Status on Research Funding
At the University of Missouri
1999

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EXECUTIVE SUMMARY

This report highlights research funding at the University of Missouri using data provided by the National Science Foundation (NSF) and the Integrated Postsecondary Education Data System (IPEDS). More specifically, it examines research funding at the public AAU institutions and at the four campuses of the University of Missouri. NSF and IPEDS data have been used because they provide consistent data on research funding for all thirty-two public AAU institutions. Please note that the data used in this study are from fiscal years 1996 (research obligations) and 1997 (research expenditures). Although more recent data are available for the University of Missouri, these are the most recent data available for all public AAU institutions. References to the "University of Missouri" or the "University" refer to the four-campus system. Trends in research funding have been examined from 1990 to 1997 and from 1995 to 1997.

The key findings include:

Federal Research Expenditures

- On average, federal research expenditures at the University of Missouri have increased 9% over the

ORGANIZATION

The report has been organized into four sections:

Section I: Federal Research Expenditures (Tables 1–10)
Section II: Research Expenditures from Industry, State, Institution, & other Sources (Tables 11–13)
Section III: Federal Research Obligations (Tables 14-15)
Section IV: Definitions and Technical Notes

SECTION I:
FEDERAL RESEARCH EXPENDITURES

The federal research expenditures reported in this section include expenditures classified as science and engineering (S&E) research and development (R&D) funds. When trend data are examined, increases or decreases in funding are noted from 1990 to 1997 and from 1995 to 1997. In addition, a definition of

Table 1. Trends in Federal Expenditures for Science and Engineering R&D at Public AAU Institutions from 1990 and 1995

Institution			% increase	% increase

Figure 1:
Public AAU Institutions: Trend in Federal Research Expenditures

Figure 1 illustrates the growth in federal expenditures at the AAU public institutions and at the University of Missouri.

- The University would have to increase federal research expenditures from $49.9 million to $137.7 million (for a total increase of about $88 million) in order to equal the public AAU average in 1997. The gap was $85 million in 1995.

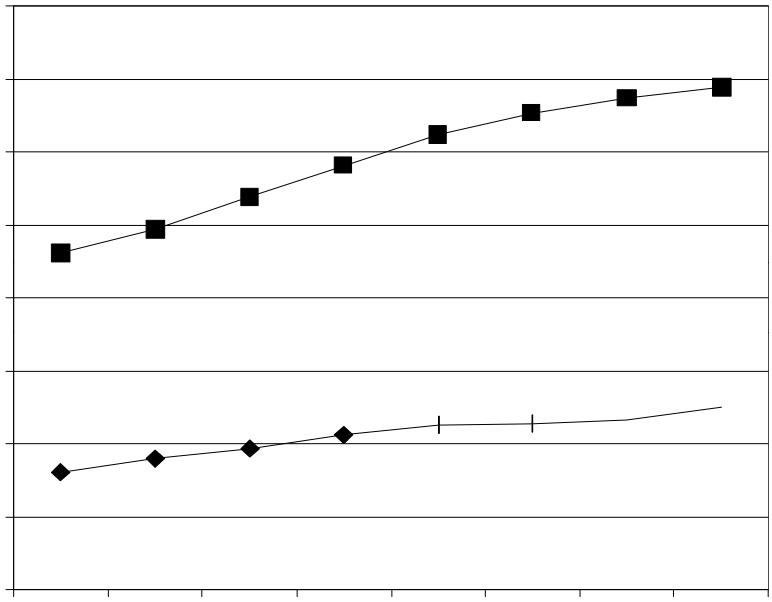

Table 2:
Public AAU Institutions: Market Share Increases and Decreases in Federal Research Expenditures

An alternative approach to understanding how well the University of Missouri has competed with other public AAU institutions is to examine the market share of each institution over time. That is, of the total federal research expenditures secured by the public AAU institutions in a given year, what percentage of that total has each institution secured? How has that institution's market share shifted from year to year? One advantage of market share analysis is that it helps to level the playing field among major and less-than-major players who compete for research dollars. In Table 2, market share of federal research expenditures has been calculated for the public AAU institutions in 1990, 1995, and 1997.

- Among the public AAU institutions, the market share for the University of Missouri held steady at 1.11% from 1990 to 1995. During the past two years, however, the University's market share has increased from 1.11% to 1.16%.

Table 2. Market Share Gain or Loss in Federal Expenditures for Science and Engineering R&D at Public AAU Institutions, 1990 to 1997

Institution	1990		1995		1997			
	$	Market Share	$	Market Share	$	Market Share	MS +/- since 1990	MS +/- since 1995
U of California-Los Angeles	164,442	5.69	201,773	4.92	238,919	5.53	-0.16	0.61
U of California-Berkeley	131,717	4.56	157,826	3.85	186,349	4.32	-0.24	0.46
U of Washington	203,353	7.04	291,284	7.11	320,784	7.43	0.39	0.32
U of Colorado	116,394	4.03	169,666	4.14	192,201	4.45	0.42	0.31
U of Florida	64,614	2.24	79,361	1.94	94,231	2.18	-0.05	0.25
U of Illinois-Urbana	117,168	4.05	139,078	3.39	156,366	3.62	-0.43	0.23
U of Pittsburgh	90,700	3.14	144,487	3.53	160,833	3.72	0.59	0.20
U of California-Santa Barbara	47,873	1.66	63,443	1.55	74,149	1.72	0.06	0.17
Indiana U	57,155	1.98	86,041	2.10	96,087	2.23	0.25	0.13
U of Michigan	180,456	6.24	275,956	6.73	296,028	6.86	0.61	0.12
U of Maryland-College Park	66,410	2.30	94,071	2.30	102,928	2.38	0.09	0.09
U of Nebraska-Lincoln	22,686	0.78	36,897	0.90	41,269	0.96	0.17	0.06
U of Kansas	26,786	0.93	42,209	1.03	46,733	1.08	0.16	0.05
University Total	32,219	1.11	45,600	1.11	49,914	1.16	0.04	0.04
Michigan State U	58,221	2.01	77,499	1.89	82,977	1.92	-0.09	0.03
U of Oregon	20,151	0.70	23,789	0.58	26,020	0.60	-0.09	0.02
U of Texas-Austin	109,593	3.79	143,939	3.51	151,954	3.52	-0.27	0.01
U of Iowa	79,046	2.73	103,115	2.52	108,534	2.51	-0.22	0.00
SUNY-Buffalo	66,876	2.31	75,713	1.85	78,092	1.81	-0.51	-0.04
U of California-Irvine	52,492	1.82	69,655	1.70	71,472	1.66	-0.16	-0.04
U of Minnesota	143,810	4.98	194,819	4.75	200,149	4.64	-0.34	-0.12
U of California-Davis	77,424	2.68	122,645	2.99	123,673	2.86	0.19	-0.13
Purdue U	64,464	2.23	93,256	2.28	91,969	2.13	-0.10	-0.15
Ohio State U	78,878	2.73	122,660	2.99	122,582	2.84	0.11	-0.15
U of Virginia	58,801	2.03	85,244	2.08	82,488	1.91	-0.12	-0.17
U of Wisconsin-Madison	178,862	6.19	229,381	5.60	233,760	5.41	-0.77	-0.18
Rutgers, the State U of NJ	40,977	1.42	72,567	1.77	68,225	1.58	0.16	-0.19
Iowa State U	34,043	1.18	58,766	1.43	52,938	1.23	0.05	-0.21
U of N Carolina-Chapel Hill	92,468	3.20	156,626	3.82				

Table 3:
Public AAU Institutions: The University of Missouri's Rank in Federal Research Expenditures

Table 3 ranks the public AAU institutions in terms of federal research dollars secured in 1990 and 1997.

- In terms of federal research expenditures, the University of Missouri-Columbia ranked 31st among the 32 public AAU institutions in 1997.

Table 3. Federal Expenditures for Science and Engineering R&D: Changes in Rank Among the Public AAU Institutions between 1990 and 1997*

1990			1997		
Rank	**Institution**	**$**	**Rank**	**Institution**	**$**
1	U of Washington	203,353	1	U of Washington	320,784
2	U of California-San Diego	182,555	2	U of Michigan	296,028

Table 4:
Private AAU Institutions: Trend in Federal Research Expenditures

Table 4 shows the trend in federal research expenditures for the private AAU institutions.

- Percentage growth in federal research expenditures since 1995 among the private AAU institutions was led by Rice University at 44%, followed by California Institute of Technology (36%), Washington University in St Louis (27%), and Stanford University (22%).

- During the past two years the private AAU institutions witnessed growth in federal research expenditures of 10%, while the public AAU institutions saw increases of 5% (Table 1). Since 1990, however, federal research expenditures among public AAU institutions grew 49% while the increase among private AAU institutions was 38%.

Table 4. Trends in Federal Expenditures for Science and Engineering R&D at Private AAU Institutions from 1990 and 1995

Institution	1990	1995	1996	1997	% change since 1990	% change since 1995
Rice U	19,997	26,429	33,238	37,935	90%	44%
California Institute of Technology	90,577	120,723	142,474	164,225	81%	36%
Washington U-St Louis	105,759	146,921	155,197	186,993	77%	27%
Stanford U	255,821	273,157	295,373	332,272	30%	22%
Northwestern U	62,183	90,387	100,810	108,292	74%	20%
U of S California	123,714	163,606	179,281	191,809	55%	17%
Emory U	52,367					

Table 5:
Private AAU Institutions: Market Share Increases and Decreases in Federal Research Expenditures

- Although its market share has dropped since 1990, Johns Hopkins University still maintains a market share of 17.1 among the private AAU institutions. Stanford University is second in market share at 7.9, MIT third at 7.4, and Harvard University fourth at 5.3.

Table 5. Market Share Gain or Loss in Federal Expenditures for Science and Engineering R&D at Private AAU Institutions since 1990 and 1995

	1990		1995		1997			
Institution	$	Market Share	$	Market Share	$	Market Share	MS +/- since 1990	MS +/- since 1995

Table 6:
Total Federal Research Expenditures by State, 1990 to 1997

Table 6 displays the total federal research expenditures secured by each of the fifty states and the District of Columbia. The states are ranked in descending order based on 1997 expenditure levels.

- The state of Missouri ranked 17th in 1997 in terms of total federal research expenditures. The State's federal research expenditures increase from $152 million in 1990 to nearly $261 million in 1997, an increase of 71%.

- Among twenty-five states that secured the most federal research expenditures in 1997, Missouri followed only Oregon (81%) and Alabama (77%) in terms of growth since 1990.

Table 6. Rank based on Federal Expenditures for Science and Engineering R&D by State, 1990 to 1997

1997 Rank	State	1990	1997	% change
1	California	1,378,820	2,028,296	47%
2	New York	902,794	1,151,542	28%
3	Maryland	729,675	927,015	27%
4	Massachusetts	649,104	915,187	41%
5	Texas	522,143	844,746	62%
6	Pennsylvania	515,094	807,553	57%
7	Illinois	352,786	529,803	50%
8	Michigan	276,078	453,776	64%
9	North Carolina	276,795	439,124	59%
10	Ohio	260,537	417,921	60%
11	Washington	230,237	365,814	59%
12	Georgia	218,498	347,407	59%
13	Florida	223,232	333,828	50%
14	Colorado	179,978	289,514	61%
15	Wisconsin	209,026	283,701	36%
16	Virginia	172,435	269,821	56%
17	Missouri	152,398	260,668	71%
18	Connecticut	190,388	242,385	27%
19	Alabama	130,208	230,894	77%
20	New Jersey	136,159	224,084	65%
21	Indiana	134,953	209,227	55%
22	Minnesota	143,810	200,149	39%
23	Tennessee	140,243	198,805	42%
24	Arizona	122,259	198,097	62%
25	Oregon	107,466	195,030	81%

Note: All dollar amounts in thousands.

Table 6 Continued --

Rank based on Federal Expenditures for Science and Engineering R&D by State, 1990 to 1997

1997 Rank	State	1990	1997	% change
26	Iowa	113,268	162,060	43%
27	Utah	126,619	158,237	25%
28	District of Columbia	86,292	153,846	78%
29	New Mexico	85,747	144,639	69%
30	Louisiana	83,213	128,017	54%
31	South Carolina	45,718	102,887	125%
32	Rhode Island	57,430	79,417	38%
33	Kentucky	38,249	75,649	98%
34	Kansas	43,478	75,116	73%
35	Hawaii	42,665	72,421	70%
36	Oklahoma	37,020	71,421	93%
37	New Hampshire	44,590	67,282	51%
38	Mississippi	43,724	62,350	43%
39	Nebraska	34,169	60,388	77%
40	Nevada	33,959	43,934	29%
41	Arkansas	17,485	35,021	100%
42	Vermont	30,555	34,042	11%
43	Delaware	17,588	32,031	82%
44				

Table 7:
Estimated Jobs Created: Total Federal Research Expenditures by Doctoral-Granting Institutions in Missouri, 1995 to 1997

Table 7 shows the change in federal research expenditures from 1995 to 1997 among the doctoral-granting institutions in Missouri. This table also includes a "jobs created multiplier" that estimates how many jobs are created for every million dollars in federal research funds that are secured by institutions in the state. For example, if the University of Missouri increased federal research funds four million dollars from 1997 to 1998, approximately 153 jobs (38.3 x $4 million) would be created in Missouri. A multiplier for each state was developed by the US Commerce Department's Bureau of Economic Analysis (BEA). Please note that the calculations in Table 7 do not account for possible inflationary effects on the number of jobs created.

- Since 1995 approximately 1,845 new jobs have been created because of the increases in federal research funding in the State of Missouri. Washington University has created the majority of these positions because of the $40 million increase that it has experienced.

- Particularly because of the influence of Washington University, it is estimated that 1,686 jobs have been created in St Louis because of increases in federal research funding since 1995. That compares to 137, 18, and 5 jobs created in Columbia, Kansas City, and Rolla, respectively.

Table 7. Estimated Jobs Created: The Contribution of Federal Expenditures for Science and Engineering R&D by Missouri Doctoral Institutions, 1995 to 1997

Institution	1995	1997	$ Increase	Jobs Created per Million $ *	Job Created since 1995	Share of Increase
Washington U	146,921	186,993	40,072	38.3	1,535	83%
UM-Columbia	32,420	35,993	3,573	38.3	137	7%
St Louis U	19,351	23,218	3,867	38.3	148	8%
UM-Kansas City	4,506	4,976	470	38.3	18	1%
UM-Rolla	5,834	6,022	188	38.3	5	0%
UM-St Louis	2,840	2,923	83	38.3	3	0%
Total	211,872	260,125	48,253		1,845	100%

* This multiplier, which is specific to the state of Missouri, is derived from a set of state multipliers developed by the US Commerce Department's Bureau of Economic Analysis (BEA) for the "College, Universities, and Professional Schools" sector.

Note: All dollar amounts in thousands.

Source: NSF, Survey of Research and Development Expenditures at College and Universities, FY1997; Bureau of Economic Analysis; Association of American Universities.

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Table 8:
Distribution of Federal Research Expenditures by Field

Table 8 displays the federal research expenditures by discipline area for the University of Missouri and public AAU institutions.

- In 1997 the majority of federal research funds expended by the public AAU institutions were in the life sciences (52%) followed by engineering (16%), the physical sciences (13%) and environmental sciences (7%). The remaining disciplines accounted for 12% of the expenditures.

- Twenty of the thirty-one public AAU institutions in 1997 (not including the University of Missouri) relied on one disciplinary area to provide the majority of their federal research expenditures. In every one of these cases the discipline area was life sciences.

- Where Columbia and Kansas City secured 72% and 91% of their federal expenditures from life sciences, respectively, Rolla garnered 65% of its federal funds in engineering and St Louis received 44% of its federal funds in physical sciences.

Table 8. Federal R&D Expenditures at the Public AAU Institutions by Science and Engineering Field, FY1997

	Engi-	Environ-	Math &	Life	Psycho-	Social

Table 9:
Market Share of Federal Research Expenditures within Each Discipline Area among the Public AAU Institutions

Table 9 displays each public AAU institution's market share within the eight discipline areas. The University of Missouri's federal research expenditures from the four campuses has been pooled.

- The discipline areas where the University of Missouri had secured the most significant market share were in the social sciences (2.2%), psychology (2.0%), life sciences (1.4%), and engineering (1.0%).

- Market share leaders in each discipline area were: Pennsylvania State in engineering (11.4%), UC Berkeley in the physical sciences (9.8%), UC San Diego in environmental sciences (24.3%), UT Austin in math and computer science (7.4%), University of Washington in life sciences (9.5%), UW Madison in psychology (11.7%), and University of Michigan in the social sciences (16.4%).

Table 9. Market Share in Federal R&D Expenditures by Discipline Area Among the Public AAU Institutions, FY1997

	Engin-	Environ-	Math &

Table 10:
Federal Research Expenditures per Full-time Faculty Member

In Table 10 the federal research expenditures secured in 1997 by each public AAU institution have been divided by the number of full-time faculty members that were employed at the institution. Reported in the table are the numbers of full-time faculty members according to two different but common definitions of "faculty." These two definitions of faculty have been provided because they are standard definitions frequently used by the public AAU institutions

IPEDS-STAFF
The definition of full-time faculty member used in the IPEDS-Staff report (IPEDS-S) includes all staff whose primary function is to teach, conduct research, and/or provide public service. These individuals must also hold academic rank (i.e., assistant professor, associate professor, etc.).

IPEDS-SALARY
The definition of full-time faculty member used in the IPEDS-Salary report (IPEDS-SA) includes only those faculty members who spend at least 50% of his or her time engaged in instructional activities. Thus, for example, the IPEDS-SALARY definition is not going to include those faculty members who are paid with external research funding, would not include most of the on-campus extension faculty, or faculty in medicine who received a significant portion of their salary from the physician's practice plan.

Discussion in this section will focus primarily on using the IPEDS-SA counts as the divisor.

- UC San Diego, the University of Washington, and the University of Colorado, respectively, expended the most research funds per full-time faculty member in 1997 among the public AAU institutions.

- There does appear to be an "economies of scale" among the public AAU institutions. That is, those

Table 10. Federal Expenditures for Science and Engineering R&D per Full-time Faculty Member at Public AAU Institutions

Institution *	Federal Research Expenditures	Full-time Faculty		Expenditures per faculty member ($)	
		IPEDS-S	IPEDS-SA	IPEDS-S	IPEDS-SA
U of California-San Diego	274,860,000	1,836	679	149,706	404,801
U of Washington	320,784,000	5,229	1,649	61,347	194,532
U of Colorado	192,201,000	2,155	1,062	89,188	180,980
U of California-Los Angeles	238,919,000	3,041	1,355	78,566	176,324
U of Wisconsin-Madison	233,760,000	NA	1,380	NA	169,391
U of Michigan	296,028,000	2,905	1,760	101,903	168,198
U of California-Berkeley	186,349,000	2,365	1,234	78,795	151,012
U of N Carolina-Chapel Hill	153,985,000	2,100	1,112	73,326	138,476
U of Minnesota	200,149,000	2,345	1,446	85,351	138,416
U of Pittsburgh	160,833,000	3,212	1,247	50,073	128,976
U of Arizona	152,221,000	1,998	1,314	76,187	115,846
U of California-Santa Barbara	74,149,000	1,107	660	66,982	112,347
Pennsylvania State U	185,206,000	2,637	1,708	70,234	108,434
U of Iowa	108,534,000	1,787	1,024	60,735	105,990
U of Illinois-Urbana	156,366,000	2,295	1,756	68,133	89,047
U of Texas-Austin	151,954,000	2,223	1,759	68,355	86,387
U of Virginia	82,488,000	1,822	972	45,273	84,864
SUNY-Buffalo	78,092,000	1,213	926	64,379	84,333
U of Maryland-College Park	102,928,000	2,404	1,336	42,815	77,042
Indiana U	96,087,000	1,591	1,278	60,394	75,185
Purdue U	91,969,000	1,914	1,469	48,051	62,607
Ohio State U	122,582,000	NA	1,979	NA	61,941
U of Florida	94,231,000	3,264	1,575	28,870	59,829
Iowa State U	52,938,000	1,393	1,016	38,003	52,104
Rutgers, the State U of NJ	68,225,000	1,817	1,357	37,548	50,276
U of Kansas	46,733,000	1,224	958	38,181	48,782
Michigan State U	82,977,000	3,284	1,851	25,267	44,828
U of Oregon	26,020,000	830	664	31,349	39,187
U of Nebraska-Lincoln	41,269,000	1,479	1,083	27,903	38,106
U of California-Davis	123,673,000	2,526	NA	48,960	NA
U of California-Irvine	71,472,000	1,357	NA	52,669	NA
University of Missouri:					
Columbia	35,993,000	2,421	913	14,867	39,423
Kansas City	4,976,000	721	468	6,902	10,632
Rolla					

SECTION II:
RESEARCH EXPENDITURES FROM INDUSTRY, STATE, INSTITUTION, AND OTHER SOURCES

Universities have sources other than federal agencies for funding research operations on their campus. These sources include funds from state & local agencies, business & industry, and funds that are provided by the institution itself. Typically, funds that are provided by a source external to the institution (e.g., federal agency, state agency, industry, etc.) for a specific research purpose are labeled .restricted expenditures.. That is, they are .restricted. because the external agency has provided the funds for a specific research project and these funds must be spent on this project. On the other hand, unrestricted research expenditures are generally provided by internal sources (e.g., governing board, the institution, etc.) and can be used for a research purpose determined by the institution.

Generally speaking, the higher the percentage of restricted research expenditures the better because the institution is using external sources to fuel its research endeavors. In addition, it is probably even more favorable if these restricted research expenditures originate from federal or industry sources in contrast to state & local sources. That is, state funds that are used to fuel research at public universities are still commitments of the state.s resources. Further, research funds provided by federal agencies.in contrast to state agencies.typically provide a higher percentage of the indirect costs affiliated with the research project.

Table 11:
Sources of Research Expenditures

Table 11 shows the sources of research expenditures for the public AAU institutions. The institutions are arranged in descending order, based on the institution's percentage of research funds that are provided by the federal government.

- The University of Oregon, University of Pittsburgh, University of Washington, and UC Santa Barbara received over 75% of their research expenditures from the federal government, ranking them at the top among the public AAU institutions.

- Among the thirty-two public AAU institutions, Columbia would rank last in the percentage of research funds it secures from the federal government (27%). Kansas City (40%), Rolla (28%), and St Louis (35%) did better but would still be included in the lowest quartile of the public AAU institutions.

- The University of Missouri funds a higher percentage of its research program (45% to 48%, depending on which campus) with institutional funds than the other public AAU institutions.

Table 11. Total R&D Expenditures at the Public AAU Institutions by Source of Funds, FY1997

Institution	Federal Government	State and Local	Industry	Institutional*	Other	Total
University of Oregon	83%	1%	1%	10%	5%	31,487
University of Pittsburgh	79%	1%	5%	8%	8%	202,533
U of Washington	78%	3%	9%	8%	2%	409,959
U CA Santa Barbara	78%	2%	3%	10%	7%	94,796
U CA San Diego	73%	4%	5%	10%	9%	378,061
University of Virginia	72%	4%	7%	8%	9%	114,085
University of Colorado	71%	2%	3%	10%	13%	269,816
U of NC Chapel Hill	70%	14%	1%	15%	0%	221,380
U CA Los Angeles	64%	2%	5%	15%	13%	374,629
U TX Austin	64%	8%	13%	14%	2%	239,021
U CA Irvine	63%	3%	9%	13%	11%	113,187
University of Michigan	61%	1%	6%	21%	11%	483,485
U of Iowa	59%	3%	9%	22%	7%	184,414
Indiana University	58%	1%	3%	26%	12%	165,354
SUNY Buffalo	58%	4%	11%	10%	18%	135,663
U WI Madison	56%	9%	4%	21%	11%	419,810
University of Minnesota	55%	14%	7%	15%	9%	363,095
U of Illinois Urbana	55%	13%	4%	24%	5%	286,470
Pennsylvania State U	54%	4%	17%	25%	0%	339,955
University of Arizona	53%	3%	5%	35%	4%	285,278
U CA Berkeley	52%	14%	5%	22%	7%	356,813
U CA Davis	48%	7%	4%	33%	8%	255,070
U MD College Park	48%	24%	2%	18%	8%	215,927
Purdue University	45%	10%	13%	32%	0%	206,588
Michigan State University	44%	17%	4%	30%	5%	190,178
University of Kansas	43%	9%	8%	35%	6%	108,893
Ohio State University	42%	16%	13%	21%	8%	289,100
Rutgers the State U NJ	37%	12%	5%	39%	7%	183,038
U of Nebraska Lincoln	35%	33%	4%	26%	2%	117,100
University of Florida	35%	24%	9%	29%	3%	271,365
Iowa State University	34%	30%	5%	27%	3%	155,433
Public AAU Average	57%	9%	7%	20%	7%	
University of Missouri: Columbia	27%	14%	6%			

Table 12:
Restricted and Unrestricted Research Expenditures

Table 12 shows the restricted and unrestricted research expenditures for the public AAU institutions.

- The University of Washington (95%), UC San Diego (91%), and the University of Colorado (90%) received the highest percentage of restricted research funds among the public AAU institutions. The public AAU institutions average 80% in restricted research expenditures.

- Fifty-three percent of the total research expenditures at the University of Missouri were restricted in 1997. This would rank the University 30th among the public AAU institutions in terms of the percentage of restricted research expenditures.

Table 12. Restricted and Unrestricted Research Expenditures at Public AAU Institutions, FY1997

Institutions	Unrestricted	Restricted	Percentage

Table 13:
Industry-Sponsored Research Expenditures

Table 13 shows the growth in industry-sponsored research expenditures for the public AAU institutions from 1990 to 1997 and from 1995 to 1997. The institutions are arranged in descending order based on their level of growth in dollars since 1995. Please note that a definition of *industry-sponsored research expenditures* is provided in Section IV: Definitions and Technical Notes.

- Over the past two years the University of Texas, University of Florida, and UC San Diego have shown the largest gains in industry-sponsored research expenditures among the public AAU institutions.

- The institutions that lead the public AAU group in terms of industry-sponsored research are Pennsylvania State University ($56.6 million), the University of Washington ($37.7 million), and Ohio State University ($36.7 million).

- The University of Missouri secured $12.6 million in industry-sponsored research expenditures in 1997. Although there have been shifts among the campuses during the past seven years, this amount is essentially equal to 1990 levels ($12.8 million).

Table 13. Industry-Sponsored R&D Expenditures at Public AAU Institutions Since 1990 and 1995

Institution	1990	1995	1996	1997	$ Gain/Loss since 1990	$ Gain/Loss since 1995
U TX Austin	3,507	3,257	15,029	29,887	26,380	26,630
Ohio State University	14,744	21,827	30,870	36,685	21,941	14,858
University of Florida	12,237	10,611	17,532	24,478	12,241	13,867
U CA San Diego	9,135	11,363	15,130	19,266	10,131	7,903
Pennsylvania State U	34,806	50,225	52,771	56,666	21,860	6,441
U CA Los Angeles	8,310	14,892	15,788	19,586	11,276	4,694
U of Iowa	6,827	11,359	14,862	15,712	8,885	4,353
U CA Berkeley	10,892	13,842	15,128	17,125	6,233	3,283
University of Michigan	27,128	28,987	34,975	31,411	4,283	2,424
U WI Madison	12,123	12,948	13,871	14,832	2,709	1,884
University of Colorado	7,426	7,607	8,902	9,403	1,977	1,796
University of Pittsburgh	6,481	8,208	7,880	9,753		

SECTION III:
FEDERAL RESEARCH OBLIGATIONS

Tables 14 and 15 show the total federal research obligations for the public AAU institutions. Both tables are organized based on the federal agency that has promised the funding: USDA, Department of Defense (DOD), Health and Human Services (HHS), Department of Energy (DOE), NASA, NSF, Department of Education (ED), and Other agencies. Table 14 displays the dollar amounts of obligations and Table 15 displays contribution of each agency to the institution's total federal obligations. The federal obligations are for 1996, the most recent year available. Please note that a definition of *federal research obligations* is provided in Section IV: Definitions and Technical Notes.

Table 14:
Federal Research Obligations by Agency

- The following universities garnered the most in federal obligations among the public AAU institutions in the federal agency categories noted below:

USDA:	Iowa State University	$25.8 million
DOD:	Pennsylvania State University	$63.8 million
HHS:	University of Washington	$218.8 million
DOE:	University of Washington	$19.4 million
NASA:	University of Arizona	$21.7 million
NSF:	University of California at San Diego	$48.3 million
ED:	University of Kansas	$4.9 million

Table 14. Federal Obligations for Research and Development at the Public AAU Institutions by Agency, FY 1996

Institution	USDA	DOD	HHS	DOE	NASA	NSF	ED	OTHER	TOTAL

Table 15:
Federal Research Obligations by Agency

- Most of the public AAU institutions (twenty of thirty-two) received the largest portion of their federal research obligations from the Department of Health and Human Services.

- The University of Missouri received the majority its federal obligations from the USDA (37%), followed by HHS (36%), NSF (15%) and DOD (5%).

- The University of Missouri secured $58.4 million in federal research obligations in fiscal year 1996. This would rank 28th among the public AAU institutions.

Table 15. Federal Obligations for Research and Development at the Public AAU Institutions by Agency (per agency percentage contribution), FY 1996

Institution	USDA	DOD	HHS	DOE	NASA	NSF	ED	OTHER	TOTAL
	Row Percentages								
University of Washington	1	10	63	6	3	13	1	4	347,511
U of Michigan	0	11	64	3	4	14	1	4	282,423
U of CA San Diego	0	12	53	5	4	19	0	7	257,234
U of CA Los Angeles	0	7	71	7	4	9	1	1	226,653
U of Minnesota	9	6	61	3	1	16	1	4	220,684
U of Colorado	0	7	55	2	8	16	1	11	197,416
PA St U University Park	12	34	30	3	5	15	0	2	190,193
U of NC Chapel Hill	0	5	81	1	0	6	3	5	181,153
U of CA Berkeley	11	9	36	4	11	26	0	3	175,032
U of Pittsburgh	0	2	86	1	1	7	2	1	165,960
U of IL Urbana-Champaign	14	17	20	2	3	41	2	1	143,900
University of Arizona	6	12	39	3	16	16	2	5	136,358
U of TX Austin	0	43	16	8	7	23	1	2	123,689
Ohio State U	20	6	42	5	5	16	0	7	111,069
U of CA Davis	8	4	52	12	2	16	1	5	110,268
University of Iowa	0	3	80	1	6	8	0	2	106,516
U of MD College Park	12	17	8	8	18	28	0	10	103,473
University of Florida	17	10	47	3	5	15	1	2	103,097
Indiana U	0	2	69	4	1	20	1	3	99,978
U of Virginia	0	7	65	4	6	15	1	3	94,205
Purdue University	25	14	23	10	2	23	0	2	88,311
Michigan State University	26	4	25	5	1	32	0	7	85,425
Rutgers St U of NJ	14	13	27	7	3	23	0	12	78,378
U of CA Irvine	1	8	62	8	4	17	0	1	69,861
U of CA Santa Barbara	0	26	11	7	6	44	0	6	64,254
Iowa State University	44	2	11	8	2	18	0	15	58,975
University of Kansas	0	3	62	5	2	17	10	0	49,762
SUNY at Buffalo	0	10	60	0	1	22	0	6	43,600
U of Nebraska Lincoln	38	7	8	0	2	34	0	13	42,043
University of Oregon									

SECTION IV:
DEFINITIONS AND TECHNICAL NOTES

The following definitions, provided by the National Science Foundation (NSF), are most relevant to the tables in this report:

> *Federal research expenditures:* when funds for research from the federal government are actually spent they are then considered .expenditures.. For example, if the University received a two-year, two million dollar grant from NASA in FY1993 and spent $1.5 million the first year and $0.5 million in the second year, the federal expenditures would be $1.5 million for FY1993 and $0.5 million for FY1994. The reporting of expenditures, in contrast to obligations, provides a more accurate picture of an institution.s research performance because it represents funds that have been already spent as compared to funds that have been promised or are expected. Furthermore, expenditure figures are less likely to show major shifts from year to year because funds received for multi-year grants are only reported in the year that they are spent.
>
> *Federal research obligations:* the amounts for research orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payment of money is required. For example, if the University were awarded a two-year, two million dollar grant from NASA in FY1993, the award amount would be recorded as two million dollars in obligations in FY1993.
>
> *Industry-sponsored research expenditures:* these are funds provided by profit making organizations and expended by the University for research-related purposes. These amounts are reported in the fiscal year that they are expended.

The National Science Foundation has historically reported research obligations and expenditures from a number of different perspectives. In this report, specifically, academic Science & Engineering (S&E) obligations and expenditures for Research & Development (R&D) are examined. Thus, funds received from the federal government for Plant, Facilities & Equipment; Fellowships, Traineeships, and Training Grants; General Support; and for other categories have been excluded. For brevity, "Science and Engineering" and "Research and Development" have not been repeated in the text of this document.

Questions or Comments

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