ARL Academic Science and Technology Libraries: Report of a Survey

Julie M. Hurd

The ARL includes among its United States and Canadian member libraries many of North America's largest research collections in science and technology. These libraries often serve as models or benchmarks for other institutions with respect to collection development and management, and the provision of information services. Science and technology librarians have used survey techniques to gather data on ARL science and technology collections for nearly ten years. This report provides findings from a survey of ARL academic science and technology libraries conducted during 1993 and 1994, and updates three earlier surveys. Seventy-five ARL academic libraries returned questionnaires for a response rate of 69 percent. This article describes survey findings on organizational structures, collections, expenditures, and services. Some comparisons are made to earlier surveys.

The Science and Technology Section (STS) of ACRL represents librarians and specialists in the fields of science and technology. In 1984 the section established an ad hoc task force to collect statistics on standalone science and technology libraries. One purpose of the original project was to compile comparative data that science librarians could use in drafting proposals and supporting funding decisions. At that time, there was no organized effort to collect data on science and technology libraries and collections. Association of Research Libraries (ARL) libraries publish descriptive statistics, but these data do not break down the subject areas that are of interest to science librarians. The original task force has been continued by the ACRL STS Committee on Comparison of Science and Technology Libraries (the Comparison Committee). The Comparison Committee is charged with collecting, analyzing, and distributing comparative data on North American academic science and technology libraries. To fulfill its charge, the committee has conducted various surveys of science and technology libraries; the results of several of these have been published in library literature.[1]

Background: Earlier Surveys

The Comparison Committee has conducted surveys for ten years.[2] The earliest efforts focused on collecting data from

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the strongest centralized science collections, whether housed in stand-alone or free-standing facilities or existing as separate divisions in larger libraries. Subsequent surveys added libraries with other variant forms of organization to encompass the diversity of science and technology collections that might be excluded by too narrow definitions.

The Comparison Committee based its first survey instrument on the formulation used for the *Annual Statistics of Medical School Libraries in the United States and Canada* (compiled by the Houston Academy of Medicine). The committee then revised the formulation to make it suitable for a science and technology library population. Over the years, Comparison Committee surveys have consisted of many of the same questions, with changes, additions, or deletions made to reflect differing focus in the data gathering and new developments in the profession. Almost everyone involved in the effort realized that major science and technology collections exhibit great variety in every feature, and designing a survey instrument that every respondent can complete in its entirety proved difficult. The Comparison Committee was able to assemble a body of data that now spans almost ten years and may be used to track trends and new developments.

The ARL member list provided a starting point for defining each survey population; additionally, strong science and technology libraries that were not ARL members were sometimes included. Each survey conducted by the committee queried many of the same libraries, but it should be recognized that variations in the populations surveyed do exist and this must be taken into account in any longitudinal comparisons that are made using committee data.

TABLE 1
Comparison Committee Surveys

Survey	Survey Population	Return
1. (1984–1985)	40 ARL stand-alone libraries	24 (60%)
2. (1986–1987)	145 libraries (ARL + ACRL members with >1 million volumes)	45 (31%)
Definition Survey[1] (1987–1988)	107 ARL libraries	91 (85%)
Historical Survey[2]	118 libraries (ARL +)	97 (82%)
3. (1988–1989)	148 libraries, as in 1986–1987	65 (44%)
4. (1992–1993)	118 ARL libraries	75 (69%)

[1]The Definition Survey examined existing physical and administrative structures in science and technology libraries.

[2]The Historical Survey traced the evolution of physical and administrative structures in science and technology libraries from the 1940s through the 1980s.

Three previous general surveys modeled on the above-mentioned survey of medical libraries have been carried out. These are referred to here as Survey 1, Survey 2, and Survey 3; the survey reported in this article is the fourth in this series. In addition, the Comparison Committee conducted two more specialized surveys, both directed toward describing physical and administrative structures. The Definition Survey defined and described organizational and administrative structures prevalent at the time researchers conducted it. The Historical Survey traced the evolution of physical and administrative structures from the 1940s through the 1980s. Table 1 defines the survey populations and shows response rates for committee surveys.

Methodology

Before undertaking the current survey, the Comparison Committee formed a subcommittee to contact former committee members who worked on the 1988–

89 survey and who might be able to identify problems with the instrument that led to low return rates. The responses received informed the design and method of distribution of the current survey. For example, some institutions were unable to respond because they did not keep separate science and technology statistics. For these institutions the committee could expect few data. In other institutions, the questionnaires apparently never reached the individuals best suited to provide the data requested. Still other respondents perceived the survey to be too long and detailed.

Institutions had the option of completing one survey for all their science and technology collections, or individual surveys for separable collections for which they gathered statistics.

After discussing the findings of this subcommittee, the Comparison Committee decided to define the current survey population precisely—all ARL libraries. (At the time of distribution of the questionnaires, there were 119 ARL libraries, of which 108 were academic libraries.) Recognizing that even in this group there was great diversity, the committee made an effort to request some data that all respondents would have in common by virtue of their participation in the annual ARL member survey. Committee members would be in personal contact with respondents and would encourage the return of the survey even if not all information was available. In this way, the committee hoped to elicit some data from each institution—at the very least sufficient details to be able to characterize the type of organizational structure for each. Institutions had the option of completing one survey for all their science and technology collections, or individual surveys for separable collections for which they gathered statistics.

The committee eliminated questions for which few institutions collected data from the survey instrument. As there were many new technologies employed in libraries, new questions were written to elicit information on their uses in the provision of science and technology information services. For example, the committee added questions on local networking and use of the Internet. The final questionnaire, including definitions and explanatory material, was thirteen pages long, counting a detachable page requesting salary information that could be optional or returned separately to preserve confidentiality. (The survey instrument is not reproduced here, but a copy is available from the author upon request.)

Committee members each contacted a subset of the population to identify the individual in each library to whom the questionnaire should be directed. Following the late summer/autumn 1993 mailing of the survey, committee members stayed in communication with the respondents to offer encouragement and answer questions. By spring 1994, most libraries that were able to participate had returned the questionnaires and data analysis began. The committee chair made a preliminary report of the survey findings at the STS Forum on Science and Technology Library Research during the ALA annual conference in June 1994. During late summer 1994, committee members made reminder calls to libraries that had indicated their willingness to participate but had not yet returned the survey.

By October 1, 1994, 75 institutions had returned 152 responses for a 69.44 percent return rate. Several institutions had indicated that they would not be able to participate. For those libraries, the committee contact persons made an effort to learn about their organizational structure. In a number of cases, nonresponding libraries totally integrated collections with no separable science and technology statistics.

The author used Microsoft Excel for the Macintosh to enter returned survey data into a spreadsheet. The data were distributed in both disk and paper formats as raw numbers to committee members assisting in data analysis. With this survey, the committee deviated from the past practice of distributing raw data to participants. The survey offered respondents the option of choosing to share their responses, with their institutions identified, or maintaining confidentiality. Enough respondents chose confidentiality to suggest that only aggregate figures should be reported for this survey. Hence, no respondents will be identified by name in any of the committee's reports.

Organizational Structure

The Definition Survey and the Historical Survey carried out by the committee several years ago provided insights into the physical structures found in major science and technology libraries. These two surveys offer a snapshot of the structures found at that time and a retrospective perspective. Although the population varied somewhat from the current survey, earlier surveys included many of the same libraries. A comparison of the list of libraries responding to the Definition Survey with this survey found that seventy-two libraries were in both groups for an overlap of 96 percent.[3] This high degree of overlap with the populations studied earlier should permit tracking of trends in library organization.

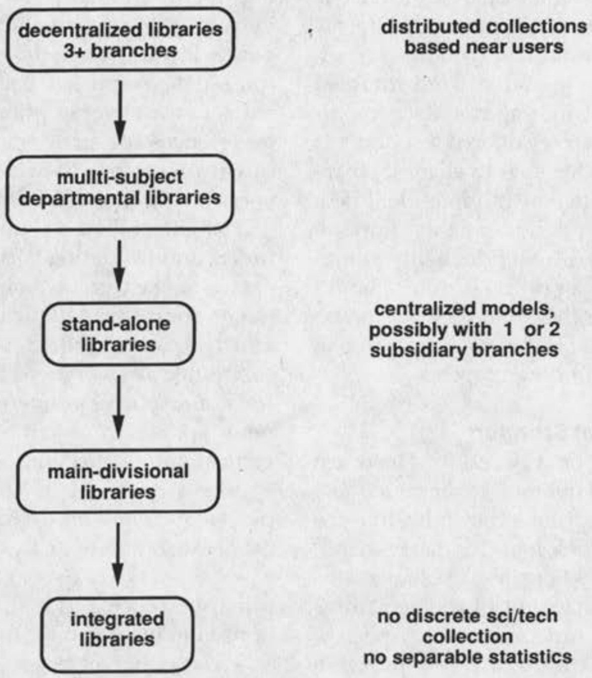
The arguments for and against centralization of academic collections are summarized by Leon Shkolnik, who concludes that "Clearly, the trend in academic libraries is toward greater centralization. . . ."[4] Comparison Committee surveys document this centralizing tendency for the physical resources in science and engineering. Holdouts to the trend appeared to be some of the oldest and largest libraries, mostly located in the Northeast. Factors that appear to contribute to this centralizing trend include economic constraints (especially costs for duplicate journal subscriptions), security considerations, space pressures, and the increasing interdisciplinarity of research. Conversely, mitigating factors include advances in automation that support decentralized data input and use, electronic formats, new delivery options, and faculty preferences for small, conveniently located collections. These and other influences are discussed by Shkolnik.

The current survey updates the Historical and Definition surveys and offers details on the variety of physical arrangements found in ARL academic science and technology libraries. Because the committee's explorations into the reasons for nonresponse pointed to a need for more options in describing physical organization of collections, some new categories were created. This survey employed the following definitions of physical organization in analyzing data:

- *stand-alone*: a separate, multidisciplinary science and technology library housed in its own building;
- *main divisional*: a science and technology division, with separate statistics, housed in a main library;
- *multisubject departmental*: a divisional library with more than three discrete subjects in its collection housed with science and technology departments;
- *subject departmental*: collections composed of one or two subjects housed in a department (*note:* some closely related combinations such as mathematics and statistics were treated as a single subject);
- *decentralized:* a library system with three or more subject departmental libraries and no major multisubject collections;
- *integrated:* a science and technology collection nonseparable from an entire library collection with no separate statistics;
- *hybrid:* various combinations of divisional, departmental, and integrated collections not fitting into the above categories (i.e., "other").

Libraries classed as stand-alone, main divisional, and integrated sometimes re-

FIGURE 1
Organizational Structures: A Continuum



ARL Academic Science/Technology Libraries

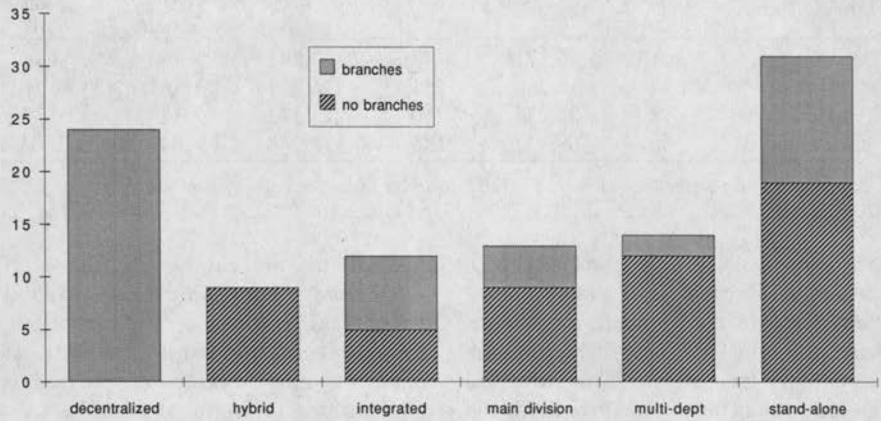
ported subsidiary branches, which will be examined in more detail in the following data.

The categories used to describe the physical structures reported might be viewed as a continuum ranging from a very decentralized arrangement with many departmental branches dispersed about a campus to a fully integrated, single institutional collection. Figure 1 displays that continuum of structures.

A total of fifty institutions, more than 63 percent of those whose organization is known, reported the presence of centralized science and technology collections, whether in stand-alone, main divisional, or multisubject departmental libraries.

Using the categories defined above, the author coded returned questionnaires and entered data into a master spreadsheet; information supplied by the respondents permitted a categorization according to type. In cases where returns represented departmental collections, the author also assigned a category for the institution as a whole. Organizational information for nonrespondents was included, if available. A sort by type for seventy-nine institutions is displayed in figure 2. Different shadings distinguish libraries with and without branches. A total of fifty institutions, more than 63 percent of those whose organization is known, reported the presence of centralized science and technology collections,

FIGURE 2
ARL Academic Sci/Tech Libraries: Organizational Types



whether in stand-alone, main divisional, or multisubject departmental libraries.

Library size is one characteristic likely to influence physical and organizational structure, as demonstrated in the analysis reported in the Definition Survey. ARL rankings provide an index that measures relative size of university libraries taking into account the number of volumes held, the number added during the previous fiscal year, the number of current serials, total operating expenditures, and the size of professional and nonprofessional staff (excluding student employees). Because this index is both generally respected and widely used, the author selected it as the measure of size for this analysis. The author entered ARL ranks for libraries into the spreadsheets and computed mean ARL rankings for each of the organizational categories and for those libraries not responding to the survey.[5] Table 2 summarizes the data for 103 separate libraries in seventy-nine institutions. Several institutions reported the presence of more than one library in a particular category, whereas others reported the existence of libraries in two or more categories.

The mean ARL rank for nonresponding libraries was 61.4; smaller institutions are underrepresented in this survey. Earlier observations that the largest institutions are more likely to maintain decentralized collections are corroborated by this study. A mean ARL rank of 33.4 characterizes the decentralized science and

TABLE 2
ARL Rankings

Category	Mean ARL Rank	# of libraries
Decentralized libraries	33.4	24
Stand-alone libraries	50.2	31
Main divisional libraries	51.5	13
Hybrid libraries	62.3	9
Multisubject departmental libraries	62.8	14
Integrated libraries	71	12
All respondents	**52.7**	**79***
All nonrespondents	**61.4**	**29**

*Some institutions reported multiple libraries in a category or libraries in more than one category; "all respondents" includes all institutions supplying any data on organizational structure.

TABLE 3
Characteristics of Types

Type	# of libraries	Size (sq. ft.)	Seats	Volumes	Active Serials	Total Staff
Departmental*	161	6,571	77	62,692	740	4.78
Multisubject	12	18,304	251	176,323	1,843	17.51
Main divisional	13	25,754	250	223,175	2,343	10.32
Stand-alone	30	68,322	586	372,260	4,040	29.01

*Averages for all subjects; see table 4 for a breakdown by subject of departmental library.

technology collections as associated with the larger libraries. Conversely, stand-alone libraries are found in institutions with a mean ARL rank of 50.2, much closer to the median rank. This study did not collect data that would provide an explanation for this observation, but it appears likely that more factors than library size alone will be determinants for a stand-alone library. The Historical Survey identified an increase in the number of stand-alone libraries, and a corresponding decline in decentralized collections, over the period studied. Numerous factors might dictate whether a particular institution would choose to build a stand-alone library. For example, the availability of funding for new construction and the relative strength and number of science programs on campus could be possible influences, as might the values and vision of campus decision makers. Additional exploration of such issues is beyond the scope of this survey and is left to future investigators.

Characteristics of the types of units are summarized in table 3. Mean size, seating capacity, collection size, and total staffing (FTEs, including hourly student employees) are shown for each group. De-

FIGURE 3
Disciplines of Departmental Libraries
(179 branches in 51 institutions)

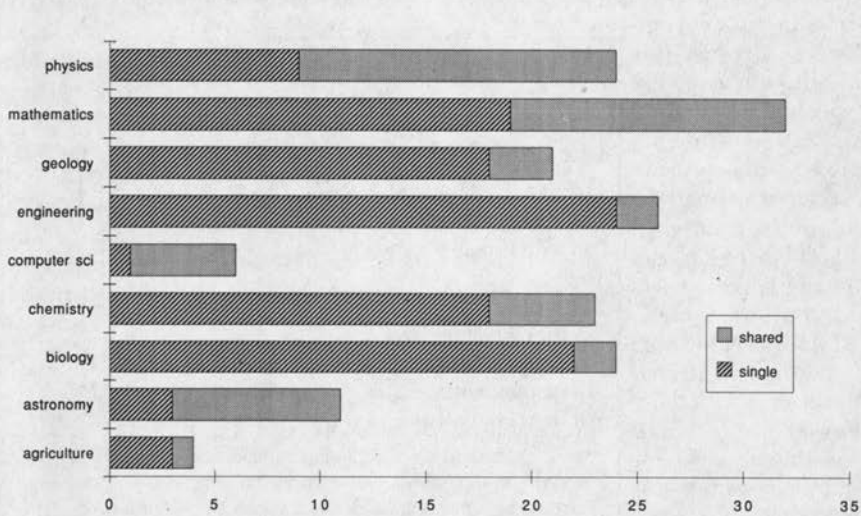


TABLE 4
Departmental Libraries

Discipline	Size (sq. ft.)	Seats	Volumes	Active Serials	Total Users	Total Staff
Biology	8,286	64	65,283	744	923	4.18
Chemistry	5,268	72	43,970	296	551	3.66
Engineering	10,739	130	103,108	1,115	2,803	6.81
Geology	6,033	67	71,605	1,046	375	5.31
Mathematics	4,543	62	49,353	624	670	4.33
Physics	5,342	75	58,181	502	563	4.43

partmental collections are the smallest, as expected, and stand-alone collections are the largest.

Departmental Libraries

Overall, fifty-one institutions reported the presence of one or more departmental libraries, and many questionnaires provided considerable detail on the nature of those 179 branch collections. The author sorted data for branches by subject. The disciplines most frequently served by departmental libraries are displayed in figure 3.

Shading on the bar graph differentiates single- and shared-discipline collections. Each subject includes any shared-discipline collections, so the total represented by summing all bars is greater than the number of branch libraries reporting. This was done to provide a picture of the relative prevalence of branch libraries in the various science disciplines. For example, mathematics departments are most likely to be served by a departmental library, whereas engineering units are least likely to share their libraries with other disciplines. Respondents reported numerous combinations, and some of these certainly reflect rational pairings (such as physics and mathematics) whereas others may merely result because two departments share a building.

The most frequently named disciplines of departmental libraries are, in rank order, mathematics, engineering and chemistry, physics, biology, and geology. The Definition Survey-ranked list is quite similar: mathematics, chemistry, engineering, physics, geology, and biology. Survey data are not likely to be capable of explaining this order, but some speculation is possible based on the nature of the disciplines' literatures and the information-seeking habits of the various scientists. Traditions within a discipline may be another possible influence. Shkolnik, and many of the authors whom he cites, identify and analyze influential factors that contribute to the presence of departmental libraries.

Table 4 shows the characteristics of the most frequently encountered discipline departmental libraries. Engineering libraries appear to be the largest, but geology collections have nearly as many active serial subscriptions, although they serve far fewer total users. ("Total users" include faculty, graduate and undergraduate students, and other affiliated academic and

TABLE 5
Comparisons: Decentralized versus Stand-Alone Libraries

Library Type (#)	Total Materials	Total Users	Cost/User	Total Staff
Decentralized (6)	$1,731,631	6,372	$271.76	32.11
Stand-alone (21)	$1,531,580	6,326	$242.11	29.01

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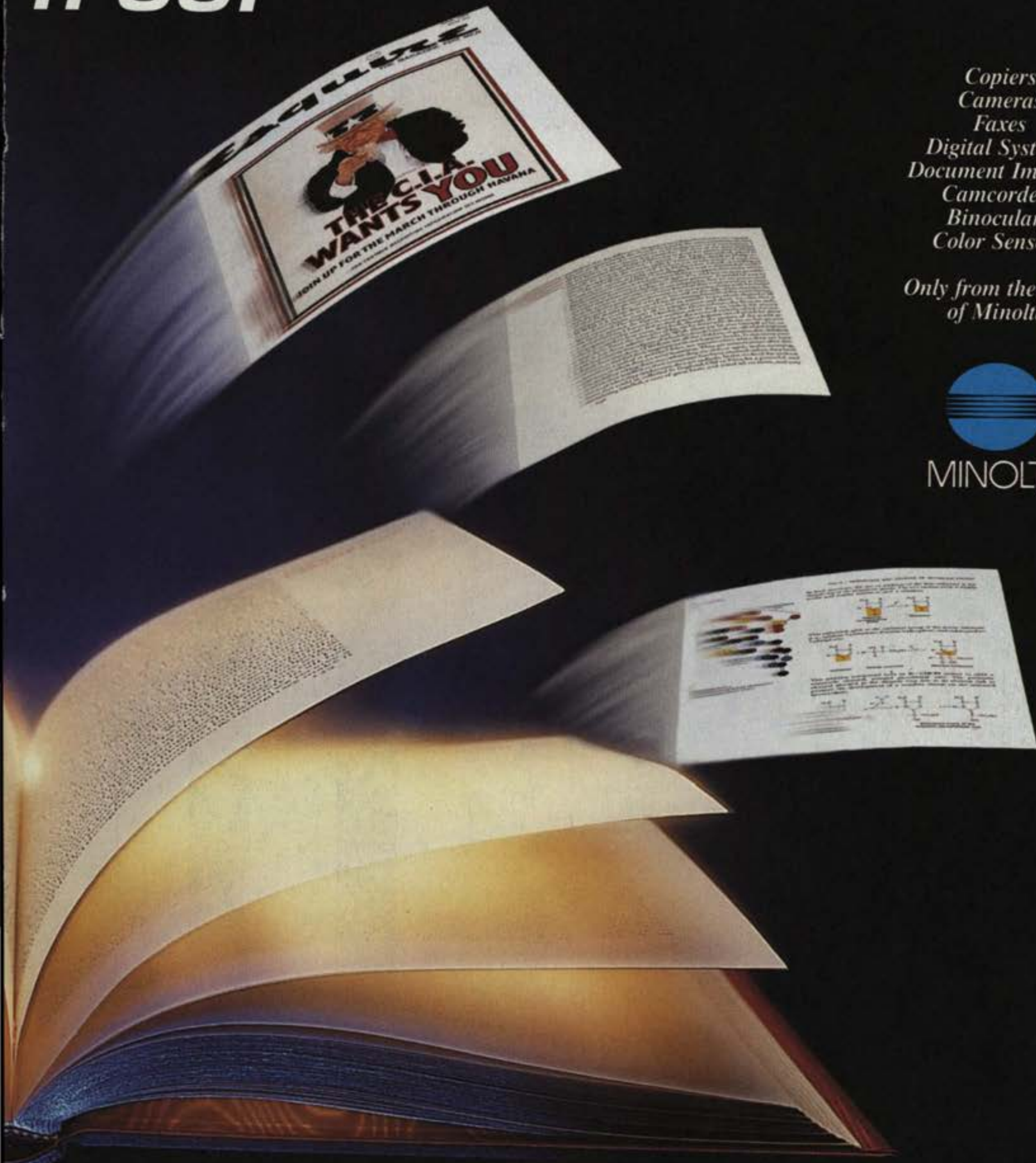

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TABLE 6
Expenditures: Departmental Libraries

Discipline	Monographs	Serials	Total	% Serials/Total	Cost/User
Biology	$61,213	$229,412	$305,758	0.81	$331
Chemistry	$25,381	$307,018	$333,940	0.92	$606
Engineering	$84,634	$307,881	$394,958	0.80	$141
Geology	$29,017	$128,964	$158,763	0.82	$423
Mathematics	$30,100	$136,464	$166,559	0.84	$248
Physics	$34,458	$313,457	$356,429	0.90	$633

professional staff for whom a departmental collection is their primary library.) Some of the variations observed may be explained by the relative sizes of the subject literatures, particularly the journal literatures. Other differences may reflect academic program strengths and sizes, as well as availability of funding on a particular campus.

Financial Support: Materials Expenditures

Survey respondents supplied information on materials expenditures for the library unit they were describing. This information was then broken down into categories for monographs, serials, and electronic resources. For some organizational types, few data were reported. For example, integrated collections, by definition, were not able to report expenditures for science materials. Data were available, and means are reported in table 5, for stand-alone and decentralized libraries. Data for subject departmental libraries are displayed in table 6.[6] Values supplied by Canadian libraries were converted to U.S. dollars at the then-prevailing exchange rate of $1 US = $0.74 Canadian. Not all libraries participating in the survey collected all the requested data, but enough did respond that differences are evident.

Institutions with decentralized collections spent, on average, $1,584,970 on serials; stand-alone libraries reported spending $1,247,031.

The survey requested information on expenditures for electronic resources, but, in fact, only a small percentage of libraries had such separate data for the survey period. Commentary provided by several survey respondents indicated that some institutions were moving toward allocating a separate line in the materials budget, whereas others reported funding electronic resources from different budget lines or through special allocations and grants. Funding and accounting for electronic resources appears to be an area where change is in process. Subsequent surveys may be able to document this development.

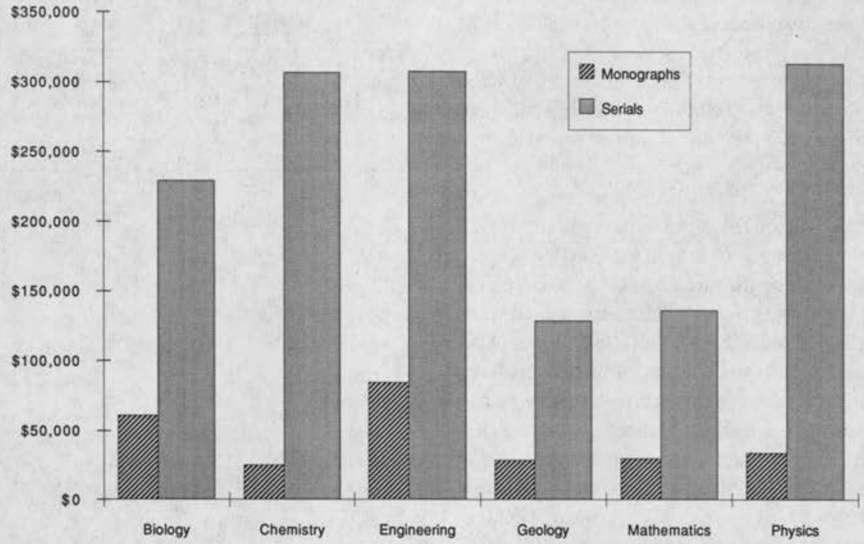
Table 5 provides comparative data on decentralized versus stand-alone collections. These data should be interpreted cautiously because very few decentralized systems were able to provide details on aggregate expenditures for all their departmental libraries. Some of the very largest decentralized systems with numerous branch libraries did not report. Consequently, the averages shown may be lower than would be the case if they had included all libraries. (Many more libraries provided data for individual departmental collections, as summarized in table 6.)

Despite the limitations noted above, the data support the conclusion that decentralized collections are more costly to maintain than stand-alone libraries. Institutions with decentralized collections spent, on average, \$1,584,970 on serials; stand-alone libraries reported spending \$1,247,031. Duplication of journal subscriptions is a feature of decentralized collections, but the larger expenditures also may be related, in part, to library size overall as measured by ARL rankings. Conversely, stand-alone libraries reported higher monographic budgets than the participating decentralized libraries. Data here are insufficient to justify any more than speculation in explaining this phenomenon. For example, the presence of a stand-alone science library may indicate the high visibility and overall relative importance of science programs on a particular campus, which would be manifested in a high level of commitment to develop the science monographic collection. In addition, fewer duplicate serial titles could easily be reflected in larger monographic budgets. The cost/user figure displayed in table 5 is based only on reported materials expenditures (monographs, serials, and electronic); staffing costs are not included. Total staffing for each type of system also is reported and would represent an additional cost factor to be considered in comparisons of the two organizational types.

Table 6 summarizes the data reported for subject departmental libraries and confirms the well-known fact that scientific journals comprise a major portion of the materials budget in each of these disciplines. The data are displayed as a bar graph in figure 4. The cost/user data for departmental libraries are based only on materials costs, as in table 5.

For the disciplines represented in figure 4 and table 6, the percentage of the materials budget spent on serials ranges from a low of 0.80 for engineering to a high of 0.92 for chemistry. Librarians who develop and manage science collections probably will not be surprised by these figures. In fact, the figures correlate closely with use patterns for types of materials as summarized by Robin Devin in a paper first presented at the 1988 Charleston Conference.[7] Devin identified more than fifty studies on the characteristics of literature use in various disciplines and summarized data from many

FIGURE 4
Departmental Libraries: Materials Expenditures



citation studies to compile a table of the percentage of citations to serials in subject literatures. The percentage of materials budgets spent on serials in ARL departmental libraries correlates positively with the relative importance of serials as measured by citations in published literature (correlation coefficient = 0.82). The percentage of the budget spent on serials also can be expected to reflect serial costs in a field. To test this hypothesis, the author consulted *Library Journal*'s 1993 periodical price index to obtain an average cost per title for each science discipline.[8] There is a very strong positive correlation of 0.94 between the percentage of the budget spent on serials and the average cost for serials in that discipline.

In the period that elapsed since Survey 3, dramatic changes took place, with a proliferation of CD-ROM products.

The cost per user computed for each discipline ranges from a low of $141 for engineering to a high of $633 for physics. The cost per user can be explained by a combination of factors including typical serials costs in a discipline, the number of serials needed to support research in that discipline, and the size of the primary user population. Engineering libraries frequently serve large undergraduate programs as well as sizable graduate programs, contributing to a lower cost per user than in disciplines such as geology where the enrollments are typically much lower. In both chemistry and physics, total user populations are comparable and of moderate size, and journal costs are among the highest of all disciplines in an academic library. Physics and chemistry collections have the highest cost per user, although a mitigating circumstance, especially in chemistry, may be the many uncounted users for whom the library serves as an important secondary collection. For example, the increasing importance of interdisciplinary research results in departmental collections being used by researchers in other fields than the primary subject. A chemistry library also may be important to scientists working in materials science, pharmacy, medicine, and many other disciplines. These secondary users are more difficult to identify and count, but they certainly benefit from collections that were developed originally to serve a particular discipline.

Survey respondents reported serials cancellations and additions.[9] Forty-two percent of the respondents (32 libraries) reported canceling serials during the period covered by the survey for a total of 5,525 cancellations. The average number of cancellations per library was 172, ranging from a high of 500 to a low of four among institutions canceling. Forty-one percent of the respondents (31 libraries) reported adding subscriptions for a total of 1,788 new subscriptions entered. The average number of additions among those institutions reporting was 57, ranging from a high of 612 new titles at one institution to a low of only one. Many institutions adding new subscriptions (14 out of 31) added fewer than twenty-five titles. Only twenty institutions were able to add titles without cutting. The net loss

TABLE 7
Top Ten CD-ROM Products

Rank	Product	Number Held
1	MathSci	44
2	Compendex/ Engineering Index	37
3/4	Biological Abstracts/ BIOSIS	35
	GeoRef	35
5	Science Citation Index	34
6	MEDLINE	33
7	INSPEC	32
8	AGRICOLA	25
9	Applied Science & Technology Index	22
10	Computer Select	21

of subscriptions in this population was 3,737 titles for the reporting period. Assigning a dollar value to this very diverse set of titles would be difficult to do precisely with available data, but the 1993 periodical price index does allow a range to be estimated. The price index includes cost information by broad subject categories. For *Science Citation Index* titles, the average cost per title during 1993 was $345.99 for domestic publications and $658.78 for foreign publications.[10] It is unlikely that all canceled subscriptions were exclusively either category, but using these values as extremes allows estimation of an upper bound of $2,461,860 and a lower bound of $1,292,964 in losses to publishers of scientific and technical journals through ARL cancellations alone!

TABLE 8
Top Ten Locally Mounted Databases

Rank	Database	Institutions
1	MEDLINE	37
2	PsycInfo/PsycLit	34
3	Expanded Academic Index/MAGS	32
4	Current Contents	27
5	ERIC	26
6	ABI/Inform	18
7	News/National Newspaper Index	16
8/9	Business Index	15
	Periodicals Abstracts	15
10	Applied Science & Technology Index	14
	General Science Index	14
	CARL Uncover	14

Electronic Resources

This survey represents the first effort to collect detailed information on electronic resources. Survey 3 had only requested a figure on CD-ROM expenditures and identification of any locally mounted databases. In the period that elapsed since Survey 3, dramatic changes took place, with a proliferation of CD-ROM products. Some institutions reported extensive tape loading of purchased or leased databases. New sections were written for the questionnaire to elicit details on some of these types of activities. The survey included questions about database availability, whether as CD-ROM-based products on stand-alone or networked workstations or as tape-loaded databases on an institutional mainframe.[11] Table 7 lists the most frequently held CD-ROM reference products, whether used over a network or on a stand-alone workstation. Table 8 shows the databases most frequently reported as locally mounted on an institutional computer. Table 9 combines the databases that are available in respondents' libraries, whether as CD-ROMs or locally mounted files.

MEDLINE leads the list by a considerable amount and was available in seventy libraries. Comparing the tables reveals details such as the fact that MathSci appears more frequently as a CD-ROM product than a local database, possibly reflecting its targeted appeal to a well-defined audience, primarily mathematicians. Other discipline-based CD-ROM products include Compendex, GeoRef, and BIOSIS. Although not analyzed for

TABLE 9
Top Ten Databases
(OPAC or CD-ROM)

Rank	Database	Institutions
1	MEDLINE	70
2	PsycInfo/PsycLit	53
3	MathSci	47
4/5	INSPEC	45
	Biological Abstracts/ BIOSIS	45
6/7	ERIC	44
	Compendex/ Engineering Index	44
8	GeoRef	40
9	Applied Science & Technology Index	36
10	Science Citation Index	34

TABLE 10
Salaries* in ARL Academic Science Libraries (N=63)

Position	Mean	Range
Assistant Director (n=13)	$57,765	$41,052–$76,900
Head (non-AUL) (n=36)	$47,694	$33,000–$67,061
Public Services (n=52)	$35,764	$25,600–$52,200
Technical Services (n=9)	$38,391	$31,212–$51,000
Entry Level (n=59)	$25,814	$21,500–$34,000

*11 respondents reported in Canadian dollars; these were converted to U.S. dollars at the rate of $1 US = $.80 Canadian.

this article, survey data exist that can be used to test whether specialized CD-ROM products are more likely to be found in subject departmental libraries than in multidisciplinary collections.

A number of the mainframe databases are multidisciplinary in nature, such as *Current Contents*, newspaper indexes, and encyclopedias. Others are likely to be of interdisciplinary interest (PsycInfo, ERIC) or used by larger groups scattered across a campus (MEDLINE). Of course, the availability of a database as a CD-ROM or a tape-loadable product also is a determining factor, as is the relative cost of the two formats.

The survey included a question about provision of access to the Internet, an area where activity seemed to be increasing dramatically as this questionnaire was written. By the time the surveys were returned, the change appeared complete: virtually all respondents stated that their libraries offer access to the Internet.

Salaries

The questionnaire also requested salary information on a separable page. Some respondents chose to include that with the rest of the questionnaire; others returned the salary page under separate cover or not at all.[12] The salaries shown in table 10 represent data submitted by sixty-three institutions. Eleven libraries reported in Canadian dollars; these were converted to U.S. dollars at the rate of exchange used by the ARL in compiling their annual salary survey for the comparable time period.[13] Not all respondents provided salaries in each category requested; thus, the number of libraries reporting in each rank is indicated in the table.

The total library budgets for the respondents range from just under $4 million to more than $35 million, with an average of about $12.5 million. ARL statistics report salaries to be, on average, 51 percent of a total library budget; that also is the percentage reported by these respondents.

Science librarians often speculate about whether salaries are better for science specialists than for those in other subject areas. ARL salary statistics tabulate salary data for law and medical librarians separately, but provide no details on science/engineering librarians or any other specialists broken down by subject area. ARL data for 1993 report an average salary for a "branch head" as $46,838, and this might be compared to salary data reported here for "head" of a science library as $47,694. The difference suggests some support for the hypothesis that science subject specialists earn higher salaries, but would need to be tested more systematically with data gathered in a fashion that allows direct comparisons across identically defined categories.

Directions for Further Research

The author did not analyze all the data collected for Survey 4 in this article. Additional analyses may result in further publication, and at least one project is under way describing staffing patterns in science and technology libraries. Marilyn Von Seggern of Washington State University and Donna Cromer of the University of New Mexico are analyzing this portion of the data and are preparing a separate article that will be submitted for publication upon completion. For that reason, this analysis reports only very general staffing data.

The Comparison Committee, under its present charge, is directed to collect statistical data of this type on an ongoing basis. Future surveys that include similar questions to those that were used here should continue to build a longitudinal collection of statistics supporting identification of trends and documenting significant changes. Given the many developments in research libraries, it is likely that Survey 5 will add new questions, especially in areas that relate to electronic resources and applications of information technology. For example, electronic journals are increasing in number and mode of distribution, especially in science libraries. Documenting their use and impact on library operations might be an additional area of exploration for the next survey.

As libraries were contacted for this survey, there was anecdotal evidence that some were reorganizing and flattening administrative hierarchies or trying new management techniques such as total quality management (TQM) or reengineering. Exploring how science libraries are participating in these developments might provide a focus for a future investigation. In addition, there will no doubt be other areas, as yet unknown, that will result in the collection of new statistics descriptive of the diversity found in science and technology libraries.

Note: The author benefited from significant input from committee members who assisted with data analysis: Andrea Duda, University of California-Santa Barbara; Bonnie Osif, Pennsylvania State University; Nancy Simons, University of Arizona; and Terry Wittig, Carnegie Mellon University. All the committee members contacted a portion of the survey population, answered questions from respondents, and provided follow-up to ensure maximum return of questionnaires. This is a joint project by a true "working" committee. The Comparison Committee expresses appreciation to all those ARL librarians who took time from busy schedules to provide data and thoughtful responses to this survey. Without their input, librarians would know much less about science and technology libraries in ARL.

Notes

1. Survey 1 is described in Emerson Hilker, "Statistical Data for Stand-Alone Science/Engineering Libraries in the United States and Canada 1984/1985," *Science & Technology Libraries* 8 (fall 1987): 89–127 (contains tabulated data from all respondents). Survey 2 is described in Emerson Hilker, "Survey of Academic Science/Technology Libraries," *College & Research Libraries News* 88 (June 1988): 375–76 (a full data set was distributed to respondents in tabulated form). The Definition Survey is described in Elaine Brekke, Kimberly Douglas, and Elizabeth Roberts, "Academic Science and Technology Libraries: Facilities and Administration," *Science & Technology Libraries* 11, no. 3 (June 1988): 107–16. The Historical Survey is described in Elizabeth P. Roberts, Elaine Brekke, and Kimberly Douglas, "Physical Structure and Administration of Science and Technology Libraries: An Historical Survey," *Science & Technology Libraries* 11, no. 3 (spring 1991): 91–105.

2. Carole S. Armstrong, "Historical Background of the STS Committee on Comparison of Science and Technology Libraries," *Report to the STS Committee on Comparison of Science & Technology Libraries,* ALA Annual Meeting, June 23, 1990.

3. Kimberly Douglas, private communication.

4. Leon Shkolnik, "The Continuing Debate over Academic Branch Libraries," *College & Research Libraries* 52, no. 4 (July 1991): 343–51.

5. *ARL Statistics., 1992–1993* (Washington, D.C.: ARL, 1994). (ARL ranks for the period corresponding most closely to the survey data were utilized.) See also URL = http://www.lib.virginia.edu/arlstats/ where data are available graphically and as files for ftp.

6. Bonnie Osif, Pennsylvania State University, carried out the analysis of expenditures for collections.

7. Robin B. Devin, "Who's Using What?" *Library Acquisitions: Practice & Theory* 13 (1989): 167–70.

8. Lee Ketcham and Kathleen Born, "The Art of Projecting: The Cost of Keeping Periodicals," *Library Journal* 118 (Apr. 15, 1993): 42–48.

9. Terry Wittig, Carnegie Mellon University, compiled and analyzed responses on serials cancellations.

10. Ketcham and Born, "The Art of Projecting," 45.

11. Andrea Duda, University of California-Santa Barbara, compiled data on CD-ROM and mainframe tape-loaded databases.

12. Nancy Simons, University of Arizona, analyzed the salary data.

13. *ARL Annual Salary Survey, 1993* (Washington, D.C.: ARL, 1994). Available as an ERIC document: ED 359 955.