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ABSTRACT

Academic research makes a key contribution to the viability and competitiveness of U.S. technology in the new global markets, as well as to the quality of life of citizens. This report provides a broad quantitative picture of the cost, availability, and the condition of existing research facilities. Data on current spending, sources of support, and future plans for construction and renovation are also included. Highlights of the report include: (1) research space at universities and colleges increased by 9% since 1988 when the first survey data were gathered; (2) from 1988 to 1992, the amount of academic research space reported as being "suitable for use in the most highly developed and scientifically sophisticated research" increased by 22%; (3) doctorate-granting institutions contained 96% of all academic science and engineering research space; and (4) the 70 research-performing historically black colleges and universities represented about 2% of the national total for research space. (PR)

SCIENTIFIC AND ENGINEERING RESEARCH FACILITIES AT UNIVERSITIES AND COLLEGES: 1992

National Science Foundation

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Project Director: Ann T. Lanier

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FOREWORD

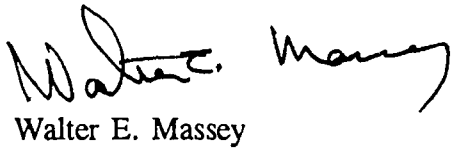
Academic research makes a key contribution to the viability and competitiveness of U.S. technology in the new global markets, as well as to the quality of life for our citizens. Broad access by the academic research community to state-of-the-art research facilities is one of several critical elements in maintaining this contribution.

The resources to construct and renovate academic research facilities over the last decade have been provided by loose partnerships among State, private, and Federal sources. The relative roles of the "partners" have fluctuated over time.

Under these circumstances, the need for accurate, reliable, and comprehensive information on academic research facilities became clear. The National Science Foundation was directed to collect the necessary data by the U.S. Congress in section 108 of the National Science Foundation Authorization Act for Fiscal Year 1986 (42 U.S.C. 1886). A pilot study published in 1986 provided the initial materials for a comprehensive report, which was designed with the in-depth participation of representatives of all the "partners." Subsequent biennial surveys have included modifications and improvements, and this volume contains the results of the fourth survey in the series.

This report provides a broad quantitative picture of the cost, availability, and condition of existing research facilities. Data on current capital spending, sources of support, and future plans for construction and renovation also are included.

These data alone do not embody the solutions to the policy issues at hand, but they can support a useful policy dialogue among all who strive for a healthy and productive U.S. science and engineering academic research enterprise.



Walter E. Massey
Director
National Science Foundation

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The National Institutes of Health (NIH) provided significant financial support as well as guidance and review under the direction of Paul Seder, NIH Office of Science Policy and Legislation.

An expert Advisory Panel contributed to the Survey design, the analysis plan, and the review of this Report. Members are

- Dennis W. Barnes, President, Southeastern Universities Research Association
- Richard Blatchly, Professor of Chemistry, Keene State College
- Frederick Jones, Dean of the School of Graduate Studies and Research, Meharry Medical College
- Robert H. McGee, Director of Research Facilities Planning, Howard Hughes Medical Institute
- Julie Norris, Assistant Vice President and Director of Sponsored Programs, University of Houston

In addition, NSF sought advice on the development of the Survey from higher education association and university representatives, who graciously provided information of considerable importance to the success of the project.

Administrators at the higher education associations who reviewed and commented on the Report included

- Carol H. Fuller, Assistant Executive Director, National Institute of Independent Colleges and Universities
- Howard Gobstein, Vice President, Association of American Universities
- Milton Goldberg, Executive Director, Council on Governmental Relations
- Jeanne L. Narum, Director, The Independent Colleges Office

The 1992 Survey was conducted by Westat, Inc., of Rockville, Maryland, under contract to NSF (Contract Number SRS-9121038). Westat staff who played significant roles in the project were

- Kenneth Burgdorf, Project Director and Report co-author
- Lance Hodes, Corporate officer-in-charge
- Diane Ward, Survey Operations Director
- Bradford Chaney, Report co-author
- William Renfrew, Systems Analyst
- Carol Litman, Report editor
- Sylvie Warren, manuscript preparation

Finally, we acknowledge the indispensable contribution of the many officials and staff members at the sample institutions who undertook the completion of the survey questionnaires.

HIGHLIGHTS

Research space at universities and colleges--In early 1992, the 525 largest research-performing U.S. universities and colleges contained an estimated 122 million net assigned square feet (NASF) of science and engineering (S&E) research space. This represented a 9 percent net increase in research space (roughly 10 million NASF) since 1988, when the first survey data in this series were gathered.

Condition/quality and adequacy of research space--From 1988 to 1992, the amount of academic research space reported as being "suitable for use in the most highly developed and scientifically sophisticated research" increased 22 percent. Over the same period, the average percentage of S&E fields in which institutions reported an inadequate amount of research space declined from 40 percent to 34 percent.

Spending for research facility construction and repair/renovation--Institutions' expected spending for construction and repair/renovation of academic S&E research facilities increased from $2.89 billion for projects started in the 2-year period 1986+87 to $3.80 billion for project starts in 1990+91. Institutions expected to spend an additional $4.11 billion for projects started in 1992+93 (dollars are not adjusted for inflation).

Financing of research facilities--The 1986+87 to 1990+91 increase of $913 million in research facilities spending largely reflected increases of $353 million in Federal Government funds and $343 million in tax-exempt bonds; private donations, however, declined by $135 million.

Distribution of research facilities by S&E field--In 1992, about 85 percent of all academic S&E research space was concentrated in 5 fields: the biological (23 percent), medical (18 percent), and agricultural sciences (16 percent); engineering (15 percent); and the physical sciences (13 percent). The medical sciences had the largest share of spending for construction of new research facilities among projects started in 1990+91 (28 percent) and also among those planned for 1992+93 (31 percent).

Research facilities at doctorate-granting institutions--The 294 S&E doctorate-granting institutions contained 96 percent of all academic S&E research space in 1992, as in 1988. Essentially all of the net increases from 1988 to 1992 in research space and in research facilities spending occurred at these institutions.

Research facilities at nondoctorate-granting institutions--The approximately 230 nondoctorate-granting universities and colleges with separately budgeted S&E research collectively contained 4.6 million NASF of research space in 1992. This amount, almost unchanged from 1988, represents about 4 percent of the national total. Spending for research facility construction and repair/renovation steadily declined at these institutions in recent years, from a comparatively high spending level in 1986+87 ($35 per existing research NASF) to a projected level for 1992+93 that was well below that for doctorate-granting institutions ($14 per NASF versus $27 per NASF). The reduction was attributable mainly to declining financial support from state/local government and from private donations.

Research facilities at historically black colleges and universities (HBCUs)--The 70 research-performing HBCUs represented in this study collectively contained 2.9 million NASF of academic S&E research space in 1992, about 2 percent of the national total. Most HBCUs reported little or no spending for construction of research facilities throughout the period covered by this series of surveys, and expected spending in 1992+93 at HBCUs ($6 per NASF of existing research space) was well below the expected level across all research-performing academic institutions ($26 per NASF of existing research space).

DATA CONSIDERATIONS

- This report provides data on the amount, condition, costs, and sources of funding for construction and repair/renovation of facilities used for organized research in science and engineering (S&E) fields for all research-performing academic institutions. The survey definition of organized research is based on OMB Circular A-21: "**Organized research** means all research and development activities of an institution that are separately budgeted and accounted for. It includes: (1) Sponsored research means all research and development activities that are sponsored by Federal and non-Federal agencies and organizations and (2) University research means all research and development activities that are separately budgeted by the institution under an internal application of institutional funds." The definition excludes departmental research that is not separately budgeted, as that is classified as part of the instructional function in OMB Circular A-21.

- **Research facility** refers to the physical plant ("bricks and mortar") in which research activities take place, including building infrastructure, fixed equipment, and nonfixed equipment costing over $1 million. The definition excludes instrumentation, i.e., nonfixed equipment costing less than $1 million. Facilities that have been designated as academically administered Federally Funded Research and Development Centers (FFRDCs) are excluded (e.g., Los Alamos, Fermi, Lincoln Lab).

- **Research space** includes the net assigned square feet (NASF) of space in research facilities, within which organized research activities take place. Multipurpose space, such as an office, is prorated to reflect the proportion of use devoted to organized research.

- Construction and repair/renovation **capital projects** are limited to projects with estimated total costs from planning to completion of $100,000 or more for research-related space. Costs include both structural costs and the cost of the associated infrastructure, such as utilities, data communications, and fixed equipment. For multipurpose space, institutions prorated the cost to reflect the proportion of research space involved in the project. For multiyear projects, all expected costs for research-related project components are allocated to the fiscal year in which the actual construction or repair/renovation begins.[1]

- In addition to factual data on amounts and costs of research space, the survey collects assessments of the condition, quality, and adequacy of existing research facilities in S&E fields. Although these assessments are, by their very nature, subjective, they do capture an overall picture of the current status of facilities. At most institutions, field-specific assessments were obtained from deans and/or department chairs in the applicable schools or departments.

- This report provides national estimates that encompass all U.S. universities and colleges that award doctorate degrees in S&E fields or otherwise participate in organized S&E research. The survey universe consists of approximately 525 institutions.[2] A stratified probability sample of 303 of these institutions was selected, with probability proportional to size, as measured by total S&E research expenditures. The sample includes all institutions among the top 100 in fiscal year 1988 research expenditures.

- The overall response rate to the 1992 survey was 89 percent; the rate was 88 percent or greater for all institution types (e.g., doctorate-granting, public, private). Extensive followup resulted in an overall item nonresponse rate of less than 3 percent.

- The findings in this report are based on a sample and are therefore subject to sampling variability. Estimated standard errors for 1988, 1990, and 1992 selected statistics and for the differences between the years are shown in Table A-4 in the Technical Notes.

- Additional information about the survey design, definitions, data collection procedures, etc. is presented in Appendix A (Technical Notes) and in a separately bound methodology report, which is available upon request from NSF.

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[1]This report contains numerous references to capital projects begun during various 2-year periods (e.g., 1990+91). All such references refer to the fiscal years of the institutions from which data were obtained.

[2]This survey universe, which is used throughout most of the report, includes historically black colleges and universities (HBCUs), as in previous cycles of the survey. However, in Chapter 6, additional information is presented with reference to an expanded group of 70 HBCUs.

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EXECUTIVE SUMMARY

Academic research facilities are a critically important national resource. The amount, condition, and adequacy of available science and engineering (S&E) research space directly affect the scope and quality of the research that can be conducted at our Nation's universities and colleges. To provide objective and systematic information on the status of academic research facilities, the National Science Foundation (NSF) was authorized (42 U.S.C. 1886)

> *...to design, establish, and maintain a data collection and analysis capability...for the purpose of identifying and assessing the research facilities needs of universities and colleges... The Foundation, in conjunction with other appropriate Federal agencies, shall conduct the necessary surveys every 2 years and report the results to the Congress.*

This report is based on NSF's 1992 Survey of Scientific and Engineering R&D Facilities at Colleges and Universities, which was the third full-scale study NSF has conducted in response to the above mandate. The 1992 study was similar to the previous studies in this series, although it entailed expanded coverage of selected topics. For example, the 1992 study collected information from an expanded sample of nondoctorate-granting colleges and universities that perform S&E research, in order to permit more detailed attention to the facilities-related characteristics and needs of these institutions.

All reported findings, from all three cycles of the survey, are national estimates derived from institution samples selected to represent the 525 largest research-performing U.S. universities and colleges.[1] The response rate was 89 percent or more in all three cycles.

The following summary first includes a discussion of overall trends and differences among types of institutions (e.g., doctorate-granting versus nondoctorate-granting). Trends for major S&E fields are then highlighted, as are findings for historically black colleges and universities, and findings for several topics of special interest in this cycle of the survey.

Amount, Adequacy, and Condition of Existing Research Space

Amount of Research Space

- There were an estimated 122 million net assigned square feet (NASF) of S&E research space[2] available at the Nation's research-performing academic institutions in early 1992. This represents a net increase of approximately 10 million NASF (9 percent) since 1988.

- As in 1988, the top 100 institutions in research expenditures accounted for the majority of all academic S&E research space in 1992 (72 percent).[3] These institutions accounted for 84 percent of total research expenditures in fiscal year 1988.

- In addition to containing relatively large absolute amounts of S&E research space, the top 100 research-performing institutions also allocated relatively large proportions of their overall academic space to S&E research (28 percent, versus 4 percent at nondoctorate-granting institutions).

Out of a total 661 million NASF of space in all academic disciplines at research-performing universities and colleges in 1992, 285 million NASF (43 percent) was assigned to S&E fields. Of that, 122 million NASF (43 percent) was allocated to research. This amount of research space represents an increase of

[1]See Technical Notes, Appendix A of this report, for a detailed description of the survey universe, sample, data collection methods, and considerations/caveats in the interpretation of findings. Additional information is contained in a separately bound methodology report, which is available upon request from NSF.

[2]Throughout this report, "research space" refers to the net assigned square footage of space within research facilities (buildings) in which "organized research" activities take place. Multipurpose space, such as an office, is prorated to reflect the proportion of use devoted to organized research, which is defined based on OMB Circular A-21: "Organized research means all research and development activities of an institution that are separately budgeted and accounted for. It includes: (1) Sponsored research means all research and development activities that are sponsored by Federal and non-Federal agencies and organizations...(2) University research means all research and development activities that are separately budgeted by the institution under an internal application of institutional funds." In accord with OMB Circular A-21, the definition excludes departmental research that is not separately budgeted.

[3]As used throughout this report, the "top 100" designation is based on institutions' fiscal year 1988 research expenditures, as reported in *Academic Science/Engineering: R&D Funds, Fiscal Year 1988*, National Science Foundation, 1989.

about 6 million NASF since 1990 and of about 10 million NASF since 1988 (Table 1).[4]

Table 1. Trends in amount of science and engineering research space, by type of institution: 1988-92

[Millions of net assigned square feet]

Type of institution	1988	1990	1992
Total	112.1	116.3	122.0
Doctorate-granting	107.4	111.2	117.4
Top 100 in research expenditures	80.6	81.7	87.5
Other	26.8	29.5	29.9
Nondoctorate-granting	4.6	5.2	4.6

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 2-2

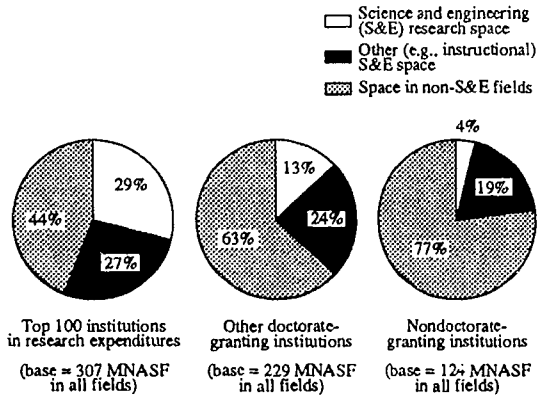
The vast majority of academic S&E research space was located at the 294 institutions that award doctorate degrees in S&E fields (96 percent), and the top 100 in research expenditures accounted for most of this (72 percent of the national total). Most of the overall increase in research space since 1988 also occurred among the top 100 institutions (Table 1).

The approximately 230 nondoctorate-granting colleges and universities that conduct S&E research collectively accounted for about 5 million NASF (4 percent) of S&E research space in 1992, essentially unchanged from 1988.

Private colleges and universities accounted for about one-quarter (26 percent) of all academic S&E research space in 1992, as was true in 1988.

Academic institutions varied considerably in their extent of emphasis upon science and engineering, as compared to other disciplines, and in their emphasis upon research within S&E fields (Chart 1). The top 100 research-performing institutions, which contained the largest total amount of S&E research space, also had the largest *relative* emphases upon S&E and S&E research: at these institutions, S&E fields accounted for over half (56 percent) of the total space allocated for all academic disciplines, and research space accounted for over half of all S&E space. At the other extreme, nondoctorate-granting institutions that are engaged in S&E research allocated most (77 percent) of their academic space to disciplines outside science and engineering, and they allocated most of their S&E space to functions other than research; S&E research space represented only 4 percent of the total academic space at these institutions.

Chart 1. Allocation of total academic space, by institution type: 1992



KEY: MNASF = millions of net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 2-1

Adequacy of Amount of Research Space

- Need for additional research space was reported more often by institutions among the top 100 in research expenditures (40 percent of their reports) than by other doctorate-granting institutions or nondoctorate-granting institutions (32 percent of their reports).

- In all institution type categories and in most S&E fields, reports of need for additional research space were less widespread in 1992 (34 percent of all assessments) than in 1990 (42 percent).

As in previous surveys, institutions were asked to assess whether their amount of research space in each

[4]The reported figures should be considered conservative estimates of the total amount of space being used for S&E research in academic settings. Space used for organized research but also for other purposes is prorated to reflect only the proportion of total usage that is for research. Also, the survey definition excludes space used for undergraduate research or for department-funded faculty research.

major S&E field was "adequate" to meet the needs of their institution's current research program, was "generally adequate," or was "inadequate." These assessments were usually obtained from deans or department heads in the affected fields.

As in previous surveys, 1992 reports of need for additional research space (i.e., reports of an inadequate current amount) were more widespread among doctorate-granting than nondoctorate-granting institutions (36 percent and 32 percent, respectively) and among public than among private institutions (39 percent and 26 percent, respectively). Similarly, reports of need for additional research space have been consistently high in engineering (45 percent of departments in 1992) and the medical sciences (38 percent), and have been relatively low in mathematics (25 percent) and the social sciences (27 percent).

Although substantial numbers of institutions have continued to report needs for additional research space, such reports were noticeably less extensive in 1992 (34 percent of all assessments) than in 1990 (42 percent) or in 1988 (40 percent). This reduced prevalence of assessed need was consistent both across fields and institution types.

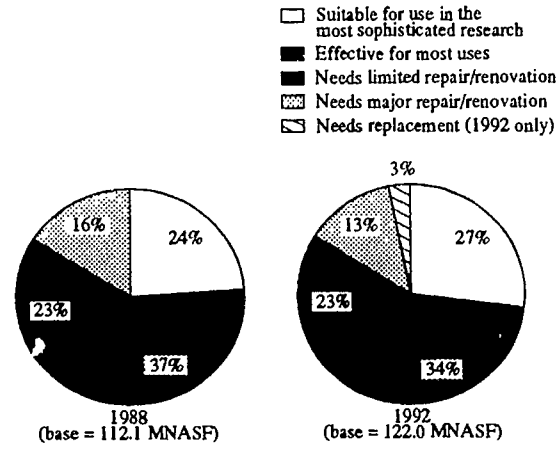
Condition/Quality of Research Space

- The proportion of S&E research space reported to be in need of limited or major repair/renovation or replacement has remained stable, at 39 percent, from 1988 to 1992 (Chart 2).

- At the other end of the quality/condition spectrum, there has been a progressive increase in the amount of research space assessed as being "suitable for use in the most highly developed and scientifically sophisticated research," from 26.7 million NASF in 1988 to 32.7 million NASF in 1992. There was a corresponding decrease in the amount of space assessed as being of intermediate quality ("effective for most purposes").

- As in previous surveys, doctorate-granting institutions reported a larger proportion of their research space as being "suitable for use in the most highly developed and scientifically sophisticated research" (27 percent in 1992) than did nondoctorate-granting institutions (17 percent).

Chart 2. Institution-assessed quality/condition of academic research facilities: 1988 and 1992



KEY: MNASF = millions of net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-1

Capital Projects to Construct or Repair/ Renovate Research Space

Total Spending for Capital Projects

- Institutions spent a total of $3.8 billion for construction and repair/renovation of S&E research facilities in projects begun during the 2-year period 1990+91, up from $3.5 billion for projects begun in 1988+89 and $2.9 billion for projects begun in 1986+87 (Chart 3).[5] These estimates were prorated to reflect project costs for research space only, and they exclude "minor" construction or repair/renovation projects with research-related costs of less than $100,000.

- Continuing the progression of increases seen during the three previous 2-year periods, institutions reported planned spending of $4.1 billion for projects beginning in 1992+93.

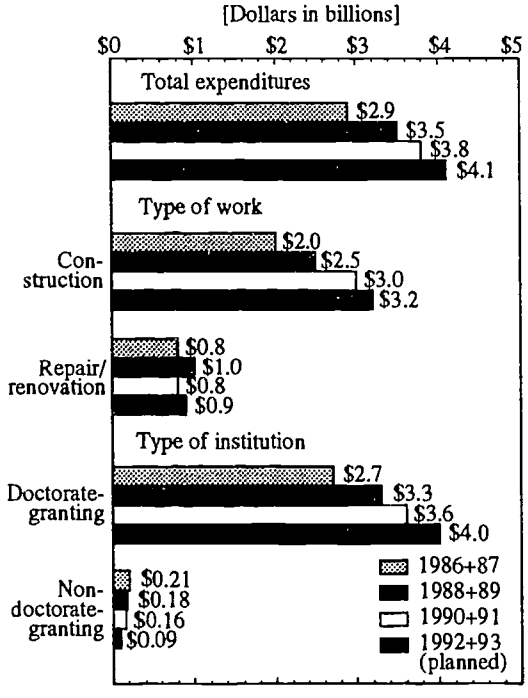
[5]All cost figures presented in this report are expressed in current dollars. See Appendix A for information about inflation adjustment to 1987 constant dollars.

- New construction projects accounted for the bulk of 1990+91 capital project expenditures ($3.0 billion, 79 percent), with repair/renovation projects accounting for the remaining $0.8 billion (21 percent).

- Although spending for research facility construction projects has increased steadily, from $2.0 billion in 1986+87 to an expected $3.2 billion in 1992+93, spending for facility repair/renovation has remained static, at a level in 1990+91 that was the same as in 1986+87 ($0.8 billion).

- The overall increase in capital project spending from 1986 to 1993 was confined to doctorate-granting institutions. Aggregate spending at nondoctorate-granting institutions during this period declined progressively, from $0.21 billion in 1986+87 to an expected $0.09 billion in 1992+93.

Chart 3. Trends in expenditures for capital projects to construct or repair/renovate academic research facilities, by expenditure type and institution type: 1986-93



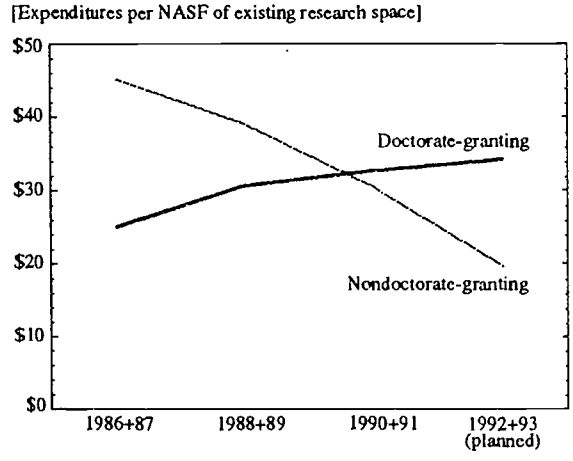
SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 3-2 and 3-6

Relative Spending for Capital Projects

The level of spending for construction and repair/renovation of S&E research facilities at nondoctorate-granting institutions seems very low in comparison to that at doctorate-granting institutions. However, because nondoctorate-granting institutions have so much less research space than doctorate-granting institutions, both individually and in the aggregate, comparisons based on total spending can be misleading.

When institutions' S&E capital project spending figures are expressed in dollars per NASF of existing research space, nondoctorate-granting institutions' capital project spending levels in 1986+87 and 1988+89 were actually higher than those at doctorate-granting institutions (Chart 4), and they declined to a level in 1990+91 that was essentially the same as that doctorate-granting institutions ($31 per existing research NASF and $33 per existing research NASF, respectively).

Chart 4. Trends in relative expenditures for capital projects to construct or repair/renovate academic research facilities at doctorate-granting and nondoctorate-granting institutions: 1986-93



KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-1, 2-2, 3-6

However, if recent trends in research facilities spending continue--downward at nondoctorate-granting institutions and upward at doctorate-granting institutions--significant disparities between the two will emerge in the near future. Institution spending plans

for 1992+93, which do reflect a continuation of recent trends, translate into size-adjusted spending projections for this period that are considerably lower for nondoctorate-granting institutions ($19.6 per existing NASF of research space) than for doctorate-granting institutions ($34.2 per existing research NASF; Chart 4).

Space Affected in Capital Projects

- S&E research facility construction projects begun in 1990+91 involved a total of 11.4 million NASF of research space, an increase from 10.6 million NASF for projects begun in 1988+89 and 9.9 million NASF for 1986+87 projects. Continuing this growth pattern, construction projects planned for 1992+93 are expected to generate 12.4 million NASF of new research space.

- Although institutions initiated projects to construct 22 million NASF of research space over the 4-year period 1988-91, the total amount of in-use research space increased by only 10 million NASF. This suggests that much of the construction activity begun during this period has not resulted in a net expansion of available research space. Some of these projects may not yet be completed, some may have been scaled back or postponed after project start, and some may always have been intended to replace outmoded or unusable research space, rather than to expand the institution's total amount of research space.

- The overall trend toward increasing construction activity occurred only at doctorate-granting institutions. Construction projects at nondoctorate-granting institutions have involved declining amounts of research space: from 1.0 million NASF in 1986+87 to a planned 0.4 million NASF in 1992+93.

- Over the time frame encompassed by this series of studies, facilities repair/renovation projects have involved progressively smaller overall amounts of research space: from 13.4 million NASF in 1986+87 to 11.4 million NASF in 1988+89 to 8.6 million NASF in 1990+91 to an expected 6.0 million NASF in 1992+93. This decline has occurred in all institution categories: large and small, public and private, doctorate-granting and nondoctorate-granting.

Sources of Funds for Capital Projects[6]

The $1 billion overall increase in spending for S&E research facility capital projects at doctorate-granting institutions from 1986+87 ($2.681 billion) to 1990+91 ($3.641 billion) reflected changes in funding support from several sources (Table 2):

- Support from state and local governments (most of which was for public institutions) increased, from $892 million to $1,175 million;

- Direct Federal Government funding support grew considerably, from $153 million to $514 million, although much of this support was concentrated in a relatively small number of institutions;[7]

- Institutions' indebtedness grew during this period, as use of tax-free bonds increased from $412 million to $690 million;

- Institutions increasingly drew upon internal institution funds (operating funds, tuition/fees, endowment income, indirect cost recovery, etc.), which rose from $661 million to $817 million; and

- External funding support from private donations declined, from $562 million in 1986+87 to $446 million in 1990+91.

In contrast to the increased research facilities funding support doctorate-granting institutions received from government sources from 1986+87 to 1990+91, nondoctorate-granting institutions experienced a sharp decline in funding support from state and local governments (from $120 million to $24 million) as well as a decline in Federal support (from $19 million to $12 million). Private donations also declined markedly during this period (from $27 million to $8 million). These decreases were partly offset as nondoctorate-granting institutions increasingly relied upon indebtedness in the form of tax-exempt bonds (from $38 million to $104 million) and upon increased

[6]This report includes data on the direct costs of construction and repair/renovation and the sources of funds for these direct costs. No attempt was made to quantify future indirect cost pressures resulting from current or planned projects or to measure institutions' indirect cost recovery from depreciation of existing facilities.

[7]Expenditures in the Federal Government category are limited to direct funding support for specific projects. The category does not include indirect financial support, such as indirect cost recovery or tax-free bonds.

Table 2. Trends in source of funds for capital projects to construct or repair/renovate research facilities at doctorate-granting and nondoctorate-granting institutions: 1986-91

[Dollars in millions]

Source of funds	Total			Doctorate-granting			Nondoctorate-granting		
	1986+ 87	1988+ 89	1990+ 91	1986+ 87	1988+ 89	1990+ 91	1986+ 87	1988+ 89	1990+ 91
Total	$2,889	3,474	3,800	2,681	3,294	3,641	208	180	159
Federal Government	172	413	526	153	395	514	19	18	12
State/local government	1,012	1,124	1,199	892	1,034	1,175	120	90	24
Private donations	589	512	454	562	454	446	27	58	8
Tax-exempt bonds	450	390	794	412	390	690	38	0	104
Other (institution funds, etc.)	665	1,033	830	661	1,020	817	4	13	13

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 4-1 to 4-4

use of internal institution funds (from $4 million to $13 million) to fund capital projects.

Fields

- Roughly five-sixths of all S&E research space was located within five fields in 1992: the biological sciences (23 percent), the medical sciences (18 percent), the agricultural sciences (16 percent), engineering (15 percent), and the physical sciences (13 percent; Table 3).

- Generally, there was little change from 1988 to 1992 in the distribution of research space among S&E fields. The largest changes were about 1 percent. However, the five largest fields increased from 83 percent of the space in 1988 to 86 percent in 1992.

- Research facility construction projects begun in 1990+91 and planned for 1992+93 generally reflect the same field distributions as seen for existing research space. Medical sciences constitute a notable exception, accounting for substantially larger shares of recent and planned construction than of presently existing research space. Another exception was in the agricultural sciences, with a smaller proportion of construction in 1990-93 than of existing space.

Despite significant amounts of new construction in the 1988 to 1992 interval, there has been little change in the distribution of space among fields. A reason is that construction appeared in roughly the same proportions as the distribution of existing space: for example, the biological sciences had 23 percent of the space in 1992, 24 percent of the space in construction projects beginning in 1990+91, and 23 percent of the space planned for construction in 1992+93. Given the low ratio of construction to existing research space, it would take substantial changes in the distribution of new construction to have a major effect on the overall distribution of space.

However, one field where above-average growth is apparent is the medical sciences, which represented 17 percent of all academic S&E research space in 1988, but which contained 28 percent of the research space in 1990+91 construction projects and 31 percent of the space in projects planned for 1992+93.

Table 3. Distribution of existing science and engineering research space and of research space to be constructed, by field: 1988-93

Field	Existing research space		Research space to be constructed	
	1988	1992	1990+ 91	1992+ 93 (Plan)
Total (NASF in millions)	112.1	122.0	11.8	12.4
	[Percentage of research space]			
Engineering	14.2%	14.8	14.4	13.9
Physical sciences	14.3	13.4	13.6	5.8
Environmental sciences	5.6	5.5	4.5	6.4
Mathematics	0.6	0.7	0.4	0.2
Computer science	1.2	1.3	2.5	3.6
Agricultural sciences	15.7	16.3	8.1	9.5
Biological sciences	21.3	22.7	23.7	22.7
Medical sciences	17.3	18.4	28.3	30.8
Psychology/social sciences	5.7	5.1	1.4	4.6
Other, not elsewhere classified	3.9	1.8	3.2	2.5

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-7 and 3-4

Historically Black Colleges and Universities

- The Nation's 70 research-performing HBCUs contained an estimated 2.9 million NASF of S&E research space in 1992, which represented about 2 percent of the national total.

- These 70 HBCUs spent a comparatively low total of $38 million for research facility construction projects in 1990+91 (the equivalent of $13 per NASF of existing research space, as compared to an overall average of $26 per existing NASF for all academic institutions), and they expect to spend even less ($6 per existing NASF) in 1992+93.

- Over the 6-year period 1986 to 1991, most of the 29 comparatively large HBCUs that have been represented in all three cycles of this survey have reported little or no research facilities construction activity. This includes all of the five largest HBCUs in S&E research activity, three of which have had no research facility construction projects during any of the periods surveyed.

Trend findings in this section must be interpreted with particular caution because of the small number and generally small size of HBCUs. Data obtained from only one or two institutions can have a substantial effect on overall estimates, and estimates are subject to substantial fluctuation from year to year.

Among the group of 29 HBCUs represented in all three cycles of the survey, there has been a modest increase in reported total S&E research space, from 1.1 million in NASF in 1988 to 1.8 million NASF in 1992. However, much of this increase has been due to factors other than construction-related expansion (e.g., administrative changes, changing use of existing space).

Only one of the five largest research-performing HBCUs reported any research facility construction projects in 1990+91 (totaling less than $4 million), none reported any projects in 1989+90, and only one reported any projects in 1986+87 (totaling just over $4 million).

Total research facilities construction spending in 1990+91 among all 29 of the survey's original HBCUs was only $22.5 million, less than 1 percent of the national total. State and local government contributions to these projects totaled $6.3 million, which represented 0.7 percent of state/local government contributions to all academic S&E research facility construction projects begun during that period. Federal Government contributions totaled $12.1 million, which represented over half of HBCUs' total funding but constituted only 2.5 percent of Federal contributions to all academic S&E research facility construction projects in that 2-year period.

The relative dearth of financial support for construction of S&E research facilities at HBCUs is expected to continue into 1992+93, when the original 29 HBCUs expect to begin only $11.1 million of new construction, half the spending level of the previous 2-year period. Expected 1992+93 construction spending at all 70 research-performing HBCUs is only slightly greater: $13.0 million.

Special Topics for the 1992 Survey

Three topics were added to the 1992 survey that had not been in earlier cycles in 1988 and 1990.

Projects Under $100,000

- At nondoctorate-granting institutions, $5 million was spent on repair/renovation projects costing $5,000 to $99,999, amounting to 13 percent of their total repair/renovation spending. At doctorate-granting institutions, the comparable figure was 15 percent.

Previous surveys collected data only on projects costing at least $100,000. These new data on smaller repair/renovation projects were collected to determine whether the focus on large projects might result in an inaccurate perception of institutions' activities, especially at the smaller nondoctorate-granting institutions that may not be as capable of conducting large projects. The data indicate that the large projects do account for the great majority of spending, at nondoctorate-granting institutions as well as at doctorate-granting institutions.

Central Research Infrastructure

- In 1990+91, institutions spent $120 million for construction and repair/renovation of central research infrastructure facilities, such as central computing and telecommunications facilities and central toxic waste storage/disposal facilities.

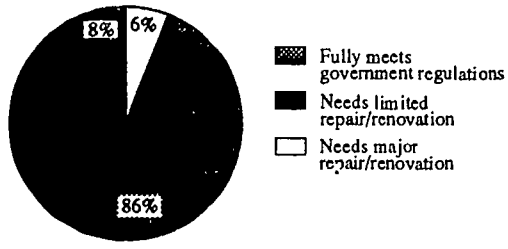
The above data were collected to determine whether information on central research infrastructure, which was excluded in previous surveys, is necessary to develop an accurate picture of spending on research facilities. The total of $120 million, though a substantial expenditure, represents only 4 percent of all capital project spending, and thus is not large enough to change materially the findings based on research space assigned to major S&E fields.

Laboratory Animal Facilities

- Laboratory animal facilities were present at 88 percent of research institutions. These facilities had 9.3 million NASF of research space, and 11.3 million NASF of total space.
- Institution officials reported that government regulations on the humane care of animals were fully met for 86 percent of the laboratory animal research space, while 8 percent of the space needed limited repair/renovation, and 6 percent needed major repair/renovation (Chart 5).
- Planned expenditures for repair/renovation or construction of laboratory animal facilities in 1992+93 were $220 million.

Many institutions commented in earlier cycles of this survey that they faced a significant burden from new Federal and state regulations concerning laboratory animal facilities. Because of this concern, the 1992 survey included several new items on this subject, as a topic of special interest for this cycle. In retrospect, however, it appears that this survey may not have been well-timed to measure the impact of such regulations. Based on the amount of space reported as meeting government regulations, institutions may have conducted much compliance-driven construction or repair/renovation prior to this survey. The planned expenditures still remaining accounted for only 5 percent of total planned expenditures for 1992+93 capital projects. Larger amounts may have been spent in earlier years. No data are available on the size of previous expenditures, but the total of 9.3 million NASF for laboratory animal facilities constituted 8 percent of all research space, and 13 percent of research space in the agricultural, biological, and medical sciences -- a sufficiently large amount to have had a significant impact in earlier years.

Chart 5. Condition of laboratory animal facilities: 1992



NASF of research space = 9.3 million

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 7-2

Chapter 1. Introduction

Background

To sustain a strong academic research capability and enable the Nation's research capacity to expand, the facilities that house the research enterprise must be maintained and replenished. Extensive congressional hearings on the status of academic research facilities were held during the mid-1980s by both the House and Senate committees on science and technology. Both committees found "sufficient evidence to suggest the presence of a serious and growing problem..."[8] and expressed concern that the Federal Government did not have in place an ongoing analytical system to document the current status of and needs for research facilities by major field of science and engineering (S&E). Such systematic information was needed to understand current and future facilities pressures and to formulate sound programs and policies in this area.

Many higher education officials have also expressed concerns about the financial burden of an increasing backlog of deferred maintenance, driven largely by needs to upgrade their facilities to satisfy ever-growing technical and health and safety requirements. Additional concerns have been raised regarding mechanisms for financing needed facilities construction, repair, and renovation. For example, the limitation on tax-exempt bonds that private institutions may have outstanding and the decreasing tax advantages of private gifts may affect institutions' abilities to secure funding for necessary repair/renovation or construction activities.

In recognition of the need for objective information in these areas, the following statute (codified as section 1886 of title 42 of the United States Code) was enacted in November 1985:

> *The National Science Foundation is authorized to design, establish, and maintain a data collection and analysis capability in the Foundation for the purpose of identifying and assessing the research facilities needs of universities and colleges. The needs of universities by major field of science and engineering, for construction and modernization of research laboratories, including fixed equipment and major research equipment, shall be documented. University expenditures for the construction and modernization of research facilities, the sources of funds, and other appropriate data shall be collected and analyzed. The Foundation, in conjunction with other appropriate Federal agencies, shall conduct the necessary surveys every 2 years and report the results to the Congress. The first report shall be submitted to the Congress by September 1, 1986.*

The Foundation's first report to Congress in response to this mandate was based on limited data collected through an existing "quick response" survey mechanism. Since then, three full-scale surveys have been conducted, in 1988, 1990, and 1992, as described below.

Survey Design

The samples for all three cycles of the survey have represented a basic universe of approximately 525 institutions, which include all those that award doctorate or master's degrees in the sciences or engineering, all others that have separately budgeted S&E research expenditures of $50,000 or more, and a group of 29 historically black colleges and universities (HBCUs) that had been identified to NSF as having separately budgeted S&E research expenditures in S&E fields. Based on updated information not available when the first two surveys were conducted, the sample for the 1992 study was also designed to represent an expanded group of 70 research-performing HBCUs.

To maximize the precision of sample-based estimates, the institution sample for the 1992 survey was selected with probability proportionate to research size, as measured by fiscal year 1988 total S&E research expenditures. The sample contained 303 institutions: all of the 100 largest institutions in research size (all of

[8] H.R. Rep. No. 44, 99th Congress, 1st Session, at 14 (1985). See also Carlos Kruytbosch, "The NSF surveys of academic research instrumentation and academic research facilities: a study in data collection and analysis and policy formation," in Robert Bud and Susan E. Cozzo. (Eds.), *Invisible Connections: Instruments, Institutions and Science*, Bellingham, WA: SPIE Optical Engineering Press, 1992, pp. 264-276.

which were doctorate-granting); 75 of the 190 other S&E doctorate-granting institutions (excluding HBCUs); 82 of the 206 eligible nondoctorate-granting institutions (excluding HBCUs); and 46 of the 70 S&E research-performing HBCUs.[9]

The 1992 sample was generally similar to those in earlier cycles of the survey. The major difference, aside from the expanded coverage of HBCUs, was that the sample of nondoctorate-granting institutions was expanded in the 1992 survey (from 51 in 1990), to permit greater attention to these institutions' characteristics and needs.

As in previous cycles, the 1992 questionnaire collected data on research square footage and on capital projects for construction or for repair/renovation of research facilities, by major S&E field. Capital projects data were collected for periods covering the institution's previous 2 fiscal years (1990 and 1991) and for work planned for the 2-year period 1992+93. The questionnaire also requested institution assessments of the condition and adequacy of its existing research facilities in each major field. In addition to these items from previous cycles of the survey, the 1992 questionnaire contained items concerning three cost factors that had not been addressed previously: (1) facility repair/renovation projects in the $5,000 to $99,999 range; (2) central research infrastructure facilities, such as central computing and telecommunications facilities; and (3) laboratory animal facilities, for which increased regulatory requirements have been imposed in recent years.

The 1992 survey was conducted by mail during the fall and winter of the 1991-92 academic year, with extensive telephone followup to maximize the response rate. To assist institutions in identifying and reporting facilities-related changes since the previous study, institutions were given computer-generated "facsimiles" of their responses to the 1990 survey. The final response rate was 89 percent, overall, with little variation by type or control of institution.

[9]Findings for the expanded group of HBCUs are presented in Chapter 6. However, to preserve comparability with earlier time periods in trend analyses, all other chapters are limited to the original 29 HBCUs.

Presentation of the Data and Organization of the Report

This report uses the data from the 1988, 1990, and 1992 surveys to describe current facilities status and identify changes over the time periods encompassed in the three studies.[10]

All of the findings discussed in this analysis are derived from a larger and more detailed series of statistical tabulations, which are presented in Appendix D. Although most of the results mentioned in the text of this report are shown in association with text tables or graphics based on data from Appendix D, occasional references are also made directly to Appendix D tables.

The first three chapters on findings provide quantitative information. Chapter 2 concerns trends in the overall amount of research space available in S&E fields at the Nation's research-performing academic institutions. Differences between institutional types, and between S&E fields, are described. Chapter 3 discusses the costs and square footage associated with construction and repair/renovation of research facilities for projects initiated in 1986-91 and for projects planned to begin in 1992 or 1993. The sources of funds for these projects are discussed in Chapter 4, with particular emphasis on the differences between public and private institutions. The status of private institutions relative to the limitation on outstanding tax-exempt bonds is also discussed in Chapter 4.

Chapter 5 presents the qualitative information collected in the survey, including institution assessments of the adequacy and condition/quality of their research facilities. Chapter 6 provides a summary of findings for HBCUs. Finally, Chapter 7 presents findings concerning laboratory animal facilities, a new topic first addressed in the 1992 survey.

Appended to this report are technical notes presenting additional information about the study design and methodology (Appendix A); a list of sampled institutions (Appendix B); the survey questionnaire (Appendix C); and detailed statistical tables (Appendix D).

[10]A companion to this NSF report is being prepared by the National Institutes of Health to provide additional information about biomedical research facilities in medical schools, in academic settings, in hospitals, and in private, nonprofit research organizations. Findings from the 1990 survey for these groups are presented in *The Status of Biomedical Research Facilities: 1990*, National Institutes of Health, September 1991.

Chapter 2. Amount of Research Space

Highlights

- In 1982, the 525 research-performing universities and colleges represented in this survey contained 122 million net assigned square feet (NASF) of space used for organized S&E research. This represented 43 percent of all S&E space at those institutions and 18 percent of all academic space.
- The total amount of available research space in 1992 (122 million NASF) was somewhat larger than the amount identified the first time the survey was conducted, in 1988 (112 million NASF).
- The top 100 institutions in research expenditures had 47 percent of the total academic space, 60 percent of the total S&E space, and 72 percent of the total S&E research space. Most of the overall increase in research space from 1988 to 1992 occurred within this group of institutions.
- Public institutions contained 75 percent of the total S&E research space in 1992 (91 million NASF), as well as similar proportions of total S&E space and total academic space.
- The fields with the largest amounts of S&E research space in 1992 were the biological sciences (23 percent), the medical sciences (18 percent), the agricultural sciences (16 percent), engineering (15 percent), and the physical sciences (13 percent). Little change occurred from 1988 to 1992 in the distribution of research space among fields.
- The top 100 institutions in total research expenditures accounted for most of the research space in each major field in 1992, ranging from 53 percent in mathematics to 84 percent in the agricultural sciences.

Introduction: Scope and Limitations of the Data

Institutions were asked to report their total space assigned to each major S&E field. Assigned space includes departmental and faculty offices, conference and seminar rooms, research space, instructional space, and space leased by the institution. The institutions were also asked to report their total NASF devoted to organized S&E research in each major field,[11] and their total space in all academic disciplines (a new item in the 1992 survey). Finally, institutions were asked the amount of their research space that is housed in leased or temporary quarters.

The reported figures should be considered conservative estimates of the total amount of space being used for S&E research in academic settings. Space that is used for organized research but is also used for other purposes is prorated to reflect only the proportion of total usage that is for research. In addition, many respondents at small, predominantly undergraduate institutions have indicated that data on space used for "organized research" understate the full extent of research activity at their institutions, since the definition does not include space used for undergraduate research or for department-funded faculty research.[12]

The survey covers a great diversity of types and uses of research space. The agricultural sciences, by their nature, tend to require large amounts of building space, while a research field such as mathematics requires relatively little space. Similarly, depending on the requirements of the research being performed, facilities vary greatly in the kinds and amounts of behind-the-walls infrastructure that is needed (e.g., to provide the power to support sophisticated electronic instrumentation or the plumbing and air-handling capacity needed to process toxic chemicals). Thus, while summary measures of total NASF of research space are useful, they can obscure important differences in the nature, use, and cost/complexity of the space in question.

Distribution of Research Space Among Institutions

Across all academic disciplines, the 525 research-performing universities and colleges represented in this study contained 661 million NASF of space in 1992 (Table 41). Of that, 43 percent (285 million NASF) was assigned to S&E fields, and 18 percent (122 million NASF) was allocated to S&E research.

[11]The survey definition of organized research is given in the Technical Notes, Appendix A.

[12]The same problem would also exist at the largest research institutions, but respondents from several of these institutions have estimated that the survey definition encompasses most of their research space, on the order of 90 percent or more.

The top 100 institutions in S&E research expenditures contained 88 million NASF of S&E research space, 72 percent of the national total. The 194 other doctorate-granting institutions contained 30 million NASF of research space (about 25 percent), and the 231 nondoctorate-granting institutions contained 5 million NASF of research space (4 percent). As well as containing the largest absolute amount of research space, the top 100 institutions also evidenced the largest relative emphases upon S&E and S&E research. Over half (56 percent) of all academic space at these institutions was assigned to S&E fields (versus 37 percent for other doctorate-granting institutions and 23 percent for nondoctorate-granting institutions), and over half (51 percent) of their S&E space was allocated for research (versus 35 percent at other doctorate-granting institutions and 16 percent at nondoctorate-granting institutions).

Public institutions contained 91 million NASF of research space in 1992, 75 percent of the national total. These institutions contained similar shares of total S&E space and of total academic space.

The total amounts of S&E space and of S&E research space, and the distribution of space among the three types of institutions, changed only slightly from 1988 to 1992 (Chart 6). Total S&E research space increased moderately (from 112 million NASF in 1988 to 122 million NASF in 1992), but the increase was confined largely to the top 100 institutions (Table 5). The amount of research space at other doctorate-granting institutions appears to have increased only slightly (from 27 million NASF in 1988 to 30 million NASF in 1992), and the aggregate amount of research space at nondoctorate-granting institutions did not change at all (5 million NASF in both 1988 and 1992). The distribution of space between public and private institutions also changed very little over this period.

Table 4. Amount and distribution of space in academic fields, by institution type and control: 1992

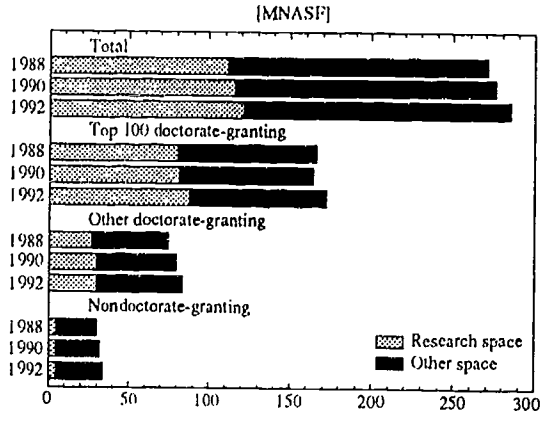
Index	Total	Institution type			Institution control	
		Doctorate-granting		Nondoctorate -granting	Public	Private
		Top 100 in research expenditures	Other			
Number of research-performing universities and colleges	525	100	194	231	319	206
Total space:		[Net assigned square feet in millions]				
Space in all academic fields[1]	661	307	229	124	505	156
Space in science and engineering (S&E) fields	285	172	84	29	219	67
Research space in S&E fields	122	88	30	5	91	31
Space distribution:		[Percentage of space]				
S&E space as a percentage of total academic space	43%	56	37	23	43	43
Research space as a percentage of total S&E space	43	51	35	16	42	47
Research space as a percentage of total academic space	18	28	13	4	18	20

(1) Projected from responses of 74 percent of institutions

NOTE: Because of rounding, component may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Colleges and Universities: 1992*, Appendix Table 2-1

Chart 6. Distribution of space assigned to academic science and engineering fields, by institution type: 1988, 1990, and 1992



KEY: MNASF = millions of net assigned square feet
SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 2-2

Research Space by S&E Field

In 1992, the amount and distribution of S&E research space varied considerably by field (Table 6). The biological sciences were the largest field in 1992, both in terms of the percentage of institutions with research space in the field (88 percent) and in terms of the total amount of research space in the field (28 million NASF, or 23 percent). The physical sciences were the next most widely distributed across institutions (82 percent), and were also in the top five in amount of research space (16 percent).

Some fields, such as psychology and the social sciences, were widely distributed across large numbers of institutions but contained relatively little aggregate research space. The reverse was the case for the agricultural sciences, which were represented at only 18 percent of all research-performing institutions but which accounted for a relatively large share of total research space (16 percent). Similarly, only about half of the Nation's research-performing academic institutions have any research space in the medical sciences (51 percent), but this field contains a relatively large total amount of research space (18 percent).

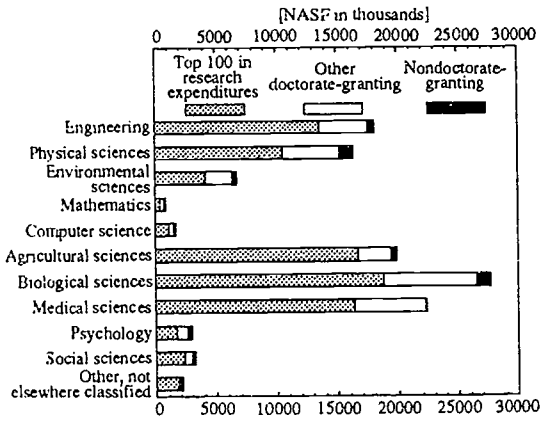
Table 5. Trends in amount of science and engineering (S&E) research space, by institution type and control: 1988, 1990, and 1992

Institution type and control	Net assigned square feet (NASF) of research space								
	Total [NASF in millions]			Mean per institution [NASF in thousands]			As a percentage of total research space		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total, all institutions	112	116	122	214	222	232	100%	100%	100%
Institution type:									
Doctorate-granting	107	111	117	367	380	399	96	96	96
Top 100 in research expenditures	81	82	88	806	817	875	72	71	72
Other	27	30	30	139	153	154	24	26	25
Nondoctorate-granting	5	5	5	20	22	20	4	4	4
Institution control:									
Public	82	87	91	258	272	285	73	75	74
Private	30	29	31	145	143	151	26	25	26

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 2-2

Chart 7. Distribution of academic science and engineering (S&E) research space among institution types, by field: 1992



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 2-7

Research space in the agricultural sciences was highly concentrated within the top 100 institutions (Chart 7), while research space in other fields, such as mathematics and psychology, was more widely distributed across the different types of institutions.

Over the 4-year period since this series of studies began, there has been little change in the overall amount or distribution of research space in individual S&E fields. The largest changes have been in the biological and medical sciences which collectively have grown from 38 percent to 41 percent of total research space.

Leased and Temporary Space

Typically, institutions housed their research in permanent, institution-owned facilities, rather than leasing space or using temporary space such as trailers and quonset huts. In 1992, only 3.9 percent of research space was leased and 2.2 percent was in temporary facilities (Table 7).

Although differences among institutions were not large, the use of leased or temporary space was especially uncommon at nondoctorate-granting institutions (0.8 percent and 0.5 percent, respectively). Private

Table 6. Trends in amount of science and engineering (S&E) research space, by field: 1988, 1990, and 1992

Field	Percentage of institutions with research space in the field, 1992	Net assigned square feet (NASF) of research space					
		Total [NASF in millions]			As a percentage of total research space		
		1988	1990	1992	1988	1990	1992
Total		112	116	122	100%	100%	100%
Engineering	53%	16	17	18	14	15	15
Physical sciences	82	16	16	16	14	14	13
Environmental sciences	57	6	6	7	6	5	6
Mathematics	54	1	1	1	1	1	1
Computer science	54	1	1	2	1	1	1
Agricultural sciences	18	18	21	20	16	18	16
Biological sciences	88	24	26	28	21	22	23
Medical sciences	51	19	20	22	17	17	18
Psychology	72	3	3	3	3	3	2
Social sciences	61	3	3	3	3	3	3
Other, not elsewhere classified	14	4	2	2	4	2	2

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-4, 2-6 and 2-7

institutions leased more of their space (6.0 percent) than did public institutions (3.2 percent), but less of their space was temporary (0.9 percent, versus 2.7 percent).

Table 7. Trends in the percentage of academic research space that is leased or housed in temporary facilities: 1988, 1990, and 1992

[Percentage of total research NASF]

Institution type and control	Leased space			Temporary space		
	1988	1990	1992	1988	1990	1992
Total	3.4%	3.1	3.9	1.8	1.5	2.2
Institution type:						
Doctorate-granting	3.5	3.2	4.0	1.8	1.5	2.3
Top 100 in research-expenditures	3.5	3.2	4.0	1.9	1.7	2.9
Other	3.4	3.2	4.0	1.3	1.0	0.7
Nondoctorate-granting	0.2	0.3	0.8	1.2	0.7	0.5
Institution control:						
Public	2.8	2.5	3.2	2.1	1.7	2.7
Private	4.9	4.8	6.0	1.0	0.9	0.9

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-2 and 2-9

Chapter 3. Construction and Repair/Renovation of Research Facilities

Highlights

Construction

- In the 2-year period 1990+91, academic institutions began $3.0 billion in research facilities construction projects, up from $2.5 billion in 1988+89 and $2.1 billion in 1986+87.

- When completed, projects begun in 1990+91 will produce 11.4 million net assigned square feet (NASF) of new research space, up from 10.6 million NASF in 1988+89 and 9.9 million in 1986+87.

- Construction projects planned to begin in 1992+93 involve an expected $3.2 billion for 12.4 million NASF of new research space, continuing the growth pattern seen over the previous 6 years.

- The growth in construction spending over the period encompassed by this series of studies has been confined to doctorate-granting institutions. Over the same period, nondoctorate-granting institutions have experienced a progressive decline in research facilities construction starts, from $0.16 billion in 1986+87 to an expected $0.06 billion in 1992+93.

- Construction projects begun in the 4-year period 1988-91 involved a total of 22.0 million NASF of new research space. Over the same period, the total amount of reported academic science and engineering (S&E) research space increased 10 million NASF, suggesting that much of the construction undertaken during this period has yet to be completed or has been used to replace outdated or inadequate space rather than to enlarge the total amount of available research space.

- Much of the construction activity begun in 1990+91 was concentrated in the medical and biological sciences, which together accounted for 55 percent of total expected spending across all S&E research fields. These two fields account for a similar share of expected research facilities construction costs for projects to be begun in 1992+93.

Repair/Renovation

- Capital project expenditures for repair and renovation of S&E research facilities (i.e., projects involving $100,000 or more in research-related costs) have remained stable over the period encompassed by this series of studies. Expenditures in 1990+91 ($0.83 billion) were essentially the same as in 1986+87 ($0.84 billion), the first period for which data were collected. Expenditures planned for 1992+93 ($0.89 billion) are again at this same general level of magnitude.

- Although spending levels have remained stable for repair/renovation capital projects, the amount of research space involved in these projects has progressively declined, from 13.4 million NASF in 1986+87 to an expected 6.0 million NASF in 1992+93.

Introduction: Scope and Limitations of the Data

Institutions were asked to estimate the research-related cost and space for construction and repair/renovation projects begun during the 2-year period 1990+91 and planned for the years 1992+93. Project start was defined as the institution's fiscal year in which actual construction or repair/renovation work began or was expected to begin. The 1988 and 1990 surveys asked about projects started during 1986+87 and 1988+89, respectively, providing a cumulative total of four sets of data spanning an 8-year window of actual and planned construction and repair/renovation activities.

All reported cost figures are institution estimates of expected total project costs (defined as cost to complete), including planning, construction, and fixed equipment. However, multipurpose projects that served both research and nonresearch purposes were prorated to reflect only the research-related portion of the cost. In the case of multiyear projects, total project costs were allocated to the fiscal year in which the construction, repair, or renovation actually began.

Previous cycles of the survey were limited to projects involving research space assignable to specific S&E fields. Central computing facilities and other such central research infrastructure facilities that serve all S&E fields were not included. In addition, previous cycles were limited to major capital projects, which were defined as those with research-related costs of $100,000 or more. The assumptions were that these

limitations significantly reduced the complexity and response burden of the questionnaire without greatly diminishing the coverage of institutions' research facility costs.

In the interest of maintaining comparability of trend data, the 1992 survey asked the same questions as in previous cycles about capital projects in the various S&E fields. In addition, to investigate the assumptions made in previous cycles and to obtain a more comprehensive picture of institutions' research facility costs, the 1992 questionnaire inquired, for the first time, about expenditures for central research infrastructure facilities that serve all S&E fields (central computing and telecommunications facilities, central toxic waste storage/disposal facilities, etc.) and about the extent of repair/renovation projects below the $100,000 floor (i.e., projects in the $5,000 to $99,999 range) previously imposed.

After describing current status and trend findings for field-related capital projects, this chapter presents findings concerning the new topics of central research infrastructure facilities and smaller repair/renovation projects.

Extent of Capital Project Activity

Over half (57 percent) of all doctorate-granting institutions began new research facility construction projects during 1990+91, up somewhat from 53 percent during the prior 2-year period (Table 8). Among doctorate-granting institutions, 1990+91 construction activity was much more prevalent among the top 100 institutions in research expenditures (81 percent of which reported construction project starts, up from 71 percent in 1988+89) than among other doctorate-granting institutions (45 percent of which reported construction project starts, about the same as in 1988+89). Construction activity was much less prevalent among the smaller nondoctorate-granting institutions, only 12 percent of which began new projects in 1990+91, down from 32 percent in 1988+89. Construction starts in 1990+91 were more common among the comparatively large public institutions (43 percent) than among private institutions (28 percent), as was also the case in the 1986+87 and 1988+89 periods.

In 1990+91, almost half (47 percent) of all research-performing institutions began research facility repair/renovation projects costing $100,000 or more, about the same as in the previous 2-year period. As with construction, the 100 largest research-performing

Table 8. Trends in percentage of institutions starting capital projects to construct or repair/renovate science and engineering research facilities, by institution type and control and type of project: 1986-93

Institution type and control	Project type and year of project start							
	Construction				Repair/renovation			
	1986+87	1988+89	1990+91	1992+93 (Planned)	1986+87	1988+89	1990+91	1992+93 (Planned)
Total	37%	44	37	36	56	48	47	45
Doctorate-granting	47	53	57	55	78	71	74	60
Top 100 in research expenditures	72	71	81	77	96	85	91	78
Other	34	44	45	43	44	63	65	50
Nondoctorate-granting	25	32	12	10	28	20	14	24
Public	44	50	43	40	66	52	49	45
Private	26	35	28	29	40	43	45	43

NOTES: As used here, capital projects are construction or repair/renovation projects with prorated costs of $100,000 or more for affected research space. Percentages are based on number of institutions with some science and engineering research space.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-4, 2-5, 3-1, and 3-5

institutions were much more likely to report 1990+91 research facility repair/renovation projects (91 percent) than were other doctorate-granting institutions (65 percent) or nondoctorate-granting institutions (14 percent).

Since institutions seldom undertake capital projects in all S&E fields simultaneously, the number or percentage of institutions beginning major construction or repair/renovation projects in a given field in a particular 2-year period is usually much smaller than the overall number or percentage of institutions with such projects. Generally, S&E fields with the largest amounts of research space also tend to have the most widespread capital project activity, in both construction and repair/renovation (Table 9). In 1990+91, for example, only 4 percent of the institutions with research activities in mathematics began projects to construct new space in that field, while 19 percent of institutions with research in the biological sciences began construction projects in that field.

In most fields, the percentage of institutions beginning capital projects remained fairly stable over the 8-year period for which actual and planned project start data were collected. Engineering and the medical sciences appear to be exceptions to this general rule. Thus, construction project starts in engineering appear to have declined (from 28 percent of institutions with engineering research in 1986+87 to 16 percent in 1990+91), while construction activity in the medical sciences appears to have become more widespread (from 20 percent of institutions with research in medical sciences in 1986+87 to 32 percent in 1990+91). Similar differences between these two fields exist in the area of repair/renovation activity (Table 9).

Overall Trends in Size of Capital Projects

Over the 8-year period encompassed by this series of studies, total spending for S&E research facilities construction increased progressively, from $2.0 billion in 1986+87 to $2.5 billion in 1988+89 to $3.0 billion

Table 9. Trends in percentage of institutions starting capital projects to construct or repair/renovate science and engineering research facilities, by field and type of project: 1986-93

Field	Project type and year of project start							
	Construction				Repair/renovation			
	1986+87	1988+89	1990+91	1992+93 (Planned)	1986+87	1988+89	1990+91	1992+93 (Planned)
Total	37%	44	37	36	56	48	47	45
Engineering	28	18	16	19	42	37	24	21
Physical sciences	9	15	11	8	22	23	22	15
Environmental sciences	9	6	15	8	13	9	13	15
Mathematics	1	2	4	2	8	8	4	6
Computer science	8	6	7	5	15	5	10	1
Agricultural sciences	38	33	30	31	33	25	27	19
Biological sciences	12	22	19	16	29	29	28	20
Medical sciences	20	18	32	28	32	32	39	30
Psychology	5	3	7[1]	3	9	4	10[1]	7
Social sciences	5	4		6	8	5		8
Other, not elsewhere classified	15	14	32	11	18	18	33	15

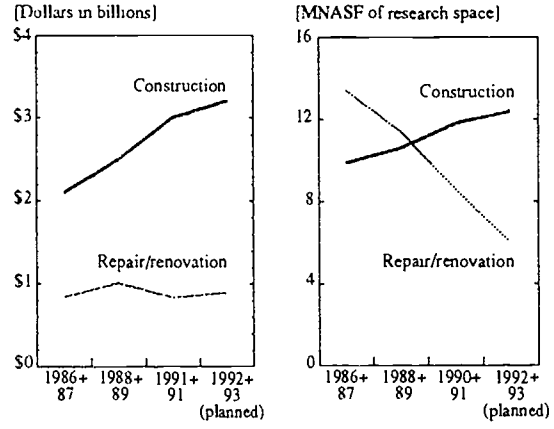
(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTES: As used here, capital projects are construction or repair/renovation projects with prorated costs of $100,000 or more for affected research space. Percentages are based on number of institutions with some research space in the field.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-4, 3-3, and 3-7

in 1990+91 to a planned $3.2 billion in 1992+93 (Chart 8). Over the same period, spending for facilities repair/renovation has remained flat, at a lower level ($0.8 billion in both 1986+87 and 1990+91).

Chart 8. Trends in the expenditures and amounts of space involved in capital projects to construct and repair/ renovate academic research facilities: 1986-93



KEY: MNASF = in millions of net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 3-2 and 3-6

The amount of new research space being created by capital construction projects increased progressively, from 9.9 million NASF in 1986+87 to 10.6 million NASF in 1988+89 to 11.4 million NASF in 1990+91 to 12.4 million NASF planned in 1992+93. Over the same period, the amount of research space affected by repair/renovation projects declined sharply, from 13.4 million NASF in 1986+87 to 6.0 million NASF planned in 1992+93.

It was noted earlier that the total amount of academic research space reported in 1992 was about 10 million NASF larger than when the survey was first conducted in 1988 (Chapter 2). The amount of new research space that has been created from construction projects begun during this same 4-year period is about twice that amount (i.e., 22 million NASF). To some extent, this difference may simply indicate that some of the projects undertaken during this period have not yet been completed. It may also indicate that some of these construction projects were intended to improve the quality/usefulness, but not necessarily the total amount, of the institution's research space. As renovation costs have increased in recent years, there may be increasing numbers of projects in which institutions have found it to be more cost-effective to construct an entirely new facility than to renovate existing buildings when the objective is to replace deteriorating or obsolete facilities, address growing scientific and technological requirements, meet increasingly stringent government health and safety regulations, etc.

Capital Project Trends by Institution Category

Overall increases in construction spending from 1986+87 to 1992+93 were found for both public and private institutions and for both categories of doctorate-granting institutions, the 100 largest and others not within the top 100 (Table 10).

However, among the many nondoctorate-granting institutions that perform S&E research, facilities spending appears to have been on a downward path. Among nondoctorate-granting institutions, total spending for construction projects declined from $163 million in 1986+87 to $128 million in 1990+91 and is expected to decline further to $64 million in 1992+93. Facilities repair/renovation spending also appears to be on a generally downward trajectory at this group of institutions.

For all of the time periods this series has encompassed, nondoctorate-granting institutions spent far less on construction than did doctorate-granting institutions. However, the amount of existing research space at nondoctorate-granting institutions is also much lower than that at doctorate-granting institutions (both individually and in the aggregate), so lower absolute spending levels would be expected.

When institution spending for facilities construction is expressed in terms of dollars per NASF of existing research space, construction spending during the most recent period for which data on actual construction starts are available (1990+91) proved to be remarkably similar across institution categories (Table 11). The two groups that were most different in total spending, the top 100 institutions in research expenditures and the much smaller nondoctorate-granting institutions, had essentially identical relative spending levels ($24.7 per existing NASF and $24.6 per existing NASF, respectively).

Table 10. Trends in expenditures for capital projects to construct or repair/renovate research facilities, by institution type and control and type of project: 1986-93

[Dollars in millions]

Institution type and control	Construction				Repair/renovation			
	1986+ 87	1988+ 89	1990+ 91	1992+93 (Planned)	1986+ 87	1988+ 89	1990+ 91	1992+93 (Planned)
Total	$2,051	2,464	2,976	3,214	838	1,010	826	894
Doctorate-granting	1,888	2,315	2,847	3,150	793	979	794	868
Top 100 in research expenditures	1,599	1,558	2,022	2,465	596	483	633	714
Other	288	757	826	685	197	496	161	154
Nondoctorate-granting	163	150	128	64	45	30	32	26
Public	1,355	1,727	2,020	2,204	436	699	449	592
Private	696	738	956	1,010	402	311	376	302

NOTES: As used here, capital projects are construction or repair/renovation projects with prorated costs of $100,000 or more for affected research space. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 3-2 and 3-6

Table 11. Trends in relative expenditures for construction of research facilities, by institution type and control: 1986-93

Institution type and control	Cost per NASF of existing research space			
	1986+87	1988+89	1990+91	1992+93 (Planned)
Total	$18.3	22.0	25.6	26.3
Doctorate-granting	17.6	21.6	25.6	26.8
Top 100 in research expenditures	19.8	19.3	24.7	28.2
Other	10.7	28.2	28.0	22.9
Nondoctorate-granting	35.4	32.6	24.6	13.9
Public	16.4	21.0	23.2	24.2
Private	23.4	24.8	32.5	32.4

NOTE: Estimates refer to construction projects with prorated costs of $100,000 or more for affected research space.

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-2 and 3-2

However, the downward trends in aggregate construction spending seen earlier for nondoctorate-granting institutions are also evident in the relative expenditure figures. Thus, while 1990+91 construction activity at nondoctorate-granting institutions was similar to the level of activity seen at doctorate-granting institutions during that period, the projections for 1992+93 are for a level of construction spending at nondoctorate-granting institutions that is far below the level expected at doctorate-granting institutions, in relative terms ($13.9 per existing NASF versus $26.8 per existing NASF) as well as in absolute terms ($64 million versus $3.15 billion).

Capital Project Trends by S&E Field

Generally, spending for research facility capital projects has been distributed among S&E fields roughly in proportion to the distribution of existing research space (Table 12; compare to Table 6), and the distribution has remained stable over the period encompassed by this series of studies. There are some exceptions to this general rule, however.

- Engineering has experienced a declining share of facilities construction activity from 1986+87 to 1990+91.
- The agricultural sciences have consistently accounted for lower shares of total construction and repair/renovation spending (2-6 percent; Table 12) than of total research space (16-18 percent; Table 6). This may indicate that per-NASF facility construction and maintenance costs tend to be relatively low in this field.
- As compared to their share of existing S&E research space (17-18 percent), the medical sciences have accounted for disproportionately high, and growing, shares of facilities construction spending (25-31 percent) and also of facilities repair/renovation spending (18-38 percent). The pattern indicates both high unit costs and a high growth rate for research facilities in this field.

Table 12. Trends in distribution of expenditures for capital projects to construct or repair/renovate research facilities, by field: 1986-93

Field	Construction				Repair/renovation			
	1986 + 87	1988 + 89	1990 + 91	1992+93 (Planned)	1986 + 87	1988 + 89	1990 + 91	1992+93 (Planned)
Total (dollars in billions)	$2.05	2.46	2.98	3.21	0.84	1.01	0.83	0.89
	[Percentage of research space]							
Engineering	21%	16	13	15	17	36	10	12
Physical sciences	9	16	14	9	13	16	18	9
Environmental sciences	3	3	6	4	3	2	2	3
Mathematics	<1	<1	<1	<1	<1	<1	<1	<1
Computer science	3	3	1	4	2	1	3	<1
Agricultural sciences	7	6	6	6	2	2	4	2
Biological sciences	23	23	28	24	27	20	31	28
Medical sciences	25	26	27	31	27	18	27	38
Psychology	1	1	1(1)	2	2	1	4(1)	1
Social sciences	2	2		4	4	1		2
Other, not elsewhere classified	7	3	3	3	4	2	1	2

(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTE: As used here, capital projects are construction or repair/renovation projects with prorated costs of $100,000 or more for affected research space.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 3-4 and 3-8

Central Research Infrastructure Facilities

Central research infrastructure facilities were a topic of special interest in the 1992 survey. Such facilities, which serve many or all S&E fields (e.g., campus-wide computer centers, telecommunications networks, toxic waste storage or disposal facilities, etc.), were not included in previous cycles of the study, leading to concerns about possibly significant underestimation of institutions' facilities-related costs. To examine this issue, the 1992 survey included items asking about recent (1990+91) and planned (1992+93) spending for central research infrastructure facilities.

In 1990+91, institutions spent an estimated $120 million for capital projects to construct or repair/renovate central research infrastructure facilities. They plan to spend an additional $131 million in 1992+93 (Table 13). About half of this recent and planned spending involves central computing and telecommunications facilities.

If added to the total of the capital projects reported in specific S&E disciplines, central research infrastructure facilities would account for 3 percent of total research facilities capital project spending, in both 1990-91 and 1992+93. This amount, while certainly significant, is relatively modest in comparison to the amounts in specific fields.

Table 13. Cost of recent and planned capital projects to construct or repair/renovate central research infrastructure facilities, by type of facility: 1990-93

[Dollars in millions]

Type of central research infrastructure facility	Year of project start	
	1990 + 91	1992+93 (Planned)
Total	$120	131
Central computing and telecommunications	67	60
Central toxic waste storage/ disposal	16	35
Other	37	36

NOTE: As used here, capital projects are construction or repair/ renovation projects with prorated costs of $100,000 or more for affected research space.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 3-10

Repair/Renovation Projects under $100,000

Another special interest topic in the 1992 survey was the issue of repair/renovation projects costing less than $100,000. Previous cycles asked only about capital projects with prorated research-related costs of $100,000 or more, on the assumptions that (1) reporting expenditures for smaller projects would entail a substantial response burden, especially for the larger research institutions, and (2) projects costing less than $100,000 would account for only a relatively small fraction of total costs in this area. The latter assumption was untested, however, which led to a concern that the survey estimates may substantially understate actual institution costs, especially costs associated with repair/renovation projects that are funded in small increments (e.g., lab by lab) or are conducted at institutions that have relatively small total amounts of research space.

To examine this issue, the 1992 survey added a new item asking institutions to report their aggregate spending in 1990+91 for repair/renovation of S&E research facilities where the research-related project cost was in the $5,000 to $99,999 range.[13] The aggregate cost in 1990+91 for repair/renovation projects in this range was an estimated $146 million. If added to the reported costs of capital projects of $100,000 or more, this would represent about 4 percent of the total (Table 14).

Unexpectedly, the proportion of total facilities-related costs in 1990+91 that was accounted for by repair/renovation projects under $100,000 was essentially the same in all institution type and control categories. Instead of having an especially high proportion of total facilities costs in this category (as had been hypothesized), nondoctorate-granting institutions actually reported relatively little spending in this category (3 percent, as compared to 4 percent in all other institution categories).

These findings suggest that, while the survey's usual reporting limit (excluding projects costing less than

[13] The item nonresponse rate was unusually high for this item, as expected (26 percent). In the analysis, data were imputed for nonresponding institutions based on data provided by responding institutions of similar research size.

$100,000) has led to a consistent underestimation of institutions' total costs for facilities construction and repair/renovation (i.e., on the order of 3-4 percent), the effect has not been large, overall or for any particular type of institution.

Table 14. Expenditures for research facility repair/ renovation projects costing $5,000 to $99,999, by institution type and control: 1990+91

[Dollars in millions]

Institution type and control	Type of project			Percentage of total for projects under $100,000
	Total	Repair/ renovation projects costing $5,000 - $99,999	All capitol projects costing $100,000 or more	
Total	$3,948	$146	$3,802	4%
Doctorate-granting	3,782	141	3,641	4
Top 100 in research expenditures	2,752	97	2,655	4
Other	1,031	44	987	4
Nondoctorate-granting	165	5	160	3
Public	2,566	97	2,469	4
Private	1,381	49	1,332	4

NOTE: As used here, capital projects are construction or repair/ renovation projects with prorated costs of $100,000 or more for affected research space.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 3-2, 3-6, and 3-11

Chapter 4. Source of Funds for Research Facilities Projects

Highlights

- Institution indebtedness arising from use of tax-exempt bonds to finance research facility construction and repair/renovation projects increased: tax-exempt bonds grew from the fourth largest source of funding in 1986+87 to the second largest source in 1990+91. State/local government funding remained the largest single source overall (although largely confined to public institutions), and Federal funding increased from the fifth largest to the fourth largest.

- While capital project funding increased at doctorate-granting institutions in every funding category but private donations, four of the top five funding categories at nondoctorate-granting institutions showed net decreases from 1986+87 to 1990+91. Tax-exempt bonds were the exception at nondoctorate-granting institutions, increasing from 19 percent of all capital project funds in 1986+87 to 65 percent in 1990+91.

- At public institutions, state/local government funding remained the largest single source of funding for new construction, though it decreased from 56 percent of all funding in 1986+87 to 40 percent in 1990+91. Most of the net increase in funding at public institutions resulted from a $348 million increase in Federal funding, which increased the Federal share from 3 percent to 19 percent. Other changes included increased institution funding and funding from tax-exempt bonds, and decreased funding from private donations.

- At private institutions, the major source of funding shifted in 1990+91 from private donations (dropping from 36 percent to 22 percent) to tax-exempt bonds (increasing from 22 percent to 34 percent).

- The dollar shifts in funding for repair/renovation were smaller than those for new construction. At public institutions, the change was primarily in institution funding, which increased from $155 million in 1986+87 to $404 million in 1988+89, and then decreased to $135 million in 1990+91. At private institutions, there was an increase in institution funding and a decrease in funding based on tax-exempt bonds.

- The number of private doctorate-granting institutions that have reached the $150 million Federal limit on tax-exempt bonds has grown from 20 (20 percent) in 1988 to 28 (27 percent) in 1992. No nondoctorate-granting institutions have reached the limit or expect to do so within the next 2 fiscal years.

Introduction: Scope and Limitations of the Data

Institutions were asked to report the total dollars of planned permanent financing of their capital projects to repair/renovate and construct research facilities from each of seven sources: the Federal Government, state/local governments, private donations, institution funds, tax-exempt bonds, other debt financing, and other sources.

To aid the collection and interpretation of the data, several simplifying rules were used. Institution responses were based on the aggregate of all research facilities projects costing over $100,000. No attempt was made to obtain information about funding sources for individual buildings, projects, or fields, and thus the responses may conceal considerable variation in funding even within individual institutions. Further, the survey focused on institutions' plans for permanent financing. Short-term arrangements, such as 3-year construction loans, might be used to allow a project to go forward, but because they are not intended as permanent funding methods, they are not included here. The focus on *plans* for financing also excludes changes in long-term arrangements, such as when a change in the bond market might encourage institutions to refinance a project, or a change in private donations results in a different funding mix.

Although institutions were not asked to specify the sources of funding beyond the seven categories used here, the within-category sources of funding were diverse. For example, Federal funding included specific programs for facilities support administered through NSF and the National Institutes of Health (NIH), as well as programs administered through the Department of Energy and the Department of Agriculture; it also included non-peer-reviewed projects that were specified individually through congressional legislation rather than being parts of larger agency programs. It did not include Federal payments for the

reimbursement of indirect costs;[14] to the extent that such funds were used for research facilities, they were classified as institution funding. No data were collected to distinguish indirect cost recovery from other institution funding such as the use of operating or endowment funds.

Overview

Combining the funding for construction with that for repair/renovation, total funding for research facilities increased from $2,889 million in 1986+87 to $3,801 million in 1990+91, an increase of $912 million (Table 15). Three-fourths of that increase came from two sources -- Federal funding (from $173 million to $525 million) and tax-exempt bonds (from $451 million to $794 million) -- while there were also increases in state/local funding and institution funds. Funding from private donations decreased from $589 million in 1986+87 to $453 million in 1990+91. Even with the changes in funding, state/local funding remained the single largest source, at $1,200 million (or 33 percent).

The funding change with the greatest long-range implications may be the increased use of tax-exempt bonds, due to the potential financial risks of debt financing.[15] Tax-exempt bonds changed from being the fourth largest funding source in 1986+87 (at 16 percent of all funding) to the second largest (at 21 percent) in 1990+91. Further, tax-exempt bonds were not limited to only a few institutions: they were used by 67 (23 percent) of the 296 institutions beginning construction and/or repair/renovation projects in 1990+91.

[14]Indirect cost recoveries, primarily from the Federal Government, include provision for a "use allowance" (2 percent per year of the non-Federal acquisition cost) or depreciation. This portion of the indirect cost rate has been growing as institutions add research space funded by other-than-Federal sources. At the same time, the proportion of all indirect costs reimbursed by the Federal Government is being reduced; the capping of administrative costs is a recent example. Indirect costs not reimbursed by the Federal Government must be absorbed by the universities, thus reducing the institutional funds potentially available for facilities.

[15]However, information on funding sources was based on institutions' *plans* for financing. Thus, debt could also accrue in other ways, as when institutions are forced to use debt financing to make up for a shortfall in planned receipts from private donations. Similarly, an unplanned increase in alternative financing might result in reduced debt financing.

Table 15. Source of funding for capital projects to construct and repair/renovate research facilities: 1986-91

[Dollars in millions]

Institution type and time period	Total	Funding source						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other/ unknown
		Federal	State/local					
Total:								
1986+87	$2,889	173	1,012	589	618	451	7	39
1988+89	3,474	413	1,124	511	915	390	112	6
1990+91	3,801	525	1,200	453	750	794	43	36
Doctorate-granting:								
1986+87	2,680	153	892	562	614	412	7	39
1988+89	3,294	395	1,034	454	902	390	112	6
1990+91	3,641	514	1,175	446	737	690	43	36
Nondoctorate-granting:								
1986+87	208	19	120	27	4	39	0	0
1988+89	180	18	91	58	13	0	0	0
1990+91	160	12	25	8	13	104	0	0

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 4-1 and 4-2

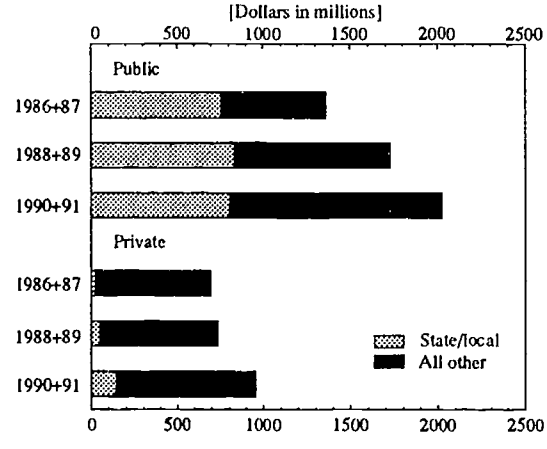
As noted, there was also a large increase in Federal funding, although 62 percent of the Federal total was concentrated at fewer than 20 institutions.

The funding pattern for doctorate-granting institutions was essentially the same as that for institutions overall, since doctorate-granting institutions had 96 percent of the total funding. However, nondoctorate-granting institutions showed a different pattern. The only categories of funding to show increases from 1986+87 to 1990+91 were tax-exempt bonds (from $39 million to $104 million), and institution funds (from $4 million to $13 million). Government funding and private donations all decreased (though private donations were at their high point in 1988+89). The net effect was that tax-exempt bonds became the primary source of funding at nondoctorate-granting institutions, increasing from 19 percent to 65 percent of all funding, while state/local funding decreased from 58 percent to 15 percent.

Sources of Funds for Construction

Public institutions differed greatly from private institutions in their funding mix for new construction, with the most fundamental difference being the importance of state funding for public institutions (Chart 9). This difference is so large that it is best to examine public and private institutions separately.

Chart 9. Source of funding for construction of research facilities, by institution control: 1988-91



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 4-3 and 4-4

Public Institutions

From 1986+87 to 1990+91, more than half ($348 million, or 52 percent) of the $665 million increase for new construction at public institutions came from an increase in Federal funding (from $40 million to $388 million; Table 16). Large increases also appeared in institution funding (from $109 million to $270 million) and in funding from tax-exempt bonds (from $190 million to $399 million). Funding from private donations decreased, from $259 million in 1986+87 to $139 million in 1990+91. State/local government funding showed a net increase, from $754 million in 1986+87 to $809 in 1990+91.

The large dollar shifts in funding sources for this sector resulted in large percentage shifts as well. Federal funding increased from 3 percent to 19 percent of all financing at public institutions, while private donations were almost the reverse, decreasing from 19 percent to 7 percent. State/local government funding showed a consistent percentage decrease over time, from 56 percent to 40 percent, despite a net increase in dollars. Financing from tax-exempt bonds doubled as a percentage from 1988+89 (from 9 percent to 20 percent), though the increase would appear smaller if the comparison were based on 1986+87 (14 percent).

Private Institutions

Funding for private institutions was substantially different from that for public institutions (Table 17). Despite a $260 million overall increase, total Federal funding for private institutions showed a decline from 1986+87 ($105 million) to 1990+91 ($88 million). The overall increase in funding at private institutions was a result of large increases in tax-exempt bonds (from $124 million to $329 million), and in state/local government funding (from $25 million to $147 million).

Sources of Funds for Repair/Renovation

Just as state funding defined a major difference between public and private institutions in construction, it was also important in the funding of repair/renovation (Chart 10). Thus, public and private institutions are again discussed separately.

Table 16. Public institutions' sources of funding for construction of new research facilities: 1986-91

Index and time period	Total	Funding source						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other/ unknown
		Federal	State/local					
Dollar contribution:				[Dollars in millions]				
1986+87	$1,355	40	754	259	109	190	2	<1
1988+89	1,727	274	838	193	256	154	8	1
1990+91	2,020	388	809	139	270	399	8	7
Relative contribution:				[Percentage of total funding]				
1986+87	100%	3	56	19	8	14	<1	<1
1988+89	100	16	49	11	15	9	<1	<1
1990+91	100	19	40	7	13	20	<1	<1

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 4-4

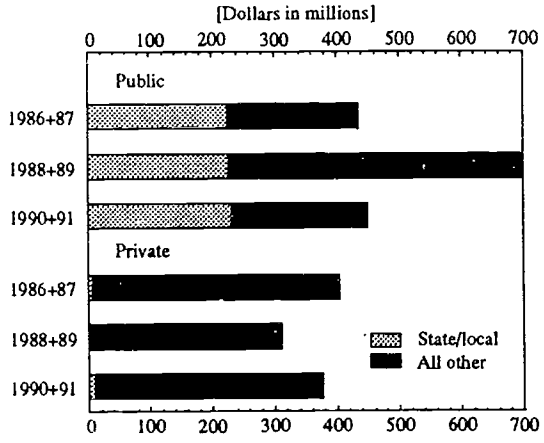
Table 17. Private institutions' sources of funding for construction of new research facilities: 1986-91

Index and time period	Total	Funding source						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other/ unknown
		Federal	State/local					
Dollar contribution:				[Dollars in millions]				
1986+87	$696	105	25	228	181	124	1	32
1988+89	738	78	52	266	88	166	88	<1
1990+91	956	88	147	214	124	329	28	26
Relative contribution:				[Percentage of total funding]				
1986+87	100%	15	4	33	26	18	<1	5
1988+89	100	11	7	36	12	22	12	<1
1990+91	100	9	15	22	13	34	3	3

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 4-3

Chart 10. Source of funding for repair/renovation of research facilities, by institution control: 1986-91



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 4-5 and 4-6

Public Institutions

At public institutions, the short-term increase in funding for repair/renovation (from $436 million in 1986+87 to $699 million in 1988+89) was primarily financed by an increase in institution funding (from $155 million to $404 million); when total funding later dropped back to earlier levels (to $449 million), that drop could again be traced to a change in institution funding (which dropped to $135 million; Table 18). Changes in funding from other sources were of a much smaller scale: for example, Federal funding showed a net increase from $13 million to $25 million, and private donations from $22 million to $44 million.

The percentage funding mix also showed relatively little change, except for the shift resulting in changes in institution funding. The percentage of funds supplied by institution funding increased from 36 percent in 1986+87 to 58 percent in 1988+89, and then decreased back to 30 percent in 1990+91. The shift in institution funding also had an effect on the percentage supplied from state/local government funds; though the dollar amounts of state/local funding showed almost no change, the enlarged base of total funding in 1988+89 due to the increase in institution funds resulted in a large percentage shift for state/local government funding (from 52 percent to 33 percent, and later back to 52 percent).

Private Institutions

At private institutions, there first was a decline in funding for repair/renovation from 1986+87 to 1988+89

Table 18. Public institutions' sources of funding for repair/renovation of research facilities: 1986-91

Index and time period	Total	Funding source						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other/ unknown
		Federal	State/local					
Dollar contribution:				[Dollars in millions]				
1986+87	$436	13	227	15	155	26	<1	<1
1988+89	699	31	229	22	404	7	5	0
1990+91	449	25	234	44	135	12	0	1
Relative contribution:				[Percentage of total funding]				
1986+87	100%	3	52	3	36	6	<1	<1
1988+89	100	4	33	3	58	1	1	0
1990+91	100	5	52	10	30	3	0	<1

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges, 1992* Appendix Table 4-6

(from $402 million to $311 million), followed by an increase in 1990+91 (to $376 million). The initial decline was due primarily to changes in private donations (from $86 million to $30 million) and tax-exempt bonds (from $112 million to $63 million), moderated partly by a doubling in Federal funding (from $14 million to $30 million; Table 19). The later increase in total funding came from a partial resurgence in private donations (to $57 million), and a substantial increase in institution funding (to $221 million).

The categories that accounted for the largest percentage of funds also accounted for the largest change in the percentage funding mix. Institution funding increased consistently from 43 percent to 59 percent, and tax-exempt bonds decreased consistently from 28 percent to 14 percent. Private donations were less consistent, first decreasing from 21 percent to 10 percent, then increasing to 15 percent.

While changes in funding sometimes lessened the differences between public and private institutions for new construction (in terms of the percentage coming from each funding source), this was not as true for repair/renovation. For example, private institutions depended more than public institutions on institution funding for new construction in 1986+87 (26 percent versus 8 percent), but by 1990+91 there was no difference (both were 13 percent). In contrast, for repair/renovation, the difference between public and private institutions increased. Institution funding at private institutions increased from 43 percent to 59 percent, while at public institutions it decreased from 36 percent to 30 percent. Similarly, the difference between public and private institutions also diminished for new construction in terms of the role of state/local government funding (changing from 56 percent versus 4 percent in 1986+87 to 40 percent versus 15 percent in 1990+91); for repair/renovation, the difference was as great in 1990+91 (52 percent versus 3 percent) as in 1986+87 (52 percent versus 2 percent). However, public and private institutions did become more similar in funding for repair/renovation in the percentage coming from private donations and tax-exempt bonds.

Limitation on Tax-Exempt Bonds for Private Institutions

For private institutions, the 1986 Federal Tax Reform Act set a limit of $150 million per college or university for tax-exempt bonds. Generally, this does not seem to have been a constraint, but it has been a growing issue for some doctorate-granting institutions (Chart 11).

Table 19. Private institutions' sources of funding for repair/renovation of research facilities: 1986-91

Index and time period	Total	Funding source						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other/ unknown
		Federal	State/local					
Dollar contribution:				[Dollars in millions]				
1986+87	$402	14	7	86	173	112	4	7
1988+89	311	30	5	30	167	63	11	5
1990+91	376	24	10	57	221	54	8	3
Relative contribution:				[Percentage of total funding]				
1986+87	100%	4	2	21	43	28	1	2
1988+89	100	10	1	10	54	20	4	2
1990+91	100	6	3	15	59	14	2	1

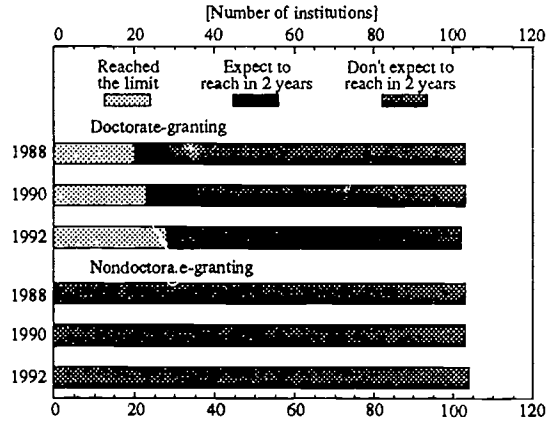
NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 4-5

Between two-thirds and three-fourths of private doctorate-granting institutions have not reached the $150 million limit in any of the three cycles of this survey, and did not expect to reach the limit within the next 2 fiscal years. However, the number of private doctorate-granting institutions that have reached the limit has grown somewhat, from 20 (20 percent) in 1988 to 28 (27 percent) in 1992. Another two institutions expected to reach the limit in the next 2 years. (However, based on past experience, generally a greater number of institutions expect to reach the limit than actually do reach the limit 2 years later. No information was collected on the reason for this disparity, such as whether the financial picture has changed for these institutions, or they have pursued alternative means of financing to avoid reaching the limit.)

Among nondoctorate-granting institutions, none reached the limit in any of the three years, and none expected to reach the limit in 1993 or 1994.

Chart 11. Number of private institutions reaching the $150 million limit on tax-exempt bonds, by doctorate-granting status: 1988-92



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 4-7

Chapter 5. Condition and Adequacy of Research Facilities

Highlights

- The amount of research space that institutions evaluated as suitable for the most scientifically sophisticated research increased by about 22 percent from 1988 to 1992. However, because there was a general increase in the amount of space in all condition categories, the percentage of space in the most sophisticated category increased by a smaller amount, from 24 percent to 27 percent.

- The fractions of research space assessed as requiring repair/renovation were greatest in the agricultural sciences (49 percent), the social sciences (40 percent), the medical sciences (39 percent), the biological sciences (39 percent), and the physical sciences (38 percent).

- The percentage of institutions reporting they had an inadequate amount of space declined from 42 percent in 1990 to 34 percent in 1992. The percentage reporting they had a generally adequate amount of space increased from 46 percent to 54 percent.

- The improvement in the adequacy of the amount of space occurred across all types of institutions and in almost all science and engineering fields. The 100 largest research-performing institutions expressed the greatest need for more space (40 percent said their space was inadequate), but also expressed the greatest improvement (from 50 percent in 1988 and 1990).

Introduction: Scope and Limitations of the Data

To obtain qualitative assessments of the condition and quality of research facilities, institutions were asked what percentage of their research space in each S&E field should be assigned to each of five categories:

- suitable for use in the most highly developed and scientifically sophisticated research in its field;

- effective for most purposes, but not applicable to the first category;

- effective for some purposes, but in need of limited renovation or repair;

- requires major repair or renovation to be used effectively; and

- requires replacement.

The fifth category was newly adopted for the current 1992 survey; thus, when examining trends over time, the fourth and fifth categories were combined to provide comparable data across all three cycles of the survey.

The assessed overall condition of research space at an institution may change for many reasons. New facilities may be built, existing facilities may be upgraded through repair/renovation, the use of space may be transferred from one field to another, facilities may deteriorate over time, and facilities requirements may change as new research methodologies or instrumentation are developed. The analysis in this report describes net change in facility condition from 1988 to 1992, however produced.

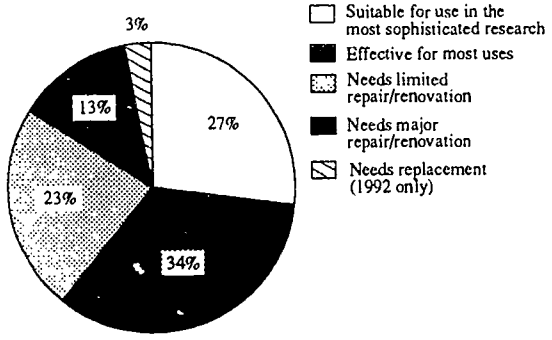
Institutions were also asked whether the overall *amount* of research space in each S&E field was adequate (sufficient to support all of the needs of the institution's research), generally adequate (sufficient to support most research needs, but may have some limitations), inadequate (not sufficient to meet the institutions' research needs), or nonexistent, but needed. For this report, the third and fourth categories were combined into a single category.

Discussions with a number of institutions indicated that, in most cases, assessments of the condition and adequacy of their research facilities were made by deans, in consultation with department heads in the affected fields.

Quality and Condition of Research Facilities

In 1992, 27 percent of all research space was considered suitable for use in the most scientifically sophisticated research, 34 percent was effective for most uses, 23 percent required limited repair/renovation, 13 percent required major repair/renovation, and 3 percent required replacement (Chart 12).

Chart 12. Institution-assessed quality/condition of academic research facilities: 1992



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-1

Because of the large total amount of space involved, percentage statistics sometimes do not fully convey the magnitude of changes in space amounts. For example, the percentage of space addressed as suitable for the most sophisticated research showed what might appear to be only a modest increase, from 24 percent in 1988 to 27 percent in 1992 (Table 20). In fact, the amount of space suitable for the most scientifically sophisticated research increased from 26.7 million NASF in 1988 to 32.7 million NASF in 1992, an increase of 22 percent.[16] Increases in this top condition category, in both relative and absolute terms, were found in all major categories of institution type and control.

From 1988 to 1992, there was no overall change in the percentage of research space assessed as requiring repair/renovation (39 percent in all three surveys). However, at doctorate-granting institutions outside the top 100 in research expenditures, there was an apparent reduction in the fraction of research space needing repair/renovation (from 35 percent in 1988 to 30 percent in 1992), and there was an offsetting increase at nondoctorate-granting institutions in the fraction of space needing repair/renovation (from 35 percent in 1988 to 40 percent in 1992).

[16]Because institutions were asked to describe the condition of space in terms of percentages of space, rather than NASF, these estimates are subject to rounding error (in addition to sampling error). The estimates presented here should be considered as approximations; they are included only to provide perspective on the nature of change occurring among institutions.

Table 20. Trends in institution-assessed quality/condition of academic research facilities, by institution type and control: 1988, 1990, and 1992

[Percentage]

Institution type and control	Suitable for use in most scientifically sophisticated research	Effective for most uses, but not most sophisticated	Requires repair/ renovation
Total:			
1988	24%	37	39
1990	26	35	39
1992	27	35	39
Top 100 in research expenditures:			
1988	24	35	41
1990	27	33	39
1992	27	32	42
Other doctorate-granting:			
1988	26	40	35
1990	24	39	38
1992	29	42	30
Nondoctorate-granting:			
1988	16	50	35
1990	19	47	34
1992	17	43	40
Public:			
1988	23	36	41
1990	25	36	40
1992	26	35	40
Private:			
1988	26	38	35
1990	30	34	36
1992	31	34	35

KEY: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-1

In 1992, the assessed percentage of research space requiring repair/renovation was greatest for the agricultural sciences (49 percent), the social sciences (40 percent), the medical sciences (39 percent), and the physical sciences (38 percent; Table 21). Generally, there was little change from 1988 to 1992 in this category, with percentage shifts typically being 3 percent or lower.

Table 21. Trends in institution-assessed quality/condition of academic research facilities, by field: 1988, 1990, and 1992

Field	Percentage of space requiring repair/renovation		
	1988	1990	1992
Total	39%	39	39
Engineering	36	37	35
Physical sciences	40	40	38
Environmental sciences	41	41	36
Mathematics	25	30	22
Computer science	32	26	21
Agricultural sciences	46	46	49
Biological sciences	37	36	38
Medical sciences	40	38	39
Psychology	33	33	31
Social sciences	38	38	40
Other, not elsewhere classified	37	28	24

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-2

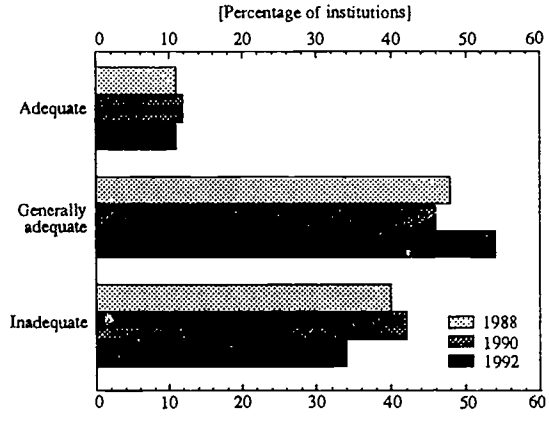
Adequacy of the Amount of Research Space

While recent construction and repair/renovation had little apparent effect on the distribution of space quality (with a general increase in all quality/condition categories), there was significant improvement in institutions' assessments of their *amount* of space. In 1988 and 1990, 40 to 42 percent of institutions' assessments were that their amount of research space was inadequate, but only 34 percent gave that report in 1992 (Chart 13).

The apparent improvement was found for all categories of institution type and control, though there were differences in the percentages of institutions with inadequate space (Table 22). The top 100 institutions in research expenditures expressed both the greatest need for more space (with 40 percent saying their space was inadequate), and the greatest improvement (a 10 percent shift--from 50 percent with inadequate space in 1988 to 40 percent in 1992).

Public institutions were more likely to report inadequate space (39 percent) than were private institutions (26 percent). They also showed less improvement over time: private institutions showed a considerable decrease in reports of inadequate space (from 37 percent in 1988, to 26 percent in 1990), while public institutions showed comparatively little change (from 42 percent in 1988 to 39 percent in 1992).

Chart 13. Institution-assessed adequacy of current research space: 1988-92



SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-3

Table 22. Adequacy of the amount of science and engineering research space, by institution type and control: 1988, 1990, and 1992

Institution type and control	Percentage of institutions reporting inadequate[1] research space		
	1988	1990	1992
Total, all institutions	40%	42	34
Institution type:			
Doctorate-granting	44	45	36
Top 100 in research expenditures	50	50	40
Other	39	40	32
Nondoctorate-granting	36	37	32
Institution control:			
Public	42	46	39
Private	37	33	26

(1) Includes category "Nonexistent but needed"

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-3

Reports of inadequate amounts of research space declined in almost all S&E fields (Table 23). Engineering was the field for which institutions most often reported inadequate space (45 percent in 1992, compared with 34 percent across all fields), but it still showed improvement since 1988, when 51 percent of the institutions reported their engineering research space to be inadequate.

Table 23. Adequacy of the current amount of science and engineering research space, by field: 1988, 1990, and 1992

Field	Percentage of institutions reporting inadequate[1] research space		
	1988	1990	1992
Total	40%	42	34
Engineering	51	49	45
Physical sciences	43	41	37
Environmental sciences	40	41	30
Mathematics	25	35	25
Computer science	47	45	30
Agricultural sciences	38	43	34
Biological sciences	46	45	37
Medical sciences	43	52	38
Psychology	32	32	33
Social sciences	37	36	27
Other, not elsewhere classified	38	44	41

(1) Includes category "Nonexistent but needed"

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 5-4

Chapter 6. Research Facilities at Historically Black Colleges and Universities

Highlights

- The Nation's 70 research-performing historically black colleges and universities (HBCUs) contained an estimated total of 2.9 million NASF of S&E research space in 1992, which represents 2.4 percent of all academic S&E research space. Of this, 1.8 million NASF (62 percent) was located at the 29 comparatively large HBCUs that were also represented in earlier cycles of the survey and that provide the basis for assessment of time trends at HBCUs.

- The total amount of S&E space at the study's original 29 HBCUs increased from 1.1 million NASF in 1988 to 1.8 million NASF in 1992, although much of this increase has been due to administrative changes rather than to construction of new research space.

- The 70 HBCUs reported starting $37.6 million of research facility construction projects in 1990+91, This is equivalent to $13 per NASF of existing research space, which is considerably lower than the overall 1990+91 average of $26 per existing NASF across all academic institutions. The HBCUs do not anticipate an upswing in construction activity in the near future. Indeed, planned construction projects for 1992+93 at HBCUs total only $13.0 million, well below the level of the previous 2-year period.

- At the group of 29 HBCUs that has been represented in all three cycles of the study, research facilities construction spending has declined progressively, from $71.8 million in 1986+87 to $22.5 million in 1990+91 and to an expected $11.1 million in 1992+93. However, since much of the total construction activity during the first two reporting periods occurred at a single institution, the decline in total construction spending does not reflect the general experience of HBCUs. Most HBCUs have reported little or no construction spending throughout the period encompassed by this series of surveys.

- The percentage of research space assessed as being suitable for the most highly developed and scientifically sophisticated research was lower at the 70 research-performing HBCUs in 1992 (22 percent) than the average for all academic institutions (27 percent), and the overall percentage of fields where an inadequate amount of research space was reported (40 percent) was higher than the percentage across all academic institutions (34 percent).

Introduction: Scope and Limitations of the Data

Historically black colleges and universities (HBCUs) are institutions that were founded primarily for black Americans, although their charters were generally not exclusionary. As defined by the National Advisory Committee on Black Higher Education and Black Colleges and Universities, there are a total of 107 HBCUs in the Nation.

The quantitative findings presented in this chapter must be interpreted with particular caution. Because of the small number and the generally small size of HBCUs, data obtained from only one or two institutions can have a substantial effect on overall estimates. Facilities-related estimates for this small group of institutions are subject to substantial fluctuation from one year to another.

Of the 107 HBCUs, 29 were listed as having reported separately budgeted research expenditures in the universe file from which the 1988 facilities survey sample was drawn, and all of them were included in the 1988 and 1990 facilities surveys. The 1992 facilities survey included a sample of institutions selected to represent a larger group of 70 HBCUs that were identified by NSF in 1990 as being involved in S&E research. The latter group, which was identified through a complete canvass of all 107 HBCUs, is believed to include all that participate in organized S&E research.

Two sets of HBCU estimates for 1992 were produced in Appendix Tables 6-1 to 6-9: estimates representing all 70 HBCUs involved in S&E research, and adjusted estimates that represent the original 29 institutions surveyed earlier. This chapter will stress estimates for the full group of 70 when discussing HBCU findings from the present cycle of the survey. When analyzing time trends, estimates for the original group of 29 HBCUs will be used.

Research Facilities in 1992

This section presents a general overview of the 1992 status of the facilities at the 70 HBCUs involved in S&E research. The findings are summarized from information presented in Appendix Tables 6-1 to 6-9.

The 70 research-performing HBCUs contained approximately 2.9 million NASF of research space in 1992, 2.4 percent of the national total for all academic institutions. This research space was a subset of an estimated total of 9.1 million NASF of total space assigned to S&E fields and of 28.2 million NASF of total academic space at these institutions.

Much (43 percent) of the research space at HBCUs was in the biological sciences. The next largest field was the agricultural sciences, with 17 percent of the research space at HBCUs. The medical sciences (11 percent), engineering (10 percent), and the physical sciences (9 percent) also accounted for substantial shares of the research space at HBCUs, as at other research-performing institutions.

During 1990+91, HBCUs began research facility construction projects totalling $37.6 million. This represents 1.3 percent of the total for all research-performing institutions; it is equivalent to $13 per existing research NASF, about half the overall average of $26 per existing NASF for all research-performing institutions (see Table 11). Expected research facility construction projects in 1992+93 total $13.0 million at HBCUs, even lower than the spending level in 1990+91.

HBCU officials reported having inadequate amounts of research space at 40 percent of their S&E research fields, somewhat higher than the overall finding of 34 percent across all academic institutions (Table 24; compare to Table 23). Officials at HBCUs also assessed 22 percent of their research space as being "suitable for the most highly developed and scientifically sophisticated research," somewhat lower than the overall average of 27 percent across all research-performing institutions (compare to Table 20). On the other hand, HBCU officials described less of their research space as requiring repair/renovation than did institutions overall (22 percent versus 39 percent), and rated most of their space as effective for most uses.

Table 24. Condition and adequacy of research facilities at historically black colleges and universities: 1992

Index	Findings
Condition of research facilities:	(Percentage of research space)
Total	100%
Suitable for most highly developed and scientifically sophisticated research	22
Effective for most purposes	56
Requiring limited repair or renovation	14
Requiring major repair or renovation	8
Requires replacement	<1
Amount of research space:	(Percentage of assessments)
Total	100
Adequate	9
Generally adequate	51
Inadequate	40

NOTES: Data are based on the enlarged sample for the 1992 survey. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 6-7 and 6-8

Table 25. Amount of space assigned to science and engineering (S&E) fields and amount of S&E research space at historically black colleges and universities: 1988, 1990, and 1992

[NASF in thousands]

Index	1988	1990	1992[1]
Total S&E space	6,077	6,175	6,576
S&E research space	1,112	1,440	1,782
S&E research space as a percentage of total space	18%	23%	27%

(1) Data are based on a reduced sample to correspond to 1988 and 1990 surveys.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 6-2

Trends in Amount and Distribution of Research Space

The remainder of this chapter is based on a reduced sample that was used to calculate statistics for 1992 for the same group of 29 HBCUs that were surveyed previously in 1988 and 1990, in order to examine changes over this period. These 29 HBCUs include most of the larger institutions in terms of S&E research expenditures. All of the 5 largest HBCUs are included in this group, as are 14 of the top 15. At this subgroup of institutions, it appears that there has been an appreciable increase in S&E research space from 1988 (1.1 million NASF) to 1992 (1.8 million NASF; Table 25). However, from a school-by-school examination of the data, it appears that much of this increase can be attributed to administrative and reporting changes, rather than to the results of widespread facilities construction activity.

There was little change in the distribution of research space among S&E fields at HBCUs (Table 26). The greatest change from 1990 to 1992 was in the agricultural sciences (decreasing from 30 percent to 23 percent of the total). This change represented a return to the levels of 1988. Engineering, the medical sciences, and the biological sciences all increased slightly in 1992 following earlier decreases from 1988 to 1990, so short-term fluctuations tended to moderate over the longer term.

Trends in Facilities Construction

Aggregate HBCU spending for research facilities construction appears to have declined sharply in recent years, from $71.8 million in 1986+87 to $55.1 million in 1988+89 to $22.5 million in 1990+91 (Table 27). In relation to these institutions' existing research space, the construction spending level at the start of this period ($65 per NASF of existing research space) was far above the overall average for all academic institutions at that time ($18 per existing research NASF; Table 11), while that for the most recent period ($16 per existing research NASF) was well below the national average ($26 per existing research NASF).

These aggregate totals are misleading, however, with such a small group of institutions. The high overall amount of construction spending in both 1986+87 and in 1988+89 was largely attributable to a single institution, which reported extensive construction activity in both periods, by itself accounting for nearly half the total. Most HBCUs, including the largest

Table 26. Distribution of science and engineering (S&E) research space at historically black colleges and universities, by field: 1988, 1990, and 1992

Index	1988	1990	1992[1]
	[Percentage of total]		
Total research space (NASF in thousands)	1,112	1,440	1,782
Engineering	14%	12	16
Physical sciences	16	13	13
Environmental sciences	1	2	2
Mathematics	1	2	2
Computer science	4	2	2
Agricultural sciences	23	30	23
Biological sciences	21	20	21
Medical sciences	16	14	16
Psychology	1	1	1
Social sciences	3	3	3
Other science, not elsewhere classified	<1	<1	0

(1) Data are based on reduced sample to correspond to 1988 and 1990 surveys.

NOTE: Because of rounding, components may not add to 100.

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 6-2

Table 27. Research facilities construction activity at historically black colleges and universities: 1986-91

Index	Year of project start		
	1986 +87	1988 +89	1990 +91[1]
Total cost for research components (in millions of dollars)	$71.8	$55.1	$22.5
Total research NASF (in thousands)	481	319	328
Cost per NASF of existing research space	$65	$50	$16

(1) Data are based on reduced sample to correspond to 1988 and 1990 surveys.

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 6-4

ones, reported little or no facilities construction activity in any of the survey report periods. Thus, three of the five largest research-performing HBCUs reported no construction project starts in the 1986 to 1992 period, and the other two each reported comparatively little spending.

Trends in Facilities Repair/Renovation

After an increase from 137,000 NASF of repair/renovation begun in 1986+87 to 308,000 NASF in 1988+89, the amount of space under repair/renovation dropped back to earlier levels (129,000 NASF) in 1990+91 (Table 28). Since the 1988+89 levels of repair/renovation at HBCUs were unusually high (28 percent of existing research space, compared with 10 percent among all academic institutions), the drop appears to represent a return to more typical levels. The cost of repair/renovation projects also declined somewhat in 1990+91 to a level ($11.6 million) lower than those recorded earlier ($14.1 million in 1986+87 and $16.6 million in 1988+89).

Table 28. Research facilities repair/renovation activity at historically black colleges and universities: 1986-91

Index	Year of project start		
	1986 +87	1988 +89	1990 +91[1]
Total cost for research components (in millions of dollars)	$14.1	$16.6	$11.6
Total research NASF (in thousands)	137	308	129
NASF as a percentage of existing research space	12%	28%	9%

(1) Data are based on a reduced sample to correspond to 1988 and 1990 surveys.

KEY: NASF = net assigned square feet

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 6-4

Trends in Source of Funds for Capital Projects

Over the three 2-year intervals encompassed by this series of surveys, HBCUs experienced substantial declines in aggregate funding support for research facilities capital projects from all three major funding sources: the Federal Government, state/local government, and private donations (Table 29). Since the levels of construction spending in the first two of these periods were inflated by a single unique institution, the levels of funding support during the third period (1990+91) may be most representative of HBCUs' recent experience. In this period, HBCUs received $6.3 million from state/local governments for research facility construction projects, 0.7 percent of the total funding support from this source at all academic institutions. The Federal Government funding contribution to HBCU construction projects during this period, $12.1 million, constituted over half of these institutions' total funding support but represented only 2.5 percent of the Federal contributions to research facilities construction at all academic institutions. Private donations, HBCUs' third major source of funds for research facilities capital projects in 1986+87 and 1988+89, decreased to nearly zero in 1990+91 (about $100,000 in total, including repair/renovation projects as well as construction projects), a downward trend also observed in most other institution categories.

Trends in the Condition and Adequacy of Research Facilities

Little change occurred among the original 29 HBCUs in their evaluations of the condition or adequacy of their research space. In 1992, 34 percent of their space was judged to be suitable for the most scientifically sophisticated research, as compared with 36 percent in 1988 and 31 percent in 1990 (Table 30). Similarly, 41 percent of HBCU research space was viewed as effective for most purposes, compared with 39 percent in 1988 and 45 percent in 1990. In effect, the percentages for both categories moved roughly halfway back to the levels reported in 1988.

Somewhat more change occurred in officials' evaluations of the adequacy of the amount of research space at their institutions. Assessments of inadequate amounts of research space increased somewhat at HBCUs from 1988 (30 percent) to 1990 (35 percent) and then remained at about that same level in 1992 (34 percent).

Table 29. Source of funds for science/engineering research facilities capital projects at historically black colleges and universities: 1986-91

[Dollars in millions]

Funding source	Construction			Repair/renovation		
	1986+87	1988+89	1990+91[1]	1986+87	1988+89	1990+91[1]
Total	$71.8	55.1	22.5	14.1	15.8	11.6
Federal Government	32.7	35.0	12.1	8.7	12.9	3.5
State/local government	25.8	11.5	6.3	4.9	0.8	8.0
Private donations	11.1	7.7	0.0	0.5	2.0	0.1
Institutional funds	2.3	0.9	4.2	0.0	0.1	0.1
Debt financing	0.0	0.0	0.0	0.0	0.0	0.0
Tax-exempt bonds	0.0	0.0	0.0	0.0	0.0	0.0
Other debt	0.0	0.0	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	0.0	0.0	0.0

(1) Data are based on a reduced sample to correspond to 1988 and 1990 surveys.

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 6-5 and 6-6

Table 30. Condition and adequacy of research facilities at historically black colleges and universities: 1988, 1990, and 1992

Index	1988	1990	1992[1]
Condition of research facilities:	(Percentage of research space)		
Total	100%	100	100
Suitable for most highly developed and scientifically sophisticated research	36	31	34
Effective for most purposes	39	45	41
Requiring limited repair or renovation	18	18	17
Requiring major repair or renovation	7	7	8
Condition of research facilities:	(Percentage of assessments)		
Total	100%	100	100
Adequate	16	16	11
Generally adequate	53	49	55
Inadequate	30	35	34

(1) Data are based on a reduced sample to correspond to 1988 and 1990 surveys.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 6-7 and 6-8

Chapter 7. Animal Care Facilities

Highlights

- An estimated 88 percent of research-performing academic institutions maintain laboratory animal facilities. Together, these facilities had 11.3 million NASF of total space in 1992, including 9.3 million NASF of research space.
- Laboratory animal facilities composed 4 percent of total S&E space, and 8 percent of total S&E research space. These facilities represent 13 percent of the total research space in the agricultural, biological, and medical sciences, where most of them are presumed to be located.
- All but 1 of the top 100 institutions in research expenditures had laboratory animal facilities. Their facilities contained 74 percent of the total space for laboratory animal facilities, while other doctorate-granting institutions had 22 percent, and nondoctorate-granting institutions had 5 percent.
- Among public institutions, 91 percent had laboratory animal facilities, compared with 83 percent of private institutions. Public institutions had 74 percent of the total laboratory animal space and 81 percent of the research space.
- Institution officials reported that government regulations on the humane care of laboratory animals were fully met for 86 percent of the research space, while 8 percent needed limited repair/renovation in order to comply, and 6 percent needed major repair/renovation.
- Almost half of the institutions with laboratory animal facilities planned either repair/renovation or construction for 1992 and 1993. Among the 100 largest institutions, 71 percent planned either repair/renovation or construction.
- Planned repair/renovation and construction of laboratory animal facilities in 1992+93 was estimated to cost $220 million. As categorized by control and type, some of the largest planned expenditures were among public institutions ($178 million), the 100 largest research-performing institutions ($132 million), and other doctorate-granting institutions ($85 million).

Introduction: Scope and Limitations of the Data

In earlier rounds of this survey of research facilities, institutions frequently commented that new Federal and state regulations on laboratory animal facilities presented a significant burden. A new Federal law, the Health Research Extension Act of 1985 (42 U.S.C. 289d), was implemented contemporaneously with the first cycle of this survey. To measure the extent of the burden created by these new regulations, questions on the amount and condition of space for laboratory animal facilities, and on plans for repair/renovation or construction were added to the questionnaire in the 1992 survey, as a topic of special interest in that cycle. Institutions were asked to include all animal housing areas and related service areas, if those areas directly supported research and were subject to government regulations concerning the humane care and use of laboratory animals.

No further changes in Federal law or regulation became effective during the time period of the current survey and, consequently, it is possible that much of the work required to renovate animal care facilities was performed before covered period. However, new Federal regulations came out on February 15, 1991, to be effective on August 14, 1991 (9 CFR Part 3). The effect of these regulations may not appear until the next cycle of this survey.

Amount of Space

Of the 525 institutions represented in this survey, 462 (88 percent) had laboratory animal facilities subject to government regulations (Table 31). Essentially all (99 percent) of the 100 largest research-performing institutions (all of which are doctorate-granting) had such facilities, as did 93 percent of other doctorate-granting institutions, and 79 percent of nondoctorate-granting institutions. Public institutions were somewhat more likely to have such facilities (91 percent) than were private institutions (83 percent).

Together, the laboratory animal facilities occupied 11.3 million NASF of space. However, this space was not distributed evenly. Though 280 of the 462 institutions (61 percent) were doctorate-granting, they accounted for 95 percent of the total space: 74 percent was at the 100 largest institutions, and 22 percent at other

doctorate-granting institutions. Space also was concentrated at public institutions, though not by the same proportions as at doctorate-granting institutions. Of the 462 institutions, 290 (63 percent) were public; this group of institutions contained 74 percent of the total laboratory animal space.

Of the 11.3 million NASF of total laboratory animal space, 9.3 million NASF (82 percent) was allocated to organized research. As with the total space, most of the research space was located at doctorate-granting institutions. Thus, the 100 largest research-performing institutions devoted 85 percent of their laboratory animal space to organized research, while other doctorate-granting institutions allocated 77 percent and nondoctorate-granting institutions allocated 56 percent. Private institutions, which had less laboratory animal space than public institutions, devoted a somewhat greater proportion to organized research (87 percent, compared with 81 percent). However, public institutions still had 6.8 million NASF (74 percent) of the total research space. Historically black colleges and universities (HBCUs) had a total of 168,000 NASF of space in laboratory animal facilities, with 138,000 NASF (82 percent) used as research space. This is the same proportion as that found overall.

To obtain a better measure of the importance of laboratory animal facilities, the statistics in Table 31 can be compared with those in Chapter 2 on all research facilities. More specifically, the 11.3 million NASF of total space for laboratory animal facilities amounted to 4 percent of all space for S&E fields, and to 8 percent of all space in the agricultural, biological, and medical sciences.[17] The percentages are larger if only research space is considered; the 9.3 million NASF of research space amounted to 8 percent of all S&E research space, and to 13 percent of all research space in the agricultural, biological, and medical sciences. Thus, though laboratory animal facilities are only one component of all research facilities, they do represent a significant proportion of research space in the life sciences.

[17]Institutions were not asked the research fields to which laboratory animal facilities were assigned, but it is presumed that most were used for research in the life (agricultural, biological and medical) sciences.

Table 31. Amount and distribution of space for laboratory animal facilities, by institution type and control: 1992

Institution type and control	Institutions with laboratory animal facilities		Total space		Research space	
	Number	Percentage of all institutions	Total [NASF in thousands]	Percentage of total space	Total [NASF in thousands]	Percentage of total space
Total, all institutions	462	88%	11,340	100%	9,320	82%
Institution type:						
Doctorate-granting	280	95	10,792	95	9,013	84
Top 100 in research expenditures	99	99	8,337	74	7,116	85
Other	181	93	2,455	22	1,897	77
Nondoctorate-granting	183	79	549	5	306	56
Institution control:						
Public	290	91	8,394	74	6,760	81
Private	172	83	2,946	26	2,559	87

NOTE: Because of rounding, components may not add to totals.

KEY: NASF = net assigned square feet

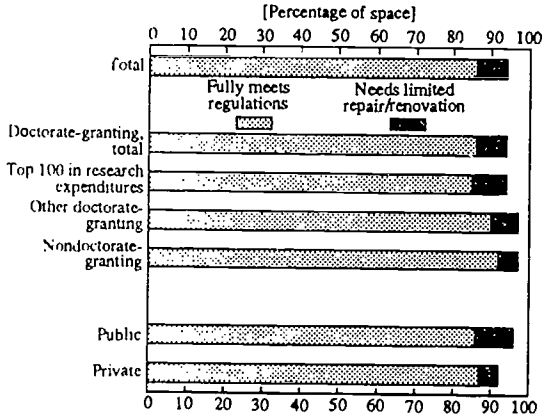
SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 2-1 and 7-1

Condition of the Research Space

Institutions were also asked to estimate the percentages of their laboratory animal facility research space that fully met government regulations, needed limited renovation or repair to meet government regulations, or needed major renovation, repair, or replacement to meet government regulations.

Overall, a reported 86 percent of laboratory animal facility research space fully met government regulations, 8 percent needed limited repair/renovation, and 6 percent needed major repair/renovation (Chart 14). The amount of space fully meeting government regulations was similar across the different types of institutions, ranging from 85 percent of space at the 100 largest institutions to 92 percent of space at nondoctorate-granting institutions. A somewhat higher proportion of research space at HBCUs fully met government regulations (94 percent), while 5 percent needed limited report to meet regulations, and 2 percent needed major work or replacement. For no institution type or control was the percentage of space needing major repair/renovation greater than 8 percent.

Chart 14. Percentage of current laboratory animal facility research space meeting government regulations, by institution type and control: 1992



SOURCE National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Table 7-2

Repair/Renovation and Construction Planned for 1992 and 1993

Roughly half the institutions with laboratory animal facilities had plans for either repair/renovation or construction for 1992 and 1993 (199 institutions, or 43 percent; Table 32).[18] The total estimated cost of this planned work was $220 million.

Compared with plans for repair/renovation or construction for 1992 and 1993 among *all* types of facilities, laboratory animal facilities made up only a small proportion of the estimated costs: only 5 percent of the total $4.1 billion and 9 percent of the $2.4 billion planned within the medical and biological sciences. Though these amounts are not insubstantial, they may indicate (together with the information provided above on the high percentage of space currently meeting Federal regulations) that the major part of the work to upgrade the facilities was completed by the time the survey was fielded. If data had been collected on laboratory animal facilities in earlier cycles of this survey, or if this survey occurred later to capture the full impact of the 1991 regulations (which have not yet gone into effect), perhaps larger proportions would have been found.

[18]Only one institution reported that it had no facilities but planned construction in 1992 or 1993. Thus, except for this one institution, the plans for repair/renovation or construction effectively represent the expansion or improvement of established laboratory animal facilities, rather than the creation of new facilities where none existed before. For this reason, the percentages reported here are based on the ratio of those institutions planning new work divided by the number of institutions already having laboratory animal facilities.

Table 32. Number of institutions planning repair/renovation or construction projects on laboratory animal facilities, by institution type and control

Institution type and control	Institutions planning projects for 1992 and 1993		Total cost	
	Number	Percentage of institutions with facilities	Dollars (Millions)	Percentage of total cost
Total, all institutions	199	43%	$220	100%
Institution type:				
Doctorate-granting	152	54	217	99
Top 100 in research expenditures	67	68	132	60
Other	85	47	85	39
Nondoctorate-granting	47	26	3	1
Institution control:				
Public	127	44	178	81
Private	72	42	42	19

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*, Appendix Tables 7-1 and 7-3

It is not correct to assume that all funds planned for construction or repair/renovation were motivated by the need to meet government regulations. For example, those institutions reporting that 100 percent of their space fully met government regulations still planned to spend $78 million (36 percent of the total), an amount roughly proportionate to the amount of animal care facilities research space they had (39 percent). New standards of animal care may have had the effect of increasing the cost per square foot for these institutions' planned projects, but the standards are not responsible for the total planned cost.

Plans for repair/renovation or construction were greater at the 100 largest research-performing institutions than at other types of institutions. In terms of the frequency of institutions with facilities that were planning such work, 68 percent among the 100 largest institutions were planning repair/renovation or construction, compared with 47 percent among other doctorate-granting institutions, and 26 percent among nondoctorate-granting institutions. A similar ordering occurred based on cost, except that essentially all of the planned cost was at doctorate-granting institutions (60 percent at the 100 largest institutions, and 39 percent at other doctorate-granting institutions), while only 1 percent of the cost was at nondoctorate-granting institutions. Essentially the same proportions of public and private institutions were planning repair/renovation or construction (44 and 42 percent, respectively), but a greater number of public institutions planned projects (127 versus 72) and at a greater total cost ($178 million versus $42 million).

APPENDIX A

TECHNICAL NOTES

TECHNICAL NOTES

This section describes the study methodology, including the universe and sample, survey questionnaire, key definitions, data collection procedures, and response rates. The discussion includes the original 1988 survey and the 1990 update survey as well as the current 1992 survey. In addition, there is a discussion of the study's weighting and estimation procedures, of the reliability of the survey estimates, of inflation adjustments, and of other considerations the reader should bear in mind when interpreting the data presented in this report.

Universe and Sample

1988 survey. The 1988 survey was designed to provide estimates for all research-performing academic institutions, as defined in NSF's FY 1983 Survey of Scientific and Engineering Expenditures at Universities and Colleges.* The FY 1983 Expenditures Study universe datafile included **all** universities and colleges that offered a master's or doctoral degree in the sciences and engineering (S&E), all others that had reported separately budgeted S&E research and development (R&D) expenditures of $50,000 or more, and all historically black colleges and universities (HBCUs) reporting any R&D expenditures. This file represented the most recent available universe survey of R&D expenditures at academic institutions. The file contained a total of 566 institutions.

All historically black colleges and universities (HBCUs) in the frame were included in the sample with certainty (N = 30), and a stratified probability sample of 223 institutions was selected from among the remaining institutions in the frame. These institutions were first stratified by control (public versus private) and highest degree awarded in science and engineering (doctorate-granting versus nondoctorate-granting). A minimum sample size of 25 was set for each of the four resulting strata, and the remaining sample size was allocated to strata in proportion to the "size" of each stratum. Stratum size was defined as the square root of the aggregate R&D expenditures in science and engineering of the institutions in the stratum. Academically administered Federally Funded Research and Development Centers were excluded from this survey.

Within strata, institutions were sampled with probability proportionate to size. Again, size was defined as the square root of the institution's FY 1983 R&D expenditures.

Following the selection of an initial sample of 253 institutions, NSF determined that several of the sampled institutions were out of the scope of the survey. Out-of-scope institutions included those in outlying territories, military academies, and three highly specialized institutions considered inappropriate, given the nature of their programs. Elimination of these out-of-scope cases reduced the final sample to 247 institutions, of which 29 were HBCUs, and 99 had (or were) medical schools.

Institutions in the sample accounted for more than 75 percent of all academic R&D expenditures in FY 1983 and encompassed at least 70 percent of the spending in each major S&E discipline. The resulting weighted national total represented by this sample was 525 institutions. The composition of this survey universe, by type of institution, is shown in Table A-1.

Table A-1. Number of institutions in the survey universe of research-performing universities and colleges: weighted estimates, 1988

Institution type	Total	Non-HBCUs		HBCUs
		Public	Private	
Total	525	296	200	29
Doctorate-granting	293	190	100	3
Top 100 in research expenditures	100	69	31	0
Other	193	121	69	3
Nondoctorate-granting	232	106	100	26

KEY: HBCU = Historically black colleges and universities

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

1990 survey. The institution sample for the 1990 survey was the same as for the 1988 survey, except for the changes noted in the next paragraph.

*Although this report deals only with academic institutions, the study also collected data from samples of nonacademic performers of biomedical research (see *The Status of Biomedical Research Facilities: 1990*, National Institutes of Health, 1991).

The sample was updated to reflect recent R&D patterns as shown in NSF's FY 1988 R&D expenditures study, which collected expenditures data for all institutions in the survey frame for the first time since FY 1983. School-by-school comparisons of these two databases resulted in the identification of 12 institutions whose FY 1988 R&D expenditures would have given them substantially higher probabilities of selection than they had using FY 1983 expenditures. These 12 institutions were made certainty selections for the 1990 survey. Five were already in the sample, having been noncertainty selections in the 1988 study; the other 7 were added to the sample for the 1990 survey.

One institution from the 1988 sample became out of scope when it distributed its assets among other institutions in the same state system. These sample changes produced a net increase of 6 institutions, increasing the total sample size to 253 in 1990. The universe represented by the sample, however, did not change.

1992 survey. The institution universe and sample for the 1992 survey were the same as for the 1990 survey, except for three changes:

- Shortly after the sample for the 1990 facilities survey was selected, NSF conducted a universe survey of all historically black colleges and universities (HBCUs) and identified an expanded group of 70 that reported separately budgeted R&D expenditures in S&E disciplines. A sample of 46 of these 70 institutions was selected for the 1992 facilities survey, with probability proportionate to size. Size was measured as the square root of the institution's reported FY 1989 R&D expenditures (a minimum size measure of $10,000 was used to afford the smallest institutions some possibility of selection). The expanded HBCU sample included 23 of the 29 HBCUs from the FY 1988 R&D expenditures survey universe file.

- The sample was expanded to include all institutions in the top 100 in FY 1988 R&D expenditures. Only two institutions from this analytically important category were not already in the sample, and they were made certainty selections in 1992.

- To improve the precision of estimates for nondoctorate-granting institutions, an expanded sample of 91 institutions in this category was selected (excluding HBCUs, which were sampled separately). The sample included all (10) public institutions with FY 1988 R&D expenditures of $2 million or more, and all (11) private institutions with FY 1988 expenditures of $1 million or more. Institutions with R&D expenditures below these cutoffs were sampled with equal selection probabilities.

Of the 91 sampled nondoctorate-granting institutions, 9 were later determined to be out of scope, since they reported in the 1992 facilities survey that they had no S&E research space and also reported in the FY 1988 R&D expenditures survey (which provided the basis for the sampling frame) that they had less than $50,000 in separately budgeted R&D expenditures. The exclusion of these out-of-scope institutions reduced the sample of nondoctorate-granting institutions to 82.

The sample design for the 1992 survey, and the changes from 1990, are summarized in Table A-2. The full 1992 institution sample is listed in Appendix B.

The Survey Questionnaire

The 1992 survey questionnaire, reproduced in Appendix C, updated information collected during earlier (1988 and 1990) surveys regarding several topics:

- The total net assigned square feet (NASF) of space in science and engineering (S&E) disciplines, and the NASF used for organized research;

- The amount of research space that is leased by the institution and the amount housed in temporary facilities;

- The condition of research facilities in each S&E discipline;

- The adequacy of the current amount of research space, by S&E discipline;

- The project costs, NASF, and sources of funds for repair/renovation and construction activities initiated in fiscal years (FY) 1990 and 1991, and planned for FYs 1992 and 1993;

- The status of the institutions relative to the cap on tax-exempt bonds (this item is applicable to private universities and colleges only).

Table A-2. Numbers of institutions in the 1990 and 1992 samples of research-performing universities and colleges

Institution type	Non-HBCUs						HBCUs	
	Total		Public		Private			
	1990	1992	1990	1992	1990	1992	1990	1992
Total	224	257	138	157	86	100	29	46
Doctorate-granting	173	175	115	117	58	58	3	5
Top 100 in research expenditures	98	100	67	69	31	31	0	0
Other	75	75	48	48	27	27	3	5
Nondoctorate-granting	51	82[1]	23	40	28	42	26	41

(1) Sample initially included nine other institutions that were later classified as out of scope of the study.

KEY: HBCU = Historically black colleges and universities.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

In addition to collecting updated information on the above topics, the 1992 questionnaire also requested information on several topics that had not been addressed previously. Specifically, in response to concerns that previous cycles of the survey may have overlooked certain important facilities-related cost components, the 1992 questionnaire added items asking about the following issues:

- Recent and planned spending for central (in addition to discipline-specific) research infrastructure facilities, such as central computing and telecommunications facilities, central toxic waste storage or disposal facilities, etc.;
- Expenditures for research facility repair/renovation projects in the $5,000 to $99,999 range, i.e., projects under the $100,000 floor used in previous cycles of the survey (nondoctorate-granting institutions were asked to report these expenditures separately by S&E discipline; doctorate-granting institutions were asked only to provide an overall spending estimate across all S&E disciplines); and
- Planned expenditures in fiscal years 1992 and 1993 for construction and repair/renovation of research laboratory animal facilities.

In addition, to provide a basis for tracking institutions' relative emphasis upon science and engineering, an item (1c) was added asking institutions to report their total amount of space across all academic disciplines.

Data Collection and Response Rates

In October 1991, a letter from Dr. Walter E. Massey, Director, NSF, and Dr. Bernadine Healy, Director, NIH, was sent to the president or chancellor of each sampled institution, asking that the institution participate in the study and that a coordinator be named for the survey. A few days following the 2-week deadline for returning the coordinator identification card, telephone followup was conducted with all sampled institutions that had not yet identified a survey coordinator. Survey materials were mailed to the coordinators during late November, with a requested return date of January 6, 1992. Receipt of the survey materials was confirmed by telephone in early December. A letter reminding coordinators of the requested return date was sent in mid-December. Nonresponse followup was conducted between January 6, 1992 and April 13, 1992.

After the questionnaires were edited, additional follow-up was conducted to resolve inconsistencies within the questionnaire or disparities between 1990 and 1992 responses.

After data collection, additional site visits were conducted, during which NSF staff members met with survey respondents to discuss the questionnaire, interpretation and reliability of the data provided, and the survey procedures. The purposes of these visits were to (1) obtain information about the data provided to assist in the analysis of the findings, and (2) to obtain information that could be used in planning for the 1994 survey.

The overall response rate for the survey was 89 percent. As Table A-3 indicates, response rates were quite high (88 percent or above) for all institution categories.

Table A-3. Academic institution response rates, by category of institution: 1992

Institution category	Number of institutions		Response rate
	Sample	Respondents	
Total	303	270	89%
Non-HBCUs:			
Doctorate-granting	175	161	92
Top 100 in research expenditures	100	94	94
Other	75	67	89
Nondoctorate-granting	82	72	88
Public	157	145	92
Private	100	88	88
HBCUS: Total	46	37	88

KEY: HBCU = Historically black colleges and universities

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Item Nonresponse

After machine editing of questionnaire responses for completeness, internal consistency, and consistency with data from previous questionnaires, extensive telephone data retrieval was conducted to minimize the amount of missing or otherwise problematic responses to individual questionnaire items. One exception was the new item (1c) on total academic space in all disciplines including those outside S&E fields. It was expected that this item would be difficult for some institutions to answer, and no data retrieval was performed for this item, which did have an unusually high nonresponse rate (26 percent).

As a result of these followup activities, most of the 303 returned questionnaires (78 percent) ultimately contained no missing values for applicable data items that were subject to data retrieval, and most individual items had very low item nonresponse rates. The item with the highest nonresponse rate (other than item 1c, discussed above) was the new item (4d) on research-related expenditures for all 1990 and 1991 repair/renovation projects in the $5,000 to $99,999 range. This item (which, like item 1c, was not subjected to data retrieval) had 21 missing values (7 percent). Next highest was the item in 4a asking the prorated total research space involved in all 1990 and 1991 repair/renovation projects costing $100,000 or more. It had 15 missing values (5 percent). The analogous item in 5a asking about space affected in planned repair/renovation projects also had a comparatively large amount of nonresponse (13 missing values; 4 percent), as did the new item (7b) asking about the institution's total amount of laboratory animal facility research space (10 missing values; 3 percent). The approximately 250 other questionnaire data elements all had fewer than 10 missing values, i.e., all had item response rates over 97 percent.

Missing values were imputed for all questionnaire items (except 1c) that were involved in the data analysis. Wherever possible, missing values for items 1, 2, and 3 (amount, condition, and adequacy of existing space) were imputed on the basis of information in the school's 1990 questionnaire. In questions 4 and 5 (on recent and planned capital projects), most missing values involved either missing costs or missing NASF, but not both. In these cases, the missing data element was imputed from the reported element, using 1990 data on average cost per NASF to estimate the one from the other.

Missing values that could not be imputed using the above methods (e.g., a missing value on the amount of research space at a school that had not provided this information in the 1990 survey) were imputed using a "hot deck" approach. This involved imputing the missing value from a "donor" institution that did provide the needed information and that was as closely matched as possible to the institution with the missing information in terms of control, type (doctorate-granting or not), and FY 1988 research expenditures.

Weighting

After data collection, sampling weights were created for use in preparing national estimates from the data. The weighting procedures used were very similar to those employed in the 1988 and 1990 studies. The first stage of the process was the creation of a base weight for each institution. The base weight is the inverse of the probability of selecting the institution for the sample. Since all the sampled institutions did not participate in this study, the base weights were adjusted to account for this unit nonresponse. An additional adjustment of the weights was made to bring the number of estimated institutions into accordance with the known number of institutions in various categories. For this final "poststratification" adjustment the institutions were

classified by type (top 100 in research expenditures, other doctorate-granting, nondoctorate-granting), control, and HBCU (historically black colleges and universities) status. The poststratified weights were used to produce the estimates shown in this report.

Reliability of Survey Estimates

The findings presented in this report are based on a sample and are therefore subject to sampling variability. Sampling variability arises because not all institutions are included in the study. If a different sample of institutions had been selected, then the results might have been somewhat different. The standard error of an estimate is a statistic that can be used to measure the extent of sampling variability for that particular estimate.

One of the ways that the standard error can be used to measure the amount of sampling variability is in the construction of confidence intervals. If all possible samples were selected and surveyed under similar conditions, then the intervals of 2 standard errors below the estimates to 2 standard errors above the estimates would include the average result of these samples in about 95 percent of the cases. Since only one sample is actually selected and surveyed, we must estimate the standard error from the sample itself. The interval constructed using the estimated standard error from the sample is called a 95 percent confidence interval. Estimated standard errors for selected statistics and the difference between the years are shown in Table A-4.

The standard errors for this study were estimated using a replication method called the jackknife repeated replication method. In essence, the sample is divided into 11 replicates, and estimates are produced for each replicate. The variability among these replicate estimates is then used to estimate the standard error.

This method of variance estimation is particularly useful in this study for measuring the fact that a large fraction of the sampled institutions from the 1988 and 1990 studies were also included in the 1992 study. Since most of the reports of the institutions between the two times are positively correlated, the estimated differences have smaller standard errors than independent or uncorrelated samples. The jackknife method incorporates this information and produces estimates of standard errors that are appropriate for this overlapping design.

Data Considerations, Definitions, and Limitations

In addition to sampling errors, survey estimates can be adversely affected by nonsampling errors. Errors of this type include those resulting from reporting and processing of data. In this survey, extensive followup with respondents was used to ensure that the data were as accurate as possible. This included cross-year review that verified inconsistencies between the current and previous questionnaires.

Research Square Footage. The definition of organized research, as specified in OMB Circular A-21 (the form used for calculation of indirect costs) was used in this survey. That definition is as follows: "**Organized research** *means all research and development activities of an institution that are separately budgeted and accounted for. It includes:* **(1) Sponsored research** *means all research and development activities that are sponsored by Federal and non-Federal agencies and organizations...* **(2) University research** *means all research and development activities that are separately budgeted by the institution under an internal application of institutional funds."*

Space information based on OMB Circular A-21 is available at many institutions, and that is the reason for using the A-21 definition in this study. However, the definition excludes departmental research that is not separately budgeted and accounted for. Therefore, research space reported on this survey may underestimate total research space at some institutions. For example, because one of the primary missions of nondoctoral institutions is research training and instruction, much of the space used for these purposes is not primarily devoted to research and as such may be multi-use space not classified as research space.** When a number of respondents were asked to quantify the magnitude of the underestimate, most confirmed that the overall extent of the underestimate was under 10 percent.

Institutions' facility recordkeeping systems vary considerably. In general, most of the larger institutions have central computerized facility inventory systems, often based on space surveys conducted specifically for OMB Circular A-21. Many institutions with smaller research programs are not required to calculate square footage for OMB Circular A-21, and do not maintain databases that can provide such information. In such cases, it was necessary for institutions to calculate or

****Modernizing Academic Research Facilities: A Comprehensive Plan*, National Science Foundation, June 1989.

Table A-4. Standard errors for selected estimates

Statistic	Total		Doctorate-granting						Nondoctorate-granting		Public		Private	
			Total		Top 100 in research		Other							
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Total research square footage (in thousands):														
1988	112,062	1,864	107,443	2,004	80,627	1,419	26,815	2,019	4,619	437	82,384	1,627	29,678	868
1990	116,327	4,054	111,166	4,092	81,659	1,327	29,508	3,574	5,161	485	86,880	3,538	29,447	1,591
1992	122,015	4,079	117,373	4,185	87,508	0	29,865	4,185	4,642	316	90,815	3,612	31,200	969
Difference:														
(90-88)	4,265	3,586	3,723	3,659	1,032	2,533	2,693	3,659	542	205	4,496	3,026	-231	1,385
(92-90)	5,687	6,239	6,207	6,404	5,849	1,327	358	6,412	-519	481	3,934	6,246	1,753	1,200
(92-88)	9,953	5,338	9,930	5,487	6,881	1,419	3,049	4,979	22	479	8,430	5,062	1,522	1,146
Repair/renovation cost (dollars in millions):														
1988	838	60	793	58	596	10	197	59	45	8	436	38	402	27
1990	1,010	265	979	264	483	12	496	259	30	15	699	266	311	18
1992	825	40	794	38	632	0	161	38	32	9	449	41	376	15
Difference:														
(90-88)	172	269	186	267	-113	18	299	261	-15	22	263	265	-91	35
(92-90)	-185	269	-185	267	150	12	-335	262	2	39	-250	270	65	38
(92-88)	-13	65	1	60	36	10	-36	62	-13	11	13	50	26	24
Repair/renovation NASF (in thousands):														
1988	13,431	1,305	12,841	1,345	9,124	304	3,717	1,299	590	90	8,745	1,196	4,685	528
1990	11,449	576	10,993	488	7,781	179	3,212	464	456	229	8,223	473	3,226	237
1992	8,606	657	8,344	624	5,622	0	2,722	624	262	81	5,420	613	3,187	180
Difference:														
(90-88)	-1,982	1,343	-1,848	1,252	-1,343	351	-505	1,276	-134	251	-522	1,233	-1,459	384
(92-90)	-2,841	928	-2,649	914	-2,159	179	-490	841	-194	228	-2,804	788	-39	328
(92-88)	-4,825	1,529	-4,497	1,620	-3,502	304	-995	1,557	-328	119	-3,325	1,491	-1,498	509
New construction cost (dollars in millions):														
1988	2,051	73	1,888	72	1,599	64	288	53	163	19	1,355	36	696	75
1990	2,464	128	2,315	131	1,558	34	757	114	150	56	1,727	108	738	62
1992	2,975	150	2,847	164	2,022	0	826	164	128	99	2,020	110	956	87
Difference:														
(90-88)	414	140	427	128	-41	83	469	127	-13	60	372	102	42	84
(92-90)	511	231	532	249	464	34	69	233	-22	116	293	165	218	115
(92-88)	924	158	959	180	423	64	538	158	-35	100	665	117	260	116
New construction NASF (in thousands):														
1988	9,922	387	8,908	401	7,261	215	1,647	407	1,014	117	7,344	223	2,578	271
1990	10,647	851	9,840	776	6,073	86	3,767	747	807	337	8,115	805	2,532	153
1992	11,817	816	11,022	1,000	6,972	0	4,050	1,000	795	225	8,268	757	3,549	230
Difference:														
(90-88)	726	903	932	765	-1,188	242	2,120	881	-207	366	771	772	-46	244
(92-90)	1,170	1,508	1,181	1,659	899	86	283	1,633	-12	419	152	1,415	1,017	282
(92-88)	1,895	817	2,114	1,018	-289	215	2,403	885	-219	248	924	809	971	296

Table A-4. Standard errors for selected estimates (continued)

Statistic	Condition							
	Suitable for sophisticated research		Effective for most purposes		Needs limited repair/renovation		Needs major repair/renovation	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Amount of research space (NASF in thousands).								
1988	26,793	836	41,114	1,175	26,264	646	17,702	397
1990	30,135	1,239	41,072	1,794	27,047	914	18,073	983
1992	32,723	1,356	42,306	1,846	27,620	1,106	19,370	607

KEY NASF = net assigned square feet

estimate square footage information specifically for this study.

Capital Projects Involving Research Facilities. Relatively few institutions maintain information on repair, renovation, and construction projects specific to research facilities. Many capital projects involve both research and nonresearch space. As a result, institutions had to estimate the proportion of a given project that was related to research facilities when the project was not exclusively for research. A guideline for this purpose was included in the questionnaire instructions as follows: *For multi-purpose facilities, prorate the costs to reflect the proportion of R&D space involved in the projects (e.g., if 20 percent of the space involved is used for organized research, report 20 percent of the total project completion costs).*

Some projects, such as whole-building renovations or new construction, may take more than one year to complete, and other projects may overlap fiscal years. Projects were allocated to the year in which actual construction activity began or will begin.

Because institutions use different dollar values to identify "major projects," this survey established a guideline to ensure consistency of reporting. As in previous cycles of the survey, projects with costs of $100,000 or more **associated with research facilities** were included. This year, for the first time, a separate question was added inquiring about costs of repair/renovation projects in the $5,000 to $99,999 range.

Dollar amounts: Current versus Constant Dollars. All capital project dollar amounts presented in this report are expressed in current dollars, not adjusted for inflation. To adjust reported amounts for the general level of inflation in the economy, a standard practice is to use the Gross Domestic Product (GDP) implicit price deflator (see National Science Foundation/SRS, *National Patterns of R&D Resources: 1992*, forthcoming). For the four 2-year time periods encompassed in this report, GDP price deflators, and their effects on estimated overall expenditures for research facilities construction, are shown in Table A-5. The same four deflators can be used to adjust all other dollar figures presented in this report.

Table A-5. Inflation-adjustment to estimated total expenditures for construction of academic research facilities, 1987-93

[Dollars in millions]

Fiscal year of project start	Average GDP price deflator for period (1987=1.0)	Expenditures	
		In current dollars	In 1987 constant dollars[1]
1986 or 1987 (Actual)	0.9856	$2,051	$2,081
1988 or 1989 (Actual)	1.0593	2,464	2,326
1990 or 1991 (Actual)	1.1488	2,976	2,591
1992 or 1993 (Planned)	1.2273	3,214	2,619

(1) Estimate = current dollar amount ÷ deflator.

Condition and Adequacy of Research Facilities. A number of respondents stated that reports of the condition and the adequacy of facilities are, by their very nature, subjective. Two persons may have different assessments of the same facility, or different opinions of what is required in order for a facility to be suitable for a particular type of research. Despite the subjectivity involved, these items do capture an overall picture of the current status of facilities. Discussions with a number of institutions indicated that, for the most part, deans in consultation with department heads reported on the condition and adequacy of facilities. A few institutions indicated that they have detailed condition data on a central database. In those cases, the facilities office was able to respond to these items.

A few institutions indicated that it is conceptually difficult to assess the condition of a research facility without including instrumentation in that assessment. Most respondents, however, indicated that they had no such problem, and were able to report on the condition of the "bricks and mortar."

Cost per Square Foot Data. The study did not collect unit cost data for individual construction or repair/renovation projects, just the aggregate research-related costs and the aggregate research space involved in all projects begun during specified periods. These aggregates can be combined into indices of average cost per square foot, which are useful in tracking broad cost trends over time. However, they are of very little practical value as guidelines for project planning. By all accounts, unit costs for both construction and repair/renovation projects are highly variable, depending on the specific requirements of the particular project and on many other factors as well (e.g., geographic region of the country). Such difference, which are of crucial importance in project planning, are obscured in the kinds of multiproject averages that can be constructed from this study's data.

APPENDIX B

LIST OF SAMPLED INSTITUTIONS

Public, Doctorate-Granting Institutions

Top 100	Institution	State
	UNIVERSITY OF ALASKA FAIRBANKS	AK
*	AUBURN UNIVERSITY	AL
	UNIV. OF ALABAMA,HUNTSVILLE	AL
	UNIVERSITY OF ALABAMA	AL
*	UNIVERSITY OF ALABAMA AT BIRMINGHAM	AL
	UNIVERSITY OF SOUTH ALABAMA	AL
	UNIVERSITY OF ARKANSAS	AR
	UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES	AR
*	UNIVERSITY OF ARIZONA	AZ
	SAN DIEGO STATE UNIVERSITY	CA
	UNIVERSITY OF CALIFORNIA	CA
*	UNIVERSITY OF CALIFORNIA	CA
*	UNIVERSITY OF CALIFORNIA-DAVIS	CA
*	UNIVERSITY OF CALIFORNIA-IRVINE	CA
*	UNIVERSITY OF CALIFORNIA-LOS ANGELES	CA
*	UNIVERSITY OF CALIFORNIA-RIVERSIDE	CA
*	UNIVERSITY OF CALIFORNIA-SAN DIEGO	CA
*	UNIVERSITY OF CALIFORNIA-SAN FRANCISCO	CA
*	UNIVERSITY OF CALIFORNIA-SANTA BARBARA	CA
	UNIVERSITY OF CALIFORNIA-SANTA CRUZ	CA
*	COLORADO STATE UNIVERSITY	CO
*	UNIVERSITY OF COLORADO HEALTH SCIENCES CENTER	CO
*	UNIVERSITY OF COLORADO, BOULDER	CO
	UNIVERSITY OF COLORADO, COLORADO SPRINGS	CO
	UNIVERSITY OF COLORADO, DENVER	CO
*	UNIVERSITY OF CONNECTICUT	CT
	UNIVERSITY OF DELAWARE	DE
	FLORIDA AGRICULTRAL & MECHANICAL UNIV.	FL
*	FLORIDA STATE UNIVERSITY	FL
*	THE UNIVERSITY OF FLORIDA	FL
*	GEORGIA INSTITUTE OF TECHNOLOGY	GA
	MEDICAL COLLEGE OF GEORGIA	GA
*	UNIVERSITY OF GEORGIA	GA
*	UNIVERSITY OF HAWAII AT MANOA	HI
*	IOWA STATE UNIV.OF SCIENCE & TECHNOLOGY	IA
*	UNIVERSITY OF IOWA	IA
	UNIVERSITY OF IDAHO	ID
	SOUTHERN ILLINOIS UNIV.AT CARBONDALE	IL
*	UNIVERSITY OF ILLINOIS AT CHICAGO	IL
*	UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN	IL
*	INDIANA UNIVERSITY	IN
*	PURDUE UNIVERSITY	IN
*	KANSAS STATE UNIVERSITY	KS
*	UNIVERSITY OF KANSAS	KS
*	UNIVERSITY OF KENTUCKY	KY
*	LOUISIANA STATE UNIVERSITY	LA
	UNIVERSITY OF SOUTHWESTERN LOUISIANA	LA
*	UNIVERSITY OF MASSACHUSETTS AMHERST CAMPUS	MA
*	UNIVERSITY OF MARYLAND AT BALTIMORE	MD
*	UNIVERSITY OF MARYLAND AT COLLEGE PARK	MD
	UNIVERSITY OF MARYLAND BALTIMORE COUNTY	MD
	UNIVERSITY OF MAINE AT ORONO	ME
*	MICHIGAN STATE UNIVERSITY	MI
*	UNIVERSITY OF MICHIGAN-ANN ARBOR	MI
*	WAYNE STATE UNIVERSITY	MI

Public, Doctorate-Granting Institutions

Top 100	Institution	State
*	UNIVERSITY OF MINNESOTA	MN
*	UNIVERSITY OF MISSOURI-COLUMBIA	MO
*	MISSISSIPPI STATE UNIVERSITY	MS
	UNIVERSITY OF MISSISSIPPI	MS
	UNIVERSITY OF SOUTHERN MISSISSIPPI	MS
	MONTANA STATE UNIVERSITY	MT
	EAST CAROLINA UNIVERSITY	NC
*	NORTH CAROLINA STATE UNIVERSITY	NC
*	UNIV.OF NORTH CAROLINA AT CHAPEL HILL	NC
	UNIVERSITY OF NORTH DAKOTA	ND
	UNIVERSITY OF NEBRASKA MEDICAL CENTER	NE
*	UNIVERSITY OF NEBRASKA-LINCOLN	NE
	UNIVERSITY OF NEW HAMPSHIRE	NH
*	RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY	NJ
*	UNIV OF MED & DENT OF N J	NJ
	NEW MEXICO INST.OF MINING & TECHNOLOGY	NM
*	NEW MEXICO STATE UNIVERSITY	NM
*	UNIVERSITY OF NEW MEXICO	NM
	UNIVERSITY OF NEVADA-RENO	NV
	STATE UNIV.OF N.Y.HEALTH SCIENCE CENTER	NY
	STATE UNIVERSITY OF N.Y.AT BINGHAMTON	NY
*	STATE UNIVERSITY OF NEW YORK AT BUFFALO	NY
*	STATE UNIVERSITY OF NEW YORK AT STONY BROOK	NY
	SUNY HEALTH SCIENCE CENTER AT BROOKLYN	NY
	CLEVELAND STATE UNIVERSITY	OH
	NORTHEASTERN OHIO UNIV.COLLEGE OF MEDICINE	OH
	OHIO UNIVERSITY	OH
*	THE OHIO STATE UNIVERSITY	OH
	THE UNIVERSITY OF AKRON	OH
*	UNIVERSITY OF CINCINNATI	OH
	WRIGHT STATE UNIVERSITY	OH
*	OKLAHOMA STATE UNIVERSITY	OK
*	UNIVERSITY OF OKLAHOMA	OK
*	OREGON STATE UNIVERSITY	OR
*	THE PENNSYLVANIA STATE UNIVERSITY	PA
*	UNIVERSITY OF PITTSBURGH	PA
	THE UNIVERSITY OF RHODE ISLAND	RI
*	CLEMSON UNIVERSITY	SC
	MEDICAL UNIVERSITY OF SOUTH CAROLINA	SC
	THE UNIVERSITY OF TENNESSEE, MEMPHIS	TN
	UNIVERSITY OF TENNESSEE KNOXVILLE	TN
	LAMAR UNIVERSITY	TX
*	TEXAS A & M UNIVERSITY	TX
	TEXAS TECH UNIVERSITY	TX
*	UNIV. OF TEXAS HEALTH SCIENCE CTR., HOUSTON	TX
	UNIV.OF TEXAS HEALTH SCIENCE CENTER	TX
	UNIV.OF TEXAS MED.BRANCH AT GALVESTON	TX
*	UNIV.TEXAS M.D.ANDERSON CANCER CTR.	TX
*	UNIVERSITY OF TEXAS AT AUSTIN	TX
	UNIVERSITY OF TEXAS AT EL PASO	TX
*	UT SOUTHWESTERN MEDICAL CENTER AT DALLAS	TX
*	UNIVERSITY OF UTAH	UT
*	UTAH STATE UNIVERSITY	UT
*	UNIVERSITY OF VIRGINIA	VA
*	VIRGINIA COMMONWEALTH UNIVERSITY	VA

Public, Doctorate-Granting Institutions

Top 100	Institution	State
*	VIRGINIA POLYTECHIC INST.& STATE UNIV.	VA
	UNIV.OF VERMONT & STATE AGRICULTURAL COLLEGE	VT
*	UNIVERSITY OF WASHINGTON	WA
*	WASHINGTON STATE UNIVERSITY	WA
*	UNIVERSITY OF WISCONSIN-MADISON	WI
	UNIVERSITY OF WISCONSIN-MILWAUKEE	WI
	WEST VIRGINIA UNIVERSITY	WV
	UNIVERSITY OF WYOMING	WY

Private, Doctorate-Granting Institutions

Top 100	Institution	State
*	CALIFORNIA INSTITUTE OF TECHNOLOGY	CA
	CLAREMONT GRADUATE SCHOOL	CA
	LOMA LINDA UNIVERSITY	CA
*	STANFORD UNIVERSITY	CA
*	UNIVERSITY OF SOUTHERN CALIFORNIA	CA
*	YALE UNIVERSITY	CT
	GEORGE WASHINGTON UNIVERSITY	DC
*	GEORGETOWN UNIVERSITY	DC
	HOWARD UNIVERSITY	DC
	NOVA UNIVERSITY	FL
*	UNIVERSITY OF MIAMI	FL
	CLARK/ATLANTA UNIVERSITY	GA
*	EMORY UNIVERSITY	GA
	MERCER UNIVERSITY	GA
	MOREHOUSE SCHOOL OF MEDICINE	GA
	ILLINOIS INSTITUTE OF TECHNOLOGY	IL
*	NORTHWESTERN UNIVERSITY	IL
*	UNIVERSITY OF CHICAGO	IL
	UNIVERSITY OF NOTRE DAME	IN
*	TULANE UNIVERSITY OF LOUISIANA	LA
	BOSTON COLLEGE	MA
*	BOSTON UNIVERSITY	MA
	BRANDEIS UNIVERSITY	MA
*	HARVARD UNIVERSITY	MA
*	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	MA
*	TUFTS UNIVERSITY	MA
*	WOODS HOLE OCEANOGRAPHIC INSTITUTE	MA
	WORCESTER POLYTECHNIC INSTITUTE	MA
*	THE JOHNS HOPKINS UNIVERSITY	MD
	SAINT LOUIS UNIVERSITY	MO
*	WASHINGTON UNIVERSITY	MO
*	DUKE UNIVERSITY	NC
	WAKE FOREST UNIVERSITY	NC
	DARTMOUTH COLLEGE	NH
*	PRINCETON UNIVERSITY	NJ
	ALBANY MEDICAL COLLEGE OF UNION UNIV.	NY
*	COLUMBIA UNIV.IN THE CITY OF N.Y.	NY
*	CORNELL UNIVERSITY	NY
*	MOUNT SINAI SCHOOL OF MED.OF CITY UNIV.	NY
	NEW YORK MEDICAL COLLEGE	NY
*	NEW YORK UNIVERSITY	NY
	POLYTECHNIC UNIVERSITY	NY
	RENSSELAER POLYTECHNIC INSTITUTE	NY
*	ROCKEFELLER UNIVERSITY	NY
	SAINT JOHN'S UNIVERSITY	NY
	SYRACUSE UNIVERSITY	NY
*	UNIVERSITY OF ROCHESTER	NY
*	YESHIVA UNIVERSITY	NY
*	CASE WESTERN RESERVE UNIVERSITY	OH
	UNIVERSITY OF DAYTON	OH
*	CARNEGIE-MELLON UNIVERSITY	PA
	HAHNEMANN UNIVERSITY	PA
	THOMAS JEFFERSON UNIVERSITY	PA
*	UNIVERSITY OF PENNSYLVANIA	PA
	BROWN UNIVERSITY	RI

Top 100	Institution	State
	MEHARRY MEDICAL COLLEGE	TN
*	VANDERBILT UNIVERSITY	TN
*	BAYLOR COLLEGE OF MEDICINE	TX
	SOUTHERN METHODIST UNIVERSITY	TX
	TEXAS CHRISTIAN UNIVERSITY	TX
	MARQUETTE UNIVERSITY	WI
	MEDICAL COLLEGE OF WISCONSIN	WI

Public, Nondoctorate-Granting Institutions

Institution	State
ALABAMA AGRICULTURAL AND MECHANICAL UNIVERSITY	AL
ALABAMA STATE UNIVERSITY	AL
UNIVERSITY OF MONTEVALLO	AL
ARKANSAS STATE UNIVERSITY	AR
UNIVERSITY OF ARKANSAS AT PINE BLUFF	AR
CALIF ST POLY UNIV POMONA	CA
CALIF ST UNIV HAYWARD	CA
CALIF ST UNIV LONG BEACH	CA
CALIFORNIA STATE UNIVERSITY-CHICO	CA
CALIFORNIA STATE UNIVERSITY-FULLERTON	CA
HUMBOLDT STATE UNIVERSITY	CA
SAN JOSE STATE UNIVERSITY	CA
UNIVERSITY OF THE DISTRICT OF COLUMBIA	DC
DELAWARE STATE COLLEGE	DE
UNIVERSITY OF WEST FLORIDA	FL
ALBANY STATE COLLEGE	GA
FORT VALLEY STATE COLLEGE	GA
GEORGIA SOUTHERN UNIVERSITY	GA
CHICAGO STATE UNIVERSITY	IL
SOUTHERN ILLINOIS UNIV EDWARDSVILLE	IL
KENTUCKY STATE UNIVERSITY	KY
NORTHWESTERN STATE UNIVERSITY LA	LA
SOUTHERN UNIV AND A&M COLLEGE	LA
UNIVERSITY OF MASSACHUSETTS AT BOSTON	MA
UNIVERSITY OF MASSACHUSETTS DARTMOUTH	MA
MORGAN STATE UNIVERSITY	MD
TOWSON STATE UNIVERSITY	MD
UNIVERSITY OF MARYLAND EASTERN SHORE	MD
LINCOLN UNVERSITY	MO
ALCORN STATE UNIVERSITY	MS
JACKSON STATE UNIVERSITY	MS
ELIZABETH CITY STATE UNIV	NC
FAYETTEVILLE STATE UNIVERSITY	NC
N.C.AGRICULTURAL & TECHNICAL STATE UNIV.	NC
UNIV.OF NORTH CAROLINA AT CHARLOTTE	NC
WINSTON-SALEM STATE UNIVERSITY	NC
WILLIAM PATERSON COLLEGE	NJ
EASTERN NEW MEXICO UNIV	NM
UNIVERSITY OF NEVADA-LAS VEGAS	NV
CUNY COLLEGE OF STATEN ISLAND	NY
CUNY QUEENS COLLEGE	NY
STATE UNIV.OF N.Y.COLLEGE AT BUFFALO	NY
SUNY COLLEGE OSWEGO	NY
CENTRAL STATE UNIVERSITY	OH
LANGSTON UNIVERSITY	OK
WESTERN OREGON STATE COLLEGE	OR
CALIFORNIA UNIVERSITY OF PENNSYLVANIA	PA
EDINBORO UNIVERSITY OF PENNSYLVANIA	PA
KUTZTOWN UNIVERSITY OF PENN	PA
SOUTH CAROLINA STATE COLLEGE	SC
WINTHROP COLLEGE	SC
TENNESSEE STATE UNIVERSITY	TN
PRAIRIE VIEW A & M UNIVERSITY	TX
SUL ROSS STATE UNIVERSITY	TX
TARLETON STATE UNIVERSITY	TX
TEXAS A & I UNIVERSITY	TX

Public, Nondoctorate-Granting Institutions

Institution	State
TEXAS SOUTHERN UNIVERSITY	TX
UNIVERSITY OF HOUSTON-CLEAR LAKE	TX
WEST TEXAS STATE UNIV	TX
VIRGINIA MILITARY INSTITUTE	VA
VIRGINIA STATE UNIVERSITY	VA
U. OF THE VIRGIN ISLANDS	VI
WESTERN WASHINGTON UNIVERSITY	WA
UNIV. OF WISCONSIN-STEVENS POINT	WI
UNIVERSITY OF WISCONSIN-GREEN BAY	WI
UNIVERSITY OF WISCONSIN-PARKSIDE	WI

Private, Nondoctorate-Granting Institutions

Institution	State
SELMA UNIVERSITY	AL
STILLMAN COLLEGE	AL
TUSKEGEE UNIVERSITY	AL
CHAPMAN UNIVERSITY	CA
HARVEY MUDD COLLEGE	CA
OCCIDENTAL COLLEGE	CA
POMONA COLLEGE	CA
UNIVERSITY OF REDLANDS	CA
UNIVERSITY OF SAN FRANCISCO	CA
COLORADO COLLEGE	CO
QUINNIPIAC COLLEGE	CT
GALLAUDET UNIVERSITY	DC
ROLLINS COLLEGE	FL
MOREHOUSE COLLEGE	GA
MORRIS BROWN COLLEGE	GA
SPELMAN COLLEGE	GA
DRAKE UNIVERSITY	IA
AMHERST COLLEGE	MA
COLLEGE OF THE HOLY CROSS	MA
EMMANUEL COLLEGE	MA
MOUNT HOLYOKE COLLEGE	MA
REGIS COLLEGE	MA
SIMMONS COLLEGE	MA
WELLESLEY COLLEGE	MA
WENTWORTH INSTITUTE OF TECHNOLOGY	MA
WILLIAMS COLLEGE	MA
GOUCHER COLLEGE	MD
BOWDOIN COLLEGE	ME
AUGSBURG COLLEGE	MN
ST MARY'S COLLEGE	MN
ST. OLAF COLLEGE	MN
RUST COLLEGE	MS
TOUGALOO COLLEGE	MS
JOHNSON C.SMITH UNIVERSITY	NC
SHAW UNIVERSITY	NC
BARNARD COLLEGE	NY
ITHACA COLLEGE	NY
MANHATTAN COLLEGE	NY
PRATT INSTITUTE	NY
ANTIOCH COLLEGE	OH
COLLEGE OF WOOSTER	OH
XAVIER UNIVERSITY	OH
PACIFIC UNIVERSITY	OR
REED COLLEGE	OR
FRANKLIN AND MARSHALL COLLEGE	PA
HAVERFORD COLLEGE	PA
SWARTHMORE COLLEGE	PA
BENEDICT COLLEGE	SC
CLAFLIN COLLEGE	SC
FURMAN UNIVERSITY	SC
ABILENE CHRISTIAN UNIVERSITY	TX
TRINITY UNIVERSITY	TX
WILEY COLLEGE	TX
HAMPTON UNIVERSITY	VA
HOLLINS COLLEGE	VA
PACIFIC LUTHERAN UNIVERSITY	WA

Private, Nondoctorate-Granting Institutions

Institution	State
SEATTLE UNIVERSITY	WA

Historically Black Colleges and Universities

Name	State
ALABAMA AGRICULTURAL AND MECHANICAL UNIVERSITY	AL
ALABAMA STATE UNIVERSITY	AL
SELMA UNIVERSITY	AL
STILLMAN COLLEGE	AL
TUSKEGEE UNIVERSITY	AL
UNIVERSITY OF ARKANSAS AT PINE BLUFF	AR
HOWARD UNIVERSITY	DC
UNIVERSITY OF THE DISTRICT OF COLUMBIA	DC
DELAWARE STATE COLLEGE	DE
FLORIDA AGRICULTRAL & MECHANICAL UNIV.	FL
ALBANY STATE COLLEGE	GA
CLARK/ATLANTA UNIVERSITY	GA
FORT VALLEY STATE COLLEGE	GA
MOREHOUSE COLLEGE	GA
MOREHOUSE SCHOOL OF MEDICINE	GA
MORRIS BROWN COLLEGE	GA
SPELMAN COLLEGE	GA
KENTUCKY STATE UNIVERSITY	KY
SOUTHERN UNIV AND A&M COLLEGE	LA
MORGAN STATE UNIVERSITY	MD
UNIVERSITY OF MARYLAND EASTERN SHORE	MD
LINCOLN UNVERSITY	MO
ALCORN STATE UNIVERSITY	MS
JACKSON STATE UNIVERSITY	MS
RUST COLLEGE	MS
TOUGALOO COLLEGE	MS
ELIZABETH CITY STATE UNIV	NC
FAYETTEVILLE STATE UNIVERSITY	NC
JOHNSON C.SMITH UNIVERSITY	NC
N.C.AGRICULTURAL & TECHNICAL STATE UNIV.	NC
SHAW UNIVERSITY	NC
WINSTON-SALEM STATE UNIVERSITY	NC
CENTRAL STATE UNIVERSITY	OH
XAVIER UNIVERSITY	OH
LANGSTON UNIVERSITY	OK
BENEDICT COLLEGE	SC
CLAFLIN COLLEGE	SC
SOUTH CAROLINA STATE COLLEGE	SC
MEHARRY MEDICAL COLLEGE	TN
TENNESSEE STATE UNIVERSITY	TN
PRAIRIE VIEW A & M UNIVERSITY	TX
TEXAS SOUTHERN UNIVERSITY	TX
WILEY COLLEGE	TX
HAMPTON UNIVERSITY	VA
VIRGINIA STATE UNIVERSITY	VA
U. OF THE VIRGIN ISLANDS	VI

APPENDIX C

SURVEY QUESTIONNAIRE

NSF Form: 1264 (9/91)

OMB # 3145-0101
Expires 1/31/94

1992 SURVEY OF SCIENTIFIC AND ENGINEERING R&D FACILITIES AT COLLEGES AND UNIVERSITIES

National Science Foundation
National Institutes of Health

Acting out of concerns raised by the academic community, Congress directed the National Science Foundation (NSF) to collect and analyze data on the availability, condition, need, cost, and funding sources of science and engineering research and development facilities at colleges and universities and to report to the Congress every two years. This survey is being conducted in response to that requirement. Institutions are requested to return the completed survey to

Westat, Inc.
1650 Research Boulevard
Rockville, MD 20850

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution. Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

We requested that the president or chancellor of your institution designate an individual to coordinate data collection for this survey. The name, title, and address of that person appear below; please correct the label if any of the information is incorrect.

Label

If someone other than the person listed above completes this questionnaire, please provide the following information:

Name	**Title/Department**	**Telephone No. and ext.**
_____	_____	_____

This form should be returned by January 6, 1992. Your cooperation in returning the survey questionnaire promptly is very important. If you have any questions regarding this survey, please contact Ms. Diane Ward at Westat's toll-free number, 800-937-8288, or Dr. Ann Lanier of NSF at 202-634-4035.

It is estimated that the response to this survey will require an average of 30 hours. If you wish to comment on this burden, please contact Herman Fleming, Reports Clearance Officer, NSF, at 202-357-9520, and the Office of Management and Budget, Paperwork Reduction Project (OMB Number 3145-0101), Washington, DC 20503.

How many person-hours were required to complete this form? _____

70

DEFINITIONS AND GUIDELINES

RESEARCH AND DEVELOPMENT (R&D)

R&D for purposes of this survey refers to "organized research" as defined in Section B.1.b of OMB Circular A-21 (revised). "**Organized research** *means all research and development activities of an institution that are separately budgeted and accounted for. It includes:* **(1) Sponsored research** *means all research and development activities that are sponsored by Federal and non-Federal agencies and organizations...* **(2) University research** *means all research and development activities that are separately budgeted by the institution under an internal application of institutional funds.*"

This definition of R&D does **not** include departmental research that is not separately budgeted. Note that sponsored research may be funded by government, foundation, corporate, university, or other sources.

R&D FACILITIES

Using the definition of R&D above, "R&D facilities" refers to the physical plant (e.g., "bricks and mortar," research vessels) in which organized R&D activities take place, including building infrastructure (power, HVAC, etc.), fixed equipment (benches, fume hoods, etc.), and non-fixed equipment costing over $1 million. **Non-fixed equipment costing less than $1 million is not included; these data are gathered in a separate NSF/NIH survey.**

Be sure to report all R&D facilities that are administered by the institution, including facilities that are leased or rented by the institution, facilities at branch campuses, agricultural experiment stations, field and mobile laboratories, etc. **Do not include** facilities that have been designated as Federally funded R&D Centers (e.g., Brookhaven, Kitt Peak, Fermi, etc.), and do not include facilities that are used by faculty but are not actually administered by the institution (e.g., research space at VA or other non-university hospitals).

R&D SPACE

R&D space refers to the **net assignable square feet (NASF)** of space in facilities within which organized R&D activities take place. Specific examples of R&D facilities are

- research laboratories,
- controlled environment space such as clean or white rooms,
- technical support space such as carpenter and machine shops,
- laboratory animal facilities, including animal production colonies, holding rooms, isolation and germ-free rooms,
- faculty or staff offices, to the extent they are used for R&D,
- fixed (built-in) equipment such as fume hoods and benches, and
- department libraries, to the extent they are used for R&D. Do not include central libraries.

For **multi-purpose** space such as faculty offices and laboratories that are used partly for research, prorate the space (NASF) to reflect the proportion of use devoted to organized R&D activity. For example, if a room or building is devoted to R&D activity approximately 40% of the time, count 40% of the NASF as R&D space.

REPAIR/RENOVATION AND NEW CONSTRUCTION

Report repair/renovation projects (repair of deteriorated condition, capital improvement, conversion, etc.) and new construction projects (addition to an existing building, new building) involving R&D facilities.

For **multi-purpose** facilities, **prorate** the cost to reflect the proportion of R&D space involved in the project.

For **multi-year** projects, allocate the entire project completion cost (planning, construction, fixed equipment) to the fiscal year in which construction actually began or is expected to begin.

SCIENCE AND ENGINEERING (S/E) DISCIPLINES

In order to facilitate comparison of data collected in this survey with that of other NSF and NIH surveys, we request that you provide information for the academic disciplines listed below. A crosswalk between NSF disciplines and NCES program classification codes appears at the end of this questionnaire. Use your best judgment in reporting fields that cross over discipline categories used in this survey. If you are unable to report separately the data for academic programs, please report the combined data as "Other Sciences, n.e.c." **and indicate what disciplines they represent.**

Engineering
Physical Sciences
Environmental Sciences
Mathematics
Computer Science
Agricultural Sciences
Biological Sciences
Medical Sciences
Psychology
Social Sciences
Other Sciences, n.e.c. (not elsewhere classified)

NOT INCLUDED in this survey are law, business administration/management (except economics), humanities, history, the arts, or education (except educational psychology).

See the NSF-NCES Crosswalk at the end of the questionnaire for additional details on classification of fields.

CENTRAL R&D INFRASTRUCTURE FACILITIES

As in previous surveys, items 1-3 in the current questionnaire are limited to R&D facilities in specified S/E disciplines or in multidisciplinary combinations of disciplines. However, items 4-5 in the current questionnaire, which concern recent and future facilities spending, now also ask about spending for "central R&D infrastructure facilities." This category refers to facilities that provide resources that serve research in many S/E disciplines, not just one or two. Examples include the following:

- Central computer centers and telecommunications/networking equipment (excluding non-fixed equipment), if used for research,
- Central toxic waste storage/disposal facilities, or
- Other central facilities (not associated with specific disciplines) if used, or needed, to support S/E research. Do not include central utilities facilities, such as central chillers or steam or power plants.

In reporting costs of recent and planned central R&D infrastructure projects, prorate the cost to reflect only the **R&D** component of the project.

ITEM 1a. PRESENT AVAILABILITY OF SCIENCE/ENGINEERING R&D FACILITIES, BY DISCIPLINE

- In column 1 below, please report the **total** net assignable square feet (NASF) assigned to science and engineering (S/E) disciplines at your institution. The totals should include all space assigned to the disciplines or departments within the disciplines, including departmental and faculty offices, conference and seminar rooms, research space, and instructional space. Include space leased by your institution.

- In column 2, report net assignable square feet devoted to **R&D** in S/E disciplines, using the OMB A-21 definition of **organized research** provided on page 2. Include space leased by your institution.

- For all schools providing data last year (1990), a facsimile of the reported data is enclosed. Please compare the current amounts of R&D space shown in column 2 below, to these shown in the 1990 facsimile. In column 3, indicate whether the differences indicate:

  A Little change; current R&D NASF is about same as in 1990 (within 20%)

  B Real change due to creation of additional S/E R&D space or to loss or redistribution among disciplines of 1990 S/E R&D space

  C Bookkeeping change (e.g., due to merging or reclassification of departments); change in definitions, procedures, or data used in producing estimates, beyond changes in actual space amounts or uses

  UK Unknown (reasons for the differences are not known)

  NA Not applicable (e.g., 1990 facsimile is not available)

Discipline	Total NASF	R&D NASF	Changes since 1989-90 (circle all that apply)
S/E FACILITIES TOTAL			
Engineering			A B C UK NA
Physical Sciences			A B C UK NA
Environmental Sciences			A B C UK NA
Mathematics			A B C UK NA
Computer Science			A B C UK NA
Agricultural Sciences			A B C UK NA
Biological Sciences Other than medical school			A B C UK NA
Biological Sciences Medical school			A B C UK NA
Medical Sciences Other than medical school			A B C UK NA
Medical Sciences Medical school			A B C UK NA
Psychology			A B C UK NA
Social Sciences			A B C UK NA
All Other Sciences, n.e.c.*			A B C UK NA

*Please specify below the disciplines included in "All Other Sciences, n.e.c."

_____

_____

ITEM 1b. LEASED AND TEMPORARY R&D SPACE

Please indicate the net assignable square feet (NASF) of **R&D** space reported in Item 1a that is leased by your institution or is housed in facilities such as trailers, quonset huts, and other temporary buildings.

_____ NASF leased R&D space

_____ NASF temporary R&D space

ITEM 1c. TOTAL ACADEMIC SPACE

Please indicate your institution's total current net assignable square footage for all academic disciplines related to instruction and research programs. This amount of space represents the total universe of space for instruction and research and includes non-science disciplines (such as humanities, history, the arts, education, business, and law) as well as science and engineering disciplines.

Note: For institutions maintaining facilities inventory systems which use the 1972 WICHE *Program Classification Structure* or 1988 NACUBO *Taxonomy of Functions*, the universe of total academic space may be defined as that space which is assigned to program (function) code 1x--Instruction or 2x--Research.

Together with Item 1a, this will be used to determine what percentage of your total academic space is assigned to S/E disciplines. If this information is not available, enter UK (unknown).

_____ Institution's total NASF

ITEM 1d. SOURCE OF SQUARE FOOTAGE DATA

Please indicate the source of data on square feet of R&D space and the year these data were last updated.

- ☐ A-21 space survey ..... YEAR_____
- ☐ A-21 proportional calculation based on R&D salaries and wages ..... YEAR_____
- ☐ Facilities inventory based on Facilities Inventory and Classification Manual (old HEGIS codes) ..... YEAR_____
- ☐ Facilities inventory NOT based on Facilities Inventory and Classification Manual (old HEGIS codes) ..... YEAR_____
- ☐ Other (specify)_____ ..... YEAR_____

ITEM 2. PRESENT CONDITION OF R&D FACILITIES, BY DISCIPLINE

Please indicate the percentage of R&D space reported in Item 1a that falls into each category (A-E and NA) defined below.

- Rate the condition of facilities based on the type of research **currently** conducted in the facility.
- **Exclude** non-fixed research instrumentation costing less than $1 million in your consideration of the status of research facilities in S/E disciplines.

A Suitable for use in the most highly developed and scientifically sophisticated research in its field
B Effective for most purposes but not applicable to category A
C Effective for some purposes but in need of limited renovation or repair
D Requires major repair or renovation to be used effectively
E Requires replacement
NA Not applicable (no R&D space in this discipline)

Discipline	Percent of R&D space in category						
	Total	A	B	C	D	E	NA
Engineering	100%						
Physical Sciences	100%						
Environmental Sciences	100%						
Mathematics	100%						
Computer Science	100%						
Agricultural Sciences	100%						
Biological Sciences Other than medical school	100%						
Biological Sciences Medical school	100%						
Medical Sciences Other than medical school	100%						
Medical Sciences Medical school	100%						
Psychology	100%						
Social Sciences	100%						
All Other Sciences, n.e.c.	100%						

Who provided the above assessments (e.g., deans, department heads, physical plant administrators, the survey coordinator)?

_____

ITEM 3. AMOUNT OF R&D SPACE, BY DISCIPLINE

Using the categories defined below, please evaluate your current overall amount of R&D space in each discipline in terms of your space needs for your current research program.

- A Adequate -- sufficient to support all the needs of your research in the discipline
- B Generally adequate -- sufficient to support most research needs in the discipline, but may have some limitations
- C Inadequate -- not sufficient to support the needs of your research in the discipline
- D Nonexistent, but needed
- NA Not applicable or not needed

Discipline	Current amount of R&D space (circle one in each row)				
Engineering	A	B	C	D	NA
Physical Sciences	A	B	C	D	NA
Environmental Sciences	A	B	C	D	NA
Mathematics	A	B	C	D	NA
Computer Science	A	B	C	D	NA
Agricultural Sciences	A	B	C	D	NA
Biological Sciences Other than medical school	A	B	C	D	NA
Biological Sciences Medical school	A	B	C	D	NA
Medical Sciences Other than medical school	A	B	C	D	NA
Medical Sciences Medical school	A	B	C	D	NA
Psychology	A	B	C	D	NA
Social Sciences	A	B	C	D	NA
All Other Sciences, n.e.c.	A	B	C	D	NA

Who provided the above assessments (e.g., deans, department heads, physical plant administrators, the survey coordinator)?

_____

ITEM 4a. R&D FACILITIES PROJECTS OVER $100,000: FY 1990 AND FY 1991

Please provide the **project completion costs** for repair/renovation and new construction of **R&D facilities** on which construction was started during your institution's **Fiscal Years 1990 and 1991**. Provide an estimate of the **R&D space** (net assignable square footage) involved.

Limit to projects over $100,000 in R&D-related costs. For projects under $100,000 please refer to item 4d.

- Report only costs and square feet for R&D components; prorate the projects as necessary.
- Report separately for R&D facilities in individual S/E disciplines and for central infrastructure facilities.

Disciplines and central R&D infrastructure facilities	Repair/Renovation		New Construction	
	R&D-related project cost	R&D-related NASF	R&D-related project cost	R&D-related NASF
TOTAL, ALL DISCIPLINE-RELATED R&D FACILITIES (EXCEPT CENTRAL INFRASTRUCTURE)				
Engineering				
Physical Sciences				
Environmental Sciences				
Mathematics				
Computer Science				
Agricultural Sciences				
Biological Sciences Other than medical school				
Biological Sciences Medical school				
Medical Sciences Other than medical school				
Medical Sciences Medical school				
Psychology/Social Sciences				
All Other Sciences, n.e.c.				
CENTRAL R&D INFRASTRUCTURE FACILITIES (NOT INCLUDED IN ABOVE)				
Central Computing and Telecommunications that support research				
Central Toxic Waste Storage/Disposal Facilities that support research				
Other (specify)				

ITEM 4b. SOURCES OF FUNDING FOR R&D FACILITIES PROJECTS OVER $100,000: FY 1990 AND FY 1991

Please indicate the planned sources for the permanent financing of the total project costs for all discipline-related S/E R&D facilities (except central infrastructure) listed in Item 4a (previous page) by reporting the expected dollar amount of funding for each source.

Sources	Repair/Renovation	New Construction
TOTAL, ALL DISCIPLINE-RELATED R&D FACILITIES (EXCEPT CENTRAL INFRASTRUCTURE) from item 4a, 1st row	**$**	**$**
Federal government		
State/local government		
Private donation		
Institutional funds (operating funds, endowments, indirect cost recovery, etc.)		
Debt Financing **Tax-exempt bonds**		
Other debt		
Other		

ITEM 4c. ACTUAL VS. PLANNED R&D FACILITIES SPENDING: FY 1990 AND FY 1991

IF YOU WERE NOT IN THE PREVIOUS SURVEY OR DID NOT HAVE A FACSIMILE OF YOUR DATA FROM THE PREVIOUS SURVEY, PLEASE SKIP TO ITEM 4d

Using your 1990 facsimile, please compare your total FY 1990-91 spending for R&D facilities repair/renovation and new construction projects in S/E disciplines (1st row of columns 1 and 3 in Item 4a) to the anticipated spending levels reported in Item 6 of the 1990 survey. Was your overall spending in FY 1990-91 generally consistent with your institution's plans as reported in the 1990 survey (i.e., was the actual expenditure within ± 25% of the plan)? If not, briefly describe any factors that contributed to the disparity (e.g., any unanticipated repair/renovation needs, funding problems, etc.). Please answer separately for repair/renovation and new construction.

☐ Check if actual REPAIR/RENOVATION spending in FY 1990-91 was generally consistent with prior plans

FACTORS CAUSING DEVIATION FROM REPAIR/RENOVATION SPENDING PLAN:

_____

_____

_____

_____

☐ Check if actual NEW CONSTRUCTION spending in FY 1990-91 was generally consistent with prior plans

FACTORS CAUSING DEVIATION FROM NEW CONSTRUCTION SPENDING PLAN:

_____

_____

_____

ITEM 4d. REPAIR/RENOVATION PROJECTS BETWEEN $5,000 AND $100,000: FY 1990 AND FY 1991

Please provide the **total project completion costs** for repair/renovation of science and engineering **R&D facilities** during your institution's **Fiscal Years 1990 and 1991**.

- Limit to repair/renovation projects between $5,000 and $100,000 in R&D-related costs. For projects over $100,000, please see item 4a.
- Report only costs for R&D components, prorating the projects (or the overall total) as necessary.

TOTAL, ALL DISCIPLINE-RELATED R&D FACILITIES (EXCEPT CENTRAL INFRASTRUCTURE) $_____

ITEM 5. PLANNED R&D FACILITIES OVER $100,000:

FY 1992 AND FY 1993

Please provide the **project completion costs** for repair/renovation and construction of **R&D facilities** on which construction will be started during your institution's **Fiscal Years 1992 and 1993**. Provide an estimate of the R&D space (net assignable square footage) involved.

- Report only costs and square feet associated with space used for R&D, prorating the projects as necessary.
- Report only projects with costs **associated with R&D facilities** of $100,000 or more.
- Report projects involving central R&D infrastructure separately in the space provided.

Disciplines and central R&D infrastructure facilities	Repair/Renovation		New Construction	
	R&D-related project cost	R&D-related NASF	R&D-related project cost	R&D-related NASF
TOTAL ALL DISCIPLINE-RELATED R&D FACILITIES (EXCEPT CENTRAL INFRASTRUCTURE)				
Engineering				
Physical Sciences				
Environmental Sciences				
Mathematics				
Computer Science				
Agricultural Sciences				
Biological Sciences Other than medical school				
Biological Sciences Medical school				
Medical Sciences Other than medical school				
Medical Sciences Medical school				
Psychology				
Social Sciences				
Other Sciences, n.e.c.				
CENTRAL R&D INFRASTRUCTURE FACILITIES (NOT INCLUDED IN ABOVE)				
Central Computing and Telecommunications that support research				
Central Toxic Waste Storage/ Disposal Facilities that support research				
Other (specify)				

APPENDIX D

DETAILED STATISTICAL TABLES

Table 2-1. Number of research-performing institutions, total net assigned square feet (NASF) of space in all academic fields, NASF in science and engineering (S&E) fields, and research NASF in S&E fields, by institution type and control: 1992

[NASF in millions]

Institution type and control	Number of research-performing institutions	Total NASF in all fields[1]	Total NASF in S&E fields	Research NASF in S&E fields
Total	525	660.8	285.4	122.0
Doctorate-granting	294	536.4	256.2	117.4
Top 100 in research expenditures	100	307.3	171.9	87.5
Other	194	229.1	84.3	29.9
Nondoctorate-granting	231	124.4	29.1	4.6
Public	319	505.0	218.7	90.8
Doctorate-granting	192	421.8	198.6	88.0
Nondoctorate-granting	127	83.2	20.0	2.8
Private	206	155.8	66.7	31.2
Doctorate-granting	102	114.5	57.6	29.4
Nondoctorate-granting	104	41.3	9.1	1.8

(1) Projected from responses of 74 percent of institutions.

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-2. Number of research-performing institutions, total net assigned square feet (NASF) of space in science and engineering (S&E) fields, and research NASF in S&E fields, by institution type and control: 1988, 1990, and 1992

[NASF in millions]

Institution type and control	Number of institutions			Total NASF in S&E fields			Research NASF in S&E fields		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	525	525	525	270.6	276.0	285.4	112.1	116.3	122.0
Doctorate-granting	293	293	294	240.7	243.9	256.3	107.4	111.2	117.4
Top 100 in research expenditures	100	100	100	165.7	163.9	171.9	80.6	81.7	87.5
Other	193	193	194	75.1	80.0	84.3	26.8	29.5	29.9
Nondoctorate-granting	232	232	231	29.9	32.1	29.1	4.6	5.2	4.6
Public	320	319	319	204.3	211.7	218.7	82.4	86.9	90.8
Doctorate-granting	191	190	192	183.5	188.9	198.6	79.3	83.6	88.0
Nondoctorate-granting	129	129	127	20.8	22.8	20.1	3.1	3.3	2.8
Private	205	206	206	66.3	64.4	66.7	29.7	29.4	31.2
Doctorate-granting	102	103	102	57.2	55.1	57.6	28.2	27.6	29.4
Nondoctorate-granting	103	103	104	9.1	9.3	9.1	1.5	1.8	1.8

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-3. Number of research-performing institutions with space assigned to science and engineering fields, by field and institution type: 1988, 1990, and 1992

Field	Total			Institution type								
				Doctorate-granting						Nondoctorate-granting		
				Top 100 in research expenditures			Other					
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	525	525	525	100	100	100	193	193	194	232	232	231
Engineering	295	299	304	86	86	86	128	129	130	81	84	88
Physical sciences	473	471	468	93	93	89	150	147	147	230	231	231
Environmental sciences	323	326	329	84	85	83	120	112	122	118	129	124
Mathematics	455	457	458	93	93	88	148	145	153	215	219	217
Computer science	426	404	426	86	86	83	133	131	144	207	187	199
Agricultural sciences	104	103	98	42	41	40	30	27	25	32	35	33
Biological sciences	499	509	513	100	100	100	170	181	182	229	228	231
In universities and colleges	475	479	485	96	95	94	151	156	161	229	228	231
In medical schools	94	105	128	50	55	60	44	50	68	0	0	0
Medical sciences	294	318	307	87	87	91	120	140	145	88	91	70
In universities and colleges	235	250	257	68	68	72	79	91	114	88	91	70
In medical schools	138	144	150	64	64	67	74	80	83	0	0	0
Psychology	472	470	435	91	91	86	155	155	155	227	225	194
Social sciences	461	447	421	94	95	91	153	155	152	214	198	177
Other, not elsewhere classified	111	75	82	47	40	38	40	23	30	24	12	14

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-4. Number of institutions with research space in science and engineering fields, by field and institution type: 1988, 1990, and 1992

Field	Total			Institution type								
				Doctorate-granting						Nondoctorate-granting		
				Top 100 in research expenditures			Other					
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	513	517	501	100	100	100	188	187	188	225	229	213
Engineering	283	296	280	85	86	86	128	129	126	70	81	68
Physical sciences	446	450	432	92	92	89	142	141	141	212	217	202
Environmental sciences	299	284	298	80	82	81	120	112	121	98	89	96
Mathematics	318	296	285	85	88	85	105	85	91	129	124	109
Computer science	332	281	284	78	79	80	95	89	90	159	113	114
Agricultural sciences	96	94	95	42	41	40	30	27	25	24	26	30
Biological sciences	480	482	464	100	100	100	163	174	175	217	208	188
In universities and colleges	456	451	434	95	94	94	144	149	152	217	208	188
In medical schools	94	105	125	50	55	60	44	50	66	0	0	0
Medical sciences	268	267	267	85	87	89	114	123	133	69	57	44
In universities and colleges	205	189	208	67	67	67	70	64	96	69	57	44
In medical schools	134	141	146	63	64	66	71	77	80	0	0	0
Psychology	403	402	377	87	86	84	131	132	142	185	184	150
Social sciences	360	347	318	89	91	87	127	117	114	144	140	116
Other, not elsewhere classified	92	69	71	45	40	37	35	18	26	12	11	7

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-5. Number of public and private research-performing institutions with space assigned to science and engineering (S&E) fields, and number with assigned research space in S&E fields: 1988, 1990, and 1992

Field	Institutions with S&E space						Institutions with S&E research space					
	Public			Private			Public			Private		
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	320	319	319	205	206	206	316	319	311	197	198	190
Engineering	219	225	220	76	73	84	207	222	204	76	73	77
Physical sciences	286	285	283	188	186	185	280	280	269	165	170	164
Environmental sciences	224	221	210	99	105	119	213	195	193	87	88	105
Mathematics	277	275	275	178	182	184	218	197	184	101	98	101
Computer science	253	247	264	173	158	162	213	164	192	120	116	92
Agricultural sciences	99	96	88	6	7	10	90	87	84	6	7	10
Biological sciences	309	313	314	190	196	199	305	298	286	175	184	178
In universities and colleges	291	291	296	184	187	189	287	277	266	168	174	168
In medical schools	68	70	79	26	35	49	68	70	77	26	35	49
Medical sciences	220	233	219	74	85	88	197	190	186	71	77	81
In universities and colleges	196	202	195	38	48	62	170	152	156	36	37	51
In medical schools	86	89	96	51	55	54	82	86	92	51	55	54
Psychology	286	285	269	186	185	166	263	261	245	140	141	132
Social sciences	272	278	262	189	169	159	246	244	214	114	103	103
Other, not elsewhere classified	92	63	61	19	13	21	73	57	53	19	13	18

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-6. Total net assigned square feet (NASF) of space in science and engineering fields, by field and institution type: 1988, 1990, and 1992

[NASF in thousands]

Field	Total			Institution type								
				Doctorate-granting						Nondoctorate-granting		
				Top 100 in research expenditures			Other					
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	270,621	276,041	285,383	165,655	163,911	171,895	75,070	80,024	84,340	29,859	32,107	29,148
Engineering	40,063	42,291	43,150	24,422	24,810	26,089	11,353	12,177	12,505	4,288	5,303	4,556
Physical sciences	35,634	37,542	36,772	18,807	19,264	19,075	9,677	9,854	10,613	7,150	8,425	7,085
Environmental sciences	12,268	12,019	12,411	7,816	7,598	6,799	3,239	3,222	4,371	1,214	1,199	1,241
Mathematics	4,786	5,190	5,198	2,179	2,279	2,207	1,490	1,662	1,753	1,116	1,249	1,238
Computer science	4,938	4,625	5,707	2,245	2,430	2,818	1,594	1,318	1,673	1,099	877	1,216
Agricultural sciences	29,994	34,093	33,161	22,276	24,706	25,699	5,948	7,194	5,500	1,771	2,103	1,962
Biological sciences	45,184	49,321	51,778	26,768	28,276	30,279	12,591	15,023	15,937	5,827	6,022	5,562
In universities and colleges	32,445	34,385	33,108	18,769	19,046	18,703	7,850	9,318	8,842	5,826	6,022	5,562
In medical schools	12,739	14,936	18,670	7,999	9,231	11,575	4,741	5,705	7,095	0	0	0
Medical sciences	66,231	63,168	70,104	43,201	39,024	43,245	21,782	22,930	25,244	1,247	1,214	1,615
In universities and colleges	21,387	21,955	24,572	14,699	15,090	15,576	5,441	5,651	7,380	1,247	1,214	1,615
In medical schools	44,843	41,213	45,532	28,502	23,934	27,668	16,341	17,279	17,864	0	0	0
Psychology	9,011	9,122	8,329	4,182	4,025	3,894	2,528	2,759	2,726	2,302	2,339	1,708
Social sciences	16,433	15,158	14,926	9,766	8,798	8,659	3,264	3,424	3,655	3,403	2,936	2,612
Other, not elsewhere classified	6,078	3,602	3,846	3,993	2,701	3,132	1,604	461	362	480	440	352

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-7. Total net assigned square feet (NASF) of research space in science and engineering fields, by field and institution type: 1988, 1990, and 1992

[NASF in thousands]

Field	Total			Institution type								
				Doctorate-granting						Nondoctorate-granting		
				Top 100 in research expenditures			Other					
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	112,062	116,327	122,015	80,627	81,659	87,508	26,815	29,508	29,865	4,620	5,161	4,642
Engineering	15,900	17,057	18,095	11,444	12,130	13,577	3,928	4,214	3,996	529	713	523
Physical sciences	16,024	16,121	16,353	10,443	10,429	10,487	4,236	4,232	4,767	1,344	1,459	1,099
Environmental sciences	6,313	6,056	6,728	4,645	4,534	4,145	1,458	1,314	2,251	210	208	332
Mathematics	722	790	829	397	415	437	260	300	300	65	75	92
Computer science	1,437	1,445	1,606	835	1,017	1,114	431	315	332	170	113	160
Agricultural sciences	17,622	20,821	19,910	14,433	16,032	16,714	2,821	4,247	2,737	368	542	459
Biological sciences	23,910	26,154	27,721	16,804	17,546	18,805	6,105	7,480	7,749	1,001	1,128	1,167
In universities and colleges	16,072	17,569	17,072	11,403	11,715	11,316	3,668	4,727	4,589	1,001	1,128	1,167
In medical schools	7,838	8,584	10,649	5,401	5,831	7,489	2,437	2,754	3,160	0	0	0
Medical sciences	19,363	19,721	22,374	14,573	14,090	16,374	4,681	5,518	5,899	109	113	100
In universities and colleges	5,320	4,959	6,234	4,208	4,133	4,806	1,004	713	1,328	109	113	100
In medical schools	14,042	14,762	16,139	10,365	9,957	11,569	3,677	4,805	4,571	0	0	0
Psychology	3,085	2,978	2,984	1,771	1,581	1,665	896	984	981	418	413	337
Social sciences	3,337	3,338	3,253	2,380	2,359	2,339	635	671	654	322	309	260
Other, not elsewhere classified	4,350	1,846	2,162	2,903	1,526	1,851	1,364	232	198	83	87	113

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-8. Total net assigned square feet (NASF) of space in science and engineering (S&E) fields, and research NASF in S&E fields, by field and institution control: 1988, 1990, and 1992

[NASF in thousands]

Field	Total NASF in S&E fields						Research NASF in S&E fields					
	Public			Private			Public			Private		
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	204,302	211,651	218,687	66,318	64,390	66,696	82,384	86,881	90,815	29,678	29,447	31,200
Engineering	29,780	32,224	33,252	10,284	10,066	9,898	11,593	12,562	13,383	4,306	4,495	4,712
Physical sciences	24,505	26,595	25,912	11,129	10,947	10,860	10,719	10,944	11,299	5,305	5,177	5,054
Environmental sciences	9,624	9,393	9,981	2,644	2,626	2,430	5,045	4,833	5,718	1,267	1,223	1,009
Mathematics	3,520	3,874	3,811	1,266	1,316	1,387	505	527	554	217	264	276
Computer science	3,530	3,041	3,947	1,408	1,584	1,759	875	735	973	562	710	633
Agricultural sciences	29,238	32,510	31,409	756	1,493	1,753	17,233	19,434	18,304	389	1,387	1,607
Biological sciences	32,596	35,837	36,060	12,588	13,484	15,718	16,327	18,307	19,094	7,583	7,847	8,627
In universities and colleges	24,164	26,449	25,754	8,281	7,937	7,354	11,473	13,240	13,327	4,599	4,329	3,745
In medical schools	8,433	9,388	10,306	4,307	5,547	8,364	4,854	5,067	5,768	2,984	3,517	4,881
Medical sciences	48,810	47,691	54,010	17,420	15,478	16,094	12,315	13,160	15,108	7,047	6,562	7,266
In universities and colleges	16,920	18,755	19,675	4,468	3,200	4,897	3,948	4,137	4,674	1,373	822	1,560
In medical schools	31,891	28,935	34,335	12,953	12,278	11,197	8,368	9,022	10,434	5,675	5,739	5,705
Psychology	6,254	6,415	5,960	2,758	2,706	2,369	2,216	2,102	2,148	869	876	836
Social sciences	12,284	11,071	11,305	4,149	4,087	3,621	2,794	2,684	2,601	543	655	652
Other, not elsewhere classified	4,162	3,000	3,038	1,917	602	808	2,761	1,593	1,632	1,589	253	530

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 2-9. Total net assigned square feet (NASF) of science and engineering research space that is leased or housed in temporary facilities, by institution type and control: 1988, 1990, and 1992

[NASF in thousands]

Institution type and control	Leased research space						Temporary research space					
	NASF			Percentage of total research NASF			NASF			Percentage of total research NASF		
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	3,771	3,551	4,755	3.4%	3.1%	3.9%	1,978	1,731	2,735	1.8%	1.5%	2.2%
Doctorate-granting	3,760	3,536	4,717	3.5	3.2	4.0	1,922	1,694	2,710	1.8	1.5	2.3
Top 100 in research expenditures	2,847	2,601	3,532	3.5	3.2	4.0	1,567	1,408	2,499	1.9	1.7	2.9
Other	913	935	1,185	3.4	3.2	4.0	355	285	212	1.3	1.0	0.7
Nondoctorate-granting	11	15	38	0.2	0.3	0.8	56	37	25	1.2	0.7	0.5
Public	2,315	2,145	2,869	2.8	2.5	3.2	1,692	1,477	2,448	2.1	1.7	2.7
Private	1,456	1,406	1,886	4.9	4.8	6.0	286	254	286	1.0	0.9	0.9

NOTES: All data are national estimates derived from samples representing the 525 largest research-performing U.S. universities and colleges. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-1. Number of research-performing institutions starting any projects to construct science and engineering research space, by institution type and control: 1986-93

Institution type and control	Construction project start year			
	1986 or 1987 [Actual]	1988 or 1989 [Actual]	1990 or 1991 [Actual]	1992 or 1993 [Planned]
Total	192	227	191	178
Doctorate-granting	135	154	165	157
Top 100 in research expenditures	72	71	81	77
Other	64	83	84	80
Nondoctorate-granting	57	73	27	21
Public	140	158	136	123
Doctorate-granting	103	106	116	116
Nondoctorate-granting	37	52	20	8
Private	52	68	55	55
Doctorate-granting	32	48	49	41
Nondoctorate-granting	19	21	7	14

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-2. For projects to construct science and engineering research space, estimated net assigned square feet (NASF) of research space to be created and estimated total cost of the construction of this research space, by institution type and control: 1986-93

[NASF in thousands; dollars in millions]

Institution type and control	Construction project start year							
	1986 or 1987 [Actual]		1988 or 1989 [Actual]		1990 or 1991 [Actual]		1992 or 1993 [Planned]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	9.922	$2,051	10,647	$2,464	11,433	$2,976	12,405	$3,214
Doctorate-granting	8,908	1,888	9,840	2,315	11,022	2,847	12,014	3,150
Top 100 in research expenditures	7,261	1,599	6,073	1,558	6,972	2,022	8,197	2,465
Other	1,647	288	3,767	757	4,050	826	3,818	685
Nondoctorate-granting	1,014	163	807	150	411	128	391	64
Public	7,344	1,355	8,115	1,727	8,268	2,020	9,055	2,204
Doctorate-granting	6,516	1,220	7,460	1,626	7,942	1,906	8,821	2,175
Nondoctorate-granting	828	134	656	101	325	114	234	29
Private	2,578	696	2,532	738	3,165	956	3,351	1,010
Doctorate-granting	2,392	667	2,381	689	3,079	941	3,194	975
Nondoctorate-granting	186	29	152	48	86	15	157	35

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

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Table 3-3. Number of research-performing institutions starting any projects to construct science and engineering research space, by field: 1986-93

Field	Construction project start year			
	1986 or 1987 [Actual]	1988 or 1989 [Actual]	1990 or 1991 [Actual]	1992 or 1993 [Planned]
Total	192	227	191	178
Engineering	79	52	48	52
Physical sciences	41	67	50	35
Environmental sciences	28	17	42	23
Mathematics	3	5	13	5
Computer science	28	21	20	14
Agricultural sciences	36	32	28	29
Biological sciences	58	107	91	72
In universities and colleges	43	87	57	52
In medical schools	20	26	41	29
Medical sciences	54	47	86	75
In universities and colleges	18	14	33	34
In medical schools	42	35	62	58
Psychology	21	11	29(1)	12
Social sciences	19	13		18
Other, not elsewhere classified	14	13	22	8

(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-4. For projects to construct science and engineering research space, estimated net assigned square feet (NASF) of research space to be created and estimated total cost of the construction of this research space, by field: 1986-93

[NASF in thousands; dollars in millions]

Field	Construction project start year							
	1986 or 1987 [Actual]		1988 or 1989 [Actual]		1990 or 1991 [Actual]		1992 or 1993 [Planned]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	9,922	$2,051	10,647	$2,464	11,433	$2,976	12,405	$3,214
Engineering	2,390	430	1,490	388	1,697	395	1,725	471
Physical sciences	799	182	2,000	401	1,609	430	719	282
Environmental sciences	380	57	324	82	529	170	792	110
Mathematics	9	2	25	8	46	12	26	4
Computer science	237	61	286	65	293	40	447	120
Agricultural sciences	1,513	150	1,146	152	955	175	1,176	199
Biological sciences	1,708	463	2,262	577	2,800	832	2,813	780
In universities and colleges	1,275	324	1,549	396	1,374	451	1,057	331
In medical schools	433	139	712	181	1,426	381	1,755	449
Medical sciences	1,948	505	2,253	647	2,961	807	3,826	996
In universities and colleges	613	203	306	61	673	151	959	211
In medical schools	1,335	302	1,948	587	2,288	655	2,868	786
Psychology	132	23	115	25	164(1)	36(1)	153	50
Social sciences	202	38	329	48			417	115
Other, not elsewhere classified	603	139	418	70	380	79	312	87

(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-5. Number of institutions performing major repair/renovation of science and engineering research facilities, by institution type and control: 1986-93

Institution type and control	Repair/renovation project start year			
	1986 or 1987 [Actual]	1988 or 1989 [Actual]	1990 or 1991 [Actual]	1992 or 1993 [Planned]
Total	288	248	244	223
Doctorate-granting	224	204	212	172
Top 100 in research expenditures	96	85	91	78
Other	128	119	121	94
Nondoctorate-granting	64	44	32	51
Public	210	164	155	141
Doctorate-granting	163	133	137	125
Nondoctorate-granting	47	31	17	16
Private	78	84	89	92
Doctorate-granting	61	71	75	47
Nondoctorate-granting	17	14	15	35

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-6. For major projects to repair/renovate science and engineering (S&E) research space, estimated net assigned square feet (NASF) of research space affected and estimated total cost of this repair/ renovation, by institution type and control, and year of project start: 1986-93

[NASF in thousands; dollars in millions]

Institution type and control	Repair/renovation project start year							
	1986 or 1987 [Actual]		1988 or 1989 [Actual]		1990 or 1991 [Actual]		1992 or 1993 [Planned]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	13,431	$838	11,449	$1,010	8,655	$835	5,993	$895
Doctorate-granting	12,841	793	10,993	979	8,352	794	5,802	868
Top 100 in research expenditures	9,124	596	7,781	483	5,622	633	4,302	714
Other	3,717	197	3,212	496	2,730	161	1,501	154
Nondoctorate-granting	590	45	456	30	303	41	190	27
Public	8,745	436	8,223	699	5,460	459	4,045	593
Doctorate-granting	8,307	399	7,890	674	5,295	431	3,979	584
Nondoctorate-granting	438	37	333	25	165	28	66	8
Private	4,685	402	3,226	311	3,195	376	1,948	302
Doctorate-granting	4,534	393	3,102	305	3,057	363	1,823	283
Nondoctorate-granting	152	9	123	6	137	14	125	19

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-7. Number of research-performing institutions performing major repair/renovation of science and engineering research facilities, by field: 1986-93

Field	Repair/renovation project start year			
	1986 or 1987 [Actual]	1988 or 1989 [Actual]	1990 or 1991 [Actual]	1992 or 1993 [Planned]
Total	288	248	244	223
Engineering	118	106	71	59
Physical sciences	98	104	98	64
Environmental sciences	40	26	37	45
Mathematics	25	26	12	17
Computer science	49	16	29	4
Agricultural sciences	32	24	25	18
Biological sciences	137	138	133	92
In universities and colleges	112	121	96	71
In medical schools	44	44	59	35
Medical sciences	85	85	103	79
In universities and colleges	28	32	41	28
In medical schools	75	70	92	65
Psychology	35	20	44[1]	27
Social sciences	29	17		24
Other, not elsewhere classified	17	17	23	11

(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-8. For major projects to repair/renovate science and engineering research space, estimated net assigned square feet (NASF) of research space affected, and estimated total cost of this repair/ renovation, by field: 1986-93

[NASF in thousands; dollars in millions]

Field	Repair/renovation project start year							
	1986 or 1987 [Actual]		1988 or 1989 [Actual]		1990 or 1991 [Actual]		1992 or 1993 [Planned]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	13,431	$838	11,449	$1,010	8,606	$826	5,986	$894
Engineering	2,716	141	1,630	361	1,159	82	1,037	108
Physical sciences	1,746	105	1,928	165	1,680	151	751	82
Environmental sciences	362	21	930	18	450	16	360	31
Mathematics	37	4	136	11	39	6	17	9
Computer science	193	17	144	9	164	21	34	2
Agricultural sciences	628	20	530	23	391	35	302	20
Biological sciences	3,611	225	3,461	201	2,356	258	1,513	253
In universities and colleges	2,555	146	2,203	126	1,055	135	707	121
In medical schools	1,056	78	1,259	76	1,301	123	806	133
Medical sciences	3,236	226	2,302	185	2,070	219	1,547	343
In universities and colleges	737	52	705	24	627	53	260	29
In medical schools	2,499	174	1,598	161	1,443	166	1,287	313
Psychology	256	14	88	11	254[1]	31[1]	129	13
Social sciences	181	36	119	8			141	14
Other, not elsewhere classified	465	30	180	17	42	6	154	19

(1) Psychology and social sciences were not differentiated in the questionnaire item for the 1990+91 period.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-9. Cost of recent and planned projects to construct and repair/renovate central research infrastructure facilities, by type of facility: 1990-93

[Dollars in millions]

Type of central research infrastructure facility	Year and type of project			
	1990 or 1991 [Actual]		1992 or 1993 [Planned]	
	Construction	Repair/renovation	Construction	Repair/renovation
Number of institutions with expenditures for infrastructure projects	35	38	47	28
Total	$69	$50	$60	$71
Central computing and telecommunications	41	26	28	32
Central toxic waste storage/disposal	13	3	24	11
Other	15	22	8	28

NOTES: Findings are limited to central research infrastructure projects with estimated total cost at completion of $100,000 or more for research-related components. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-10. Cost of construction and repair/renovation of central research infrastructure facilities, by institution type and control, year, and type of facility: 1990-93

[Dollars in millions]

Institution type and control	Year and type of facility							
	1990 or 1991 [Actual]				1992 or 1993 [Planned]			
	Total	Computing	Toxic waste	Other	Total	Computing	Toxic waste	Other
Total	$120	67	16	37	131	60	35	36
Doctorate-granting	119	66	16	37	126	56	34	36
Top 100 in research expenditures	69	28	4	36	111	47	30	34
Other	50	38	12	1	15	9	4	2
Nondoctorate-granting	1	1	0	0	4	4	1	0
Public	91	61	11	20	117	49	32	35
Doctorate-granting	91	60	11	20	113	46	32	35
Nondoctorate-granting	0	0	0	0	3	3	1	0
Private	28	6	5	17	14	11	2	0
Doctorate-granting	28	6	5	17	13	10	2	0
Nondoctorate-granting	1	1	0	0	1	1	0	0

NOTES: Findings are limited to central research infrastructure projects with estimated total cost at completion of $100,000 or more for research-related components. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-11. Number of research-performing institutions and total project completion cost of all repair/renovation projects between $5,000 and $100,000 for science and engineering research facilities, by institution type and control: 1990 and 1991

[Dollars in millions]

Institution type and control	Number of institutions	Total completion costs
Total	355	$146
Doctorate-granting	242	141
Top 100 in research expenditures	91	97
Other	151	44
Nondoctorate-granting	112	5
Public	220	97
Doctorate-granting	165	95
Nondoctorate granting	55	2
Private	135	49
Doctorate-granting	77	46
Nondoctorate-granting	58	3

NOTES: Project costs reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 3-12. Number of research-performing nondoctorate-granting institutions reporting repair/renovation projects between $5,000 and $100,000 for science and engineering research facilities, and total project completion cost of these projects, by field: 1990 and 1991

[Dollars in thousands]

Field	Number of institutions with projects	Total completion cost of projects
Total	112	$5,456
Engineering	18	578
Physical sciences	50	1,509
Environmental sciences	27	606
Mathematics	4	33
Computer science	16	133
Agricultural sciences	3	124
Biological sciences	61	1,311
In universities and colleges	61	1,311
In medical schools	0	0
Medical sciences	8	126
In universities and colleges	8	126
In medical schools	0	0
Psychology	25	562
Social sciences	20	448
Other, not elsewhere classified	4	25

NOTES: Project costs reflect research components only. Costs for central research infrastructure facilities are excluded.
Discipline breakdowns for repair/renovation projects costing under $100,000 were obtained only from nondoctorate-granting institutions.
Because of rounding, components may add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-1. Research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of construction funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$2,050.6	145.4	779.1	487.5	289.8	313.1	3.1	31.9
Doctorate-granting	1,887.7	129.9	690.4	462.5	289.2	280.1	3.1	31.9
Nondoctorate-granting	162.9	15.5	88.7	25.1	0.6	33.1	0.0	0.0
1988 or 1989:								
Total	2,464.5	352.0	890.7	459.2	343.8	320.2	95.9	0.8
Doctorate-granting	2,315.0	339.0	807.3	411.7	338.3	320.2	95.9	0.8
Nondoctorate-granting	149.5	13.0	83.4	47.5	5.6	0.0	0.0	0.0
1990 or 1991:								
Total	2,975.6	476.3	956.6	352.6	394.1	727.5	35.4	33.1
Doctorate-granting	2,847.3	465.5	947.9	348.0	390.3	627.0	35.4	33.1
Nondoctorate-granting	128.4	10.8	8.7	4.6	3.8	100.5	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-2. Research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of construction funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$837.9	27.3	233.1	101.0	328.0	137.6	3.8	7.4
Doctorate-granting	792.7	23.5	201.7	99.3	325.2	132.2	3.8	7.4
Nondoctorate-granting	45.2	3.7	31.4	1.6	3.0	5.4	0.0	0.0
1988 or 1989:								
Total	1,009.5	61.1	233.8	52.1	570.8	69.9	15.9	5.2
Doctorate-granting	979.2	55.9	226.6	42.1	563.6	69.8	15.9	5.2
Nondoctorate-granting	30.3	5.1	7.1	10.0	7.2	0.0	0.0	0.0
1990 or 1991:								
Total	825.7	49.0	243.0	100.6	355.4	66.4	8.0	3.2
Doctorate-granting	794.1	48.3	227.3	97.5	346.7	63.2	8.0	3.2
Nondoctorate-granting	31.6	0.7	15.8	3.2	8.7	3.3	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-3. Private research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of construction funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$695.8	105.1	24.6	228.4	180.6	123.6	0.7	31.7
Doctorate-granting	667.3	98.5	24.5	223.9	180.0	107.0	0.7	31.7
Nondoctorate-granting	28.5	6.6	0.2	4.5	0.6	16.7	0.0	0.0
1988 or 1989:								
Total	737.5	77.7	52.3	266.3	87.5	165.7	87.8	0.2
Doctorate-granting	689.4	70.7	52.3	226.9	85.9	165.6	87.8	0.2
Nondoctorate-granting	48.1	7.0	0.0	39.4	1.7	0.0	0.0	0.0
1990 or 1991:								
Total	955.6	88.2	147.2	213.5	123.9	328.9	27.6	26.2
Doctorate-granting	940.9	83.2	147.2	208.9	120.1	327.6	27.6	26.2
Nondoctorate-granting	14.7	5.0	0.0	4.6	3.8	1.3	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-4. Public research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of construction funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$1,354.8	40.3	754.5	259.1	109.2	189.5	2.4	0.2
Doctorate-granting	1,220.4	31.4	665.9	238.6	109.2	173.1	2.4	0.2
Nondoctorate-granting	134.4	8.9	88.5	20.6	0.0	16.4	0.0	0.0
1988 or 1989:								
Total	1,727.0	274.3	838.4	192.9	256.3	154.5	8.1	0.6
Doctorate-granting	1,625.6	268.3	755.0	184.8	252.4	154.6	8.1	0.6
Nondoctorate-granting	101.4	6.0	83.4	8.1	3.9	0.0	0.0	0.0
1990 or 1991:								
Total	2,020.0	388.1	809.4	139.1	270.2	398.6	7.8	6.9
Doctorate-granting	1,906.4	382.3	800.7	139.1	270.2	299.4	7.8	6.9
Nondoctorate-granting	113.7	5.8	8.7	0.0	0.0	99.2	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-5. Private research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of repair/renovation funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$402.0	14.1	6.5	86.0	172.9	112.1	3.5	7.2
Doctorate-granting	393.4	12.6	6.6	85.0	171.8	107.2	3.5	7.2
Nondoctorate-granting	8.6	1.5	0.0	1.0	1.2	4.9	0.0	0.0
1988 or 1989:								
Total	311.0	29.7	4.5	30.1	167.3	63.3	11.0	5.2
Doctorate-granting	305.3	29.4	4.5	28.2	163.8	63.3	11.0	5.2
Nondoctorate-granting	5.7	0.2	0.0	1.9	3.6	0.0	0.0	0.0
1990 or 1991:								
Total	376.4	24.4	9.5	56.8	220.8	54.3	8.0	2.6
Doctorate-granting	362.8	24.4	9.5	53.7	213.6	51.1	8.0	2.6
Nondoctorate-granting	13.6	0.0	0.0	3.2	7.2	3.3	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-6. Public research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-91

[Dollars in millions]

Year of project start and type of institution	Total	Source of repair/renovation funds						
		Government		Private donations	Institution funds	Tax-exempt bonds	Other debt	Other
		Federal	State/local					
1986 or 1987:								
Total	$435.9	13.2	226.6	15.0	155.1	25.5	0.3	0.2
Doctorate-granting	399.3	10.9	195.1	14.3	153.4	25.0	0.3	0.2
Nondoctorate-granting	36.6	2.2	31.4	0.6	1.8	0.5	0.0	0.0
1988 or 1989:								
Total	698.5	31.4	229.3	22.0	403.5	6.6	4.9	0.0
Doctorate-granting	673.9	26.5	222.1	13.9	399.8	6.5	4.9	0.0
Nondoctorate-granting	24.6	4.9	7.1	8.1	3.6	0.0	0.0	0.0
1990 or 1991:								
Total	449.3	24.6	233.5	43.8	134.6	12.1	0.0	0.6
Doctorate-granting	431.3	23.9	217.8	43.8	133.1	12.1	0.0	0.6
Nondoctorate-granting	18.0	0.7	15.8	0.0	1.5	0.0	0.0	0.0

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research-related space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 4-7. Number of private research-performing institutions, by status relative to the $150 million limit on institution tax-exempt bonds: 1988, 1990, and 1992

Status relative to the $150 million limit on tax-exempt bonds	Total			Doctorate-granting private			Nondoctorate-granting private		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	205	206	206	103	103	102	103	103	104
Have reached the limit	20	23	28	20	23	28	0	0	0
Have not, but expect to reach the limit in next 2 fiscal years	9	12	2	8	12	2	1	0	0
Have not, and do not expect to reach the limit in next 2 fiscal years	176	171	176	75	68	72	102	103	104

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table S-1. Condition of science and engineering (S&E) research facilities, by institution type and control: 1988, 1990, and 1992

[Percentage of institutions' S&E research space]

Institution type and control	Condition of research facilities and year												
	Suitable for use in most scientifically sophisticated research			Effective for most uses, but not most scientifically sophisticated			Requires limited repair/renovation to be used effectively			Requires major/repair renovation to be used effectively[1]			Requires replacement[2]
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992	1992
Total	23.9%	25.9	26.8	36.8	35.3	34.7	23.5	23.3	22.6	15.8	15.5	12.8	3.1
Doctorate-granting	24.3	26.2	27.2	36.2	34.8	34.3	23.5	23.3	22.4	16.0	15.7	12.9	3.2
Top 100 in research expenditures	23.9	27.2	26.7	35.0	33.4	31.8	24.0	22.9	23.4	17.1	16.5	14.2	3.9
Other	25.6	23.5	28.8	39.8	38.6	41.8	21.8	24.2	19.3	12.8	13.6	9.2	1.0
Nondoctorate-granting	15.6	18.9	16.8	49.5	47.2	43.0	23.8	22.8	29.2	11.1	11.1	9.8	1.2
Public	23.1	24.5	25.5	36.2	35.7	34.8	24.4	23.9	23.1	16.4	15.9	13.1	3.5
Doctorate-granting	23.4	24.6	25.7	35.7	35.4	34.6	24.4	24.0	22.9	16.6	16.0	13.2	3.6
Nondoctorate-granting	17.5	21.1	19.1	48.0	44.3	41.8	24.0	22.7	26.8	10.4	11.8	11.2	1.1
Private	26.2	30.1	30.8	38.4	34.1	34.3	21.0	21.2	21.4	14.4	14.5	11.7	1.8
Doctorate-granting	27.0	31.1	31.8	37.6	32.9	33.6	20.9	21.1	20.7	14.5	14.8	12.0	1.9
Nondoctorate-granting	11.5	15.1	13.3	52.8	52.4	44.9	23.3	22.9	32.8	12.4	9.7	7.5	1.4

(1) The data for 1988 and 1990 in this category include space requiring replacement.

(2) This category was first used in the 1992 survey.

NOTE: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 5-2. Condition of science and engineering (S&E) research facilities, by field: 1988, 1990, and 1992

[Percentage of institutions' S&E research space]

Field	Condition of research facilities and year												
	Suitable for use in most scientifically sophisticated research			Effective for most uses, but not most scientifically sophisticated			Requires limited repair/renovation to be used effectively			Requires major/repair renovation to be used effectively[1]			Requires replacement[2]
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992	1992
Total	23.9%	25.9	26.8	36.8	35.3	34.7	23.5	23.3	22.6	15.8	15.5	12.8	3.1
Engineering	26.1	27.9	28.4	37.6	35.6	36.1	22.4	22.0	22.2	13.9	14.5	10.8	2.4
Physical sciences	25.7	26.3	29.9	34.5	33.5	32.5	22.3	23.7	23.0	17.5	16.5	12.5	2.1
Environmental sciences	18.7	18.7	22.5	40.6	40.4	41.9	26.0	26.1	23.7	14.7	14.8	9.5	2.4
Mathematics	29.5	25.9	30.6	45.3	44.6	47.1	19.4	21.9	17.5	5.8	7.6	3.0	1.8
Computer science	32.6	38.3	43.9	35.0	35.5	35.4	16.2	18.0	13.7	16.2	8.1	6.0	1.0
Agricultural sciences	21.2	20.3	16.8	32.5	33.6	34.3	26.2	24.1	22.7	20.0	22.0	18.5	7.7
Biological sciences	27.5	29.8	28.2	35.5	34.0	33.6	22.2	22.5	23.4	14.8	13.7	12.5	2.3
In universities and colleges	23.2	27.5	25.5	36.2	34.3	32.6	25.0	24.2	26.7	15.5	14.0	12.5	2.8
In medical schools	36.2	34.3	38.6	34.0	33.5	30.2	16.5	18.9	17.4	13.4	13.2	12.5	1.4
Medical sciences	23.2	27.3	27.9	36.5	34.6	33.6	24.2	23.8	23.2	16.0	14.3	12.4	2.9
In universities and colleges	18.1	24.0	24.4	40.1	35.1	34.4	27.2	23.8	24.0	14.6	17.0	13.8	3.4
In medical schools	25.2	28.4	29.7	35.1	34.4	33.3	23.1	23.7	22.3	16.6	13.4	12.6	2.0
Psychology	23.2	20.5	22.2	43.7	46.6	46.9	20.8	21.4	20.9	12.3	11.6	9.0	1.0
Social sciences	14.8	17.2	17.1	47.7	45.0	42.8	26.7	28.1	26.7	10.8	9.8	12.2	1.2
Other, not elsewhere classified	15.9	36.0	40.5	47.6	36.4	35.6	22.6	16.9	17.1	13.9	10.7	5.7	1.1

(1) The data for 1988 and 1990 in this category include space requiring replacement.

(2) This category was first used in the 1992 survey.

NOTE: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 5-3. Adequacy of the amount of science and engineering research space, by institution type and control: 1988, 1990, and 1992

Institution type and control	Number of institutions[1]			Percentage of institutions' assessments								
				Adequate			Generally adequate			Inadequate[2]		
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	513	517	501	11.4%	11.8%	11.4%	48.2%	46.4%	54.4%	40.4%	41.8%	34.2%
Doctorate-granting	288	287	288	10.0	10.6	11.3	46.4	44.7	53.2	43.6	44.7	35.5
Top 100 in research expenditures	100	100	100	6.1	9.5	8.2	43.9	40.2	51.5	50.0	50.3	40.3
Other	188	187	188	13.0	11.5	13.5	48.4	48.4	54.4	38.7	40.1	32.0
Nondoctorate-granting	225	229	213	14.0	13.8	11.6	50.0	49.1	56.7	36.1	37.1	31.7
Public	316	319	311	10.3	10.7	9.4	47.2	43.0	52.0	42.4	46.3	38.6
Doctorate-granting	191	190	192	8.2	8.8	8.2	44.5	42.7	52.2	47.3	48.5	39.5
Nondoctorate-granting	125	129	119	14.5	14.6	11.9	52.5	43.5	51.6	33.0	41.9	36.5
Private	197	198	190	13.9	13.9	15.4	48.9	53.3	59.1	37.2	32.7	25.5
Doctorate-granting	97	97	96	14.6	15.1	18.5	51.4	49.9	55.4	34.0	35.1	26.1
Nondoctorate-granting	101	100	94	13.1	12.5	11.0	45.8	57.7	64.2	41.1	29.8	24.7

(1) Excludes institutions that have no research space in the field and report "not applicable or not needed."

(2) Includes the category "nonexistent but needed."

NOTE: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 5-4. Adequacy of the amount of science and engineering research space, by field: 1988, 1990, and 1992

Field	Number of institutions[1]			Percentage of institutions' assessments								
				Adequate			Generally adequate			Inadequate[2]		
	1988	1990	1992	1988	1990	1992	1988	1990	1992	1988	1990	1992
Total	513	517	501	11.4%	11.8%	11.4%	48.2%	46.4%	54.4%	40.4%	41.8%	34.2%
Engineering	283	296	290	8.7	10.6	5.8	40.1	40.8	49.1	51.1	48.6	45.1
Physical sciences	445	450	433	4.7	8.7	10.6	52.4	50.8	52.3	42.9	40.5	37.0
Environmental sciences	297	284	314	11.0	11.1	10.5	49.4	48.4	59.4	39.5	40.5	30.1
Mathematics	318	296	300	21.0	17.6	16.1	53.6	47.2	58.6	25.4	35.2	25.3
Computer science	331	280	297	15.0	13.5	12.9	38.2	41.5	56.7	46.9	45.0	30.3
Agricultural sciences	96	94	96	11.0	17.0	17.5	51.2	39.9	48.2	37.7	43.1	34.3
Biological sciences	470	482	464	7.5	9.0	9.2	46.1	45.8	53.8	46.4	45.2	37.1
In universities and colleges	444	451	434	8.3	8.7	10.8	45.8	48.2	51.8	45.9	43.1	37.4
In medical schools	91	105	125	3.7	10.4	3.6	47.3	35.5	60.5	49.0	54.1	35.9
Medical sciences	255	267	268	8.8	10.4	10.1	48.7	37.5	51.7	42.5	52.0	38.2
In universities and colleges	191	189	210	14.3	13.0	14.2	46.0	40.3	50.1	39.7	46.7	35.7
In medical schools	134	141	146	0.8	7.0	4.2	52.6	33.8	54.1	46.6	59.2	41.8
Psychology	403	398	388	16.8	13.2	17.2	51.4	54.3	50.0	31.8	32.4	32.9
Social sciences	360	345	328	12.9	12.7	8.2	50.2	51.0	64.4	36.9	36.2	27.4
Other, not elsewhere classified	90	69	71	10.4	16.9	14.0	51.3	39.2	44.9	38.4	44.0	41.1

(1) Excludes institutions that have no research space in the field and report "not applicable or not needed."

(2) Includes category "nonexistent but needed."

NOTES: Because of rounding, components may not add to 100.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-1. Total net assigned square feet (NASF) of academic space, total NASF in science and engineering (S&E) fields, and research NASF in S&E fields, in historically black colleges and universities (HBCUs); original and expanded groups of institutions: 1992

[NASF in millions]

Index	Original group 1992[1]	Expanded group 1992[1]
Number of research-performing HBCUs	29	70
Total academic space[2]	16.0	28.2
Space in S&E fields	6.6	9.1
Space used for research in S&E fields	1.8	2.9

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

(2) Projected from responses of 66 percent of original group and 55 percent of expanded group.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-2. Total net assigned square feet (NASF) of space in science and engineering (S&E) fields and NASF used for research in historically black colleges and universities (HBCUs): 1988, 1990, and 1992

[NASF in thousands]

Field	Total NASF in S&E fields				Research NASF in S&E fields			
	1988	1990	1992 [Original][1]	1992 [Expanded][1]	1988	1990	1992 [Original][1]	1992 [Expanded][1]
Number of research-performing HBCUs	29	29	29	70	29	29	29	70
Total NASF	6,077	6,175	6,576	9,095	1,112	1,440	1,782	2,920
Engineering	777	979	1,207	1,353	152	167	285	302
Physical sciences	804	810	1,005	1,380	179	190	235	275
Environmental sciences	44	56	85	131	10	26	35	64
Mathematics	173	164	191	325	12	26	29	34
Computer science	150	114	160	283	43	30	42	53
Agricultural sciences	604	834	783	930	259	433	414	497
Biological sciences	1,130	934	1,009	2,145	232	291	375	1,258
In universities and colleges	509	546	621	1,757	141	170	254	1,137
In medical schools	621	388	388	388	91	121	121	121
Medical sciences	1,846	1,766	1,773	1,932	177	207	293	334
In universities and colleges	593	956	963	1,070	37	50	133	147
In medical schools	1,253	810	810	862	141	158	160	187
Psychology	119	105	86	173	14	19	16	25
Social sciences	304	322	278	438	28	47	57	78
Other, not elsewhere classified	126	91	0	5	4	4	0	0

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-3. Expenditures for central research infrastructure facilities at historically black colleges and universities (HBCUs): 1990+91

[Dollars in millions]

Type of central research infrastructure facility	Original HBCU group, 1990 or 1991[1]			Expanded HBCU group, 1990 or 1991[1]		
	Total	Construction	Repair/ renovation	Total	Construction	Repair/ renovation
Total	$1.6	0.1	1.5	1.6	0.1	1.5
Central computing and telecommunications	1.6	0.1	1.5	1.6	0.1	1.5
Central toxic waste storage/disposal	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

NOTES: Project costs are prorated to reflect research components only. The data are limited to projects with research-related total costs at completion of $100,000 or more. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-4. Research facility construction and repair/renovation projects at historically black colleges and universities (HBCUs), by project characteristics: 1986-91

Project characteristic	Original 29 HBCUs[1]				All 70 research HBCUs[1]	
	1986 or 1987 [Actual]	1988 or 1989 [Actual]	1990 or 1991 [Actual]	1992 or 1993 [Planned]	1990 or 1991 [Actual]	1992 or 1993 [Planned]
Construction projects:[2]						
Number of HBCUs with projects	11	10	6	5	10	6
Total project completion cost (in millions)	$71.8	$55.1	$22.5	$11.1	$37.6	$13.0
NASF (in thousands)	481	319	328	202	449	223
Repair/renovation projects costing $100,000+:[2]						
Number of HBCUs with projects	13	10	5	10	8	11
Total project completion cost (in millions)	$14.1	$15.8	$11.6	$5.7	$21.4	$6.5
NASF (in thousands)	137	308	129	116	177	122
Repair/renovation projects costing $5,000-$99,999:						
Number of HBCUs with projects	-	-	10	-	21	-
Total project completion costs (in millions)	-	-	$0.6	-	$1.1	-

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

(2) Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

NOTE: Because of rounding, components may not add to totals.

KEY: NASF = net assigned square feet
- = data not collected

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-5. Source of funds for science and engineering research facility construction projects at historically black colleges and universities (HBCUs): 1986-91

[Dollars in millions]

Source of funds	Year of project start			
	1986 or 1987[1]	1988 or 1989[1]	1990 or 1991 [Original][2]	1990 or 1991 [Expanded][2]
Number of institutions	29	29	29	70
Total	$71.8	$55.1	$22.5	$37.6
Federal Government	32.7	35.0	12.1	13.0
State/local government	25.8	11.5	6.3	18.0
Private donations	11.1	7.7	0.0	0.0
Institutional funds	2.3	0.9	4.2	4.6
Debt financing	0.0	0.0	0.0	0.0
Tax-exempt bonds	0.0	0.0	0.0	0.0
Other debt	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	1.9

(1) Data for the first two time periods were heavily inflated by construction activity at a single institution, which accounted for a substantial fraction of the total dollar amount shown.

(2) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for resesarch space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-6. Sources of funds for science and engineering research facilities repair/renovation projects at historically black colleges and universities (HBCUs): 1986-91

[Dollars in millions]

Source of funds	Year of project start			
	1986 or 1987	1988 or 1989	1990 or 1991 [Original][1]	1990 or 1991 [Expanded][1]
Number of institutions	29	29	29.0	70
Total	$14.1	$15.8	$11.6	$21.4
Federal Government	8.7	12.9	3.5	3.6
State/local government	4.9	0.8	8.0	17.7
Private donations	0.5	2.0	0.1	0.2
Institutional funds	0.0	0.1	0.1	0.1
Debt financing	0.0	0.0	0.0	0.0
Tax-exempt bonds	0.0	0.0	0.0	0.0
Other debt	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	0.0

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-7. Condition of science/engineering (S&E) research facilities at historically black colleges and universities (HBCUs): 1988-92

[Net assigned square feet of research space, in thousands]

Condition of research facilities	Year			
	1988	1990	1992[1] [Original]	1992[1] [Expanded]
Number of institutions with any research space in S&E disciplines	29	29	29	70
Total	1,112	1,440	1,782	2,920
Suitable for use in most sophisticated scientific research	399	445	610	652
Effective for most uses but not the most sophisticated	428	643	723	1,627
Requiring limited repair/renovation to be used effectively	195	252	299	414
Requiring major repair/renovation to be used effectively	76	100	149	225
Requires replacement[2]	-	-	0	3

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

(2) Category was first used in 1992.

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 6-8. Adequacy of amount of research space in science and engineering (S&E) disciplines at historically black colleges and universities (HBCUs): 1988-92

[Percentage of institutions]

Adequacy of amount of space	Year			
	1988	1990	1992 [Original][1]	1992 [Expanded][1]
Number of institutions with any research space in S&E disciplines	29	29	29	70
Total	100.0%	100.0%	100.0%	100.0%
Adequate	16.5	16.1	10.6	8.9
Generally adequate	53.2	49.1	55.0	50.7
Inadequate[2]	30.2	34.8	34.4	40.4

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

(2) Includes the responses "inadequate" and "nonexistent but needed."

NOTE: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 7-1. Total net assigned square feet (NASF) and research NASF of laboratory animal facilities, by institution type and control: 1992

[NASF in thousands]

Institution type and control	Laboratory animal facilities		
	Number of institutions	Total space	Research space
Total	462	11,340	9,320
Doctorate-granting	280	10,792	9,013
Top 100 in research expenditures	99	8,337	7,116
Other	181	2,455	1,897
Nondoctorate-granting	183	549	306
Public	290	8,394	6,760
Doctorate-granting	192	8,018	6,572
Nondoctorate-granting	98	376	189
Private	172	2,946	2,559
Doctorate-granting	87	2,774	2,442
Nondoctorate-granting	85	173	118

NOTES: Refers to institutions reporting any space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 7-2. Government regulation status of laboratory animal facilities, by institution type and control: 1992

[Percentage of current laboratory animal facility research space]

Institution type and control	Regulation status of laboratory animal facilities			
	Total	Fully meets government regulations	Needs limited repair/renovation to meet regulations	Needs major repair/renovation or replacement to meet regulations
Total	100%	86	8	6
Doctorate-granting	100	86	8	6
Top 100 in research expenditures	100	85	9	6
Other	100	90	7	3
Nondoctorate-granting	100	92	5	3
Public	100	86	10	5
Doctorate-granting	100	86	10	5
Nondoctorate-granting	100	89	7	4
Private	100	87	5	8
Doctorate-granting	100	87	5	8
Nondoctorate-granting	100	96	3	1

NOTES: Refers to institutions with any research space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals.
Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 7-3. Total cost of repair/renovation and construction projects in laboratory animal facilities planned for 1992 and 1993, by institution type and control

[Dollars in millions]

Institution type and control	Number of institutions planning projects	Total cost of planned projects
Total	199	$220
Doctorate-granting	152	217
Top 100 in research expenditures	67	132
Other	85	85
Nondoctorate-granting	47	3
Public	127	178
Doctorate-granting	110	177
Nondoctorate-granting	16	1
Private	72	42
Doctorate-granting	41	40
Nondoctorate-granting	31	2

NOTES: Refers to institutions with any research space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals.
Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

Table 7-4. Laboratory animal facilities at historically black colleges and universities (HBCUs): 1992

Indicator	Original group[1]	Expanded group[1]
Total NASF in laboratory animal facilities (in thousands)	143.5	168.1
Research NASF in laboratory animal facilities (in thousands)	118.2	137.6
Regulation status (in percentage of NASF):		
Fully meets government regulations	93.9%	93.6%
Needs limited repair to meet regulations	4.4	4.9
Needs major work or replacement to meet regulations	1.7	1.5
Cost of planned construction and repair/renovation of laboratory animal facilities, FY 1992 and FY 1993 (dollars in thousands)	$726.1	$795.2

(1) The original group consists of the 29 HBCUs also surveyed in 1988 and 1990; the expanded group is the 1992 population of all research-performing HBCUs.

KEY: NASF = net assigned square feet

NOTE: Because of rounding, components may not add to 100.

SOURCE: National Science Foundation/SRS, *Scientific and Engineering Research Facilities at Universities and Colleges: 1992*

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