# MATHEMATICS RESEARCH LIBRARIES AT THE END OF THE TWENTIETH CENTURY

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Contents



## 1. Overview

Libraries are special resources in mathematics, and their health is a matter of concern not only to librarians but also to mathematicians. Spiraling journal costs, budget problems, space problems, and the increasing role of electronic media continue to require decisions that affect every aspect of the operation.

In the late 1980's, the AMS became interested in collecting data on mathematics research libraries to replace anecdotal information. The overall purpose is to assist librarians and mathematicians to build and maintain the best possible mathematics research libraries in academic institutions. The first AMS survey of mathematics research libraries was conducted in the fall of 1990 (*Notices of the AMS*, December 1991, 1258–1262). As in 1990, the goal of the 1996 survey is to document the state of the system.

The 1996 survey was run in the fall of 1996 and extended into February 1997. As in 1990, the questionnaire was sent to all institutions granting the doctorate in mathematics in the US and Canada (see Section 3). The questionnaire was designed to be filled out by the librarian in charge of the Mathematics Library, which is defined as the main mathematics collection used by the mathematics faculty and graduate students, whether this collection is housed in a general library or some other structure such as a science library or branch library. In

*Date*: August 4, 1997.

some institutions, there is more than one collection which is important to mathematicians, and rather than combine data it was requested that these collections should be reported separately. The focus, however, is on the main collection in each institution. A copy of the questionnaire appears in Section 4.

The questionnaire was sent to 25 institutions in AMS Group I public, 23 in Group I private, 56 in Group II, 72 in Group III, and to 29 Canadian doctoral-granting departments. The US peer groups are determined by "scholarly quality of program faculty," as reported in the 1995 publication, *Research-Doctorate Programs in the United States: Continuity and Change*. Group I is composed of 48 departments with scores in the 3.00–5.00 range and is further divided into public and private institutions. Group II is composed of 56 departments with scores in the 2.00–2.99 range. Group III contains the remaining US departments with doctoral programs and includes a number of departments that were not part of the 1995 ranking. The response rates are:

Group I public: 23 libraries in 22 institutions;
  22/25 or 88% of institutions responded (1990, 85% for all of Group I)
Group I private: 22 libraries in 21 institutions;
  21/23 or 91% of institutions (1990, 85% for all of Group I)
Group II: 37 libraries in 35 institutions;
  35/56 or 63% of institutions (1990, 74%)
Group III: 48 libraries in 48 institutions;
  48/72 or 67% of institutions (1990, 66%)
Canadian: 26 libraries in 25 institutions;
  25/29 or 86% of institutions (1990, 48%)

In all, this amounts to responses from 156 libraries in 151 institutions, that is, 151/205 or 74% of all institutions (see Section 3 for a list of the 205 institutions). For comparison, the 1990 overall response rate was 138 libraries in 134 institutions, that is, 134/193 or 69% of all institutions.

Some factors should be kept in mind in interpreting results. As in 1990, the survey assumes a local definition of mathematics: in some cases, this includes related subjects such as statistics. Data also include 6 departmental reading rooms (1 in Group I public, 2 in Group II, 2 in Group III, and 1 in Canada). An effort was made to get more responses from reading rooms, but we regret that the numbers are too small to report them as a separate group. Reading rooms nevertheless play a very important role in many departments.

The size of the mathematics literature is also a factor in interpretation of results. Compared to the humanities, the mathematics literature is relatively compact and monolithic. Its size and diversity nevertheless come as a surprise to many people.

- In 1996, *Mathematical Reviews* selected articles from 1629 journals (in 1990, about 1400), and of these it indexed cover-to-cover about 600 (in 1990, about 400).
- In 1997, there are about 29 purely electronic journals in mathematics or closely related areas. Of these, 22 are indexed cover-to-cover. About 123 journals are offered in both paper and electronic format, and this number appears to be rapidly rising.

The authors thank B. TePaske-King and P. Shanks of *Mathematical Reviews* for supplying these figures.

## Trends and Conclusions

Some of the ground covered in the 1990 survey was not duplicated in 1996. In 1990 there were questions probing characteristics that make a good library. These are the same today. The ideal mathematics library has a deep and broad collection including older and historical materials and complete runs of journals. Mathematicians prize ease of access, ability to browse, and a pleasant environment. Professionalism in the staff and good service are also frequently named by mathematicians as important characteristics of a good library.

In the 1996 survey we have been especially interested in comparisons with 1990. Direct comparisons are complicated by the fact that the Group I population is enlarged from 39 in 1990 to 48 in 1996. Group I is also newly divided into two subgroups, Group I public and Group I private (see Section 3). In some places Group I public and Group I private are combined in a separate additional listing for the purpose of comparison with 1990.

These conclusions stand out.

- Significant numbers of journals are being cancelled, and some added (Tables 12A–12C). Since the questionnaire did not ask the respondents to note if domestic titles were replacing foreign or if titles were replaced with those of equal value, we cannot state the extent to which this trend is deleterious. However, a major reshaping of journal collections is underway, from broadly based collections to those which more closely reflect the specific research interests of various departments. Market forces and inflation are driving cancellations. This is shown most strikingly in Group I public universities and Canadian universities: the former with a net change of −22 due to a decrease in state funding and the latter a net change of −46 due to the decline of the Canadian dollar. Subscriptions of paper journals in 1996 are down about a quarter from 1990 (Table 11A). These data are consistent with data published by Chrzastowksi and Schmidt (*Library Acquisitions: Practice and Theory*, 1997) which show an overall drop of 18% in domestic science serial holdings in a national aggregate serial collection between 1992 and 1994. A small part of the decrease in mathematics can also be attributed to more accurate accounting methods that allow better separation of mathematics from other subjects.
- Serials budgets are up sharply, but they cannot compensate for price increases. The median for Group I rose 58% from 1990 to 1996 (Table 8A). Group II rose 32%, Group III rose 20%, and the Canadians rose only 11% in US dollars. Canadian serials budgets increased 30% in Canadian dollars, but a strong decrease in exchange rates for Canadian currency negated much of the budget increase. Spiraling journal costs have hit smaller libraries especially hard, and a growing gap between budgets of large and small libraries may be a byproduct of the journal cost crisis.
- The median for total number of volumes is up 15%. In terms of numbers reporting space problems, this issue seems to take second place to budget shortfalls. The problem is very serious for those who have it. Space problems affect about 29% of all libraries (Table 14): 20% have less than a quarter of their books in other locations, 9% a quarter or more. In a subject that has so much emphasis on browsing and the older literature, a badly split collection threatens productivity and quality of scholarship.
- The web-based MathSciNet is popular: after only a little more than a year, already 69% of all libraries report that they have subscribed (Table 7).
- Demand for electronic journals is modest thus far (Tables 11B–11D). There is interest in receiving journals in both paper and electronic format. The numbers for purely

electronic journals obtained by subscription, or free but cataloged, are very small. At the same time, 60% of all libraries provide access to free electronic preprints, journals, and other mathematical resources such as e-math (Table 7, column (H)).

- There is an increase in the number of mathematics libraries that are part of a general library or a science and engineering library (Table 1B). The increase appears across all groups. In Group I this is due to at least one change from a departmental library to a science library, but another effect is the change of population by the 25% enlargement of Group I from 1990. We also note erosion of the numbers of mathematics libraries located in the same building as the mathematics faculty (Table 2). There remains, however, a strong correlation of location in the same building with the top-ranked departments: the figure drops from 73% in Group I to 17% in Group III.
- Oversight by a professional librarian remains strong in 1996 as in 1990 (Table 6B). There is an increase from 77% to 91% in Group I. Group III also shows an increase, while Group II is down slightly. The decrease from 75% to 65% in the Canadian group must be read in light of the fact that the 1996 Canadian population is significantly larger than in 1990.

**Thanks**

We express our appreciation to the librarians who took time from busy schedules to provide the information that was requested. It is our impression that respondents took seriously the task to provide accurate data. The task was not easy due to the variety of structures and difficulty in some cases to extract information specific to mathematics. To all respondents, a hearty thank you!

## 2. Summary of Data

The main results are presented in a series of tables. The numbers (23), (22), (37), (48), (26), (156) shown in parentheses are reminders of the numbers of respondents in the groups. Often questions were left blank; in a few cases (such as Table 1A) we could fill in the blanks from personal knowledge. Where appropriate we add a "Total" row or column, or write $(X/23)$, $(X/22)$, etc., to indicate the number of usable responses. In a small number of cases, we discarded or corrected data where the question was obviously misinterpreted. A few outliers, very high or very low numbers, are questionable but retained: some of them are correct, and the incorrect ones do not affect the overall picture.

**Question 1: Structure of the Mathematics Library.** Question 1a asks to identify the structure of the library for which data are reported. The options are:

A. Part of a general library of a university library system
B. Part of a science and/or engineering library of a university library system
C. Branch library of a university library system, containing mathematics together with other sciences such as physics or astronomy
D. Branch library of a university library system, containing mathematics together with other mathematical sciences, such as statistics or computer science
E. Branch library of a university library system, containing only mathematics
F. Departmental reading room
G. Other

**Table 1A**

**Structure of the Mathematics Library**

| | A | B | C | D | E | F | G | Total |
|---|---|---|---|---|---|---|---|---|
| Group I public (23) | 1 | 4 | 6 | 9 | 2 | 1 | | 23 |
| Group I private (22) | 4 | 6 | 3 | 5 | 4 | | | 22 |
| Group II (37) | 16 | 8 | 2 | 4 | 4 | 2 | 1 | 37 |
| Group III (48) | 34 | 9 | 1 | | 2 | 2 | | 48 |
| Canadian (26) | 10 | 8 | | 4 | 3 | 1 | | 26 |
| Total (156) | 65 | 35 | 12 | 22 | 15 | 6 | 1 | 156 |

**Table 1B**

**Percentage of mathematics libraries that are part of general or science and engineering libraries**

| | 1996 | 1990 |
|---|---|---|
| Group I combined | 33% | 17% |
| Group II | 64% | 41% |
| Group III | 90% | 74% |
| Canadian | 69% | 58% |
| Total | 64% | 50% |

Question 1b asks if the library is located in the same building as the mathematics faculty. For consistency with 1990 data, when physically separate buildings function as one, they are counted as the "same" building. There is an overall decrease from 1990 figures for the same question.

**Table 2**

**Location in Building with Mathematics Faculty**

| | 1996 | 1990 |
|---|---|---|
| Group I public | 87% | |
| Group I private | 64% | |
| Group I combined | 73% | 83% |
| Group II | 38% | 59% |
| Group III | 17% | 28% |
| Canadian | 46% | 55% |

More than half of the respondents said that their libraries include statistics, computer science, or other areas such as actuarial mathematics, applied mathematics, and mathematics education.

**Question 2: Policies and Operation of the Mathematics Library.** Table 3 shows the number of libraries with:

A. Open stacks for browsing
B. Bound mathematics journals in one area
C. Unbound mathematics journals displayed separately from other subjects
D. Security system
E. Allow bound journals to circulate more than overnight
F. Give keys to selected users

**Table 3**

**Policies**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Group I public (23) | 23 | 18 | 15 | 17 | 15 | 12 |
| Group I private (22) | 22 | 16 | 12 | 16 | 8 | 9 |
| Group II (37) | 36 | 20 | 18 | 25 | 16 | 9 |
| Group III (48) | 47 | 32 | 18 | 44 | 17 | 5 |
| Canadian (26) | 26 | 21 | 11 | 18 | 16 | 7 |
| Total (156) | 154 | 107 | 74 | 120 | 72 | 42 |

In Table 3, (A), (B), (C) enable browsing, which mathematicians consider important. Open stacks (A) are nearly universal; (B) and (C) are common in Group I and Canadian institutions and less frequent in Groups II and III. Circulation of bound journals (E) is mixed.

Use of a security system in Group I is the same as in 1990 (69% in both surveys); in Group II use is up from 58% in 1990 to 67% in 1996, in Group III up from 75% in 1990 to 91% in 1996, and in Canadian institutions up from 59% in 1990 to 69% in 1996.

The practice to give keys to selected users in Group I is about the same in 1996 as in 1990 (a little less than 50%); it is not so common in the other groups.

A closely related question is how many hours the library is open and staffed. The most prevalent hours are in the 75–99 and 100–124 ranges. These are typical of large libraries. The patterns in the 1996 numbers for hours open are similar to 1990. As in 1990, the number of hours open in the summer session show definite cutbacks; such cutbacks are even greater for hours open between sessions.

**Table 4A**

**Hours open in regular session**

| | 0–49 | 50–74 | 75–99 | 100–124 | 125–150 |
|---|---|---|---|---|---|
| Group I public (23/23) | 4 | 6 | 10 | 1 | 2 |
| Group I private (22/22) | 4 | 2 | 8 | 8 | |
| Group II (36/37) | 5 | 7 | 12 | 11 | 1 |
| Group III (45/48) | | 2 | 27 | 16 | |
| Canadian (26/26) | 7 | 2 | 15 | 2 | |
| Total (152/156) | 20 | 19 | 72 | 38 | 3 |

**Table 4B**

**Hours open in the summer session**

| | 0–49 | 50–74 | 75–99 | 100–124 | 125–150 |
|---|---|---|---|---|---|
| Group I public (23/23) | 11 | 6 | 4 | | 2 |
| Group I private (22/22) | 12 | 5 | 3 | 2 | |
| Group II (35/37) | 10 | 9 | 13 | 3 | |
| Group III (46/48) | 6 | 15 | 23 | 2 | |
| Canadian (22/26) | 7 | 8 | 6 | 1 | |
| Total (148/156) | 46 | 43 | 49 | 8 | 2 |

Most libraries report a large number of reader spaces. Shortcomings in this area are a problem for some branch libraries.

**Table 5**

**Number of reader spaces**

| | 0–9 | 10–19 | 20–29 | 30–39 | 40–49 | $\geq 50$ |
|---|---|---|---|---|---|---|
| Group I public (22/23) | 1 | 1 | 4 | 1 | | 15 |
| Group I private (17/22) | | 3 | 3 | 1 | 1 | 9 |
| Group II (23/37) | 2 | 2 | 4 | 2 | 1 | 12 |
| Group III (26/48) | 1 | 1 | | 1 | | 23 |
| Canadian (14/26) | 1 | 2 | | 1 | | 10 |
| Total (102/156) | 5 | 9 | 11 | 6 | 2 | 69 |

A professional librarian is defined as a person having at least an MLS from an ALA accredited school.

**Table 6A**

**Number of professional librarians in the Mathematics Library**

| | 0.10–0.24 | 0.25–0.49 | 0.50–0.99 | $\geq 1.00$ |
|---|---|---|---|---|
| Group I public (22/23) | 1 | 1 | 4 | 16 |
| Group I private (19/22) | | 2 | 1 | 16 |
| Group II (25/37) | | 3 | 1 | 21 |
| Group III (33/48) | 1 | 2 | | 30 |
| Canadian (17/26) | 2 | | 1 | 14 |
| Total (116/156) | 4 | 8 | 7 | 97 |

For comparison with 1990, we look at percentages for totals. These percentages are lower bounds because a nonresponse converts to zero in the calculation.

**Table 6B**

**Some oversight by professional librarians**

| | 1996 | 1990 |
|---|---|---|
| Group I public | 96% | |
| Group I private | 86% | |
| Group I combined | 91% | 77% |
| Group II | 68% | 71% |
| Group III | 69% | 61% |
| Canadian | 65% | 75% |

For all but Group III, the great majority of libraries have 1 or 2 support staff; there are more in large libraries. The distribution is shown in Table 6C.

**Table 6C**

**Number of support staff**

| | 0.1–0.9 | 1.0–1.9 | 2.0–2.9 | 3.0–3.9 | 4.0–4.9 | $\geq 5.00$ |
|---|---|---|---|---|---|---|
| Group I public (22/23) | 1 | 7 | 8 | 1 | | 5 |
| Group I private (18/22) | 3 | 5 | 2 | 1 | 2 | 5 |
| Group II (26/37) | 2 | 10 | 2 | 1 | 3 | 8 |
| Group III (31/48) | 3 | 5 | 2 | 2 | 2 | 17 |
| Canadian (19/26) | | 5 | 2 | | | 12 |
| Total (116/156) | 9 | 32 | 16 | 5 | 7 | 47 |

Most libraries also report the use of 1 to 3 student assistants. Again, large libraries have more.

**Question 3: Electronic Media.** Table 7 shows electronic products available in the library.

A. MathSciNet (Web version on the Internet)
B. MathSci online (component of online catalog, through site-load or consortium arrangement)
C. MathSci on CD ROM
D. Science Citation Index online
E. Science Citation Index CD ROM
F. CompactMath (online version of *Zentralblatt für Mathematik*)
G. Campus network including some of the above products
H. Access to other electronic sources in mathematics (such as preprints, electronic journals, e-math)

The questions A–F had second components asking if the products were available from faculty offices. There was not sufficient response to record results.

**Table 7**

**Electronic products**

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Group I public (23) | 19 | 4 | 14 | 5 | 11 | 1 | 5 | 18 |
| Group I private (22) | 20 | 3 | 11 | 4 | 11 | 2 | 4 | 19 |
| Group II (37) | 25 | 4 | 14 | 5 | 15 | 3 | 4 | 23 |
| Group III (48) | 23 | 3 | 11 | 15 | 14 | | 2 | 23 |
| Canadian (26) | 21 | 3 | 8 | 1 | 9 | | 3 | 10 |
| Total (156) | 108 | 17 | 58 | 30 | 60 | 6 | 18 | 93 |

Over all groups, 69% report use of (A) MathSciNet (Web version) as compared to 37% for (C) the CD ROM version; 11% have (B) the online version through a site-load or consortium. Only 3% subscribe to (F) CompactMath.

Group III and Canadian institutions are most affected by lack of electronic access; an exception is that the larger libraries in Group III are more likely to have products like (D) and (E).

Comparisons with 1990 are not so easy to make because the electronic scene has been in such a state of change.

- Already in 1990 most libraries had their catalog online; it was not felt worth asking this question in 1996 as the practice now is essentially universal.
- Availability of electronic media from faculty offices was an issue in 1990. We conjecture that the nonresponse to our questions in this area mean that this is not an issue in 1996, that is, access is widely available to faculty who desire it.
- MathSciNet did not exist in 1990. In 1990 only 28% reported some version of MathSci available inhouse in the library; 62% had MathSci available via a vendor. Today having some version of MathSci is on its way to becoming universal in Group I and the Canadian institutions, but Groups II and III lag in this area.

**Question 4: Expenditures and Income Sources.** Question 4a asks to itemize expenditures in various categories for collection development. Tables 8A–8C give breakdowns by category, and Table 9 pulls the separate figures together in a total.

Canadian figures were reported in Canadian currency, but for comparison purposes these were converted to US currency: all figures are in US dollars.

**Table 8A**

**Serials budget**

| | Group I public (19/23) | Group I private (21/22) | Group I combined (40/45) | Group II (27/37) | Group III (45/48) | Canadian (23/26) |
|---|---|---|---|---|---|---|
| 1–19 K | | | | 3 | 6 | |
| 20–39 K | | 1 | 1 | | 5 | 3 |
| 40–59 K | | 1 | 1 | | 6 | 5 |
| 60–79 K | 1 | 1 | 2 | | 11 | 2 |
| 80–99 K | 1 | 2 | 3 | 5 | 8 | 3 |
| 100–119 K | 5 | 6 | 11 | 7 | 6 | 2 |
| 120–139 K | 1 | 2 | 3 | 7 | 1 | 7 |
| 140–159 K | 5 | 5 | 10 | 2 | 2 | 1 |
| 160–179 K | 2 | | 2 | 1 | | |
| 180–199 K | 1 | 2 | 3 | 1 | | |
| 200–219 K | | | | | | |
| 220–239 K | 1 | | 1 | | | |
| 240–259 K | 2 | 1 | 3 | 1 | | |
| 260–279 K | | | | | | |
| 280–299 K | | | | | | |
| 1996 Median | 147 K | 119 K | 139 K | 115 K | 66 K | 94 K |
| 1990 Median | | | 88 K | 87 K | 55 K | 85 K |

In Table 8A, Group I libraries cluster in the 100–160 K range, Group II in the 80–140 K range, and Group III in the 60–120 K range. Canadian libraries appear to be divided into two distinct clusters. The percentage increases of medians in Table 8A are

Group I combined: 58%
Group II: 32%
Group III: 20%
Canadians: 11% in US dollars, 30% in Canadian dollars

The exchange rate between the US and Canadian dollars changed dramatically from 1990 to 1996. While in the fall of 1990 it was approximately $CDN 1.18 per $US, this figure increased to 1.38 by the fall of 1996. So while the median serials budget increased from 100K to 130K in Canadian funds, the equivalent figure in $US (and thus, roughly, the purchasing power) rose from 85K to only 94K. A question arises if the relatively small number (12) of Canadian returns in 1990 skews the picture. The institutions that responded in 1990 were examined separately, and it appears that they are representative. The picture does not change significantly if summaries are done only for this group.

The numbers for additional electronic products are relatively small. They are shown in Table 8B.

**Table 8B**

**Additional electronic products**

| | Group I public (7/23) | Group I private (13/22) | Group II (10/37) | Group III (14/48) | Canadian (5/26) |
|---|---|---|---|---|---|
| 1–4 K | 5 | 5 | 5 | 6 | 2 |
| 5–9 K | 2 | 6 | 3 | 7 | 2 |
| 10–14 K | | 1 | 2 | | |
| 15–19 K | | | | 1 | 1 |
| 20–24 K | | 1 | | | |
| Median | 2 K | 6 K | 4 K | 5 K | 6 K |

Group I outspends Groups II and III for monographs and other items, as shown in Table 8C.

**Table 8C**

**Other items: monographs, etc.**

| | Group I public (17/23) | Group I private (22/22) | Group II (26/37) | Group III (45/48) | Canadian (22/26) |
|---|---|---|---|---|---|
| 1–9 K | 3 | 3 | 11 | 22 | 13 |
| 10–19 K | 3 | 7 | 6 | 16 | 6 |
| 20–29 K | 4 | 4 | 6 | | 1 |
| 30–39 K | 1 | 3 | 2 | 4 | 1 |
| 40–49 K | 5 | 4 | 1 | 3 | 1 |
| 50–59 K | 1 | | | | |
| $\geq 60$ | | 1 | | | |
| Median | 22 K | 24 K | 13 K | 10 K | 7 K |

The totals in Table 9 are the sum of the responses for

(1) Serials (Table 8A)
(2) Electronic products if not included in serials (Table 8B)
(3) Other items: monographs, etc. (Table 8C)

Total expenditures from Table 9 typically run in these ranges:

Group I public, 150–199 K
Group I private, 100–199 K
Group II, 100–200 K
Group III, 1–149 K
Canadians, 50–150 K

**Table 9**

**Total of all reported expenditures: serials, electronic products, other items (monographs, etc.)**

| | Group I public (19/23) | Group I private (17/22) | Group II (23/37) | Group III (43/48) | Canadian (22/26) |
|---|---|---|---|---|---|
| 1–49 K | | 1 | 3 | 15 | 3 |
| 50–99 K | 1 | 2 | 3 | 14 | 9 |
| 100–149 K | 5 | 5 | 10 | 12 | 8 |
| 150–199 K | 8 | 7 | 6 | 2 | 2 |
| 200–249 K | 2 | 1 | | | |
| 250–299 K | 3 | | 1 | | |
| $\geq$ 300 K | | 1 | | | |
| Median | 164 K | 152 K | 127 K | 69 K | 95 K |

Table 9 does not tell the full story. Some categories were left blank. Many libraries also receive income from other sources such as from the mathematics department, gifts and endowments, and general funds. These are sometimes significant in Group I and II institutions, but Group III and the Canadians are less endowed in these areas.

Another measure of financial support gauges the share that mathematics receives in the entire library budget, as shown in the next table.

**Table 10**

**Percentage of the total university library materials budget received by mathematics**

| | Group I public (13/23) | Group I private (17/22) | Group II (19/37) | Group III (40/48) | Canadian (18/26) | Total (107/) 156 |
|---|---|---|---|---|---|---|
| 0.00–0.99% | 1 | 1 | | 1 | | 3 |
| 1.00–1.99% | 1 | 3 | | 1 | 2 | 7 |
| 2.00–2.99% | 4 | 3 | 3 | 4 | 5 | 19 |
| 3.00–3.99% | 6 | 3 | 3 | 8 | 4 | 24 |
| 4.00–4.99% | 1 | 5 | 3 | 7 | 1 | 17 |
| 5.00–5.99% | | 2 | 4 | 9 | 4 | 19 |
| 6.00–6.99% | | | 1 | 6 | | 7 |
| 7.00–7.99% | | | 3 | 2 | 1 | 6 |
| 8.00–8.99% | | | | | | |
| 9.00–9.99% | | | 1 | 1 | 1 | 3 |
| $\geq$ 10% | | | 1 | 1 | | 2 |
| Median | 3.0% | 3.0% | 5.0% | 4.55% | 3.3% | 4.0% |

Group III libraries had the highest percentage of the library budget, but from Table 9 it is seen that their budgets are less than in Groups I and II. Spreads are rather large with typical scores in these ranges:

Group I public, 2–4%
Group I private, 1–5%
Group II, 2–8%
Group III, 2–7%
Canadians, 2–6%

**Question 5: The Collection in the Mathematics Library.** The journal literature is very important in mathematics, and one of the key figures for any library is the number of currently received journals.

By far the greatest number of journals remain in paper format only (Table 11A). Journals received in both paper and electronic format are shown in Table 11B. Tables 11C and 11D show electronic journals obtained by subscription or free but cataloged; the numbers here are small, and in particular there are strikingly few paid subscriptions to journals in electronic format only. Free and uncataloged journals are not reported in any of the tables below; their availability in libraries is reflected in Table 7, column (H).

**Table 11A**

**Currently received journals: number of titles received in paper only**

| | Group I public (22/23) | Group I private (22/22) | Group I combined (44/45) | Group II (35/37) | Group III (46/48) | Canadian (25/26) | Total (150/156) |
|---|---|---|---|---|---|---|---|
| 1–39 | | | | | 2 | | 2 |
| 40–79 | | 2 | 2 | 1 | 12 | 3 | 18 |
| 80–119 | 1 | 1 | 2 | 1 | 12 | 5 | 20 |
| 120–159 | | 3 | 3 | 4 | 8 | 4 | 19 |
| 160–199 | 4 | 2 | 6 | 9 | 7 | 3 | 25 |
| 200–239 | 2 | 4 | 6 | 6 | 1 | 2 | 15 |
| 240–279 | 2 | 1 | 3 | 5 | 2 | 5 | 15 |
| 280–319 | 4 | 3 | 7 | 4 | | 1 | 12 |
| 320–359 | 4 | 1 | 5 | 1 | 1 | 1 | 8 |
| 360–399 | 1 | 1 | 2 | 2 | | | 4 |
| 400–439 | | 1 | 1 | | | 1 | 2 |
| 440–479 | | | | 1 | | | 1 |
| 480–519 | | | | 1 | | | 1 |
| 520–559 | 1 | 3 | 4 | | 1 | | 5 |
| 560–599 | | | | | | | 0 |
| $\geq 600$ | 3 | | 3 | | | | 3 |
| 1996 Median | 305* | 232* | 296* | 231* | 114* | 180* | 186* |
| 1990 Median | | | 393* | 293* | 168* | 272* | 261* |

* Reading rooms in the US are excluded from these medians.

Group III and the Canadians are hardest hit: the drop in medians in Table 11A is 25% for Group I, 21% for Group II, 32% for Group III, 34% for the Canadians, and 29% overall.

**Table 11B**

**Currently received journals: number of titles received in both paper and electronic format**

| | Group I public (12/23) | Group I private (15/22) | Group II (15/37) | Group III (13/48) | Canadian (8/26) | Total (63/ 156) |
|---|---|---|---|---|---|---|
| 1–4 | 8 | 5 | 9 | 8 | 6 | 36 |
| 5–9 | 3 | 5 | 2 | 3 | | 13 |
| 10–14 | | 3 | 2 | 1 | 2 | 8 |
| 15–19 | 1 | 2 | | | | 3 |
| 20–24 | | | 1 | 1 | | 2 |
| 25–29 | | | 1 | | | 1 |
| Median | 3 | 6 | 2 | 4 | 2 | 3 |

**Table 11C**

**Currently received journals: number of titles received in electronic format only, by subscription**

| | Group I public (3/23) | Group I private (6/22) | Group II (6/37) | Group III (6/48) | Canadian (2/26) | Total (23/ 156) |
|---|---|---|---|---|---|---|
| 1–4 | 3 | 4 | 4 | 6 | 2 | 19 |
| 5–9 | | 1 | 2 | | | 3 |
| 10–14 | | | | | | 0 |
| 15–19 | | 1 | | | | 1 |
| Median | 2 | 3 | 2 | 1 | 2 | 2 |

**Table 11D**

**Currently received journals: number of titles received in electronic format only, free and cataloged**

| | Group I public (4/23) | Group I private (5/22) | Group II (3/37) | Group III (1/48) | Canadian (1/26) | Total (14/ 156) |
|---|---|---|---|---|---|---|
| 1–4 | 2 | 2 | 1 | | 1 | 6 |
| 5–9 | | 1 | 1 | | | 2 |
| 10–14 | 2 | 1 | 1 | | | 4 |
| 15–19 | | | | | | 0 |
| 20–24 | | 1 | | 1 | | 2 |
| Median | 8 | 5 | 5 | 20 | 4 | 5 |

Few libraries have escaped cancellation projects in recent years.

- One question asked how many paper journals were cancelled because the same journal is now obtained electronically. This simply is not occurring: among the 156 libraries responding, 107/156 answered none and 7/156 answered 1 each.

On the other hand, many journals are being cancelled and some added. The next three tables detail responses in this area.

Table 12A is the net change in number of journals, that is, the difference of the number added and number cancelled. In Group I, about twice as many show a negative net change as positive.

Tables 12B and 12C show the numbers of cancellations and additions separately. The medians for the Canadian group are particularly striking when total holdings (Table 11A) are taken into account.

**Table 12A**

**Net change in number of journals: number gained minus number cancelled**

| | Group I public (20/23) | Group I private (18/22) | Group II (25/37) | Group III (39/48) | Canadian (21/26) | Total (123/156) |
|---|---|---|---|---|---|---|
| 80 to 89 | 1 | | | | | 1 |
| 70 to 79 | | | | | | 0 |
| 60 to 69 | 1 | | | | | 1 |
| 50 to 59 | | | | | | 0 |
| 40 to 49 | | | | | | 0 |
| 30 to 39 | | 1 | | | | 1 |
| 20 to 29 | 1 | | | | 1 | 2 |
| 10 to 19 | | | | 1 | | 1 |
| 0 to 9 | 1 | 8 | 3 | 6 | | 18 |
| −1 to −9 | 2 | 2 | 6 | 10 | 2 | 22 |
| −10 to −19 | 4 | 4 | 4 | 9 | 1 | 22 |
| −20 to −29 | 1 | 1 | 3 | 4 | 1 | 10 |
| −30 to −39 | 1 | | 1 | 2 | 5 | 9 |
| −40 to −49 | 4 | | 6 | | 1 | 11 |
| −50 to −59 | 1 | | | 1 | | 2 |
| −60 to −69 | | 1 | | 4 | 3 | 8 |
| −70 to −79 | | | 1 | | 2 | 3 |
| −80 to −89 | 2 | | | 1 | | 3 |
| −90 to −99 | | | 1 | | 3 | 4 |
| $\leq -100$ | 1 | 1 | | 1 | 2 | 5 |
| Median | −22 | 0 | −18 | −10 | −46 | −16 |

**Table 12B**

**Number of journals cancelled since 1990**

| | Group I public (20/23) | Group I private (20/22) | Group II (27/37) | Group III (42/48) | Canadian (24/26) | Total (133/ 156) |
|---|---|---|---|---|---|---|
| 0–9 | 2 | 5 | 3 | 11 | 2 | 23 |
| 10–19 | 3 | 5 | 7 | 12 | 1 | 28 |
| 20–29 | 3 | 4 | 3 | 7 | 3 | 20 |
| 30–39 | 1 | 2 | 3 | 4 | 2 | 12 |
| 40–49 | 2 | 1 | 2 | | 3 | 8 |
| 50–59 | 3 | | 3 | 2 | 1 | 9 |
| 60–69 | 1 | 1 | 2 | 2 | 3 | 9 |
| 70–79 | 1 | | 2 | 2 | 4 | 9 |
| 80–89 | | 1 | | 1 | | 2 |
| 90–99 | | | | | 1 | 1 |
| $\geq 100$ | 4 | 1 | 2 | 1 | 4 | 12 |
| Median | 40 | 20 | 30 | 17 | 60 | 27 |

**Table 12C**

**Number of journals added since 1990**

| | Group I public (20/23) | Group I private (18/22) | Group II (25/37) | Group III (41/48) | Canadian (21/26) | Total (125/ 156) |
|---|---|---|---|---|---|---|
| 0–9 | 10 | 5 | 14 | 30 | 11 | 70 |
| 10–19 | 3 | 5 | 8 | 7 | 8 | 31 |
| 20–29 | 2 | 4 | 2 | 4 | 1 | 13 |
| 30–39 | 3 | 3 | | | | 6 |
| 40–49 | | | | | 1 | 1 |
| 50–59 | | 1 | | | | 1 |
| 60–69 | | | 1 | | | 1 |
| 70–79 | | | | | | 0 |
| 80–89 | 1 | | | | | 1 |
| 90–99 | | | | | | 0 |
| $\geq 100$ | 1 | | | | | 1 |
| Median | 10 | 19 | 9 | 2 | 9 | 8 |

Group III stands out in Table 12C for the very small number of additions to replace cancellations. Whereas the other groups are reshaping their collections, Group III appears to be mainly reducing.

The total number of volumes including bound journals and monographs is given in the next table. As in journals added shown in Table 12C, Group III shows very little growth in the total number of volumes shown in Table 13.

**Table 13**

**Total number of volumes**

| | Group I public (19/23) | Group I private (15/22) | Group I combined (34/45) | Group II (24/37) | Group III (26/48) | Canadian (13/26) | Total (97/156) |
|---|---|---|---|---|---|---|---|
| 0–9 K | 1 | 1 | 2 | 3 | 8 | 1 | 14 |
| 10–19 K | | 1 | 1 | 1 | 5 | 3 | 10 |
| 20–29 K | 4 | 3 | 7 | 9 | 7 | 3 | 26 |
| 30–39 K | 5 | 4 | 9 | 6 | 3 | 3 | 21 |
| 40–49 K | 3 | 4 | 7 | 5 | 1 | 3 | 16 |
| 50–59 K | 3 | | 3 | | | | 3 |
| 60–69 K | 1 | 2 | 3 | | 1 | | 4 |
| 70–79 K | | | | | | | 0 |
| 80–89 K | 2 | | 2 | | 1 | | 3 |
| 1996 Median | 38.5 K* | 36 K* | 37 K* | 29 K* | 21 K* | 26 K* | 30 K* |
| 1990 Median | | | 34 K* | 25 K* | 20 K* | 28 K* | 26 K* |

* Reading rooms in the US are excluded from these medians.

As a measure of the space problem, respondents were asked to estimate the total number of mathematics volumes in storage locations because of space shortage, and to give the figure as a percentage of the total number of mathematics volumes owned if all were under one roof.

**Table 14**

**Percentage in storage locations due to space shortage**

| | Group I public (17/23) | Group I private (15/22) | Group II (21/37) | Group III (24/48) | Canadian (12/26) | Total (89/156) |
|---|---|---|---|---|---|---|
| 0% | 2 | 7 | 11 | 16 | 8 | 44 |
| 1–4% | 3 | 3 | 1 | 2 | 2 | 11 |
| 5–9% | 3 | | 1 | 1 | | 5 |
| 10–14% | 2 | | 4 | 1 | | 7 |
| 15–19% | 1 | 2 | | 1 | | 4 |
| 20–24% | 1 | 1 | 1 | | 1 | 4 |
| 25–29% | 2 | 2 | 2 | 1 | | 7 |
| 30–34% | 2 | | | 1 | 1 | 4 |
| 35–39% | | | | | | 0 |
| 40–44% | 1 | | | | | 1 |
| 45–49% | | | | | | 0 |
| $\geq 50\%$ | | | 1 | 1 | | 2 |

About 29% of all libraries report some space problem. The problem is quite serious for the 14 libraries (9% of the total) with more than 25% in storage. Overall, however, fewer libraries seem to rate space as a key issue today as opposed to 1990: in 1990, at least 46% of all libraries reported some space problem (the 1990 data do not allow an exact figure for comparison).

## 3. Peer Groups

The AMS peer groups were reorganized in 1996. The main change is that Group I is enlarged from 39 to 48 departments and divided into Group I public (25 departments) and Group I private (23 departments). For additional information on the groups, see the e-math web page (`http://www.ams.org/committee/profession/groups_des.html`).

Group I Public: 25 total

- CUNY, Graduate School and University Center
- Georgia Institute of Technology
- Indiana University at Bloomington
- Michigan State University
- Ohio State University, Columbus
- Pennsylvania State University, University Park
- Purdue University
- Rutgers University
- SUNY at Stony Brook
- University of California, Berkeley
- University of California, Los Angeles
- University of California, San Diego
- University of California, Santa Barbara
- University of Illinois at Chicago
- University of Illinois at Urbana-Champaign
- University of Maryland, College Park
- University of Michigan
- University of Minnesota, Minneapolis
- University of North Carolina at Chapel Hill
- University of Oregon
- University of Texas at Austin
- University of Utah
- University of Virginia
- University of Washington
- University of Wisconsin, Madison

Group I Private: 23 total

- Boston University
- Brandeis University
- Brown University
- California Institute of Technology
- Carnegie Mellon University
- Columbia University

- Cornell University
- Duke University
- Harvard University
- Johns Hopkins University
- Massachusetts Institute of Technology
- New York University, Courant Institute
- Northwestern University
- Princeton University
- Rensselaer Polytechnic Institute
- Rice University
- Stanford University
- University of Chicago
- University of Notre Dame
- University of Pennsylvania
- University of Southern California
- Washington University
- Yale University

Group II: 56 total

- Arizona State University
- Auburn University
- Case Western Reserve University
- Claremont Graduate School
- Clemson University
- Colorado State University
- Dartmouth College
- Florida State University
- Iowa State University
- Kansas State University
- Kent State University
- Lehigh University
- Louisiana State University, Baton Rouge
- North Carolina State University
- Northeastern University
- Oregon State University
- Polytechnic University
- SUNY at Albany
- SUNY at Binghamton
- SUNY at Buffalo
- Syracuse University
- Temple University
- Texas A & M University
- Texas Tech University
- Tulane University
- University of Arizona
- University of California, Davis
- University of California, Irvine

- University of California, Riverside
- University of California, Santa Cruz
- University of Cincinnati
- University of Colorado, Boulder
- University of Connecticut, Storrs
- University of Delaware
- University of Florida
- University of Georgia
- University of Hawaii
- University of Houston
- University of Iowa
- University of Kentucky
- University of Massachusetts, Amherst
- University of Miami
- University of Missouri, Columbia
- University of Nebraska, Lincoln
- University of North Texas
- University of Oklahoma
- University of Pittsburgh, Pittsburg
- University of Rochester
- University of South Carolina, Columbia
- University of Tennessee
- University of Texas at Arlington
- Vanderbilt University
- Virginia Polytechnic Institute & State University
- Washington State University
- Wayne State University
- Wesleyan University

Group III: 72 total

- Adelphi University
- Air Force Institute of Technology
- American University
- Bowling Green State University
- Brigham Young University
- Bryn Mawr College
- Catholic University of America
- Central Michigan University
- Clark University
- Clarkson University
- College of William and Mary
- Colorado School of Mines
- Drexel University
- Emory University
- Florida Atlantic University
- George Washington University
- Howard University

- Idaho State University
- Illinois Institute of Technology (discontinued graduate program)
- Illinois State University
- Indiana University-Purdue University, Indianapolis
- Marquette University
- Mississippi State University
- Montana State University, Bozeman
- Naval Postgraduate School
- New Jersey Institute of Technology
- New Mexico State University
- North Dakota State University
- Northern Illinois University
- Ohio University
- Oklahoma State University
- Old Dominion University
- Portland State University
- Rockefeller University
- Southern Illinois University at Carbondale
- Southern Methodist University
- St. Louis University
- Stevens Institute of Technology
- Tufts University
- University of Alabama at Birmingham
- University of Alabama, Huntsville
- University of Alabama, Tuscaloosa
- University of Alaska, Fairbanks
- University of Arkansas at Fayetteville
- University of Central Florida
- University of Colorado, Denver
- University of Denver
- University of Idaho
- University of Kansas (in Group II based on the 1983 NRC rankings)
- University of Maryland Baltimore County
- University of Memphis
- University of Mississippi
- University of Missouri, Kansas City
- University of Missouri, Rolla
- University of Montana
- University of New Hampshire
- University of New Mexico (in Group II based on the 1983 NRC rankings)
- University of North Carolina at Charlotte
- University of Northern Colorado
- University of Rhode Island
- University of South Florida
- University of Southwestern Louisiana
- University of Texas at Dallas
- University of Toledo

- University of Vermont
- University of Wisconsin, Milwaukee
- University of Wyoming
- Utah State University
- West Virginia University
- Western Michigan University
- Wichita State University
- Worcester Polytechnic Institute

Canadian Institutions: 29 total

- Carleton University
- Concordia University
- Dalhousie University
- McGill University
- McMaster University
- Memorial University of Newfoundland
- Queen's University
- Simon Fraser University
- Technical University of Nova Scotia
- Université Laval
- Université de Montréal
- Université de Sherbrooke
- Université du Québec à Montréal
- Université du Québec à Chicoutimi
- University of Alberta
- University of British Columbia
- University of Calgary
- University of Guelph
- University of Manitoba
- University of New Brunswick
- University of Ottawa
- University of Regina
- University of Saskatchewan
- University of Toronto
- University of Victoria
- University of Waterloo
- University of Western Ontario
- University of Windsor
- York University

## 4. AMS Library Committee and questionnaire

The survey questionnaire was written by the AMS Library Committee. The Canadian Mathematical Society also participated in the 1996 survey. Current ($^*$) and participating retired ($^\dagger$) members of the AMS Library Committee are:

Librarians:

Nancy D. Anderson$^*$(Co-chair), University of Illinois,
Carol Hutchins$^*$, Courant Institute, New York University
Dorothy McGarry$^*$, University of California, Los Angeles
Mary Ann Southern$^\dagger$, Duke University
Martha Tucker$^*$, University of Washington
John W. Weigel II$^\dagger$, University of Michigan

Mathematicians:

George E. Andrews$^\dagger$, Pennsylvania State University
Bruce Berndt$^*$(Co-chair), University of Illinois,
Felix Browder$^\dagger$, Rutgers University
Lawrence S. Husch$^*$, University of Tennessee
James Rovnyak$^\dagger$, University of Virginia
James J. Tattersall$^*$, Providence College
Hung-Hsi Wu$^*$, University of California, Berkeley

Canadian Liaison:

Karl Dilcher, Dalhousie University

Members of the AMS Library Committee were active in all phases of the survey, including contacting libraries for responses and analyzing results. Special thanks are extended to

- Dorothy McGarry, who took charge of much of the coordination in the early stages of the planning of the survey,
- Kinda Remick and other AMS staff for their good-natured and efficient conduct of a survey that was, for AMS, a little off the beaten track, and
- John W. Weigell II, who graciously agreed to have his name and FAX number on the questionnaire and fielded questions from respondents.

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