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OCCASIONAL PAPERS

TOWARD A GENERAL THEORY OF CIRCULATION

by

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CONTENTS

| | |
|---|----|
| ABSTRACT. | 1 |
| INTRODUCTION. | 2 |
| THE ENVIRONMENT | 2 |
| ANALYZING CHARGING BEHAVIOR | 5 |
| ANALYZING BOOK RETURNING BEHAVIOR | 20 |
| GENERALIZING ABOUT BORROWER BEHAVIOR. | 33 |
| USING BORROWER BEHAVIOR | 40 |
| TOWARD A GENERAL THEORY OF CIRCULATION. | 43 |
| REFERENCES. | 48 |
| APPENDIX. | 50 |
| VITA. | 55 |

ABSTRACT

A study of the circulation process in the library indicates that patterns of behavior can be identified in the way borrowers charge and return library materials, and that those patterns tend to remain constant under different loan policies. Thus the length of time books are retained is determined more by the nature of the material and the nature of the borrower than by formal loan policy. The results of the study of circulation at one library are compared with results of studies published about other libraries and with a sampling of opinions about circulation patterns by other librarians. A general theory of circulation is proposed which will permit the prediction of how books will be charged and how they will be returned.

INTRODUCTION

The plight of the man who was unable to see the forest because of the many trees in his way may be considered analogous to the situation facing many librarians who attempt to grapple with the problems of circulation. In the case of circulation, however, it would seem that even the presence of the tree is often overlooked due to preoccupation with one or more of its individual branches. These branches include loan policy, charging systems, overdue fines, renewal policy, etc., and a moment's reflection reveals that most of the professional literature devoted to "circulation" is actually focused on one of these subtopics. The tree itself--the circulation process as a whole--receives much less attention.

Nevertheless, one thing that most libraries still have in common, regardless of size, type, or location, is the daily entry and exit of patrons through their doors with library materials. This recurring circulation process, the same in its essentials in all kinds of libraries, is the forest. Looking at circulation from this perspective is most infrequent of all. This study was undertaken as an attempt to begin the formulation of such a broad perspective on circulation. It represents an effort to discover if certain law-like statements might be made about circulation at a general level. If confirmed, those statements could form the foundation of a general theory of circulation.

The method adopted was to work from the specific to the general, using the concept of borrower behavior. In general, borrower behavior may be defined as any action by the borrower which can be objectively identified and empirically verified. Two primary aspects of borrower behavior can be identified in the circulation process: charging and discharging behavior. The study was based upon the assumption that through an extended analysis of circulation records and statistics, definite patterns could be identified in the way books were charged and returned. It was further postulated that these patterns of borrower behavior would remain relatively fixed over periods of time and be relatively unchanged by differences in formal loan policy. The attempt to confirm or refute these two hypotheses constitutes the first part of this study.

The second part of the study is related to the actual patterns of borrower behavior identified. If such patterns could be identified within one library, an attempt would be made to determine if like or dissimilar patterns of borrower behavior could be identified at other libraries. This was accomplished by analyzing circulation statistics reported in the literature and by querying other circulation librarians. The goal of this second part of the study was to develop hypotheses about the nature of book charging and returning which would be applicable to all libraries and then test them with the available data. These hypotheses, if confirmed, might be advanced as the basis of a general theory of circulation.

THE ENVIRONMENT

The College of William and Mary, chartered in 1693, can claim a distinguished history. Second only to Harvard in age among institutions of higher education in the

United States, its distinguished alumni include Thomas Jefferson, John Marshall, James Monroe, and John Tyler. Early in the twentieth century, after more than 200 years as a private college, William and Mary became a unit of the public education system of the Commonwealth of Virginia.

Named in honor of Dr. Swem, distinguished historian, bibliographer, and librarian of the college for many years, the Earl Gregg Swem Library houses a collection of approximately 650,000 bound volumes divided between the Dewey Decimal (DDC) and Library of Congress (LCC) classification systems, microform holdings in excess of 1.3 million items, and extensive collections of rare books and manuscript materials. It serves an academic community of about 5,000 undergraduate and graduate students, and 1,000 faculty and administrative staff on the Williamsburg campus.

The college is predominantly an undergraduate liberal arts institution, although a variety of advanced degrees are offered. Also part of the college, though located on separate campuses, are the Virginia Institute of Marine Science (VIMS) and the Virginia Associate Reserach Campus (VARC). The college is also administratively responsible for the operation of Christopher Newport College, a 4-year undergraduate institution located in Newport News, and for Richard Bland Community College, a 2-year junior college located in Petersburg. Students, faculty, and administrative staff of all the college's divisions are entitled to use the library. In recognition of its position as one of the major intellectual resource centers of the commonwealth and its obligation as a publicly funded institution, borrowing privileges are further extended to any permanent resident of Virginia 18 years of age or older.

Prior to June 1974, the library's loan policy, although never formally codified and published, was understood to be as follows. Faculty members, their spouses, and a small number of special individuals (primarily members of the research staff of the Colonial Williamsburg Foundation) enjoyed indefinite book loans. These borrowers were entitled to retain materials charged until they were recalled by the library for the specific use of another borrower. All other borrowers were entitled to a basic loan period of three weeks, but books would be renewed an unlimited number of times at the borrower's request as long as no other request for the material was received. No limit was imposed on the number of books which might be charged by any borrower. With the exception of faculty members, all borrowers were liable for overdue fines in the amount of 5¢ per day per book, and for replacement costs of lost or damaged books.

Because it was the source of most of the data in this study, the circulation charging and discharging system in use at the library will be described here in some detail. The system is entirely manual. The basic document of the circulation system is the charge card which is completed by the borrower for each transaction (see Figure 1). Books in the circulation collection do bear a date due slip inside the cover, but books are not pocketed and do not have permanent charge cards. Supplies of blank charge cards are located throughout the library, and borrowers are required to complete one for each book they wish to borrow. The borrower then presents the completed charge card, the book, and either a valid college identification card or library borrower's card to the circulation desk attendant. Cards are checked for completeness of information and legibility, then compared with the call number imprinted on the book to ensure accuracy. Both the card and the book are stamped with the current date due. The charge card is retained by the desk attendant, sleeved with a plastic cover which is color-coded to indicate approximate date due, and filed in a daily charge file according to call number.

| | |
|---------------------------------|---------------------|
| PLEASE PRINT | |
| <u>Date Due</u> | |
| <u>Call Number</u> | <u>Borrower</u> |
| | W&M Undergrad _____ |
| | W&M Graduate _____ |
| | W&M Faculty _____ |
| | Other _____ |
| <u>Author</u> | |
| <u>Title</u> | |
| _____ | |
| _____ | |
| <u>Borrower</u> | |
| <u>Address</u> | |
| _____ | |
| <u>Signature</u> | |
| _____ | |
| Use one call slip for each book | |
| PLEASE PRINT | |
| EARL GREGG SWEM LIBRARY | |
| College of William and Mary | |

Figure 1. Charge Card

At the conclusion of each day, the accumulated charges are counted for a statistical record maintained by the circulation department. This record includes the total number of books charged, the number of books charged by specified classes of borrowers, and the number of books charged from each of the subject classes in the two classification systems used in the library. Once this tabulation has been made, the charge cards are filed in the master circulation file by call number. Thus, location information for all books charged out of the library at any given time should theoretically be available in one master file--but the information is accessible only by call number.

When a book is returned to the library, the appropriate charge card is removed from the master file and simply thrown away. The date due stamped in the book is defaced, and the book is transferred to temporary storage shelves prior to its return to the stacks. At regular intervals all charge cards with a particular color-coded cover are removed from the master file for the preparation of overdue notices. Before any notice is sent, a search is made for the book within the library to make sure it was not returned and uncleared through some error. Following this search, overdue notices are issued, the plastic cover is changed to a color code reserved for overdues, and the charge card is returned to the master file.

Books may be renewed in two ways. If the book is presented at the loan desk, the charge card is removed from the master file, both book and charge card are stamped with the new due date, and the transaction is handled as an original charge from that point. Borrowers may also renew books by listing call number, author, and title on one of the library's renewal request forms. The charge cards in the master file are processed in the same manner, but the patron is simply informed what the new due date will be.

Another look at the charge card shown in Figure 1 should make it clear that the system, though perhaps cumbersome, is well suited to produce meaningful data about circulation behavior. What is charged may be known from the call number, which is unique to each book. Who charges may be determined from both the personal information recorded and the required indication of borrower status. How long materials are retained may be calculated from the due date(s) stamped on the charge card. Furthermore, since the charge card is restricted to a single transaction, it may be conveniently sorted and counted in a variety of ways to generate meaningful information.

Thus the charge card used at Swem Library can provide the answers to the three fundamental questions about circulation. Who charges books? What books do they charge? How long are books retained before they are returned? The answers to these questions, when identified, may be said to comprise borrower behavior.

ANALYZING CHARGING BEHAVIOR

The first study of charging behavior at Swem Library was conducted during the period 21 October--10 November 1973. This period, approximately midsemester at the college, was chosen in the belief that it would represent the most typical pattern of library use. Nine days (five weekdays and four weekend days) were selected at random¹ for use in obtaining the data for analysis. On these days the daily circulation report was prepared utilizing a special form designed for the study (see Figure 2). The actual number of books charged in each subject area within each classification

| | Total | S | F | O | R |
|-------|-------|---|---|---|----------|
| 000 | | | | | |
| 100 | | | | | |
| 200 | | | | | |
| 300 | | | | | |
| 400 | | | | | |
| 500 | | | | | |
| 600 | | | | | |
| 700 | | | | | |
| 800 | | | | | |
| 900 | | | | | |
| Bio | | | | | |
| Va | | | | | |
| Unc | | | | | |
| Fic | | | | | |
| DDC | | | | | |
| A | | | | | |
| B | | | | | |
| C-G | | | | | |
| H-L | | | | | |
| M,N | | | | | |
| P | | | | | |
| Q | | | | | |
| R-T | | | | | |
| U,V | | | | | |
| Z | | | | | |
| LC | | | | | |
| TOTAL | | | | | |
| Date | | | | | Initials |

Figure 2. Daily Charge Record

system used by the library, as well as the status of the borrower, was recorded. At the conclusion of the sampling period, the aggregate results were computed and tabulated.

Table 1 shows the distribution of book charges during the sample period by classification system and indicates that books in the DDC collection account for less than one-third of total book circulation. At the time of this sample, the sizes of the DDC and LCC collections were approximately equal, but nearly all materials acquired after 1967 bear LCC call numbers. That the DDC collection received less use than the LCC collection came as no surprise, since regular circulation statistics had revealed a pattern of declining circulation of DDC materials over the past five years both in terms of actual numbers and as a percentage of total circulation. It should also be noted that the calculation of the distribution of charges for each day of the sample period produced variations no greater than $\pm 3\%$ from the aggregate figures shown above.

Table 2 illustrates the distribution of book charges by subject area within each of the classification systems. Included with the DDC charges are books bearing special call numbers signifying biography, fiction, and Virginiana. Small separate collections of these materials are maintained in the stacks, consisting of materials acquired before 1950 which are being reclassified to LCC as rapidly as possible. In addition, there is a small, constantly changing collection of unclassified books, i.e. books for which catalog cards have not yet become available.

The results are interesting insofar as they indicate that the preference for LCC materials exists within all of the subject areas, with the exception of fine arts. It is also useful to note that book circulation, regardless of classification system, tends to be concentrated in the subject areas of literature, history, and the social sciences. Each of these three subject areas accounts for more than 20% of daily charges on a regular basis. Again, the table presented here is based on the total sample, but tabulations on a daily basis showed a high level of consistency among those subject classes which had significant borrowing activity. For example, the percentage of book charges originating in classes 300, 800, 900, C-G, H-L, and P varied no more than $\pm 4\%$ on a daily basis.

Table 3 is the most instructive about patterns of borrower behavior, for it shows the distribution of book charges by type of borrower for each of the subject classes in each classification system. While something similar to Tables 1 and 2 could have been derived from regular circulation records, the information presented in Table 3 was largely unknown. The relative percentages of total book circulation attributable to student, faculty, and other borrowers were known, and the percentages obtained from the sample were consistent with previous records. In fact, the percentages derived from the sample varied less than $\pm 1.5\%$ with the annual circulation statistics for each of the past five years. Such calculations, however, were always based on simple aggregate figures of total book circulation. Where those charges originated had never clearly been identified.

Perhaps simplistically, it had been assumed that book borrowing by other or noncollege borrowers was heavily concentrated in Virginiana, fiction, or in subject areas of only marginal interest to students and faculty. This assumption meant that student and faculty access to core materials related to the curriculum would not be significantly impaired by the library's liberal loan policy vis-à-vis noncollege borrowers. The evidence produced by the study raised questions about the accuracy of that assumption.

| | |
|---|-------|
| Total sample book circulation | 5,928 |
| Average daily book circulation | 660 |
| Total sample DDC circulation | 1,735 |
| Average daily DDC circulation | 192 |
| Average percentage of daily circulation | 29% |
| Total sample LCC circulation | 4,193 |
| Average daily LCC circulation | 466 |
| Average percentage of daily circulation | 71% |

Table 1. Circulation Distribution by Classification System
(Oct.-Nov. 1973)

| Dewey Decimal Classification System Charges | | | Library of Congress Classification System Charges | | |
|--|--------|------------|--|--------|------------|
| Class | Number | Percentage | Class | Number | Percentage |
| 000 | 5 | 0.3 | A | 8 | 0.2 |
| 100 | 53 | 3.2 | B | 517 | 12.3 |
| 200 | 60 | 3.5 | C-G | 933 | 22.2 |
| 300 | 286 | 16.5 | H-L | 1224 | 29.2 |
| 400 | 34 | 1.9 | M,N | 221 | 5.3 |
| 500 | 81 | 4.7 | P | 842 | 20.1 |
| 600 | 72 | 4.2 | Q | 206 | 4.9 |
| 700 | 202 | 11.6 | R-T | 220 | 5.2 |
| 800 | 474 | 27.3 | U,V | 7 | 0.2 |
| 900 | 257 | 14.8 | Z | 15 | 0.4 |
| Biog. | 32 | 1.8 | | | |
| Va. | 61 | 3.5 | | | |
| Uncl. | 17 | 0.9 | | | |
| Fict. | 101 | 5.8 | | | |

Table 2. Circulation Distribution by Subject (Oct.-Nov. 1973)

| Dewey Decimal Classification System | | | | | Library of Congress Classification System | | | | |
|-------------------------------------|------------------|-----------------|-----------------|---------------|---|------------------|-----------------|-----------------|---------------|
| Class | Book Circulation | Student Charges | Faculty Charges | Other Charges | Class | Book Circulation | Student Charges | Faculty Charges | Other Charges |
| 000 | 5 | 60% | - | 40% | A | 8 | 50% | 25% | 25% |
| 100 | 53 | 81% | - | 19% | B | 517 | 72% | 3% | 25% |
| 200 | 60 | 68% | - | 32% | C-G | 933 | 75% | 5% | 20% |
| 300 | 286 | 67% | 1% | 32% | H-L | 1224 | 71% | 5% | 24% |
| 400 | 34 | 79% | - | 21% | M,N | 221 | 74% | 5% | 21% |
| 500 | 81 | 81% | 4% | 15% | P | 842 | 79% | 3% | 18% |
| 600 | 72 | 69% | 3% | 28% | Q | 206 | 73% | 11% | 17% |
| 700 | 202 | 82% | 2% | 16% | R-T | 220 | 66% | 5% | 29% |
| 800 | 474 | 83% | 2% | 15% | U,V | 7 | 57% | 14% | 29% |
| 900 | 257 | 62% | 3% | 35% | Z | 15 | 33% | - | 67% |
| Biog. | 32 | 59% | 3% | 38% | | | | | |
| Va. | 61 | 23% | 13% | 64% | | | | | |
| Uncl. | 17 | 53% | 23% | 24% | | | | | |
| Fict. | 101 | 70% | 5% | 25% | | | | | |
| TOTAL | 1735 | 72% | 3% | 25% | TOTAL | 4193 | 73% | 4% | 23% |

Table 3. Circulation Distribution by Borrower Status (Oct.-Nov. 1973)

As the table clearly shows, book borrowing by noncollege patrons is nearly evenly distributed throughout the entire collection, and the proportion of book charges attributable to noncollege borrowers is substantial. The pattern of book charging revealed here was provocative enough to stimulate surveying of noncollege borrowers in order to learn more about their use of the library. These studies, not wholly pertinent to this topic of inquiry and thus not reported here, showed that more than 78% of the noncollege patrons surveyed were students at some other institution of higher education and that 62% of those borrowers depended upon Swem Library for primary library service.

It thus seems likely that noncollege borrowers are in some sense competing with borrowers from the William and Mary community for available library materials. In an academic library, information needs are often immediate, and even under the best conditions recall procedures are time-consuming and expensive. It may also be assumed that a significant amount of use of the collection is accomplished through browsing. It would therefore seem that student and faculty access to significant amounts of curriculum-related materials is limited by the borrowing behavior of noncollege borrowers.

Table 3 is based on the total sample, but tables calculated on a daily basis were surprisingly consistent with the figures shown. This fact demolished another cherished opinion, i.e. that use of the library by noncollege borrowers was primarily a weekend phenomenon. Consequently, noncollege borrowers might be regarded as competitors for library space as well as for library materials.

A followup study of charging behavior was undertaken during the period 24 February --9 March 1974, utilizing exactly the same methodology as has been described. The data derived from this sample, though not fully reported here, were consistent with those obtained from the first sample. The variation in distribution of charges by classification system was no greater than $\pm 1\%$. Variations in the distribution of charges by subject area were within $\pm 1.5\%$ for the subjects of major borrowing activity. Differences in the distribution of charges by borrower status were somewhat larger, but in no case did they exceed $\pm 8\%$.

A third analysis of the patterns of charging behavior was undertaken during the period 21 October--10 November 1974, exactly one year after the first survey. The results of this sample are reported in Tables 4, 5 and 6. Although environmental conditions for the first two samples were identical, the third sample was taken under altered circumstances. At the time of the third sample, the library's formal loan policy had been extensively modified. The nature of the changes will be discussed later, but the most significant change was the lengthening of the loan period from three to four weeks. Moreover, the separate biography collection had been almost completely reclassified to LCC and dispersed at the time the third sample was taken.

A comparison of the third sample with the first sample reveals that variance in distribution of charges by classification system was only 1%, and variations in the distribution of charges by subject averaged 1.6%. Larger variances can be found in the distribution of charges by borrower status, but for subjects of major borrowing activity they do not exceed $\pm 8\%$. Variances are much larger in the DDC subject areas than in the LCC subject areas. This may be attributed to the smaller number of DDC charges numerically, spread over more DDC subjects.

| | |
|---|-------|
| Total sample book circulation | 5,134 |
| Average daily book circulation | 570 |
| Total sample DDC circulation | 1,374 |
| Average daily DDC circulation | 153 |
| Average percentage of daily circulation | 28% |
| Total sample LCC circulation | 3,760 |
| Average daily LCC circulation | 418 |
| Average percentage of daily circulation | 72% |

Table 4. Circulation Distribution by Classification System
(Oct.-Nov. 1974)

| Dewey Decimal Classification System Charges | | | Library of Congress Classification System Charges | | |
|--|--------|------------|--|--------|------------|
| Class | Number | Percentage | Class | Number | Percentage |
| 000 | 10 | 0.7 | A | 8 | 0.2 |
| 100 | 96 | 7.0 | B | 332 | 8.8 |
| 200 | 28 | 2.0 | C-G | 875 | 23.3 |
| 300 | 275 | 20.0 | H-L | 1039 | 27.6 |
| 400 | 23 | 1.7 | M,N | 196 | 5.2 |
| 500 | 87 | 6.3 | P | 867 | 23.1 |
| 600 | 75 | 5.5 | Q | 227 | 6.0 |
| 700 | 110 | 8.0 | R-T | 184 | 4.9 |
| 800 | 307 | 22.3 | U,V | 15 | 0.4 |
| 900 | 242 | 17.6 | Z | 17 | 0.5 |
| Biog. | 3 | 0.2 | | | |
| Va. | 32 | 2.3 | | | |
| Uncl. | 7 | 0.5 | | | |
| Fict. | 79 | 5.7 | | | |

Table 5. Circulation Distribution by Subject (Oct.-Nov. 1974)

| Dewey Decimal Classification System | | | | | Library of Congress Classification System | | | | |
|-------------------------------------|------------------|-----------------|-----------------|---------------|---|------------------|-----------------|-----------------|---------------|
| Class | Book Circulation | Student Charges | Faculty Charges | Other Charges | Class | Book Circulation | Student Charges | Faculty Charges | Other Charges |
| 000 | 10 | 70% | 10% | 20% | A | 8 | 50% | 37% | 13% |
| 100 | 96 | 79% | - | 21% | B | 332 | 74% | 4% | 21% |
| 200 | 28 | 64% | 7% | 29% | C-G | 875 | 79% | 5% | 15% |
| 300 | 275 | 69% | 3% | 28% | H-L | 1039 | 76% | 3% | 21% |
| 400 | 23 | 74% | - | 26% | M,N | 196 | 75% | 5% | 20% |
| 500 | 87 | 74% | 5% | 21% | P | 867 | 80% | 4% | 16% |
| 600 | 75 | 68% | 4% | 28% | Q | 227 | 74% | 3% | 23% |
| 700 | 110 | 69% | 6% | 25% | R-T | 184 | 69% | 4% | 27% |
| 800 | 307 | 75% | 2% | 21% | U,V | 15 | 53% | 20% | 27% |
| 900 | 242 | 68% | 4% | 28% | Z | 17 | 47% | 24% | 29% |
| Biog. | 3 | 67% | - | 33% | | | | | |
| Va. | 32 | 34% | 14% | 60% | | | | | |
| Uncl. | 7 | 57% | 5% | 29% | | | | | |
| Fict. | 79 | 72% | - | 23% | | | | | |
| TOTAL | 1374 | 71% | 3% | 26% | TOTAL | 3760 | 77% | 5% | 18% |

Table 6. Circulation Distribution by Borrower Status (Oct.-Nov. 1974)

Tables 7, 8 and 9 are based on the total data accumulated from all three sample periods. The total book circulation of 16,664 charged on the 27 days used as data collection points represents slightly more than 10% of the library's total annual book circulation. It should be recalled that the samples were taken at approximately 6-month intervals, and that one of the samples was taken under a substantially different loan policy. Nevertheless, there is a high degree of similarity among the patterns of book charging found in each of the sample periods. Furthermore, the patterns observed on a daily basis are consistent with the patterns found in the samples. The patterns of charging behavior exhibited thus seem to be relatively fixed and constant. In most cases the percentages have been rounded to whole numbers for convenience.

If the patterns of charging behavior shown in these tables are taken to represent the patterns of borrowing behavior which will be exhibited in the library on a continuing basis, then it should be possible to predict the distribution of book charges with reasonable accuracy. Naturally, predictions on a daily basis will be less accurate than those for a longer period of time--and predictions of numbers of charges in the subject areas of only limited borrowing activity will be less accurate than those for subjects with more frequent circulation.

An attempt was made to verify the patterns of charging behavior developed from the survey. Using regular circulation records, the total monthly book circulation for each of the nine months comprising the 1974 academic year was established. From this total circulation figure, a predicted distribution of charges was calculated for each month using the percentages developed from the study. Unfortunately, regular circulation statistics did not include a breakdown of charges by borrower type within each subject area. Therefore, the predicted distribution of charges by status of borrower could only be calculated and tested on the basis of total charges.

The results of this first attempt at verification of the models of borrowing behavior developed from the study are shown in Tables 10, 11 and 12. In reading these tables it should be remembered that the numbers of predicted charges shown in all three tables were calculated solely on the basis of total actual monthly charges. In other words, from a known total number of charges for each month, a prediction is made about how many of those charges originated in the DDC and LCC collections, how many of those charges were made by student, faculty, and other borrowers, and how many of those charges originated in three major subject areas within each classification system. In order to evaluate the accuracy of the predictions, actual circulation statistics for the period were extracted from the records and listed for comparison.

As expected, predictions of the distribution of charges for the entire 9-month period were much more accurate than those for each month within the period. Even on a monthly basis, however, prediction of the distribution of charges by classification system and by subject was nevertheless within reasonable limits of accuracy. Prediction of the distribution of charges by borrower status for the entire period was reasonably accurate, but within each month of the period wide variations were found. This was especially true in the case of faculty charges.

Clearly there remains much room for improvement and refinement of the models of borrowing behavior developed here. Nevertheless, the nature of the results of this preliminary testing are encouraging. Additional analyses of charging patterns using the same methodology have been scheduled on a quarterly basis during 1975. It is

| | |
|---|--------|
| Total sample book circulation | 16,664 |
| Average daily book circulation | 617 |
| Total sample DDC circulation | 4,783 |
| Average daily DDC circulation | 177 |
| Average percentage of daily circulation | 28% |
| Total sample LCC circulation | 11,881 |
| Average daily LCC circulation | 440 |
| Average percentage of daily circulation | 72% |

Table 7. Circulation Distribution by Classification System
(Total Sample)

| Dewey Decimal Classification System Charges | | | Library of Congress Classification System Charges | | |
|--|--------|------------|--|--------|------------|
| Class | Number | Percentage | Class | Number | Percentage |
| 000 | 33 | 1 | A | 20 | 0.2 |
| 100 | 263 | 6 | B | 1239 | 10 |
| 200 | 140 | 3 | C-G | 2657 | 22 |
| 300 | 827 | 17 | H-L | 3317 | 28 |
| 400 | 79 | 2 | M,N | 652 | 5 |
| 500 | 256 | 5 | P | 2542 | 22 |
| 600 | 245 | 5 | Q | 697 | 6 |
| 700 | 513 | 11 | R-T | 659 | 6 |
| 800 | 1164 | 24 | U,V | 40 | 0.3 |
| 900 | 768 | 16 | Z | 58 | 0.5 |
| Biog. | 62 | 1 | | | |
| Va. | 154 | 3 | | | |
| Uncl. | 34 | 1 | | | |
| Fict. | 245 | 5 | | | |

Table 8. Circulation Distribution by Subject (Total Sample)

| Dewey Decimal Classification System | | | | Library of Congress Classification System | | | | | |
|-------------------------------------|------------------|-----------------|-----------------|---|-------|------------------|-----------------|-----------------|---------------|
| Class | Book Circulation | Student Charges | Faculty Charges | Other Charges | Class | Book Circulation | Student Charges | Faculty Charges | Other Charges |
| 000 | 33 | 69% | 3% | 28% | A | 20 | 67% | 21% | 12% |
| 100 | 263 | 72% | - | 27% | B | 1239 | 69% | 4% | 27% |
| 200 | 140 | 64% | 3% | 33% | C-G | 2657 | 74% | 5% | 21% |
| 300 | 827 | 66% | 3% | 31% | H-L | 3317 | 73% | 4% | 23% |
| 400 | 79 | 75% | - | 25% | M,N | 652 | 68% | 5% | 27% |
| 500 | 256 | 69% | 3% | 28% | P | 2542 | 75% | 4% | 21% |
| 600 | 245 | 61% | 3% | 36% | Q | 697 | 69% | 7% | 24% |
| 700 | 513 | 69% | 4% | 27% | R-T | 659 | 62% | 4% | 34% |
| 800 | 1164 | 76% | 3% | 21% | U,V | 40 | 52% | 15% | 33% |
| 900 | 768 | 64% | 4% | 32% | Z | 58 | 38% | 12% | 50% |
| Biog. | 62 | 64% | 2% | 34% | | | | | |
| Va. | 154 | 36% | 8% | 56% | | | | | |
| Uncl. | 34 | 47% | 26% | 27% | | | | | |
| Fict. | 245 | 69% | 4% | 27% | | | | | |
| TOTAL | 4783 | 68% | 3% | 29% | TOTAL | 11,881 | 72% | 4% | 24% |

Table 9. Circulation Distribution by Borrower Status (Total Sample)

| Month | Actual Total Charges | Predicted DDC Charges | Actual DDC Charges | Percent Error | Predicted LCC Charges | Actual LCC Charges | Percent Error |
|-------|----------------------|-----------------------|--------------------|---------------|-----------------------|--------------------|---------------|
| Jan. | 8,228 | 2,303 | 2,451 | 5.2 | 5,924 | 5,797 | 2.2 |
| Feb. | 12,466 | 3,490 | 3,693 | 5.4 | 8,976 | 8,773 | 2.3 |
| Mar. | 15,078 | 4,221 | 4,361 | 3.2 | 10,856 | 10,717 | 1.3 |
| Apr. | 22,514 | 6,303 | 6,166 | 2.2 | 16,210 | 16,348 | 0.8 |
| May | 10,138 | 2,838 | 2,777 | 2.2 | 7,299 | 7,361 | 0.8 |
| Sept. | 6,764 | 1,893 | 1,608 | 17.7 | 4,870 | 5,156 | 5.5 |
| Oct. | 12,742 | 3,567 | 3,412 | 4.5 | 9,174 | 9,330 | 1.7 |
| Nov. | 16,875 | 4,725 | 4,490 | 5.2 | 12,150 | 12,385 | 1.9 |
| Dec. | 14,512 | 4,063 | 3,824 | 6.2 | 10,448 | 10,688 | 2.2 |
| TOTAL | 119,317 | 33,403 | 32,762 | 1.9 | 85,907 | 86,555 | 0.7 |

Table 10. Circulation Distribution by Classification System (Verification Testing)

| Month | Predicted Student Charges | Actual Student Charges | Percent Error | Predicted Faculty Charges | Actual Faculty Charges | Percent Error | Predicted Other Charges | Actual Other Charges | Percent Error |
|-------|---------------------------|------------------------|---------------|---------------------------|------------------------|---------------|-------------------------|----------------------|---------------|
| Jan. | 5,924 | 4,881 | 21.3 | 329 | 942 | 65.0 | 1,975 | 2,405 | 17.8 |
| Feb. | 8,975 | 7,961 | 12.7 | 499 | 916 | 45.5 | 2,992 | 3,589 | 16.6 |
| Mar. | 10,856 | 10,364 | 4.7 | 603 | 683 | 11.7 | 3,619 | 4,031 | 10.2 |
| Apr. | 16,210 | 17,519 | 7.4 | 901 | 488 | 84.6 | 5,403 | 4,507 | 19.8 |
| May | 7,299 | 7,432 | 1.7 | 406 | 463 | 12.3 | 2,433 | 2,243 | 8.4 |
| Sept. | 4,870 | 4,106 | 18.6 | 271 | 654 | 58.5 | 1,623 | 2,004 | 19.0 |
| Oct. | 9,174 | 8,970 | 2.2 | 510 | 658 | 22.4 | 3,058 | 3,114 | 1.7 |
| Nov. | 12,150 | 12,540 | 3.1 | 675 | 653 | 3.3 | 4,050 | 3,682 | 9.9 |
| Dec. | 10,449 | 11,690 | 10.6 | 581 | 430 | 35.1 | 3,482 | 2,392 | 45.5 |
| TOTAL | 85,907 | 85,463 | 0.5 | 4,775 | 5,887 | 18.8 | 28,635 | 27,967 | 2.3 |

Table 11. Circulation Distribution by Borrower Status (Verification Testing)

| Month | Predicted 300 Charges | Actual 300 Charges | Percent Error | Predicted 800 Charges | Actual 800 Charges | Percent Error | Predicted 900 Charges | Actual 900 Charges | Percent Error |
|-------|-----------------------------|--------------------------|------------------|-----------------------------|--------------------------|------------------|-----------------------------|--------------------------|------------------|
| Jan. | 391 | 348 | 12.3 | 553 | 558 | 0.8 | 368 | 267 | 37.8 |
| Feb. | 593 | 552 | 7.4 | 838 | 947 | 11.5 | 558 | 613 | 8.9 |
| Mar. | 717 | 771 | 7.0 | 1013 | 982 | 3.1 | 675 | 672 | 0.4 |
| Apr. | 1071 | 1235 | 13.2 | 1513 | 1295 | 16.8 | 1008 | 1044 | 3.4 |
| May | 482 | 497 | 3.0 | 681 | 646 | 5.4 | 454 | 414 | 9.6 |
| Sept. | 321 | 244 | 31.5 | 454 | 362 | 25.4 | 302 | 217 | 39.1 |
| Oct. | 606 | 621 | 2.4 | 856 | 751 | 13.9 | 570 | 451 | 26.3 |
| Nov. | 803 | 776 | 3.4 | 1134 | 1025 | 10.6 | 756 | 842 | 10.2 |
| Dec. | 690 | 773 | 10.7 | 975 | 846 | 15.2 | 650 | 520 | 25.0 |
| TOTAL | 5674 | 5817 | 2.4 | 8017 | 7412 | 8.1 | 5341 | 5040 | 5.9 |

Table 12. Circulation Distribution by Subject
(Verification Testing)

| Predicted C-G Charges | Actual C-G Charges | Percent Error | Predicted H-L Charges | Actual H-L Charges | Percent Error | Predicted P Charges | Actual P Charges | Percent Error |
|-----------------------------|--------------------------|------------------|-----------------------------|--------------------------|------------------|---------------------------|------------------------|------------------|
| 1303 | 972 | 34.0 | 1658 | 1625 | 2.0 | 1363 | 1585 | 14.0 |
| 1974 | 1854 | 6.4 | 2513 | 2541 | 1.1 | 2065 | 2116 | 2.4 |
| 2388 | 2160 | 10.5 | 3039 | 3247 | 6.4 | 2497 | 2546 | 1.9 |
| 3566 | 3398 | 4.9 | 5438 | 4848 | 6.3 | 3728 | 4061 | 8.1 |
| 1605 | 1417 | 13.2 | 2043 | 2104 | 2.8 | 1679 | 1979 | 15.1 |
| 1071 | 954 | 12.2 | 1363 | 1567 | 13.0 | 1120 | 1198 | 6.5 |
| 2018 | 1940 | 4.0 | 2568 | 2600 | 1.2 | 2110 | 2197 | 3.9 |
| 2673 | 2794 | 4.3 | 3402 | 3389 | 0.3 | 2795 | 2928 | 4.5 |
| 2298 | 2326 | 1.2 | 2925 | 3276 | 10.7 | 2403 | 2465 | 2.5 |
| 18,896 | 17,815 | 6.0 | 24,049 | 25,197 | 4.5 | 19,759 | 21,075 | 6.2 |

possible that in the foreseeable future, knowledge of total book charges for any given period of time will permit the construction of reasonably accurate inferences about the specific nature of those book charges.

Before concluding this discussion of the analysis of charging behavior at Swem Library, one final note on methodology should be appended. The rather formidable array of statistical tables presented may create the erroneous impression that data collection of this type and scope represents an investment in time and expense that most libraries cannot afford. Nothing could be further from the truth. On a daily basis, the tabulation of circulation using the special form for the study required no more than 10 minutes more than do usual counting procedures. Assuming that the counting was performed by a clerical employee earning \$3.50/hr., the cost of accumulating the raw data for the 27 days of the 3 sample periods was \$15.75 (4.5 hrs.). This should be easily within the means of any library. The analysis of the raw data is another matter, but the mathematical calculations are simple and readily accomplished with the aid of a calculator. In short, any library with a comparable recordkeeping system can develop the kind of information about its circulation patterns reported for an extremely modest cost. The benefits of doing so, which will be discussed later, are considerable.

It may be useful to summarize what has been learned about the patterns of book charging behavior at Swem Library. On the basis of the data collected it would appear that at least five law-like statements can be made about this aspect of the circulation process.

1. Repetitive patterns can be identified in the way books are charged, and these patterns tend to remain constant through time.
2. On given day x , approximately one-third of all books charged will bear DDC call numbers; approximately two-thirds of all books charged will bear LCC call numbers.
3. On given day x , approximately one-fourth of all books charged will be loaned to noncollege borrowers, and nearly three-fourths of all books charged will be loaned to students.
4. On given day x , the proportionate relationship between student and noncollege book charges will be present within each subject area of the collection.
5. On given day x , book charges in history, literature, and social science will comprise approximately two-thirds of total book circulation.

ANALYZING BOOK RETURNING BEHAVIOR

While the analysis of charging behavior is relatively simple and straightforward (after all, a book is either borrowed or it is not), any investigation of book returning behavior is fraught with complications. Almost immediately the investigator realizes that he/she is venturing into unexplored territory. Writing about the generally unsophisticated level of most library statistics, Burns points out: "Just how unsophisticated is seen clearly in the profession's diligent collection of statistical information about library materials checked out, whereas a record is seldom kept of items discharged....Yet checking an item in is just as important as checking it

out...."² It may be argued that the lack of adequate statistics about book returns cited by Burns is the result of conceptual shortsightedness on the part of librarians. As will be discussed later, an informal query of circulation librarians in academic libraries failed to elicit any meaningful data about book returns. Marginal notes by the respondents showed clearly that many had never considered book returns to be important. They not only failed to keep statistics about book returns, they never considered the question at all.

At the time the first investigation of book returning behavior at Swem Library was initiated in March 1974, there were a number of operational conditions in the library which influenced the shape of the study. The design of the study was further conditioned by what had already been learned about patterns of charging behavior. For some time it had been clear to the circulation staff that there were serious problems with the library's loan policy. There were frequent complaints about the amount of time devoted to processing renewal requests, and even more complaints about the time and expense involved in preparing overdue notices weekly. In short, it appeared that the statutory 3-week loan period was actually the exception rather than the rule. Thus, prior to the beginning of this study a decision had been made by the circulation librarian to secure a major revision of the library's loan policy.

This decision influenced the study in two ways. First, it was hoped that the data derived from the study could be used to support the proposed changes in loan policy in discussions with both the library administration and library advisory committees of the faculty. Secondly, the development of models of book returning behavior made it possible to evaluate the changes, which had been proposed on the basis of intuition, for possible success or failure.

From the outset it was recognized that a major change in circulation policy in the middle of the research study would provide a unique opportunity to study the relationship between library policy and borrower behavior. Substantial changes in library policy are not undertaken lightly. The researcher in an operational context is therefore seldom able to alter the experimental environment and compare the results. In this case, however, an opportunity was presented to test the concept of borrower behavior as a separate entity: if borrower behavior patterns remained substantially the same under two significantly different sets of conditions, then those behavior patterns could be said to exist apart from and perhaps transcend formal library policy.

This issue is one of great practical, as well as theoretical, importance. If borrower behavior is malleable, then the library has the potential to shape that behavior through its policy-making powers in ways which will improve library service for all. If, however, borrower behavior is persistent, then the library cannot rely on policy formulation alone to modify borrower behavior in the ways it feels are necessary.

The purposes and methodology of the study of book returning behavior may be better understood if some points are restated. Every day books are charged from the library with a date due stamped in them. Some of those books will be returned to the library before the date due, others will be returned on the date due, and others will be returned at various intervals after the date due. Unfortunately, some will never be returned. The basic questions about this phenomenon which are addressed by this study can be easily summarized. Are there any discernible patterns in the way books are returned? What are they? How are they affected by changes in loan policy? What factors other than loan policy might affect book returning behavior?

Of necessity, only a small number of variables which might influence book returning behavior could be studied. Those chosen for this study were borrower status, subject matter of the material, and convenience of access to the library. Each of these factors requires some additional comment.

It was determined that the attempt to identify patterns of book returning behavior based on borrower status should be limited to student and other borrowers, thus ignoring the faculty. Several reasons may be cited for this decision. First, the small number of faculty charges made it unlikely that book returns would occur in large enough numbers to be meaningful. Furthermore, while the loan policy for students and other borrowers was identical, loan policy for faculty members was substantially different. Finally, it was believed that the motivations for and methods of use of library materials would be different for faculty members.

The investigation of book returning behavior based on subject was limited to four major subject areas: literature (800 and P call numbers), social science (300 and H-L call numbers), history (900 and C-G call numbers), and science/technology (500, 600 and Q-T call numbers). The analysis of charging behavior had previously indicated that, collectively, these four subjects accounted for nearly 80% of total book circulation. No attempt was made to differentiate between DDC and LCC call numbers within subject areas.

The final variable of interest to this study was convenience of access to the library. This was arbitrarily defined as a measure of distance from the library to the borrower's home address. Three levels of access were established: residence on campus, residence in the city of Williamsburg, and residence outside the immediate area. While only student borrowers would have campus addresses, significant numbers of students live in Williamsburg and outside the immediate area. It was thus believed that each of these three levels of access would be well represented numerically in any sample of book returns.

The method of collecting data about book returns was essentially the same as that used by other investigators. During a 7-day period beginning 15 March 1974, the individual transaction cards for each book returned to the library on each day were removed from the master circulation file and preserved in a special holding box. Extreme care was taken to make sure that charge cards for all books returned on one day were removed from the master file, and that the separate identity of each day's returns was maintained at all times. These charge cards formed the raw data for the study.

The first step in analyzing the data was to determine the actual effective loan period for each book returned. The effective loan period may be defined as the elapsed time between the date the book was charged and the date returned. Therefore, the incidence of renewals and overdues was of interest only insofar as they extended the effective loan period for individual books. In other words, a book three weeks overdue and a book renewed once and returned on the date due would have the same effective loan period and be treated alike in this study.

The large number of transaction cards produced from the sample (n=3357) and the fact that all of the various sorting and counting operations had to be performed manually soon made it clear that determining the exact term of each book loan in elapsed days would be impractical. It was therefore decided to assign each transaction to a place on a range of seven relative loan periods. These were: 2 weeks or less, 2- to 4-week loans, 4- to 6-week loans, 6- to 12-week loans, loans of from 3 to 6

months, loans of from 6 months to 1 year, and loans of over 1 year. The data obtained on each day of the 7-day sample period were counted and tabulated separately. Then the data for each of the seven days were combined to produce the tables which are reproduced here. The operations performed on the transaction cards each day were somewhat complex and will be described briefly.³

The first operation required was to sort the transaction cards into seven groups representing the relative loan periods which had been established. This was done in the following manner. Each card bore a date due stamp exactly three weeks later than the date the book was charged. For each date that book returns were analyzed, a rough chart was prepared indicating the first and last date due marking necessary for inclusion in each of the relative loan periods. Cards with date due markings falling within these limits were grouped accordingly. In cases where books had been renewed, the earliest date due stamped was used to determine the length of the loan. Upon completion of this operation; the charge cards for all books returned on a given day were distributed among the seven relative loan periods. The cards in each of these groups were then subjected to the following operations.

The cards for each effective loan period were first sorted according to the status of the borrower. At this point, charge cards for all books returned by faculty members were discarded. Then a count was made of the number of books returned by student and other borrowers, as shown by the indication of borrower status on the cards themselves. Following this, the cards were sorted according to the borrower's home address into three groups corresponding to the three levels of library access. A count was then made of the number of books returned by borrowers with campus addresses, those with Willimasburg addresses, and by those with addresses outside the immediate area. Finally, the cards were again sorted on the basis of the subject of the books returned as shown by the call number recorded on each card. A count was then made of the number of books returned in literature, history, social science, and science/technology for each of the relative loan periods. The raw scores of numbers of books returned were then used to calculate percentages of book returns found in each of the relative loan periods.

The distribution of book returns by borrower status is shown in Table 13 which follows. There was a discernible difference in the pattern of book returning behavior exhibited by student and other borrowers. In general, other borrowers tended to retain books for a longer period of time before returning them than did student borrowers. Of the 2752 books returned by student borrowers during the sample period, almost 80% showed an effective loan period of 4 weeks or less. Of the 605 books returned by other borrowers, only 61.3% showed an effective loan period of 4 weeks or less.

As noted previously, complaints about renewals and overdues were common among members of the circulation staff. A brief consideration of Table 13 indicates why this was so. Assuming that the book returns assigned to the 2-4 week relative loan period were divided equally between the third and fourth week, and assuming that the pattern of book returns found here can be applied to daily charging activity (the basis for this assumption will be discussed later), the following would appear to be true:

1. Approximately 40% of the books charged to students on any day will either be renewed or overdue at the end of the standard 3-week loan period.

| Term of Loan | Student Returns | | Other Returns | |
|----------------|-----------------|------------|---------------|------------|
| | Number | Percentage | Number | Percentage |
| 2 wks. or less | 1049 | 38.1 | 144 | 23.8 |
| 2-4 wks. | 1148 | 41.7 | 227 | 37.5 |
| 4-6 wks. | 209 | 7.6 | 109 | 18.0 |
| 6-12 wks. | 317 | 11.5 | 99 | 16.4 |
| 3-6 mo. | 0 | 1.1 | 25 | 4.1 |
| 6 mo.-1 yr. | 0 | - | 0 | - |
| Over 1 yr. | 0 | - | 1 | 0.2 |

Table 13. Distribution of Book Returns by Borrower Status (March 1974)

2. Nearly 60% of the books charged to noncollege borrowers on the same day will be renewed or overdue.

It is therefore clear that the observed behavior of the borrowers is in conflict with the standard loan policy of the library.

Tables 14 and 15 show the distribution of book returns for the three levels of access to the library, and for the four selected subject areas. Differences can be noted in each case.

The evidence here would suggest that there is a relationship between the distance the borrower lives from the library and the length of time he/she retains books before returning them. The differences in the patterns of book returning behavior for borrowers with campus and Williamsburg addresses are less striking than those exhibited by borrowers living outside the immediate area.

The distribution of book returns by subject shown in Table 15 reveals distinct patterns for each of the four subjects studied. In the social sciences, literature, and history, the percentages of books returned with effective loan periods of four weeks or less were very similar: 88.4%, 82.8%, and 87.7%, respectively. Yet within that 4-week period, differences could be found. Relatively few books in the social sciences had been charged for less than two weeks. However, books returned in both history and literature tended to be evenly divided between the 2-week and 4-week effective loan periods. A much greater difference can be seen in comparing the pattern of book returns in these three subject areas with the pattern observed in science/technology. Significantly larger percentages of books returned in this subject area had been absent from the library for longer periods of time.

At this point an important caveat must be issued about the patterns of book returning behavior identified in the sample. Variations in behavior were found based on borrower status, level of access to the library, and subject matter of the material. It can therefore be assumed that each of these factors has some effect on book retention. It was, however, clearly beyond the capacity of this initial study to investigate the relative importance of each factor in determining the behavior observed.

Noncollege borrowers tend to retain materials for longer periods of time than do student borrowers. Noncollege borrowers also enjoy less access to the library as defined in this research, and they borrow a significant amount of materials in the science/technology subject area. So it may well be that the noted differences based on status are in fact the result of access or subject. In fact, the patterns found in the three variables studied might be attributable to some other variable: complexity of the language of the material, size of type, course or research deadlines, etc.

A more structured investigation should be capable of identifying other possible determinants of behavior and providing some insight about their relative strength. As the variables become more specific, however, larger samples will be required in order to generate an adequate data base. Experiments along these lines were designed and conducted at Swem Library during 1975.

On 1 June 1974, a revised circulation policy was instituted at Swem Library. This new loan policy established three distinct types of borrowing privileges which were believed to be related to the needs of the borrowers. Faculty borrowing privileges

| Term of Loan | Campus Address | | Williamsburg Address | | Other Address | |
|---------------|----------------|------------|----------------------|------------|---------------|------------|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| 2 wks or less | 562 | 44.8 | 622 | 38.6 | 133 | 24.9 |
| 2-4 wks. | 579 | 46.1 | 743 | 46.1 | 255 | 47.7 |
| 4-6 wks. | 94 | 7.5 | 184 | 11.4 | 78 | 14.6 |
| 6-12 wks. | 20 | 1.6 | 50 | 3.1 | 34 | 6.3 |
| 3-6 mo. | 0 | - | 9 | 0.6 | 31 | 5.9 |
| 6 mo.-1 yr. | 0 | - | 3 | 0.2 | 3 | 0.6 |
| Over 1 yr. | 0 | - | 0 | - | 0 | - |

Table 14. Distribution of Book Returns by Borrower Access (March 1974)

| Term of Loan | Social Sciences | | Literature | | History | | Science/Technology | |
|----------------|-----------------|------------|------------|------------|---------|------------|--------------------|------------|
| | Number | Percentage | Number | Percentage | Number | Percentage | Number | Percentage |
| 2 wks. or less | 321 | 32.3 | 372 | 43.6 | 311 | 44.8 | 83 | 34.0 |
| 2-4 wks. | 557 | 56.1 | 335 | 39.2 | 298 | 42.9 | 83 | 34.0 |
| 4-6 wks. | 81 | 8.1 | 138 | 16.1 | 64 | 9.3 | 29 | 11.9 |
| 6-12 wks. | 34 | 3.4 | 0 | - | 17 | 2.5 | 44 | 18.0 |
| 3-6 mo. | 1 | 0.1 | 9 | 1.1 | 3 | 0.5 | 5 | 2.1 |

Table 15. Distribution of Book Returns by Subject (March 1974)

Note: No charges recorded with an effective loan period of longer than six months.

were extended only to teaching and research faculty at the college. These borrowers were entitled to a loan period of one year, with an option to renew books for an additional year if desired. Thus, in place of the former indefinite loan, no faculty member could retain any book for longer than two years. Spouses of faculty members, members of the college administrative staff, special individuals (e.g., members of the Colonial Williamsburg research staff), graduate students engaged in research related to a thesis or dissertation, and undergraduate honors students engaged in major independent study programs were entitled to special borrowing privileges. These borrowers were entitled to a 6-month loan period with an option to renew books for an additional 6 months if desired. Thus, no special borrower could retain any book for longer than one year. All other borrowers, i.e. nearly all student and noncollege borrowers, were entitled to regular borrowing privileges. The loan period for regular borrowers was four weeks, with an option to renew books for an additional four weeks if desired. Thus the maximum loan period for regular borrowers was eight weeks. The library reserved the right to recall any book from any borrower at any time after one week from the date charged.

It was this circulation policy which was in effect when the second investigation of book returning behavior was undertaken in October 1974. The period selected for the second sample was the 7-day period beginning 12 October 1974. The number of transactions available for study from the sample proved to be significantly smaller than that obtained from the first sample; however, it was felt that the size was sufficient to make it unnecessary to prolong the sampling. The methodology used was identical in every respect to that previously described.

If the data in Table 16 is compared with that in Table 13, it is immediately apparent that the pattern of book returns found in the two samples are nearly identical. (In fact, the degree of coincidence was so striking that an error in computation was suspected, but a thorough recount of both samples produced the same results.) The distribution of book returns by level of access and by subject area shown in Tables 17 and 18 show the same degree of correlation with the patterns of book retention identified in the first sample. In general, the variances between the two samples are on the order of $\pm 2\%$.

A number of law-like statements can be made about the patterns of book returning behavior identified at Swem Library. They are:

1. At least one-quarter of the books charged on any given day will be returned within two weeks of the date charged.
2. Approximately two-thirds of the books charged on a given day will be returned within four weeks of the date charged.
3. Nearly 90% of the books charged on a given day will be returned within six weeks of the date charged.
4. Books charged to noncollege borrowers tend to be retained for longer periods of time prior to return than books charged to student borrowers.
5. The length of time a book is retained prior to return to the library tends to vary with the distance the borrower lives from the library.

| Term of Loan | Student Returns | | Other Returns | |
|----------------|-----------------|------------|---------------|------------|
| | Number | Percentage | Number | Percentage |
| 2 wks. or less | 496 | 39.2 | 100 | 25.1 |
| 2-4 wks. | 533 | 42.1 | 149 | 37.4 |
| 4-6 wks. | 94 | 7.4 | 84 | 20.8 |
| 6-12 wks. | 124 | 9.8 | 50 | 12.4 |
| 3-6 mo. | 19 | 1.5 | 17 | 4.3 |

Table 16. Distribution of Book Returns by Borrower Status (Oct. 1974)

Note: No charges recorded with an effective loan period over 6 months.

| Term of Loan | Campus Address | | Williamsburg Address | | Other Address | |
|----------------|----------------|------------|----------------------|------------|---------------|------------|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| 2 wks. or less | 297 | 45.1 | 276 | 40.4 | 74 | 22.9 |
| 2-4 wks. | 298 | 45.2 | 321 | 46.9 | 164 | 50.8 |
| 4-6 wks. | 52 | 7.9 | 69 | 10.1 | 54 | 16.7 |
| 6-12 wks. | 10 | 1.5 | 17 | 2.5 | 16 | 5.0 |
| 3-6 mo. | 2 | 0.3 | 1 | 0.2 | 15 | 4.6 |

Table 17. Distribution of Book Returns by Borrower Address (Oct. 1974)

Note: No charges recorded with effective loan periods over 6 months.

| Term of Loan | Social Sciences | | Literature | | History | | Science/Technology | |
|----------------|-----------------|------------|------------|------------|---------|------------|--------------------|------------|
| | Number | Percentage | Number | Percentage | Number | Percentage | Number | Percentage |
| 2 wks. or less | 111 | 27.9 | 195 | 42.7 | 121 | 45.3 | 61 | 32.8 |
| 2-4 wks. | 234 | 58.8 | 176 | 38.6 | 116 | 43.5 | 63 | 34.4 |
| 4-6 wks. | 38 | 9.5 | 68 | 14.9 | 25 | 9.4 | 19 | 10.3 |
| 6-12 wks. | 15 | 3.8 | 4 | 0.9 | 4 | 1.5 | 35 | 19.1 |
| 3-6 mo. | 0 | - | 13 | 2.9 | 1 | 0.5 | 6 | 3.4 |

Table 18. Distribution of Book Returns by Subject (Oct. 1974)

Note: No charges recorded with effective loan periods over 6 months.

6. Books charged in the subject area of science/technology tend to be retained for longer periods of time prior to return than books charged in the subject areas of literature, history, and the social sciences.
7. Patterns can be identified in the way books are returned. These patterns tend to remain constant through time, and will recur under any set of formal loan regulations that is not unduly punitive.

The first six statements above are based on the assumption that the patterns observed in the way books are returned to the loan desk each day can be said to control the manner in which books charged each day are returned. This seems to be a reasonable assumption, and appears to have been accepted by other investigators. Nevertheless, confirmation of these hypotheses can only be obtained from an analysis of the circulation history of books charged on specific days. Such an analysis requires a great deal of time and is obviously beyond the scope of this study. However, a followup investigation along these lines is already underway at Swem Library.

By using special color-coded sleeves on the transaction cards, it is possible to identify and monitor the history of charges on individual days. Since October 1974 the transactions of two days have been marked and their history followed. Results so far have tended to confirm the patterns observed in cumulative book returns. Since it may require six months or more to conclude the analysis of a single day's charges, however, the confirming data base is still too small to regard with any high degree of confidence.

The seventh statement also requires some discussion. The differences in library loan regulations in effect at the time the samples were taken have been noted. Although the changes in the statutory loan period were significant, in both cases the loan policy was essentially nonpunitive. The unlimited renewal option in the first loan policy made it possible for borrowers to retain most materials as long as desired. The 8-week maximum loan period established by the revised loan regulations provided for longer book loans than most borrowers required, since in both samples the overwhelming majority of materials returned had been on loan for six weeks or less. Therefore, it can be argued that in a certain sense, library loan policy was never a serious factor in determining book returning behavior. In both cases it permitted the borrower to retain materials for as long as he/she wished without significant penalty.

In order to test the affective power of loan policy on the behavior of the borrower, a punitive loan policy, e.g., 2-week loan with no renewal and a rigorous fine policy, would have to be introduced. If the pattern of book retention remained substantially the same under these circumstances, one would have to conclude that formal loan policy had little real impact on borrower behavior.

An equally valid test would be to extend indefinite borrowing privileges to all borrowers and observe the pattern of book retention when all formal constraints are removed. Unfortunately, such tests are nearly impossible to structure in most libraries. Yet, if similar patterns of book retention can be identified in different libraries with different loan policies, some support could be found for the notion that loan policy may not be as influential as other factors in determining behavior.

GENERALIZING ABOUT BORROWER BEHAVIOR

This study has produced a number of propositions about the way borrowers charge and return books at Earl Gregg Swem Library. It was found that books in the LCC collection tended to receive greater circulation, that borrowing activity was concentrated in a few subject areas, and that student and noncollege borrowers tended to charge the same types of materials. It was also discovered that significant proportions of books were returned within certain periods of time, and that differences in the length of time books were retained prior to return to the library could be identified on the basis of borrower status, distance the borrower lived from the library, and subject matter of the books themselves. These differences in how books were charged and returned remained constant over a 1-year period of time, and occurred under two substantially different loan policies.

With some understanding achieved about the patterns of borrower behavior to be found in one library, the question of interest became whether similar patterns could be identified at other libraries. It was decided to focus attention on patterns of book retention rather than book charging. Among academic libraries, book charging would appear to be directly related to course offerings and methods of instruction. Patterns of charging in academic libraries are thus apt to reveal more about the institution, its course offerings, and teaching methods than about the borrower. Book retention--particularly if it can be identified by subject or other distinguishing characteristics--is, however, clearly related to the borrower himself.

The first step in the investigation was to search the literature to discover if similar research had been reported. A number of studies had been published with information relevant to book retention. Since each of these was done for different purposes, each deserves a brief comment before an attempt is made to compare their findings.

The study conducted by Burkhalter and Race at the University of Michigan in 1963⁴ was related to an operational problem. The basic issue was whether the current 2-week loan period should be extended. The methodology included an analysis of the number, frequency, and cost of renewals, as well as a study of how books were used. The question of interest to these researchers was to determine "the length of time it takes a user to return a book to the library after he has finished using it."⁵ Therefore, the total elapsed time between the date a book was charged and the date it was returned was only of marginal interest. The inquiry was focused on the question of what portion of that total elapsed time prior to return could be characterized as use-less. A questionnaire was constructed and borrowers were asked to estimate the length of time books were retained after use was completed but before they were returned. Thus the data published on length of book loans were used only for comparison with patterns projected from the responses to the questionnaire. The sample of book returns analyzed was small (n=618), and all books returned after the official loan period (14 days) were simply shown as overdue.

A much larger and more comprehensive investigation was conducted at the University of Lancaster, England. In a series of papers, Buckland and his colleagues pointed out the relationship among the length of time books are retained by borrowers, duplication policies, demand, and user satisfaction.⁶ Based on a realization that demand for specific books will vary and that duplication may not be economically feasible, Buckland advocated a variable loan policy where the term of loan permitted is

determined by the number of times a book has been circulated within an established period of time.⁷

Buckland and his colleagues used the data on book returns found in the Burkhalter and Race study, and also surveyed samples of charge slips for books returned at Manchester, Strathclyde, Sussex, and Lancaster universities. The loan policies in force at the libraries studied varied widely: Manchester had a 1-week loan, Strathclyde and Sussex had 2-week loans, while Lancaster had an end-of-term loan period.⁸ Again in this study, the actual effective loan period of books returned was only of secondary interest. The attention of this study was focused on the frequency and incidence of renewals, and on the relationship between the date returned and the official date due.

It was found that the proportion of books returned was much higher on the date due, and on the dates immediately before and after the date due, than at any other time. From this, Buckland concluded: "What effect does the official loan period have on the length of time books are kept out? Circulation data from a number of universities showed that there is a marked tendency for books to be kept out until they are due back. There was little evidence that the status of the borrower or the subject matter of the book had any relevance."⁹

This statement is clearly in contradiction with the findings of this study. In part the differences may arise from the methodology used. The use of relative loan periods in this study makes it difficult to confirm or deny Buckland's findings about the returns in relation to the date due. For example, in the sample taken under the 3-week loan policy, nearly 42% of the books returned had been retained for more than two weeks but less than four weeks. It is entirely possible that most of these items were returned on or about the date due, thus lending support to Buckland's findings. As will be shown later, it is possible to arrange the data derived by Buckland in a different format and provide some support for the findings of this investigation.

Buckland's study of renewals revealed no relationship between the frequency of renewal and either the status of the borrower or the subject matter of the material. A detailed analysis of renewals at Swem Library, though possible to obtain from the transaction cards, was felt to be beyond the scope of this inquiry. A brief review of circulation statistics, however, did show that the total incidence of renewals dropped sharply--from about 20% of daily circulation to about 5%--under the longer 4-week loan period.

Based on his study of the way books were returned and renewed, Buckland offered this conclusion: "These findings are highly significant. They mean that the librarian has, in his ability to determine official loan periods, a powerful and precise control device for influencing the availability of the books in his library. They permit us to predict how long books will be kept out under any given loan policy." (emphasis in original).¹⁰

The findings of this study would support the conclusion that it is possible to predict how long books will be kept out; it does not support the conclusion that official loan policy is the determining factor. At Swem Library there appears to be a type of "natural" term to book loans, related to both the nature of the borrower and the nature of the materials. Book returning behavior by the borrowers remains consistent despite changes in the official loan period. Thus, the ability to predict

depends not on the power to make policy, but on knowledge of the patterns of borrower behavior.

Another study of book circulation at the Science Library of the Massachusetts Institute of Technology was reported by Morse.¹¹ There were no actual figures on book returns and loan periods reported, so it is difficult to compare the findings with those of this study. However, Morse did report significant differences in mean loan periods for books in different subject areas within the science/technology class. These occurred under one standard loan policy and ranged from 2.9 weeks for mathematics books to 8.0 weeks for engineering and general science books.¹²

One further study of interest was conducted at Purdue University in 1974.¹³ The purpose of this effort was to study the relative effect of different types of overdue notices in securing the return of books. Attention was focused on the 2-week period following the date due for books studied in the sample, but some useful information about total book returns can be inferred from the statistical data published.

In Table 19, relevant statistical data about book returns have been extracted from the studies mentioned and tabulated for the purpose of comparison. Despite the facts that these studies were conducted over more than ten years, done for various purposes, and that the data reported vary in scope and format, a degree of similarity can be found.

A comparison of the pattern of returns for science books at Strathclyde with the pattern of returns for other books at the same library reveals the tendency toward longer retention of science materials already noted at William and Mary. It may also be noted that the idea of differences in actual effective loan periods based on subject was supported by Morse. The patterns of book returns observed among postgraduates and staff at both Manchester and Strathclyde lend some support to the concept of variations in loan period based on borrower type. Interestingly enough, in these two samples published by Buckland, well over one-half of the books returned had been retained longer than the statutory 4-week loan period.

As part of the general investigation of borrower behavior, a decision was made to try to obtain similar information from a number of academic libraries. A questionnaire was prepared in August 1974 and sent to 50 academic libraries, 40 in the United States and 10 in Canada. The libraries to receive questionnaires were selected on the basis of collection size, geographic distribution, enrollment, etc. An attempt was made to obtain a sample of libraries with a wide geographic distribution which might, in some sense, be considered similar to Swem Library. A list of the libraries solicited and those who responded is included in the appendix with a copy of the questionnaire itself and the cover letter. A total of 23 responses was eventually received, 17 originating from United States libraries and 6 originating from Canadian libraries.

Any discussion of this aspect of the investigation of borrower behavior must be prefaced by the admission that the questionnaire was an afterthought rather than a planned part of the research.¹⁴ It was issued before the collection of data and analysis of book returning behavior had been completed. Therefore, the questions included in the survey were not so directly related to the rest of the study as one might wish. A number of items were included simply as matters of professional interest and were not germane to the study at all. It was also recognized at the beginning,

| Source | Sample Size | Cumulative Percentage of Books Returned Within: | | | | Remarks |
|------------------|-------------|---|--------|--------|---------|---|
| | | 2 wks. | 4 wks. | 6 wks. | 12 wks. | |
| William and Mary | 4018 | 38.5 | 80.3 | 87.8 | 98.8 | 3 & 4 wk. loan periods, total samples science/technology charges only |
| | 428 | 33.6 | 67.7 | 78.9 | 97.4 | |
| Michigan | 316 | 86.0 | - | - | - | 2 wk. loan, undergraduates only |
| | 302 | 95.7 | - | - | - | |
| Manchester | 2233 | 76.3 | 92.2 | 97.0 | 99.1 | 1 wk. loan, undergraduates |
| | 730 | 24.9 | 48.3 | 69.1 | 88.3 | |
| Sussex | 6874 | 75.0 | 98.5 | 99.5 | 100.0 | 2 wk. loan, undergraduates |
| | 2281 | 58.5 | 89.1 | 94.8 | 98.6 | |
| Strathclyde | 949 | 51.9 | 85.0 | 90.5 | 98.2 | 2 wk. loan, undergrad., sci./tech. charges |
| | 1098 | 17.2 | 57.4 | 76.1 | 88.9 | |
| Purdue | 969 | - | 88.0 | 93.0 | - | 3 wk. loan, standard overdue notice |
| | 1524 | - | 85.0 | 91.0 | - | |
| | 1868 | - | 80.0 | 86.0 | - | |

Table 19. Comparative Data on Book Returning Behavior

Source: Data for Michigan adapted from Burkhalter, B.R., and Race, P.A. "An Analysis of Renewals, Overdues and Other Factors Influencing the Optimal Charge-out Period." In Barton Burkhalter, ed. Case Studies in Systems Analysis in a University Library. Metuchen, N.J., Scarecrow Press, 1968, p. 33; data for Manchester, Sussex and Strathclyde adapted from Buckland, Michael K., et al. Systems Analysis of a University Library: Final Report on a Research Project (University of Lancaster Library Occasional Papers No. 4). Lancaster, Eng., University of Lancaster, 1970, pp. 82-86; data for Purdue adapted from Baaske, Jan, et al. "Overdue Policies: A Comparison of Alternatives," College & Research Libraries 35:358, Sept. 1974.

based on discussions with other librarians and a reading of the literature, that most (if not all) of the libraries contacted would be unable to provide any empirical data about patterns of book returning behavior. Respondents were consequently asked to estimate in cases where statistics were not available. As a result, the information developed from the questionnaire is speculative at best, and can claim no more validity than common sense allows. Where the data developed at Swem Library describe what actually occurs, the data developed from the questionnaire describe what some librarians think occurs.

The questionnaire itself was divided into four sections designed to provide information about: (1) the institution, (2) loan policies in effect, (3) the behavior of the borrowers, and (4) recent changes in loan policy or available statistics. The responses to the first two sections were generally full and informative, but responses to the questions about borrower behavior were often omitted entirely. The questionnaire must share the blame for this; a better vehicle would no doubt have produced a better response. Nevertheless, the marginal comments received on the completed forms make it clear that most of the respondents have never asked these kinds of questions.

The item most pertinent to this study was the fifth question, which concerned borrower behavior. In effect, the respondent was asked to construct a table similar to that shown in Table 16.¹⁵ The response to this item was disappointing; only six of the questionnaires received included this information. Due to this lack of response, information provided from the fourth question concerning quantity and length of overdues was used in conjunction with information provided about loan policy to infer patterns of book returns at five other libraries.

Patterns of book returning behavior which have been inferred from the responses to the questionnaire are shown in Table 20. Despite the obvious differences in the nature of the institutions and the loan periods in effect, the patterns are not unlike those found at Swem Library.

The other item of particular interest in the questionnaire was Question 6, which concerned borrower behavior. A list of eight possible factors was presented, and the respondents were asked to estimate their impact on the length of time books were retained by ranking them in order of importance. The ranking of factors which appears in Table 21 was obtained by adding the numerical score assigned to each factor on the questionnaire by the respondents. By this method, the lowest score would be assigned to the factor believed to be most important in determining book returning behavior. Five of the respondents in the sample indicated that they had no idea which factors were important and were unwilling to guess.

Space was provided on the questionnaire for respondents to indicate any other factors which they felt were important determinants of book returning behavior at their libraries. A number of other factors were mentioned, including simple forgetfulness that books were charged, the practice of loaning materials to friends or classmates, temporary loss, and apathy.

It must be stressed again that the ranking is based on estimates of effectiveness rather than empirical evidence. Nevertheless, the results are of speculative interest. In interpreting the evaluation of these factors, it may be useful to consider the types of factors involved. The respondents felt that the most important

| Source | Cumulative Percentage of Books Returned Within: | | | | Remarks |
|----------------------------------|---|--------|--------|---------|------------------------|
| | 2 wks. | 4 wks. | 6 wks. | 12 wks. | |
| William and Mary | 38.5 | 80.3 | 87.8 | 98.8 | 3 & 4 wk. loan periods |
| Lafayette College | 17.5 | 95.0 | 98.0 | 99.0 | 4 wk. loan period |
| Drake University | 65.0 | 85.0 | 90.0 | 95.0 | 2 wk. loan period |
| University of Wyoming | 70.0 | 85.0 | 95.0 | - | 3 wk. loan period |
| Memphis State University | 15.0 | 55.0 | 80.0 | 90.0 | 4 wk. loan period |
| Gonzaga University | 40.0 | 80.0 | 95.0 | - | 2 wk. loan period |
| Georgia Institute of Technology | - | 80.0 | 95.0 | - | 4 wk. loan period |
| University of Arkansas | 40.0 | 70.0 | 90.0 | 97.0 | 2 wk. loan period |
| U. of North Carolina (Charlotte) | 75.0 | 93.0 | 98.0 | 99.0 | 2 wk. loan period |
| McMaster University | 45.0 | 80.0 | 95.0 | - | 2 wk. loan period |
| University of Calgary | 15.0 | 90.0 | - | - | 2 wk. loan period |
| U. of Prince Edward Island | 25.0 | 60.0 | 95.0 | 98.0 | 3 wk. loan period |

Table 20. Estimated Comparative Data on Book Returning Behavior

| Rank | Factor | Total Raw Score |
|------|---|-----------------|
| 1 | Course or research deadline | (38) |
| 2 | Date due | (51) |
| 3 | Length or difficulty of material | (62) |
| 4 | Subject of the material | (68) |
| 5 | Fear of not being able to locate the book later | (85) |
| 6 | Liability for overdue fines | (88) |
| 7 | Distance the borrower lives from the library | (100) |
| 8 | Desire to deny use to other borrowers | (120) |

Table 21. Factors Influencing Book Retention

factor influencing retentive behavior was an institutional constraint beyond the control of either the library or the borrower. Next in importance would appear to be factors related to the type of materials borrowed: subject matter and length or difficulty. Conditions imposed by the library, i.e. date due, fines policy, and the ability to produce materials when needed, are seen to be less important. The least importance of all is assigned to the nature of the borrower himself: the distance he/she lives from the library, his/her attitude about the use of materials by others, forgetfulness, etc.

There are clear differences between the opinions expressed by the respondents and the conclusions of this study. This study does not argue that library policy is not a factor in book returning behavior, but it does contend that more importance is traditionally assigned to it than warranted by the facts. Most of the respondents were agreed that date due was extremely important in determining book retention. Yet an examination of Table 20 shows that in many cases, 50% or more of the books charged had not been returned at the end of the statutory loan period. One of these estimates --either the importance of due date or how the books are being returned--is clearly in error.

USING BORROWER BEHAVIOR

From beginning to end, this study took slightly more than one year to complete, and represents a significant number of manhours devoted to sorting, counting, and calculating. While the topic of inquiry is of considerable theoretical interest, it is doubtful that the study would have been pursued to such lengths without the conviction that the information derived from it would be useful in the planning and conduct of operations within the library. It was believed that information about borrower behavior was an essential element of management information which had too long been overlooked.

The problems and decisions facing Earl Gregg Swem Library are undoubtedly similar to those facing other libraries. Therefore, a brief discussion of a few of those problems, and the role that information about borrower behavior can play in their consideration, may be useful in stimulating similar research at other libraries.

Among the patterns of charging behavior identified was the relatively small circulation for books in the DDC collection. This fact was extremely pertinent to the consideration of the status of the reclassification program in the library. At the time of this study the total book collection was about evenly divided between the Library of Congress and Dewey Decimal classification systems. Since the library was opened in 1967, an effort has been underway to reclassify all books in the DDC collection to LCC. Because of the inability to secure adequate and separate funding for the project, the reclassification program has gone very slowly. As a result, the bulk of the present LCC collection represents new acquisitions rather than reclassified materials.

As Fussler has pointed out, "The recorded circulation use of books is a reasonably reliable index of all use, including...browsing use within the library."¹⁶ Circulation of the DDC collection at the time of this study accounted for only 29% of total circulation, and an examination of circulation statistics shows that this proportion is part of a historic trend of declining DDC circulation.

The concept of total reclassification has been strongly endorsed by some librarians and many faculty members over the years, so decisions about its future course may rightly be considered political decisions. However, based on the fact that these materials receive little circulation and, by inference, little use, it can be argued that massive expenditures for reclassification will be of little interest or value to the user.

The concentration of circulation in the subject areas of social science, history, and literature was also pertinent to the reclassification issue. Prior to this study, the emphasis of the program had been placed on the elimination of the small separate collections of biography, Virginia, and fiction. The information derived from this study showed that, collectively, these sections accounted for only 10.3% of total DDC circulation. The biography section, which had the highest priority for reclassification, accounted for only 1.4% of total DDC circulation.

If the decision is made to continue reclassification, or even to intensify it, the question of priorities becomes even more important. If the convenience of the user is to be served, then reclassification should be directed first at those subject areas in the DDC collection which receive greatest use. Clearly the biography section is not to be numbered among them.

The patterns of charging activity which were developed by this study became the basis for work scheduling of shelving and shelf-reading within the circulation department. Working from a known total of available student shelving hours, approximately 30% of the time was allocated to the DDC stacks and the balance to the LCC stacks. Within those limits, student work schedules were assigned according to the amount of circulation activity observed in the various subject divisions. In other words, low-use areas, such as the 000's, Z's etc., receive only a few hours of shelving effort once or twice each week. High-use areas, such as social science and literature, are shelved every day and receive a large proportion of total shelving efforts.

No attempt has been made to judge the effectiveness of this method of work scheduling on an empirical basis. Subjectively, however, the following effects have been noted. The backlog of unshelved books has been reduced significantly even though book circulation has increased. This is perhaps the result of applying the most effort where it is most needed on a regular basis. Fewer modifications in student work schedules have been necessary to cope with unexpected overloads. This has made planning and supervision easier, and increases shelving efficiency. Complaints from patrons about books being out of order in the stacks have declined markedly; the number of searches initiated for books not located by patrons in the stacks has declined by about 40% since the system was started.

Swem Library, like many academic libraries, is facing a critical shortage of shelving space. According to latest estimates, shelving space in the library will be exhausted sometime in 1976. Since the addition of new stack ranges is not feasible in the present building, and construction of an addition to the library has a low priority in college building plans, it appears certain that some library materials will have to be placed in storage in the near future. Delivery services are cumbersome and expensive at best. Therefore the interests of all will be best served if the materials selected for storage receive little use. This study has identified a number of subject collections which appear to get little use, and the search for candidates for storage will begin there.

One further area in which the results of this study have been of immediate operational interest is the issue of library service to noncollege patrons. No conclusions have been reached about curtailing this service, but the matter has been identified as a topic of legitimate concern to the library and the college. Access to instructional materials by students is clearly being limited to some extent by the borrowing behavior of noncollege patrons. Competition for the limited available study space in the library is another valid concern. Furthermore, there is the issue of cost.

Like many other libraries, Swem Library is funded through a formula appropriation which relies primarily on number of enrolled students. Thus, that portion of total library services which is extended on behalf of noncollege patrons is never recognized in the budgeting process. We know that circulation activity by noncollege borrowers accounts for about 25% of total charges on a daily basis. It follows, then, that approximately 25% of the funds expended on circulation services, shelving, searching, clerical activities, etc., are being spent on behalf of noncollege borrowers. Furthermore, it must be assumed that similar patterns exist in other public service departments of the library, notably reference and periodicals. In a time of increasing financial pressure on the library, the question must be asked whether the library can continue to devote this proportion of its resources to this type of service without some kind of reimbursement.

The patterns of book returning behavior observed in this study have had more impact on the formulation of library policy than on the conduct of operations. However, the pattern of book returns has been used in conjunction with the patterns of charging behavior in arranging work schedules for the circulation staff. Knowledge of the length of time books are likely to be retained has also been of some help to the staff at the loan desk in dealing with patrons who are seeking books already charged.

Formerly, when patrons learned that a book was in circulation, the tendency was to ask for the date due and, if it was not too far distant, to ask that the book be held for them on its return. There was a definite reluctance to ask that a book be recalled, even though library policy provides for recalls after one week from the date charged. Now staff members at the loan desk are able to speak knowledgeably about how long books are likely to be kept prior to return. For example, if a patron asks about a book charged in one of the science/technology classes, he/she is informed that the likelihood of its being returned in two weeks is about 30%, within four weeks the likelihood is 60%, etc., unless a recall is issued. Patrons can weigh this information against the immediacy of their needs and decide if a recall is desirable. Since this information has been provided to patrons, there has been a modest increase in the number of recalls requested. More important is the fact that patrons clearly value this kind of information. They recognize that "When is it due?" and "When is it likely to be back?" are two different questions, and the second question is the one that interests them most.

Loan policy was extensively revised in the course of the study and it was observed that the patterns of book returning behavior remained unchanged. Thus, it would seem that in considering future changes in loan policy, the library can adopt one of two courses: to shape its loan policy (1) to accommodate or (2) to conflict with borrower behavior. By accommodating itself to borrower behavior, the library may expect to minimize its administrative costs. There should be fewer renewals and

fewer overdues to process--both expensive tasks. This course of action should also cause the library to realize less income from overdue fines, but at Swem Library this is not a significant factor, since all income accrues to the general fund of the college rather than to the library. If, however, library fines were to become a significant revenue factor in the library budget, it might elect to impose a loan policy in maximum conflict with borrower behavior in order to generate additional income.

The differences noted in the retention of books by subject raises the question of whether or not some type of variable loan period based on subject might be devised. The fact that retention also seems to be related to distance the borrower lives from the library argues for a variable loan period based on level of access. This would be much more difficult to administer, but not impossible. An easier solution would be to consider ways to improve access for those living farther from the library. This might be accomplished by establishing book return depositories in various locations, or by working out cooperative arrangements with other libraries whereby Swem Library books can be returned at their facilities and vice versa.

The examples discussed so far indicate that accumulating data about borrower behavior is far from a sterile exercise. Knowledge of borrower behavior is vital to an understanding of what is going on in the library. The experience of Swem Library--that a number of things were occurring which were unknown and unsuspected by the staff--is probably typical of most libraries. Therefore, the improvements in the planning and conduct of library service that have been realized at Swem Library by utilizing this knowledge can probably be realized by other libraries undertaking the same process of self-discovery.

TOWARD A GENERAL THEORY OF CIRCULATION

From the study of borrower behavior conducted at Swem Library and described in this paper, it is possible to construct a general theory of circulation. It may be termed a "general theory," because it encompasses the entire circulation process as a whole and its applicability is not limited to libraries of any particular size, type, or location. Before proceeding to describe the theory, however, a brief discussion of why such a theory is desirable is in order.

At the very beginning of this paper, it was noted that the total circulation process, particularly at the theoretical level, seldom receives much attention from the profession at large. There is a growing trend in American libraries to deprofessionalize circulation staff positions on the grounds that the work involved is primarily clerical and administrative. Lacking any theoretical base for his/her work (what library school offers a course in circulation?), the circulation librarian works in virtual isolation from professional colleagues. His/her problems and concerns are seldom recognized, much less understood, by peers or superiors. The establishment of a theoretical framework for circulation may, in a sense, help to legitimize circulation as an important area of professional involvement. It will at least provide a common frame of reference within which fruitful discussion of circulation issues and problems can take place. It may also produce a better understanding of what is involved in the circulation process, which is basic to improving circulation service. Finally, a general theory of circulation may help to achieve much-needed standardization in the way circulation statistics are compiled and reported.

There are practical considerations as well, and these will become more important as the trend toward cooperative library service increases. It is already not uncommon for one library to honor another library's borrowing card. As the time approaches when borrowers will expect to use a number of libraries simultaneously for different needs, a uniform loan policy among the cooperating libraries will become more desirable. A uniform loan policy developed on common patterns of borrower behavior which can be empirically verified would probably be easier to administer, more convenient for the patron, and could avoid a wide range of political squabbles.

The mushrooming growth of library collections has forced many libraries to put books in storage, either on an individual basis or through a cooperative depository arrangement. Here, the goals of both library service and library economy can be enhanced if the selection of materials for storage can be based on patterns of use. Differences in the patterns of use among cooperating libraries may also be of value in shaping plans for cooperative acquisitions.

For these and other reasons, a general theory of circulation may prove to be valuable. The first element of such a theory, perhaps its cornerstone, may be summarized as follows:

Under nonpunitive conditions, patterns of behavior in the way borrowers charge and return materials will be determined more by the nature of the borrower and the nature of the material than by formal loan policy. These patterns of behavior can be identified and will tend to remain constant.

A moment's reflection on the nature of the circulation process may be helpful in developing the other two elements of the general theory of circulation to be proposed here. The circulation process may be defined as the sum of a series of transactions. Some transactions represent the charging of materials, while other transactions represent the returning of materials. In either case, each transaction requires the involvement of both the borrower and the material. Therefore, a general theory of circulation must recognize the equal importance of borrower and material in the circulation process.

On each day that the library is open for operation, a finite and determinable amount of library materials will be charged. These materials will be of a recognizable type, e.g., specific subject, physical size, etc., and will be charged by recognizable types of borrowers, e.g., students, faculty, etc. The circulation control system has the potential to identify individual transactions which collectively make up the total daily circulation on the basis of material type, borrower type, some other variable for which the system has been designed, or a combination of these variables. Therefore, total daily circulation, the total of all books charged, will always be equivalent to the sum of a finite number of batches of transactions which are identifiable by material type and borrower type. This can be expressed by the formula:¹⁷

$$C = \sum x_1 + x_2 + \dots x_n$$

where: C = Total daily circulation

and x = The number of items charged of a specific material type by a specific borrower type.

The analysis of charging behavior at Swem Library revealed that patterns could be identified in the way books were charged, that these patterns could be distinguished by both borrower type and material type, and that these patterns remained constant. Total daily circulation will thus always equal the sum of the percentages of charges attributable to a finite number of borrower types--these percentages will remain constant--when multiplied by itself. Total daily circulation will also always equal the sum of the percentages of charges attributable to a finite number of material types--these percentages will remain constant--when multiplied by itself. These relationships can be expressed as follows:

$$C = \sum (B_1 + B_2 + \dots B_n) C$$

$$C = \sum (M_1 + M_2 + \dots M_n) C$$

$$C = \sum (B_1 + B_2 + \dots B_n) (M_1 + M_2 + \dots M_n) C$$

where B = the percentage of books charged by a specific borrower type which is constant and known

and M = the percentage of books charged of a specific material type which is constant and known

By definition:

$$\sum x_1 + x_2 + \dots x_n = \sum (B_1 + B_2 + \dots B_n) (M_1 + M_2 + \dots M_n) C$$

And

$$x_1 = (B_1 M_1) C$$

Therefore, the second element of the proposed general theory of circulation which describes charging behavior at the library may be stated as follows:

Charging activity will take place within the library so that:

$$C = \frac{x}{BM}$$

where C = the total number of charges for a specific day

x = the number of charges of a specific material type, charged by a specific borrower type on that day

B = the percentage of C which is charged by a specific borrower type which remains constant and is known

M = the percentage of C which is charged of a specific material type which remains constant and is known

At the same time some materials are being charged from the library, other materials are being returned to the library. Each item returned is of a recognizable material type, was charged by a recognizable borrower type, and was retained for a finite period of time prior to return. Again, the circulation control system is capable of identifying these and/or other variables for each book returned to the library.

In order to simplify the discussion, our consideration will be limited to the charges of a single day. Furthermore, it will be assumed that all books charged on that day will eventually be returned to the library. Obviously, this total circulation will be returned to the library over a finite span of time which may, for convenience, be separated into a number of specified intervals.

It was noted previously in the discussion of charging behavior that total circulation can be defined as the sum of a finite number of batches of transactions identified by material type and borrower type. Thus, by noting how each batch of transactions making up total circulation is returned during each interval, the pattern of book returns for total circulation can be determined. For each batch, the sum of the numbers of books returned within each interval will be equivalent to the total number of the batch charged on the day being considered. This may be expressed by the formula:

$$x = \sum R_1 + R_2 + \dots R_n$$

where x = the number of charges of a specific material type charged by a specific borrower type on a specific day

and R = the number of books of that specific material type returned by that specific borrower type within a specified interval of time which were charged on that day

The analysis of book returning behavior at Swem Library revealed that patterns could be identified in the way books were returned, that these patterns could be distinguished by both borrower type and material type, and that these patterns remained constant. Therefore, the number of books returned within a specific interval of a specific material type, returned by a specific borrower type, will be equivalent to the sum of the percentages of books returned within that interval attributable to a finite number of borrower types--these percentages will remain constant for each interval--when multiplied by the total number of those charges circulated. It will also be equal to the sum of the percentages of books returned within that interval attributable to a finite number of material types--these percentages will remain constant for each interval--when multiplied by the total number of those charges circulated. These relationships may be expressed by:

$$R = \sum (b_1 + b_2 + \dots b_n) x$$

$$R = \sum (m_1 + m_2 + \dots m_n) x$$

$$R = \sum (b_1 + b_2 + \dots b_n) (m_1 + m_2 + \dots m_n) x$$

where b = the percentage of books returned within a specified interval of time by a specific borrower type which is constant and known

and m = the percentage of books returned within a specified interval of time which is of a specific material type which is constant and known

Since each batch of transactions comprising total circulation will be returned over a range of intervals, the following will prevail:

$$x = \sum [(b_1 + b_2 + \dots b_n)_1 + (b_1 + b_2 + \dots b_n)_2 + \dots (b_1 + b_2 + \dots b_n)_n]$$

$$\sum [(m_1 + m_2 + \dots m_n)_1 + (m_1 + m_2 + \dots m_n)_2 + \dots (m_1 + m_2 + \dots m_n)_n]$$

and

$$R_a = (b_1)_a (m_1)_a (x)$$

Therefore the third element of the proposed general theory of circulation which describes discharging behavior at the library may be stated as follows:

Discharging activity will take place within the library so that:

$$X = \frac{R}{b_1 m_1}$$

where X = the total number of charges of a specific material type charged by a specific borrower type on a specific day a portion of total daily circulation

R = the number of books of that specific material type returned by that specific borrower type within a specified interval of time

b_1 = the percentage of books returned within that specific interval of time by a specific borrower type which is constant and known

m_1 = the percentage of books returned within that specific interval of time which is of a specific material type which is constant and known

The two equations summarizing charging and discharging activity in the library which are proposed here as part of a general theory of circulation have the capacity, once the appropriate patterns of borrower behavior are identified, to predict how books will be charged and how they will be returned. Using the patterns of charging behavior, if total circulation is known, then one can predict the number of items of any material type charged by any borrower type. In addition, using the patterns of returning behavior, knowledge of the number of items charged of any type of material by any type of borrower will permit prediction of how those materials will be returned. Thus, in theory, one need monitor only a small fraction of total circulation activity in order to make valid inferences about the whole or any one of its parts.

The underlying premise of this study, stated explicitly as the first element of the general theory of circulation developed from the study, has been that the nature of circulation is determined more by the nature of the borrower and the nature of the material than by library policy. Therefore, it is on this issue that future research should be undertaken. The variables used in this study--borrower status, level of access, and subject--are only a few of the many possible determinants of borrower behavior. Others, as well as these, should be investigated.

As the title of this paper suggests, this study is only the first step toward a general theory of circulation. The purpose of this investigation was to develop deeper insight into the circulation process at a particular library, to develop generalizations on that basis which might be applicable to circulation at other libraries, test those generalizations insofar as possible with data obtained from other studies and informal expressions of opinion, and to stimulate the interest of library theoreticians and practitioners in the subject.

To stimulate the interest of practitioners is without doubt the critical first step toward a general theory of circulation. Verification of the patterns of borrower behavior identified at Swem Library or the identification of wholly unlike patterns cannot take place without an attitudinal change on the part of those librarians responsible for the collection and reporting of circulation statistics. The preoccupation with charging statistics must be replaced by a balanced view which recognizes the equal importance of book returns. It will be extremely difficult to make comparative evaluations about circulation in different libraries until more standardization is achieved in the way in which circulation data are reported.

The utility of the information developed about how the library is used by its patrons has been noted briefly. Analyses of circulation operations along the lines suggested here can provide important management information and may replace some library myths with library realities. This alone should be some inducement to progress toward a general theory of circulation.

Final paper submitted 3 September 1975

REFERENCES

1. The method used to select the days for data collection may be literally called the "dart board method." Pages of a desk calendar for every day in the time period were tacked to a large cork board. A blindfolded member of the circulation staff threw darts at the board, and the first nine days hit by a dart were used as data collection points.
2. Burns, Robert W., Jr. "An Empirical Rationale for the Accumulation of Statistical Information," Library Resources & Technical Services 18:255, Summer 1974.
3. Grateful acknowledgment is made to Bernadette Freeman of my staff for her assistance in the task of sorting and counting the transaction cards.

4. Burkhalter, B.R., and Race, P.A. "An Analysis of Renewals, Overdues and Other Factors Influencing the Optimal Charge-out Period." In Barton Burkhalter, ed. Case Studies in Systems Analysis in a University Library. Metuchen, N.J., Scarecrow Press, 1968, pp. 11-33.

5. Ibid., p. 23.

6. MacKenzie, A. Graham, ed. Planning Library Services; Proceedings of a Research Seminar Held at the University of Lancaster, 9-11 July 1969 (University of Lancaster Library Occasional Papers No. 3). Lancaster, Eng., University of Lancaster, 1969, (ED 060 895); Buckland, Michael K., et al. Systems Analysis of a University Library; Final Report on a Research Project (University of Lancaster Library Occasional Papers No. 4). Lancaster, Eng., University of Lancaster, 1970 (ED 060 894); Brophy, P., et al. A Library Management Game; A Report on a Research Project (University of Lancaster Library Occasional Papers No. 7). Lancaster, Eng., University of Lancaster, 1972 (ED 071 700); and Buckland, Michael K. "An Operations Research Study of a Variable Loan and Duplication Policy at the University of Lancaster," Library Quarterly 42:97-106, Jan. 1972.

7. Buckland, op. cit., pp. 103-04.

8. _____, et al., op. cit., pp. 79-81.

9. Buckland, op. cit., p. 100-01.

10. Ibid.

11. Morse, Philip M. Library Effectiveness: A Systems Approach. Cambridge, Mass., MIT Press, 1968, pp. 113-22.

12. Ibid., p. 120.

13. Baaske, Jan, et al. "Overdue Policies: A Comparison of Alternatives," College & Research Libraries 35:354-59, Sept. 1974.

14. The results of the first samples of book returns had been compiled for some time prior to the 1974 ALA conference in New York. Buckland discussed his work in a number of forums during the conference, and the contradictions between his findings and mine were obvious. The questionnaire was rather hastily drawn up shortly thereafter in an attempt to discover if the William and Mary results were as atypical as Buckland seemed to believe, or if similar patterns had been noted at other libraries.

15. The blank table shown in the questionnaire requests information about book returns by faculty members, and distinguishes between graduate and undergraduate student borrowers. Originally it was intended to investigate differences in behavior among these groups, but the effort was abandoned because of the small graduate student population at William and Mary. The information about faculty book returns was also desired for the operational consideration of further revisions in faculty loan policy.

16. Fussler, Herman H., and Simon, Julian L. Patterns of Use of Books in Large Research Libraries. Chicago, University of Chicago Press, 1969, p. 3.

17. Grateful acknowledgment is made to Stuart Kolner of my staff for his assistance in translating these concepts into mathematical notation.

APPENDIX

The College of William and Mary in Virginia

EARL GREGG SWEM LIBRARY

Williamsburg, Virginia. 23185

August 28, 1974

Dear Colleague:

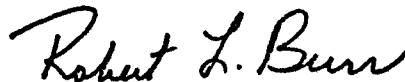
I would like to ask for a few minutes of your time, and solicit your cooperation in a research project which should be of interest to most circulation librarians. I am investigating the phenomenon of borrower behavior as a separate entity affecting and affected by borrowing regulations and procedures. If borrower behavior can be identified as a discrete element, then circulation policies can be designed to reinforce that behavior, contradict it, or modify it.

Enclosed is a brief questionnaire which should be completed and returned to me in the envelope provided. A prompt response would be appreciated. In completing the questionnaire, please feel free to use your best professional opinion or estimate for any response where actual statistical data is not readily available.

I would be most happy to answer any questions you might have regarding the research project, and would welcome any comments or suggestions you might care to offer.

Thank you for your cooperation.

Sincerely yours,



Robert L. Burr
Circulation Librarian

RLB:kd

Encl.

APPENDIX

Circulation Department
Swem Library
The College of William and Mary

I. INSTITUTIONAL INFORMATION

1. What is the approximate enrollment at your institution? _____
2. Please estimate the approximate number of: faculty _____,
undergraduates _____, grad. students _____.
3. Estimated size of library collection: _____.
4. Total annual circulation: _____.
5. Does this figure include circulation of journals? _____ If yes,
indicate percentage of circulation attributed to journals. _____%
6. Please indicate approximate annual circulation attributed to:
undergraduates _____ grad. students _____ faculty _____ other
borrowers _____.

II. LOAN POLICIES

1. What is the normal loan period for the following types of borrowers:
undergraduates _____ grad. students _____ faculty _____ other
borrowers _____.
2. May books be renewed? _____ If yes, indicate maximum number of
renewals allowed _____.
3. What percentage of books circulated to the following types of borrowers
are renewed: undergraduates _____% graduates _____% faculty _____%
other borrowers _____%.
3. Is a fine imposed on overdues? _____ If yes, briefly describe
fine policy _____

III. BORROWER BEHAVIOR

1. What percentage of student circulation can be attributed to:
 general interest reading _____% course related reading _____%
 research for papers/theses/dissertations _____%.

2. Is there any limit on the number of books borrowed at one time? _____
 If yes, how many _____.

3. Estimate the number of books normally charged at one time by the
 average borrower. _____

4. What percentage of books returned by borrowers are returned:
 on or before due date _____% less than 1 week overdue _____%
 1-2 weeks overdue _____% 2-4 weeks overdue _____% more than one
 month overdue _____%

5. Please estimate the length of time books are held by different types
 of borrowers by assigning percentage of book returns by dates shown.

| Period of Use | Types of Borrowers | | | |
|----------------|--------------------|----------|---------|---------|
| | Undergrad. | Graduate | Faculty | Other |
| 2 wks. or less | _____ % | _____ % | _____ % | _____ % |
| 2-4 wks. | _____ % | _____ % | _____ % | _____ % |
| 4-6 wks. | _____ % | _____ % | _____ % | _____ % |
| 6-12 wks. | _____ % | _____ % | _____ % | _____ % |
| 3-6 months | _____ % | _____ % | _____ % | _____ % |
| 6-12 months | _____ % | _____ % | _____ % | _____ % |
| 1 year & over | _____ % | _____ % | _____ % | _____ % |

6. Using numbers 1-8, rank the items below according to their importance
 in determining the length of time books are held by borrowers.

- _____ Subject area of material
- _____ Fear of not being able to locate book later
- _____ Date due
- _____ Length or difficulty of material
- _____ Course or research deadline
- _____ Liability for library fines
- _____ Desire to deny use to others
- _____ Distance from residence to library

7. Note any other factors which you feel affect book retention in a significant way. _____

8. Indicate any periods in the academic year when charging activity is especially high. _____

9. Indicate any periods in the academic year when discharging activity is especially high. _____

IV. MISCELLANEOUS (attach separate sheet if desired)

1. Please briefly describe any recent changes in circulation policy with your reasons for instituting the change and your evaluation of its effectiveness.

2. Please indicate if responses to Section III (Borrower Behavior) have any statistical support. If you have conducted any research on borrower behavior, please communicate your findings and conclusions.

APPENDIX

Survey on Borrower Behavior

*indicates response received

Dartmouth College Library
Hanover, New Hampshire

Arizona State University Library
Tempe, Arizona

San Francisco State College Library
San Francisco, California

University of Denver Library*
Denver, Colorado

Georgetown University Library*
Washington, D. C.

DePauw University Library
Greencastle, Indiana

Univeristy of Maine Library*
Orono, Maine

Tufts University Library
Medford, Massachusetts

Eastern Michigan University Library
Ypsilanti, Michigan

SUNY Albany Library
Albany, New York

Colgate University Library*
Hamilton, New York

University of Akron Library
Akron, Ohio

Ohio Wesleyan University Library
Delaware, Ohio

Miami University Library
Oxford, Ohio

Lehigh University Library
Bethlehem, Pennsylvania

Auburn University Library*
Auburn, Alabama

University of Arkansas Library*
Fayetteville, Arkansas

San Jose State College Library
San Jose, California

University of Delaware Library
Newark, Delaware

Georgia Institute of Tech. Library*
Atlanta Georgia

Drake University Library*
Des Moines, Iowa

Amherst College Library
Amherst, Massachusetts

Western Michigan University Library
Kalamazoo, Michigan

University of Mississippi Library
Oxford, Mississippi

SUNY College at Buffalo Library*
Buffalo, New York

UNC Charlotte Library*
Charlotte, North Carolina

Cleveland State University Library
Cleveland, Ohio

Oberlin College Library
Oberlin, Ohio

Oregon State University Library
Corvallis, Oregon

Lafayette College Library*
Easton, Pennsylvania

| | |
|--|---|
| University of Rhode Island Library Kingston, Rhode Island | Clemson University Library * Clemson, South Carolina |
| E. Tennessee State University Library Johnson City, Tennessee | Memphis State University Library* Memphis, Tennessee |
| Rice University Library Houston, Texas | Virginia Polytechnic Institute Library* Blacksburg, Virginia |
| Old Dominion University Library Norfolk, Virginia | University of Richmond Library* Richmond, Virginia |
| Gonzaga University Library* Spokane, Washington | University of Wyoming Library* Laramie, Wyoming |
| University of Calgary Library* Calgary, Alberta | Simon Fraser University Library Burnaby, British Columbia |
| University of Manitoba Library* Winnipeg, Manitoba | University of New Brunswick Library Fredericton, New Brunswick |
| University of Newfoundland Library St. Johns, Newfoundland | Dalhousie University Library Halifax, Nova Scotia |
| McMaster University Library* Hamilton, Ontario | University of Prince Ed. Island Library* Charlottetown, P.E.I. |
| McGill University Library Montreal, Quebec | University of Saskatchewan Library* Saskatoon, Saskatchewan |

VITA

Robert L. Burr is currently Director of Libraries, Gonzaga University, Spokane, Washington. He earned his A.B. at Canisius College, Buffalo, New York, and the MSLS degree at Case Western Reserve University, Cleveland, Ohio. Mr. Burr is affiliated with ALA, Virginia Library Association, Southeastern Library Association, Association of College & Research Libraries, AAUP, Beta Phi Mu, and Mensa. In addition, he has served as chairman of the Research Development Committee (1977) of the Library Research Round Table, and is a member of the Executive Board of the National Libraries Association.

Before serving in his current position, Mr. Burr was Director of Circulation Services, College of William & Mary, Williamsburg, Virginia (1973-77); Purchasing Manager and Assistant to the President, Audn Corporation, Hamburg, New York (1971-72); and Assistant Production Manager and Purchasing Agent, Carleton Controls Corporation, East Aurora, New York (1966-71).

Mr. Burr has authored articles appearing in several publications: "Libraries, Librarians and Librarianship; A Model," Libri 23:3, 1973; "Library Goals and Library Behavior," College & Research Libraries 36:1, Jan. 1975; "Perspective on Competence," The National Librarian 1:2, May 1976; "A Behavioral Model of the Circulation Process" (paper presented at the 1976 ALA conference, available on cassette from ALA); and "Certification and Competence," Library Journal 102:15, Sept. 1, 1977.

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