
Chapter 2

Adequacy and Condition of Research Space

Highlights . . .

- ◆ Fifty percent or more of all research-performing institutions indicated inadequate amounts of science and engineering (S&E) research space in the biological sciences outside of medical schools, the physical sciences, engineering, agriculture, the medical sciences outside of medical schools, and the medical sciences in medical schools.
- ◆ Eighteen percent of all S&E research space was considered to require major renovation or replacement. This portion of space amounts to 24.5 million net assignable square feet (NASF).
- ◆ Since 1988, the agricultural sciences has been the field with the greatest amount of S&E space needing repair/renovation or replacement. In 1996, 5.3 million NASF of agriculture research space were reported as needing repair/renovation or replacement, an increase from 3.6 million NASF in 1988.

Background

Information focused solely on the amount of S&E research space and its growth or decline over time is insufficient for understanding whether there is enough space to conduct any form of research, and whether the condition of that space is suitable for conducting particularly sophisticated research. Assessments of both the quantity and quality of existing research space made by respondents at each institution in 1996, and over time, are examined below.

The Survey Questions

Respondents were asked to rate the adequacy of the amount of research space in each field at their institution by choosing one of the following (see Item 2 of the survey in Appendix C):

- A Adequate amount of space: sufficient to support all current S&E research program commitments in the field;
- B Inadequate amount of space: not sufficient to support the needs of your current S&E research program commitments in the field; or non-existent, but needed; or
- NA Not applicable or no space needed in this field.

For each field, respondents indicated the condition of research space by reporting the percentage of space falling into one of the following categories (see Item 3 of the survey in Appendix C):

- A Suitable for use in the most scientifically competitive research in the field;
- B Effective for most levels of research in the field, but may need limited repair/renovation;
- C Requires major renovation or replacement to be used effectively (includes categories D and E from 1994 survey); or
- NA Not applicable or no research space in this field.

To determine the overall amount and percentage of space that was rated in each of the above-listed categories, the amount of research space in each field (reported in Item 1a) was multiplied by the percentage of space reported in each of the above

categories and totaled across fields. If a university had 1,000 net assignable square feet (NASF) of research space in physical sciences and 30 percent of that space “requires major repair,” 300 NASF ($1000 \times .30$) were considered to require major repair. These calculations were performed for each field for each institution, and they were summed to provide the total amount of space in each category.

Data Considerations

The survey measures both the adequacy of the amount of S&E research space and the condition of this space in each S&E field. Responses are based upon the assessments of a variety of different individuals, including the survey coordinator at the institution, as well as deans and other administrators. It must be noted that the two questions designed to gather information about the adequacy of the amount of research space and its condition elicit more subjective responses than do other survey items.

Furthermore, the wording and response choices of both of the above questions differ slightly from the version used two years earlier. In 1994, five categories were listed to elicit assessments of the amount of research space available, and five categories measured the condition of S&E research space. That being the case, changes in the percentages of institutions reporting the adequacy and condition of their research space must be interpreted cautiously.

For the first time, the 1996 survey asked respondents to report additional space needed to support current S&E research program commitments. They also were asked to indicate the amount of space rated as needing major renovation or replacement, which is funded and scheduled to be renovated or replaced. Responses to these questions, included as parts of Items 2 and 3, are presented in Chapter 6.

Findings

Was the Amount of S&E Research Space Sufficient for Current Research Commitments?

Reports of inadequate research space varied across field and institution type. The percentage of institutions indicating that the amount of available S&E research space was inadequate ranged from 30 percent for mathematics to 66 percent for the

medical sciences in medical schools (Table 2-1). Over half of all institutions reported inadequate amounts of space in the medical sciences in medical schools (66 percent), engineering (57 percent), the medical sciences outside of medical schools (57 percent), the physical sciences (54 percent), the biological sciences outside of medical schools (53 percent), and agricultural sciences (52 percent). Nearly half of the institutions reported inadequate amounts of space in five additional fields: the social sciences (47 percent); the biological sciences in medical schools (46 percent); earth, atmospheric, and ocean sciences (46 percent); the computer sciences (44 percent); and psychology (44 percent). About one third (30 percent) of the institutions reported that mathematics, the remaining field, had inadequate research space.

Table 2-1. Percentage of institutions reporting inadequate amounts of science and engineering (S&E) research space in existing fields by institution type and field: 1996 ¹

Field	Total	Institution type		
		Doctorate-granting		Nondoctorate-granting
		Top 100 in research expenditures	Other	
Biological sciences-- outside medical school	53%	61%	49%	52%
Physical sciences	54	56	55	51
Psychology	44	43	42	42
Social sciences	47	55	42	44
Mathematics	30	30	26	32
Computer sciences	44	39	36	47
Earth, atmospheric, and ocean sciences	46	46	39	47
Engineering	57	57	57	48
Agricultural sciences	52	30	50	35
Medical sciences-- outside medical school	57	44	65	47
Medical sciences-- medical school	66	40	69	-
Biological sciences-- medical school	46	31	38	-

¹ Includes both "inadequate amount" and "nonexistent space, but needed."

KEY: "-" = Number of institutions less than 5; included in total.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

The top 100 institutions were most likely to indicate inadequate research space in the biological sciences outside of medical schools, with 61 percent reporting this to be the case. Three other fields were reported to have inadequate research space by over half of the top 100 institutions: the physical sciences (56 percent), the social sciences (55 percent), and engineering (57 percent).

Medical sciences space was most likely to be reported as inadequate by the other doctorate-granting universities, both outside medical schools (65 percent) and within (69 percent). In fact, the percentages of those institutions indicating medical science space to be inadequate were much higher than for the top 100 institutions.

Two fields, the biological sciences outside of medical schools (52 percent) and the physical sciences (51 percent), were listed by over half of the nondoctorate-granting institutions as having inadequate S&E research space.

What Was the Condition of S&E Research Space?

Over a third (37 percent) of the S&E research space at research-performing institutions was rated as “suitable for use in the most scientifically sophisticated research.” While 38 percent of the S&E research space at doctorate-granting institutions also was rated this way, as was 37 percent at the other doctorate-granting institutions, less than a quarter (24 percent) of the S&E research space at nondoctorate-granting institutions was reported in the highest quality category (Table 2-2).

Table 2-2. Institutional assessment of the quality and condition of science and engineering (S&E) research space by institution type: 1996
[Percentage of space]

<i>Institution type</i>	<i>Suitable for the most scientifically competitive research in the field</i>	<i>Effective for most levels of research</i>	<i>Requires major renovation or replacement</i>
Total	37%	44%	18%
Doctorate-granting	38	43	18
Top 100 in research expenditures	38	43	19
Other	37	45	17
Nondoctorate-granting	24	57	18

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Colleges and universities classified a total of 18 percent of their S&E research space as requiring either major repair/renovation or replacement. There was general consistency among the different types of institutions regarding the amount of S&E research space in this condition, with 19 percent of the S&E research space at the top 100 doctorate-granting institutions, 17 percent of the research space at other

doctorate-granting institutions, and 18 percent of the research space at the nondoctorate-granting institutions requiring major repair/renovation or replacement.

Such similarities across institution types mask large differences in actual amounts of space. The 18 percent of space rated as needing major repair/renovation at the top 100 universities, for instance, actually represents 17.6 million NASF, whereas the 18 percent of space rated in the same category at nondoctorate-granting institutions represents only 1.1 million. In total, the nation's research-performing institutions reported that 24.5 million NASF of research space required major repair/renovation or replacement.

How Much S&E Research Space in Each Field Required Either Repair/Renovation or Replacement?

Similar to 1994, in 1996, institutions reported research space in the agricultural sciences to have the greatest need for repair/renovation or replacement. Of the 22 million NASF of S&E research space in the agricultural sciences (Table 1-6), 5.3 million NASF were assessed as requiring repair/renovation or replacement (Table 2-3). This space is approximately one quarter of the total S&E research space in that field. This relatively large need is concentrated in a small number of institutions (only 20 percent of all research-performing institutions had research space in the agricultural sciences).

Table 2-3. Trends in the amount of science and engineering (S&E) research space requiring repair/renovation or replacement by field: 1988-1996
[NASF in millions]

<i>Field</i>	<i>1988</i>	<i>1990</i>	<i>1992</i> ¹	<i>1994</i> ¹	<i>1996</i>
Biological sciences--outside medical school	2.4	2.5	2.6	3.2	3.4
Physical sciences	2.9	2.7	2.4	3.1	3.4
Psychology	0.4	0.4	0.3	0.4	0.4
Social sciences	0.3	0.3	0.4	0.3	0.5
Mathematics	0.1	0.1	0.1	0.1	0.1
Computer sciences	0.2	0.1	0.1	0.1	0.2
Earth, atmospheric, and ocean sciences	0.9	0.9	0.8	1.3	1.3
Engineering	2.2	2.6	2.3	3.2	4.0
Agricultural sciences	3.6	4.6	5.2	4.4	5.3
Medical sciences--outside medical school	0.8	0.9	1.0	1.0	1.5
Medical sciences--medical school	2.4	1.9	2.7	2.9	3.6
Biological sciences--medical school	1.0	1.2	1.6	1.6	1.6

¹ Includes both "requires major repair or renovation" and "requires replacement."

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Institutions also indicated (in 1996) that 4 million NASF of engineering research space required repair/renovation or replacement. Medical sciences in medical schools contained 3.6 million NASF, and the biological sciences outside of medical schools and the physical sciences each contained 3.4 million in need of repair/renovation or replacement.

Since 1988, the amount of research space requiring repair/renovation or replacement in many of the S&E fields increased. In the agricultural sciences, the amount increased from 3.6 million NASF in 1988 to 5.3 million in 1996. In every year of the survey, the agricultural sciences were reported to be the field with the greatest amount of space in this condition. The amount of S&E research space in the biological sciences outside of medical schools requiring repair/renovation or replacement increased from 2.4 million NASF in 1988 to 3.4 million in 1996. Engineering space in this condition grew from 2.2 million NASF to 4.0 million.