

**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

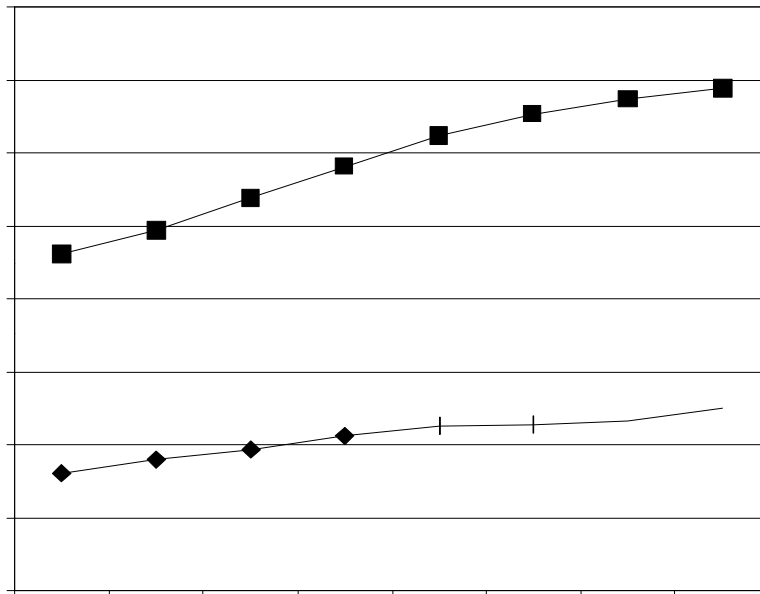
Table 1. Trends in Federal Expenditures for Science and Engineering R&D at Public AAU Institutions from 1990 and 1995

| 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 | | MS +/- since 1990 | MS +/- since 1995 |
|-------------------------------|---------------|--------------|---------------|--------------|---------------|--------------|----------------------|----------------------|
| | \$ | Market Share | \$ | Market Share | \$ | Market Share | | |
| 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

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

***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 | | 1990 | 1997 | % change |
|------|----------------|-----------|-----------|----------|
| Rank | State | | | |
| 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 ($38.3 \times \$4$ 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 Rolla | 4,976,000 | 721 | 468 | 6,902 | 10,632 |

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

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).

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

| <u>Institution</u> | <u>USDA</u> | <u>DOD</u> | <u>HHS</u> | <u>DOE</u> | <u>NASA</u> | <u>NSF</u> | <u>ED</u> | <u>OTHER</u> | <u>TOTAL</u> |
|--------------------|-------------|------------|------------|------------|-------------|------------|-----------|--------------|--------------|
|--------------------|-------------|------------|------------|------------|-------------|------------|-----------|--------------|--------------|

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

| <u>Institution</u> | <u>USDA</u> | <u>DOD</u> | <u>HHS</u> | <u>DOE</u> | <u>NASA</u> | <u>NSF</u> | <u>ED OTHER</u> | <u>TOTAL</u> |
|---------------------------|------------------------|------------|------------|------------|-------------|------------|-----------------|--------------|
| | <u>Row Percentages</u> | | | | | | | |
| 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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