0
Private Not For Profit	6,293,708	7.3	11,062,564	8.8	10,437,421	7.3
TOTAL	**$85,901,979**	**100.0**	**$125,817,503**	**100.0**	**$142,762,792**	**100.0**

One important assessment of the research metabolism at Texas Tech is how we do in obtaining funding from the National Science Foundation, one of two sources for highly competitive funding for federal science and technology research and development. The table below shows the number of proposals submitted, the monetary values of the submitted proposals, the number of awards made to TTU, and the monetary value of the awards made. As the data in the table show, the growth of support from NSF has been remarkable between FY09 and FY11, the award amounts almost doubled. If you factor in the effects of NSF American Recovery and Reinvestment Act (ARRA) funding opportunities, there is a clear increasing trend for all measures relative to NSF funding. This is a wonderful tribute to the efforts of TTU faculty.

Institution Research Metabolism as Represented by Sponsored Program Activity Associated with National Science Foundation Funding by Fiscal Year

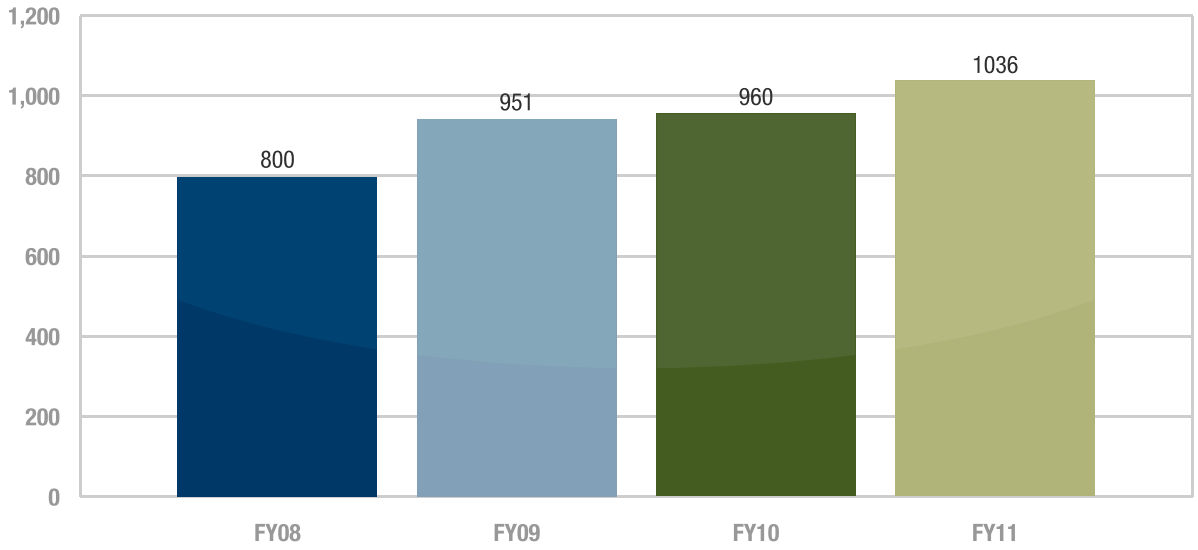
Parameter	FY08	FY09 (ARRA data)	FY10 (ARRA data)	FY11 (ARRA data)
Number of NSF Proposals Submitted	159	224 (6)	244 (1)	241
Monetary Value of NSF Proposals Submitted	$61,338,612	$92,511,376 ($5,542,900)	$94,417,765 ($1,889,137)	$96,294,899
Number of NSF Awards Made to Texas Tech University	57	70 (4)	65 (2)	81 (2)
Monetary Value of NSF Awards Made	$7,460,544	$12,044,406 ($990,966)	$8,862,205 ($230,864)	$17,206,386 ($286,775)

The following charts present a number of measures that describe the sponsored research enterprise at TTU. Data are provided for (i) annual institutional research metrics about proposals submitted, the monetary value of the proposals submitted, the number of awards made to TTU, and the monetary value of the awards, (ii) annual institutional metrics for federal research awards and expenditures, (iii) annual institutional metrics for research expenditures, (iv) annual institutional federal R&D agency research funding activity, (v) annual research metrics for sponsored program activity by college.

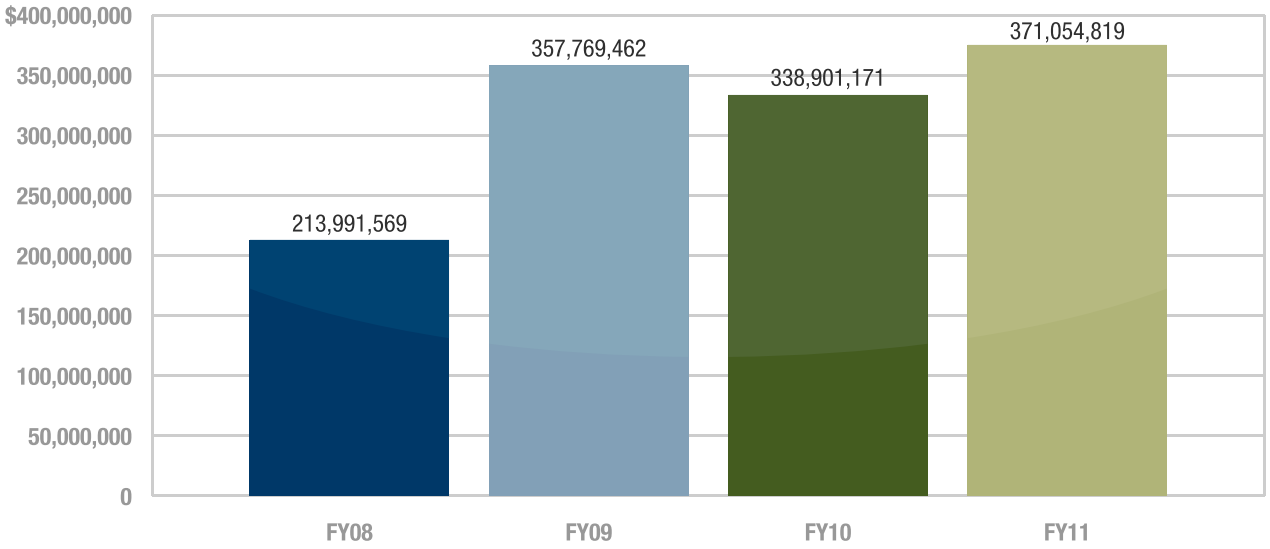
While there are generally very positive trends for the institution, there are areas in which work is needed. One of those areas is the need to increase our federal funding and the support of research assistantships, particularly Ph.D. candidates, on externally-funded projects.

Annual Institutional Research Metrics

Number of Proposals Submitted

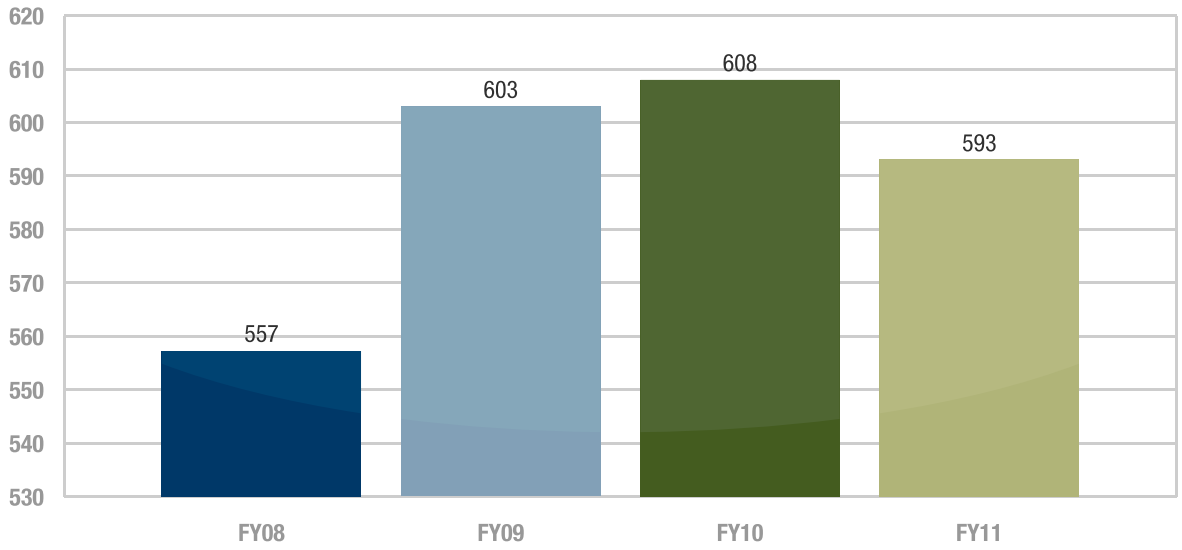


Proposal Value

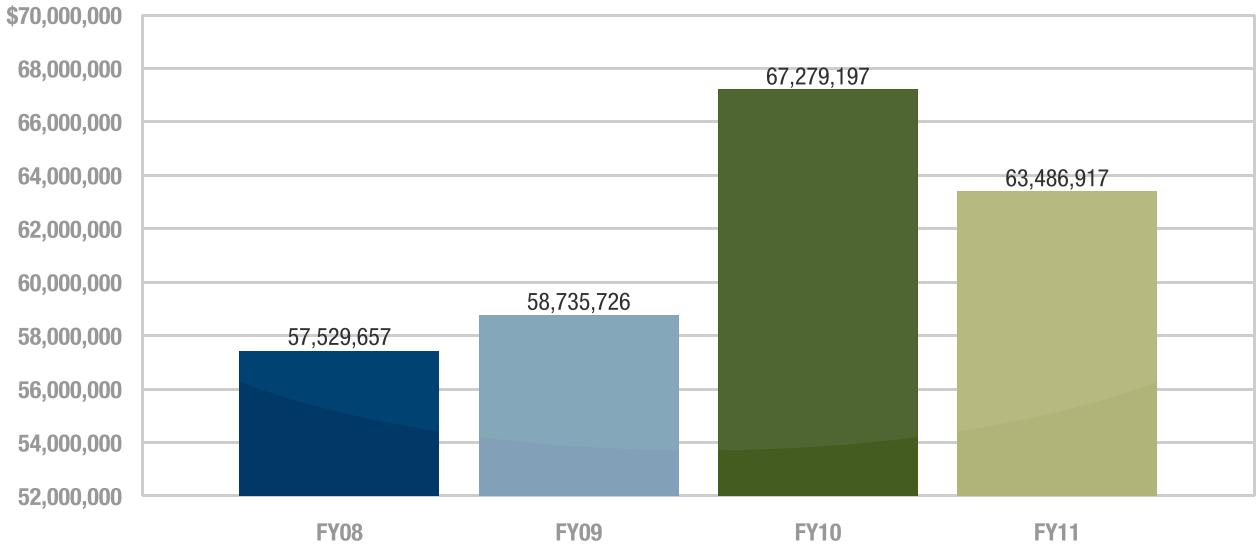


Annual Institutional Research Metrics *(Cont'd)*

Number of Awards Received

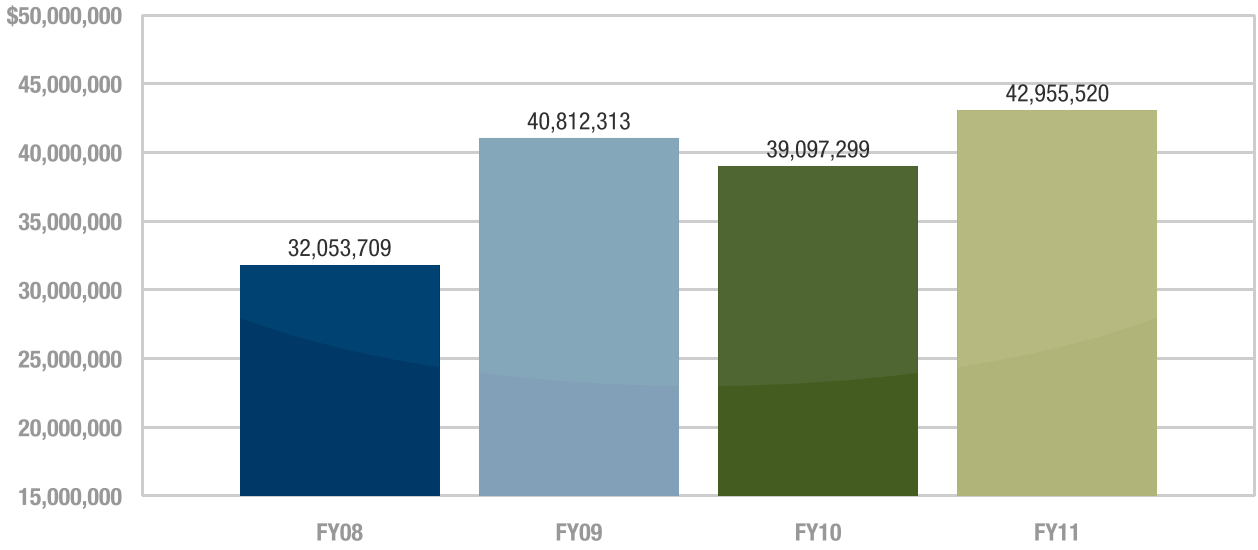


Award Value



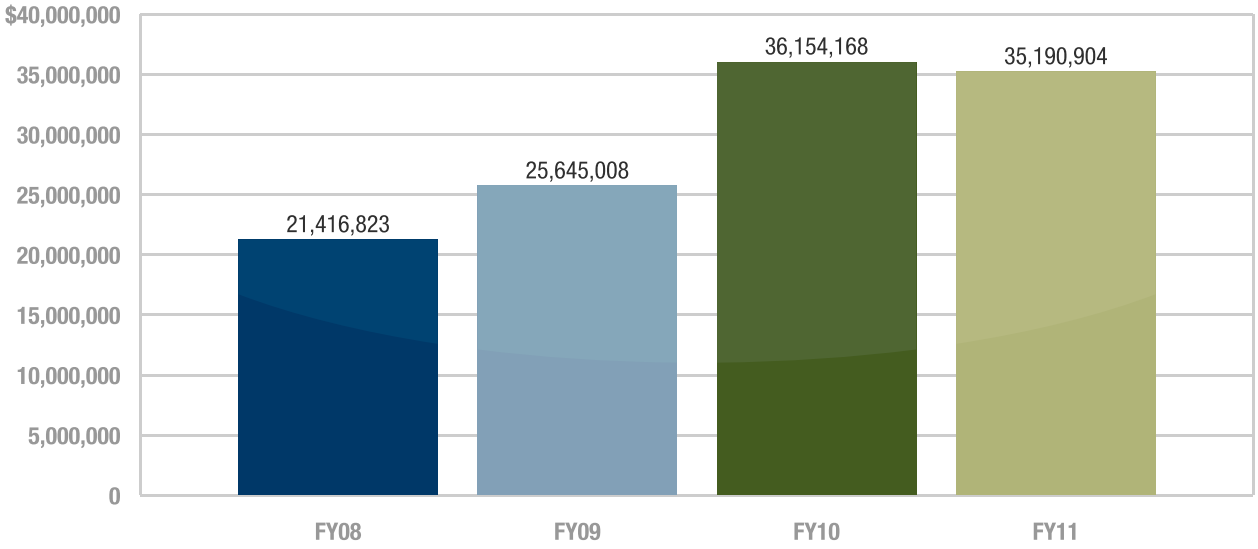
Annual Institutional Research Metrics for Federal Research Awards & Expenditures

Federal Research Awards



	FY08	FY09	FY10	FY11
Federal	28,531,991	34,705,324	30,680,029	36,606,246
Federal Pass Through	3,521,718	6,106,989	8,417,270	6,349,274
Total	**32,053,709**	**40,812,313**	**39,097,299**	**42,955,520**

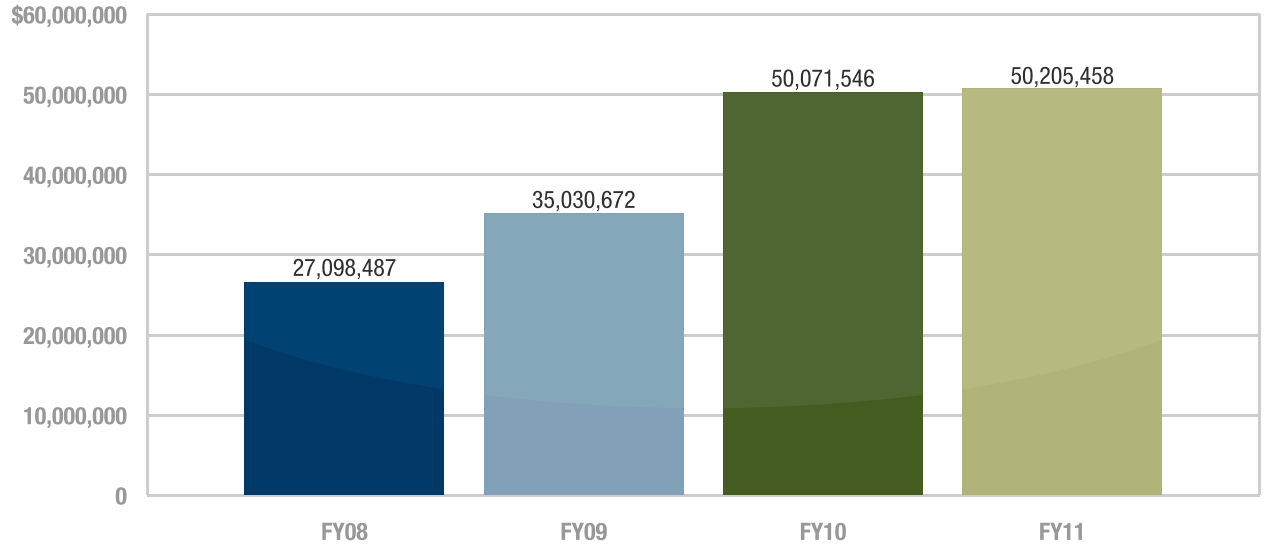
Federal Research Expenditures



Annual Institutional Research Metrics for Research Expenditures

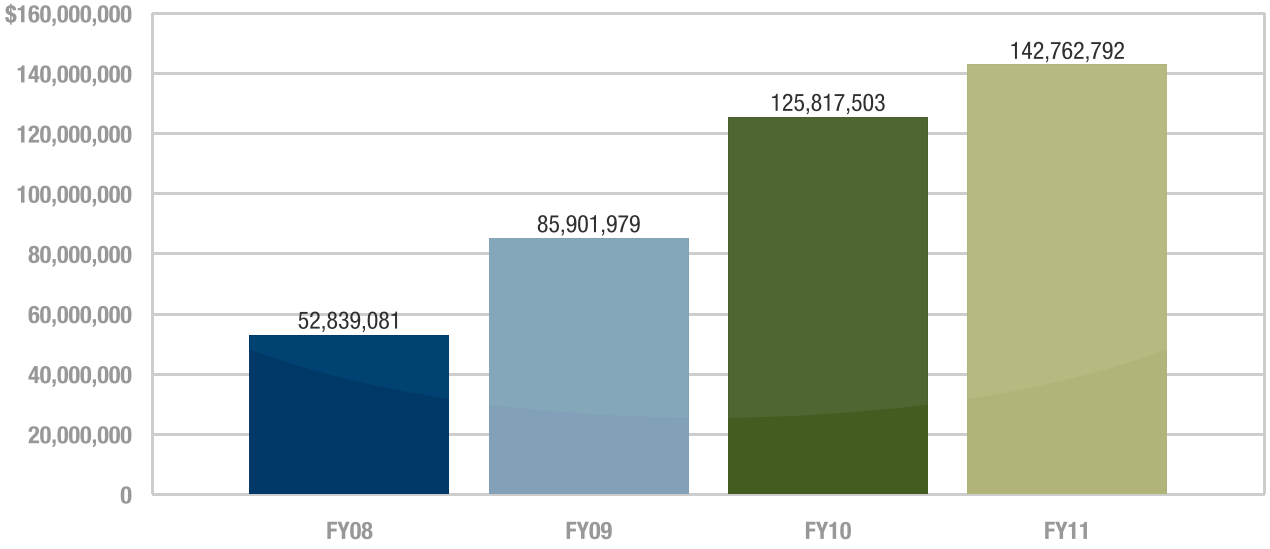
Restricted Research Expenditures

(As reported to the Texas Higher Education Coordinating Board)



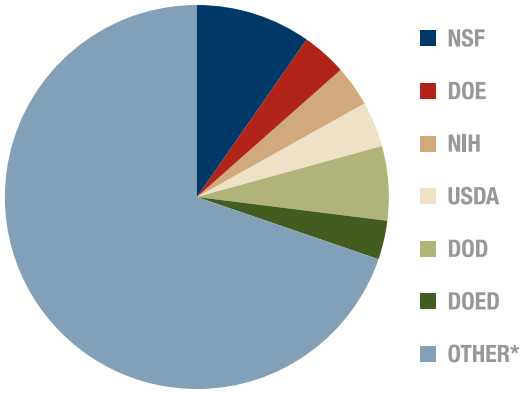
Total Research Expenditures

(As reported to the Texas Higher Education Coordinating Board)

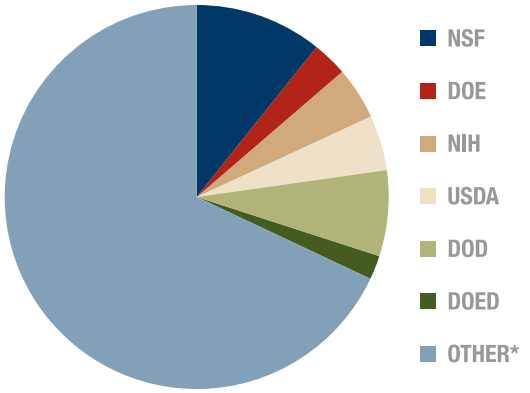


Annual Institutional Federal R&D Agency Research Funding Activity

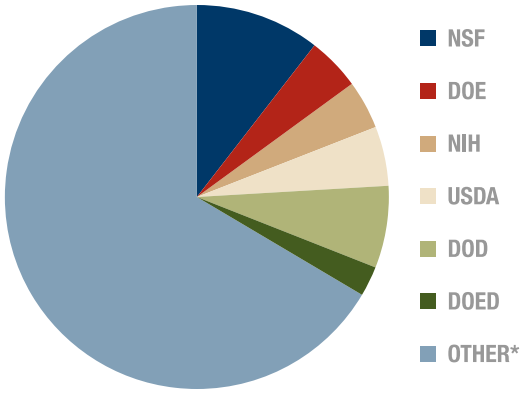
Number of Awards by Funding Agency



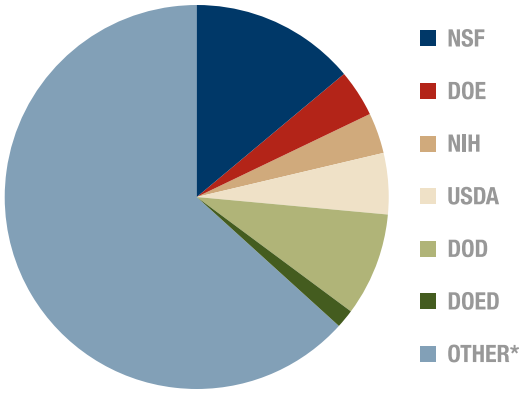
	FY08
NSF	57
DOE	21
NIH	14
USDA	23
DOD	33
DOED	15
OTHER	394
Total	**557**



	FY09
NSF	70
DOE	17
NIH	23
USDA	26
DOD	38
DOED	14
OTHER	415
Total	**603**



	FY10
NSF	65
DOE	25
NIH	22
USDA	31
DOD	43
DOED	17
OTHER	405
Total	**608**

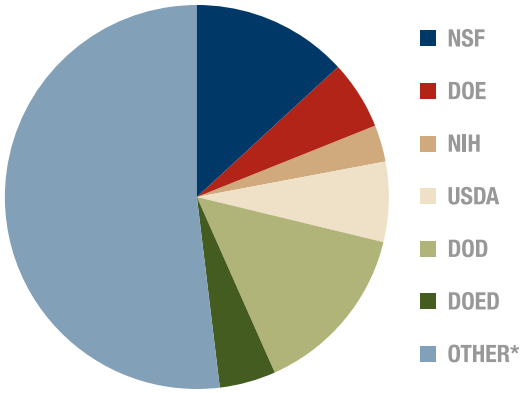


	FY11
NSF	81
DOE	23
NIH	20
USDA	29
DOD	49
DOED	10
OTHER	381
Total	**593**

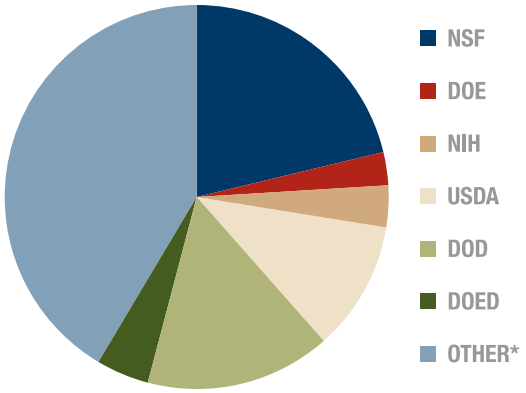
*OTHER category is composed of all of the agency types in our database; including foreign agencies, industrial groups, nonprofit organizations, state agencies, other universities, and the rest of the federal and federal pass-through agencies.

Annual Institutional Federal R&D Agency Research Funding Activity *(cont'd)*

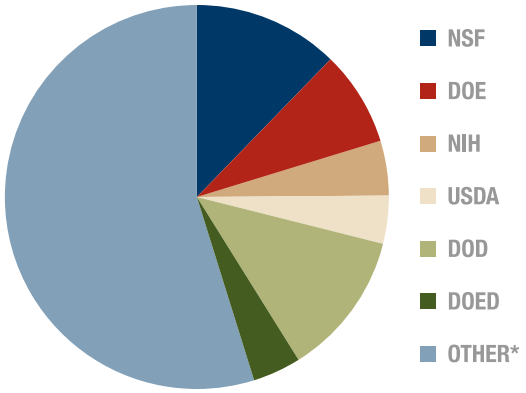
Award Values by Funding Agency



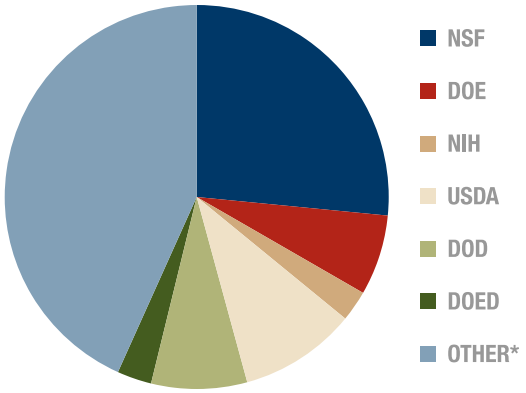
	FY08
NSF	7,460,544
DOE	3,464,373
NIH	1,337,460
USDA	3,854,633
DOD	8,972,423
DOED	2,514,482
OTHER	29,925,742
Total	**57,529,657**



	FY09
NSF	12,044,406
DOE	1,912,921
NIH	1,959,357
USDA	6,375,930
DOD	9,351,126
DOED	2,696,706
OTHER	24,035,280
Total	**58,735,726**



	FY10
NSF	8,862,205
DOE	4,922,105
NIH	2,928,175
USDA	2,939,818
DOD	8,089,656
DOED	2,639,197
OTHER	36,898,041
Total	**67,279,197**

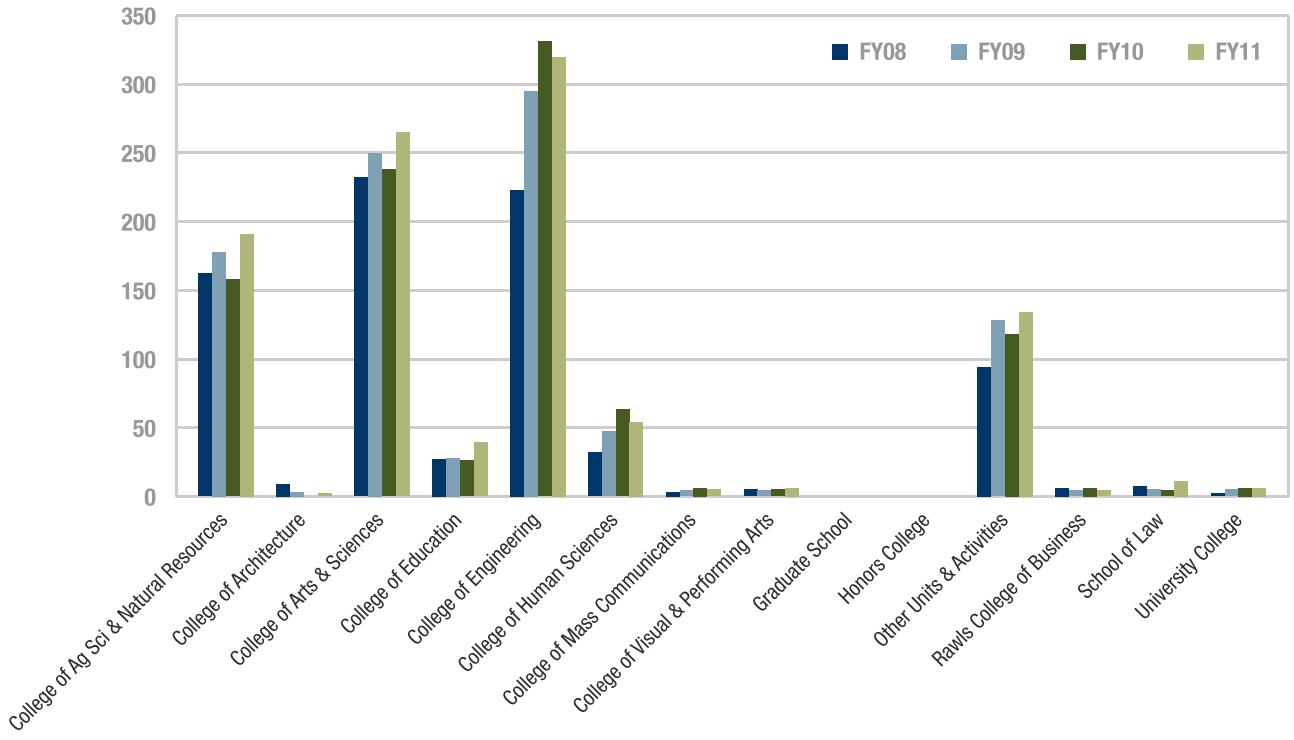


	FY11
NSF	17,206,386
DOE	4,829,409
NIH	1,553,435
USDA	5,834,567
DOD	4,436,097
DOED	1,800,660
OTHER	27,826,363
Total	**63,486,917**

*OTHER category is composed of all of the agency types in our database; including foreign agencies, industrial groups, nonprofit organizations, state agencies, other universities, and the rest of the federal and federal pass-through agencies.

Annual Research Metrics for Sponsored Program Activity by College

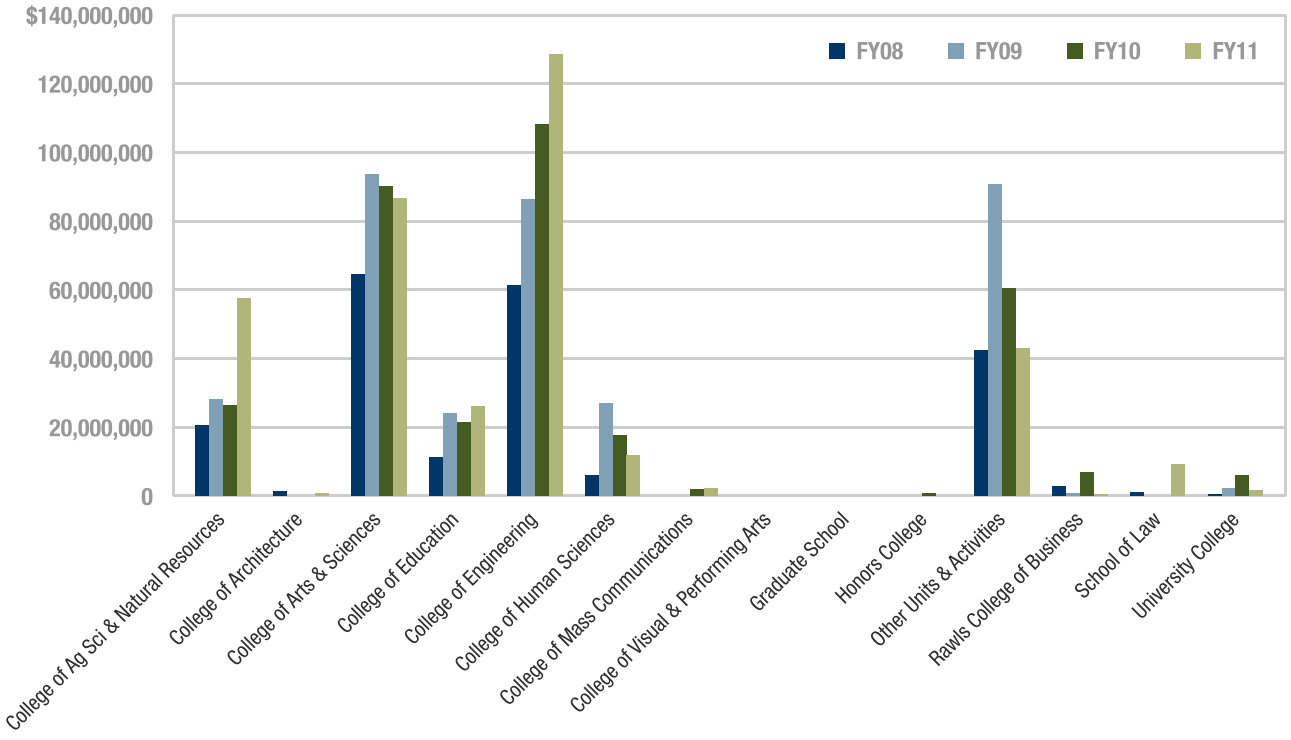
Number of Proposals Submitted



	FY08	FY09	FY10	FY11
College of Ag Sci & Natural Resources	162	178	158	191
College of Architecture	9	3	0	2
College of Arts & Sciences	232	250	238	265
College of Education	27	28	26	39
College of Engineering	222	295	331	320
College of Human Sciences	31	47	63	53
College of Mass Communications	3	4	6	5
College of Visual & Performing Arts	5	4	5	6
Graduate School	0	0	-	-
Honors College	-	0	0	0
Other Units & Activities	94	128	118	134
Rawls College of Business	6	4	6	4
School of Law	7	5	3	11
University College	2	5	6	6
Total	**800**	**951**	**960**	**1036**

Annual Research Metrics for Sponsored Program Activity by College *(Cont'd)*

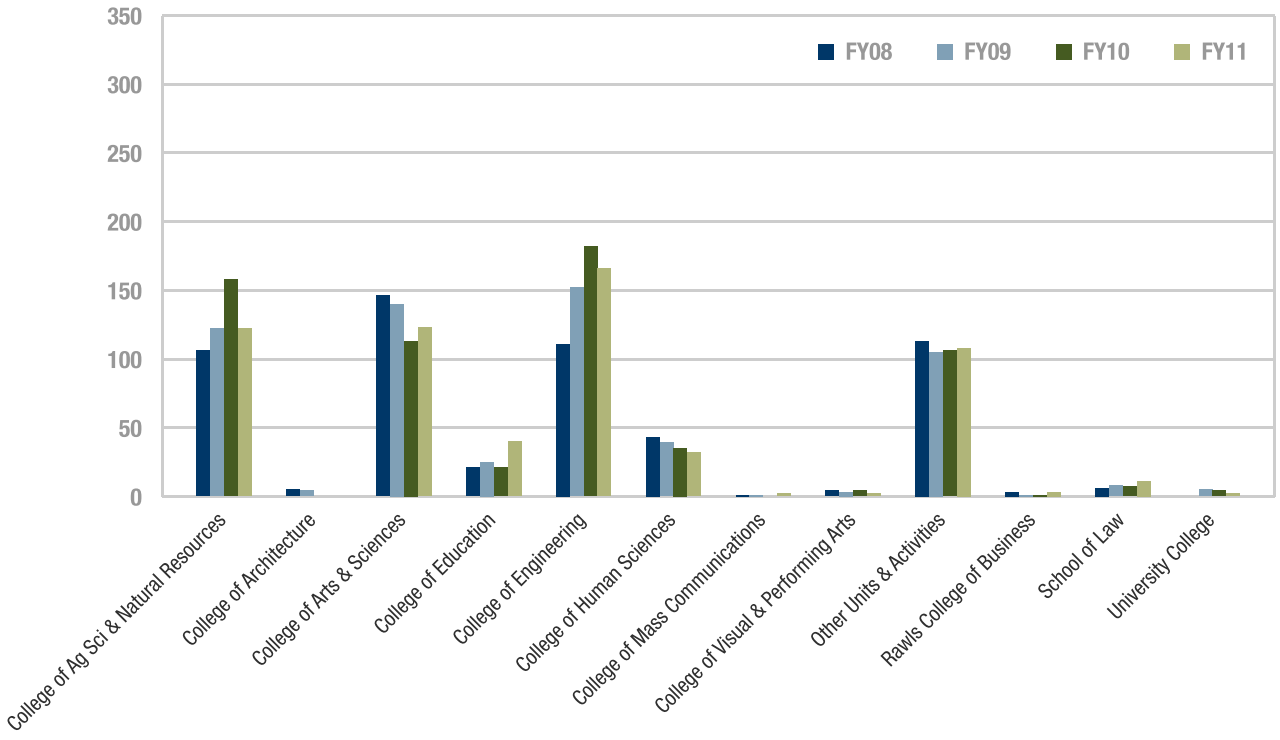
Proposal Value



	FY08	FY09	FY10	FY11
College of Ag Sci & Natural Resources	20,351,864	28,727,834	26,929,007	57,766,370
College of Architecture	936,309	117,543	79,928	730,981
College of Arts & Sciences	64,946,752	94,181,630	90,906,603	86,869,186
College of Education	12,672,474	24,706,155	21,526,152	26,404,247
College of Engineering	61,044,820	87,155,214	108,629,474	128,417,974
College of Human Sciences	6,724,513	27,505,615	18,613,820	11,866,796
College of Mass Communications	301,654	252,848	2,040,191	2,542,305
College of Visual & Performing Arts	60,650	60,000	187,200	452,389
Graduate School	29,819	194,857	-	-
Honors College	-	120,647	784,146	433,081
Other Units & Activities	42,635,270	91,717,474	60,767,659	43,646,971
Rawls College of Business	3,015,825	725,653	7,354,006	551,238
School of Law	760,581	473,941	417,123	9,834,280
University College	511,038	1,830,051	665,862	1,552,001
Total	**213,991,569**	**357,769,462**	**338,901,171**	**371,067,819**

Annual Research Metrics for Sponsored Program Activity by College *(Cont'd)*

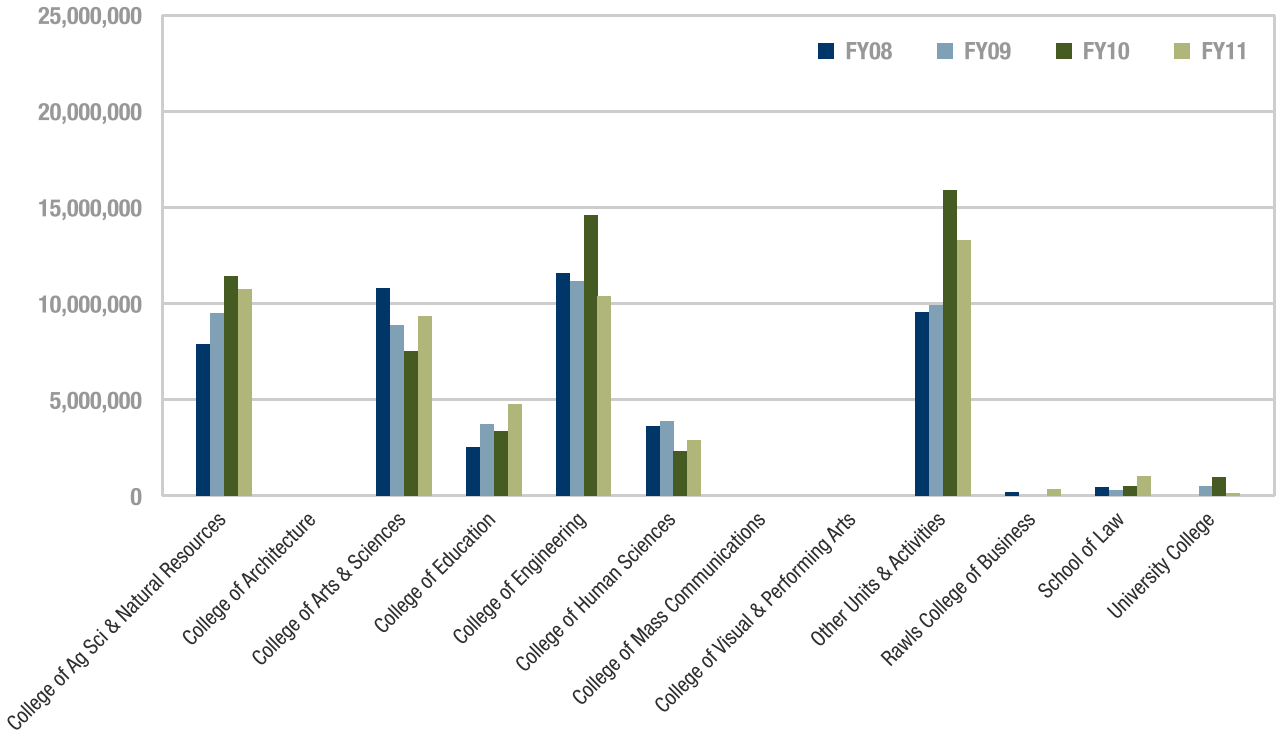
Number of Awards Received



	FY08	FY09	FY10	FY11
College of Ag Sci & Natural Resources	106	122	136	123
College of Architecture	4	4	-	-
College of Arts & Sciences	146	140	113	123
College of Education	21	25	21	20
College of Engineering	111	152	181	166
College of Human Sciences	43	39	35	32
College of Mass Communications	1	1	-	2
College of Visual & Performing Arts	4	3	4	2
Other Units & Activities	113	105	106	108
Rawls College of Business	2	1	1	3
School of Law	6	7	7	11
University College	-	4	4	3
Total	**557**	**603**	**608**	**593**

Annual Research Metrics for Sponsored Program Activity by College *(Cont'd)*

Award Value



	FY08	FY09	FY10	FY11
College of Ag Sci & Natural Resources	8,180,852	9,573,872	11,668,679	10,876,333
College of Architecture	43,580	35,349	-	-
College of Arts & Sciences	15,878,044	13,894,938	12,645,520	14,509,432
College of Education	2,694,815	3,581,175	3,278,984	4,821,859
College of Engineering	16,577,916	16,137,104	19,577,748	15,276,955
College of Human Sciences	3,657,739	3,945,356	2,070,945	2,782,410
College of Mass Communications	42,456	68,503	-	67,644
College of Visual & Performing Arts	43,445	41,000	60,000	30,500
Other Units & Activities	9,580,240	10,113,609	15,932,449	13,186,078
Rawls College of Business	261,847	142,503	50,220	309,958
School of Law	568,722	374,818	673,299	1,406,531
University College	-	827,499	1,321,353	219,217
Total	**57,529,657**	**58,735,726**	**67,279,197**	**63,486,917**

Appendix - Priority 3

Priority # 3 - Expand and Enhance Research and Creative Scholarship

We will significantly increase the amount of public and private research dollars in order to advance knowledge, improve the quality of life in our state and nation, and enhance the state's economy and global competitiveness.

GOAL	2009	2010	Change 2009 to 2010	2010 Target	2011 Target	2015 Target	2020 Target
New Total Research Expenditures (THECB)	$85.90 M	$125.82 M	46.46%	$100 M	$130 M	$160 M	$200 M
Restricted Research Expenditures - Must be ≥ $45 M (NRUF)	$35,030,672	50,071,546	42.93%	$45 M	$55 M	$80 M	$150 M
Federal Research Expenditures (NSF)	$25,645,008	$35,970,000	40.3%	$30 M	$36 M	$65 M	$130 M
Federal Research Expenditures per Faculty Full-Time Equivalent (THECB)	$28,269	Unavailable	Unavailable	$30,000	$32,000	$40,000	$80,000
Number of TTU-led Collaborative Research Projects with TTUHSC	2	4	100%	3	4	5	10
Proposals Submitted	950	959	0.84%	1,000	1,110	1,300	1,600
Strategic Faculty Hires	NA	6	NA	15	15	20	30
Research Space in Square Feet*	480,775	436,325	-9.25%	500,000	500,000	700,000	1 M
Total Research Expenditures (NSF)	$94,649,000	$133,360,000	40.89%	$110 M	$120 M	$170 M	$225 M
New Post-doctorates**	TBD	TBD	TBD	73	80	87	100

* In July 2010 an audit of research space was conducted and square footage was removed from the inventory if it was incorrectly categorized as primarily utilized for research.

** A review is underway to ensure that all post-doctorate positions are properly entered into Banner and properly reported in the NSF Survey of Graduate Students and Post-doctorates in Science and Engineering.

Adjustments to Texas Tech University Strategic Plan Goals:

New goals - Total Research Expenditures (THECB) and post-doctorates (NSF) - have been added.

KEY STRATEGIES

1. **Large Research Initiatives Within the Eight Strategic Research Themes** – Pursue five large strategic research initiatives and submit proposals to federal agencies and other sponsors. These are intended to advance disciplinary, multidisciplinary, and interdisciplinary research that builds capacity and excellence in core areas. (Complete by August 2011)

2. **Faculty Strategic Hires** - Fill fifteen strategic hire lines. They are expected to fully integrate in their departments and with their colleagues in advancing the research, teaching and outreach engagement of their department and college and advance the goals of the institution. Strategic hires likely will align with the eight strategic research themes of the institution, are expected to bring significant funding with them, and are expected to lead large initiatives that advance the research mission of the institution. (Complete by August 2011)

3. **Research Partnerships** -- Establish three new strategic research partnerships. These should promote sponsored research, especially with targeted federal agencies, and in conjunction with Institutional Advancement for targeted corporations and foundations. Specifically, these partnerships should include cooperative research agreements with national labs, science and technology research agencies and the private sector. (Complete by August 2011)

    a. *Trans-disciplinary Research* – Resolve support for trans-disciplinary research under the RCM construct. (Complete by August 2011)

    b. *Responsible Conduct of Research* – In collaboration with the TTU Ethics Center, complete the implementation of a responsible conduct of research training program to maintain compliance with federal requirements. (Complete by August 2011)

    c. *Research Space* – Complete the implementation and planning of the University Space Committee findings and recommendations around space conversion and new space development. (Complete by August 2011)

    d. *Undergraduate Research* - Appoint and charge Task Force for Undergraduate Research, with completion of study and set of recommendations for improved coordination and enhancement of undergraduate research. (Complete by September 2011)

KEY CHALLENGES

1. Supporting and enhancing trans-disciplinary research in the RCM environment and under budget constraints.

2. The ever-increasing and complex research regulatory environment.

3. The risk of loss of state resources for start-up packages for traditional and strategic hires (e.g., Research Development Fund) or program support (e.g., special lines), and for support of finance capital projects (e.g., Tuition Revenue Bonds, other funding streams).

4. Expansion of internal resources to encourage and support faculty research/creative activity across all disciplines, but especially in the social sciences, humanities, and creative arts.

5. Managing tactical budget reduction process for Research Division at the same time that research needs to grow and remain compliant.

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