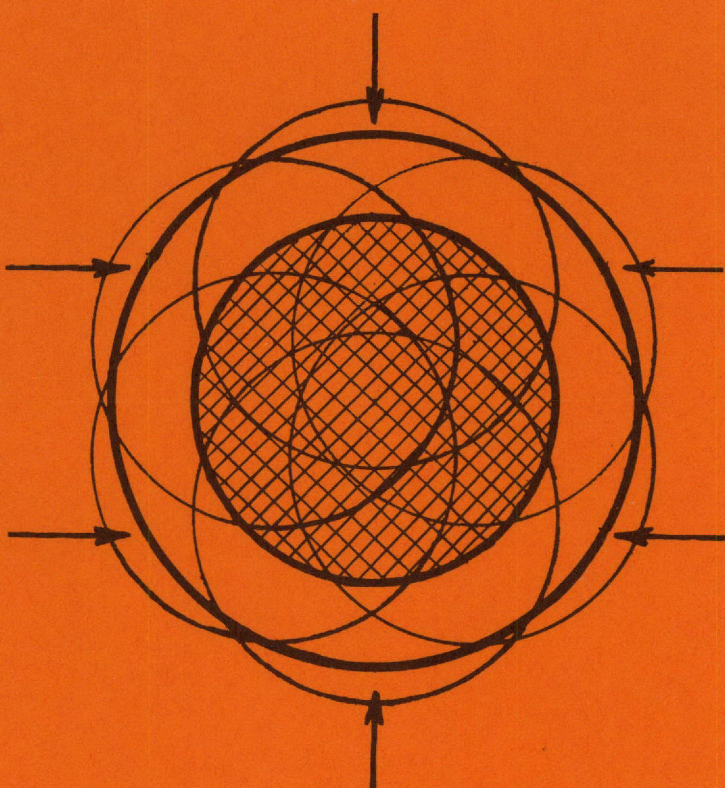
Proceedings

First Texas Conference on Library Mechanization



Texas Library and Historical Commission
Monograph Number Six

1966

PROCEEDINGS OF THE
FIRST TEXAS CONFERENCE ON LIBRARY MECHANIZATION

held March 23-24, 1966
Downtowner Motel
Austin, Texas

Sponsored by the Texas State Library,
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Edited by
JOHN B. CORBIN

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The purpose of this conference was to acquaint librarians and other interested persons with existing installations in Texas libraries, with experimentation and planning being carried on, and with basic machines on the market today. This institute was a pre-conference to the annual meeting of the Texas Library Association held in Austin March 24-26, 1966.

Welcome

R. W. BIRCH, *Branch Manager*
IBM Corporation
Austin, Texas

I would like to take this opportunity on behalf of IBM to welcome you to Austin to the State Library Mechanization Conference. IBM is certainly pleased to co-sponsor this important event.

I am reminded of an internal IBM class, approximately five years ago. The attendees were so-called "elite" IBM systems people, and one of the assignments was to design a system for the control and circulation of classified documents in a library. While the fact that the documents were classified perhaps made the problem a little more difficult, I was struck by two facts. Number one: most of us considered it a trivial problem until we attempted to solve it. Number two: the machine solutions ranged very broadly and included the largest computers that IBM built at that particular time.

I do think in the ensuing years, however, we have taken a more realistic viewpoint of your problems. They are certainly challenging problems and we are trying to learn more about them. I believe the speakers from IBM who are represented at this conference will give you some indication of perhaps some progress that we have made in the past years. But we are also here to learn and understand more about your problems and hope that we can continue to work with you.

Again, may I say how happy we are to have you in Austin, and if there is anything that my office can do to assist you while you are here, please feel free to call on us. Thank you.

MARY-LOUISE VANCE, *Chairman*
Acquisitions Round Table
Texas Library Assocation

Fellow librarians, systems analysts, and other ladies and gentlemen: it is a pleasure to welcome each of you to this First Texas Conference on Library Mechanization.

The response has been gratifying. The Acquisitions Round Table is happy to be a co-sponsor. We are indebted to John Corbin for arranging this conference and to the participants who will enlighten us on existing installations in Texas libraries and on basic machines on the market today.

We librarians have a range of problems which can be helped by automation. Through the years, librarians have used many devices to improve library management and service; to name a few: the card catalog, the electric typewriter and eraser, the microfilm camera, the microfiche reader, the pasting machine, the posting machine, the telephone, the Xerox machine...

So the quest for automation should be regarded as a continuation of our long tradition of change and improvement.

It is our hope that this conference will prove most helpful in formulating future programs in many Texas libraries.

Introduction to the Conference

JOHN B. CORBIN, *Director*
Technical Services Division
Texas State Library

Our society today is in its second industrial revolution. This began after the Second World War with the development of the transitor and other devices wherein one machine could organize, control, and perform operations faster, better, and more economical than hundreds of mere humans.

This trend to automation is not going to stop; indeed, it is going to gain impetus. It is estimated that by the year 2,000 A.D. only ten per cent of the population will be working and the rest will be paid to be idle. And this is only thirty-four years from now.

As society gains more leisure time to read and to use libraries, as it becomes more aware and more interested in libraries as institutions for the storage and dissemination of recorded information, its demands for rapid and modern service is going to increase. Libraries must begin to accept and to adopt the fruits of technology to their own uses, or, one day soon, they will find themselves and their services replaced by a large memory bank located in city hall or the finance office.

There is no reason why this should be. The machines are here for the librarian's use today and have been for several years. All we have to do is to set to work to adapt them to our needs or demand that machines be invented for us. Too many librarians are guilty of thinking or saying: "I'm waiting for a new and better model." They will be waiting forever.

It's true that there is no feasible or economical way at this time to store and retrieve the contents of a library on machines. But this is only one aspect, though not small, of a library. There are budgets to maintain, statistics to compile, books to purchase, salaries to compute, books to circulate, indexes to compile, and hundreds of other menial tasks around that easily can be done by machines. Why not mechanize some of these while we are waiting for that improved model to appear?

You all are here these two days to see and to hear of some mechanization programs existing today. We are not here to tell you that this or that system is the one you should install in your library. Each system is designed for a particular institution and a peculiar situation. We are here, rather, to share with you our experiences, our thoughts, and our tribulations of working with our own programs of mechanization in order that you might go home and begin thinking about systems of your own.

A "Total Systems" Approach to Library Mechanization

DONALD H. KRAFT, *Industry Representative*
IBM Corporation
Chicago, Illinois

Data processing equipment is being used to assist the librarian in many clerical tasks relating to acquisitions, technical processing, cataloging, circulation, control of books, serials, and accounting functions. This is resulting in better service to the user, fewer clerical tasks for the librarian, and more time for the librarian to perform professional duties.

In many cases, the necessary data processing equipment is available in a nearby computing center or accounting department. Library data processing functions can be scheduled on this equipment as are more conventional payroll, inventory and billing applications.

EQUIPMENT DESCRIPTION

From the wide range of available data processing equipment, certain types will be briefly described, since they are currently being applied to library functions:

1. The card punching machine (keypunch) is used to record information in IBM cards in the form of holes, as the operator goes through the motions of typing on its keyboard. This machine can also be used to interpret the punches into their corresponding alphabetic and numeric characters. This interpreting is in the form of printing across the top of the card directly above the holes. If it is desirable to have the same information repeated in a number of cards, data is punched into the first card only and then automatically duplicated into the cards following. This machine can be used to keypunch lower case characters as well as upper case ones.

2. The sorter can arrange cards into alphabetic and numeric sequences at speeds from 450 to 2,000 cards per minute. It can also select certain cards from a large file, i.e., overdue cards from the charge-out file.

3. The reproducer can duplicate the information from a deck of punched cards into a deck of blank cards. It can sense the presence of certain types of pencil marks on cards and convert them to punches in the cards.

4. The accounting machine, or tabulator, performs a great variety of jobs. It can list onto paper at speeds from fifty to 150 lines per minute the contents of punched cards which are fed into it. It has the ability to add, subtract, multiply, and divide numbers which it reads from cards. The accounting machine is used to write purchase orders, print book lists and catalogs, write overdue notices, etc. It can print numbers, upper case letters, and certain punctuation marks and special characters.

5. The collator can interfile IBM cards into a file and also select certain cards from a file. In a sense, it is a "mechanical file clerk." The collator is particularly useful in automated circulation control systems, where it interfiles charges and selects out discharges from the charge file.

6. The Document Writing System has the capacity for both the punching and printing functions required in library procedures. It consists of an IBM card punch connected by a cable

and control unit to an IBM electric typewriter. The card punch, in addition to performing the operations described above, also can be used to read cards and to print their contents on the electric typewriter, which can print both upper and lower case characters. This system is presented as an alternate for those libraries whose size does not require the greater processing speed available with a data processing system consisting of the card punch, sorter, and accounting machine. The procedures, however, are basically the same, regardless of which system is used. Special libraries find the Document Writing System particularly useful.

7. A computer combines the functions of all of the punched card equipment above. A computer reads information from punched cards or paper tape. It can perform arithmetic operations (add, subtract, multiply, divide) and logical operations (compare characters to determine if they are equal or not) under the control of a program of instructions stored in its main memory. The program may modify itself, based upon the results of prior computations. The main memory is usually made of magnetic cores. Auxiliary storage is provided by magnetic discs, drums, tape, and film. The results of the computation may be printed or punched into cards. Certain models have a printer capable of printing both lower case and upper case characters.

COMPUTER CAPABILITIES

If a computer is available, much larger volumes of information may be processed in less time than with punched card equipment. Also, the librarian may plan a more sophisticated system. Some of the more important attributes of this computer "sophistication" are outlined below:

1. **Speed.**—Arithmetic and logical elements in computers now operate in speed ranges measured in **nanoseconds**. A nanosecond is one billionth of a second. In order to comprehend how small a sliver of time a nanosecond is, the librarian might well ponder over the ratio of nanoseconds to seconds:

$$\frac{\text{1 nanosecond}}{\text{1 second}} = \frac{\text{1 minute}}{\text{2,000 years}}$$

You are familiar with the physical constant: speed of light = 186,000 miles/second. Expressed in terms of a nanosecond, light can travel only one foot in one nanosecond.

New information may be read into a computer at the rate of 1,000 punched cards per minute. Reports can be printed at speeds of up to 1,100 lines (of 132 characters each) per minute, fully seven times as fast as punched card accounting machines. Information can be searched in a computer's direct access memory containing hundreds of millions of pieces of data, found and displayed on a video console in a second or two.

2. **Fewer manual operations.**—A computer operates with pre-thoughtout programs of instructions, which direct its every move. Since the computer has the functional capabilities of all the punched card equipment, plus these stored programs, there are fewer human operations and no human decisions once the system is operational.

3. **On-Line capabilities.**—It is possible to attach card readers, keyboards, typewriters, and video consoles to certain types of computers, providing the librarian with instantaneous communication with the computer without the necessity of first punching cards. These devices are called **terminals** and the capability of transmitting information directly into a computer from them is called **on-line.**

The librarian may use a typewriter or video terminal to interrogate the computer's store of information and have his query answered within seconds with the desired information displayed on the terminal. Many terminals may be connected to a computer via telephone lines; therefore, the distance between the terminals and the computer is no physical restriction.

This on-line capability is very useful in a large library operation, particularly in the areas of acquisitions and circulation control.

4. **Storage.**—A computer has two basic types of storage:

   a. **Main.**—Information is stored by magnetizing tiny doughnut shaped magnetic cores, approximately the size of the typewriter character "o". Information can be stored and retrieved in a millionth of a second using magnetic cores. Since this form of storage is relatively expensive, it is used only for the program of instructions and the information being used by the computer's logic at a given point in time. Data is generally stored in auxiliary units and transferred to magnetic cores only when needed.

   b. **Auxiliary.**—Large quantities of bulk data, such as, "books on order," "shelf list," etc., might be stored on magnetic tapes, disk files, or large magnetic film strip files. Each has different characteristics of capacity, access time to information, and, of course, cost. Magnetic tapes are processed sequentially or serially in the manner of a tape recorder. Information is stored onto tape magnetically at the densities up to 1,600 characters per inch, and it takes approximately four minutes to search a 2,400-foot reel of magnetic tape. Direct access devices, such as rotating disks, store information magnetically on their surfaces. Capacities of a disk storage unit vary from 500,000 characters to 200,000,000 characters. The latter figure would represent one complete set of **Encyclopedia Britannica.** Information can be accessed in approximately one-tenth of a second. Other direct access storage devices have larger capacities but slower access times.

EVALUATING

The librarian, who is a novice in the data processing field, must be cautioned that the world of data processing has to be evaluated in terms of "trade-offs." For example, faster speeds imply higher costs. On-line communications ability, while very desirable, is relatively costly. The **librarian** must make the final decision as to whether the advantages of extra sophistication outweigh the costs. In making this decision, he must consider what uses will be made of the information, how current the information has to be, and the frequency with which the information is requested.

TOTAL SYSTEMS APPROACH WITH PUNCHED CARD EQUIPMENT

To illustrate how these data processing machines can assist the librarian, let us trace the path of some IBM cards as they are processed. The procedures can use an IBM Document Writing System (very low volumes, i.e., a special library) or a card punch - sorter - collator - accounting machine combination (medium to heavy volume of transactions). Where either the Document Writing System or accounting machine can be employed, the word "printer" is used. The use of the Document Writing System in a library is described in detail in the IBM manual entitled *The IBM 870 Library Administrative Processing System for Federal Government Libraries and Special Information Repositories* (*No.* E50-0029).

When a book is about to be ordered, cards are punched containing such information as the author's name, title, publisher, cost, etc. These cards are then fed into the printer, which produces the purchase order. The same cards, when merged manually or on the sorter with other similar cards, can be used to print an "on-order list" on the printer. When the invoice for the book arrives, these cards are manually pulled from a file and used with the printer to write the check and accompanying voucher. The same cards are used to prepare a "new acquisition list" which can be made on duplicating master paper by the printer.

Many functions of technical services can be performed with the same equipment. Spine labels, book plates, book cards and pocket labels can be prepared by the printer, using information previously punched in the card.

A master shelf list card for each book is prepared automatically from the original cards by the reproducer or Document Writing System. Once the book has been cataloged and this new information punched into cards, a descriptive catalog card, complete with tracings, keywords and/or abstract can then be made with the printer. Duplicate catalog cards can be printed by passing the cards through the printer again. If the punched cards for all books in the library are arranged by the sorter into alphabetical order by author and then printed, one has a book catalog. These cards can be arranged into sequence by subject matter and listed, producing a book catalog in that sequence. Similarly, a third book catalog can be printed in alphabetical order of the titles.

Other cards can be made from the original by use of the Document Writing System or reproducer. These are book cards and are used for circulation control. Where circulation volume is heavy, IBM Data Collection equipment has been used successfully to record and control charging and discharging of books. Slipping is completely eliminated. In addition to handling book charge-outs, returns, and overdue notices, the cards provide valuable circulation statistics.

Card procedures can be used with serials for purchase orders, check writing, printing of a union list of serials, serials holdings lists, posting of periodicals, claims reports, automatic notification of binding dates, and preparation of routing slips.

Data processing machines can assist the library staff by producing fund accounting reports and agency expense reports, as well as the usual financial reports on a periodic basis. The basic input comes from the cards used to write the purchase orders plus added cost information obtained from invoices.

The Decatur Public Library (Illinois) is an outstanding example of a public library which has installed a total system with punched card equipment.

TOTAL SYSTEMS APPROACH WITH A COMPUTER AND TERMINALS

Communicating with the central computer system by means of terminals—both visual display and typewriter—library personnel can keep current with acquisitions and cataloging, increase their effectiveness in technical processing, and maintain rigid control in the areas of serials records and circulation.

Prior to preparing a purchase order for a new book, a bibilographic search of materials already in the library or on order must be made. An inquiry originated at a terminal in the acquisitions department causes the system to search its on-order file and its library holdings file (shelf list) stored in the computer's auxiliary memory. If the requested book or document is not recorded in the files, the purchase order is written and the information is immediately stored in the on-order file.

Upon receipt of the book, information stored at the time it was ordered is called from the on-order file.

Cataloging is facilitated by the use of a terminal-oriented computer system in that a master subject heading file stored in the system is queried to check the subject headings assigned by the cataloger. An author file and a title file, also stored in the system, may be queried by the cataloger to provide necessary cross-reference information. Catalog cards or book catalog entries are prepared. Spine labels, book cards and book pocket labels are also created automatically as by-products of the stored information.

Information on serials holdings is stored as a logical file within the computer's auxiliary memory. This file contains the master information necessary in performing the daily check-in of new serials as well as in the filing of claims notices. Periodic review of the file initiates follow-up action for serials not received and claims notices are prepared as an automatic by-product.

Records of all books on loan are maintained by the system. As a book is checked out, a library terminal reads the book identification from a punched card and the patron identification from a badge. The record enters automatically the file of outstanding books and is then available by terminal to patrons who would like to know when certain books, which are out, will be returned, and to the librarian who has a need to know what books are charged out to a given borrower (in the event he has to leave school and "clear" the library).

When books are checked out, the system can use the borrower's identification number to search a delinquency list (those who owe unpaid fines). If the borrower happens to be on the list, a message can be sent back to the terminal advising the librarian of the fact.

This on-line search ability can also be used at the time a book is returned to the library. The book number is checked against a file of books on "hold" and, if the returned book is on the list, a message is sent to the librarian indicating that a certain borrower is waiting for the book and that is should not be shelved.

A periodic scan of the outstanding book file reveals those books which are overdue, and notices are prepared by the system's high speed printer.

The date processing and information retrieval capabilities of modern data processors enable the research library to perform new and valuable services. In the past, keeping current with the latest publications and activities of the many fields embraced by an institution has been impractical or impossible. Manual review of new material, whether for research or academic purposes, is both time consuming and costly. In many cases it is also incomplete.

If the library desires to make available to certain of its patrons a selective dissemination of information system, this could be readily accomplished by computer. It would have in its memory the interest profiles of the people on the system. These profiles would consist of LC or Dewey classification numbers and subject headings which represent the readers' interests. The profiles would also include names of authors and perhaps keywords which might occur in title. These profile items would be matched by the computer against the corresponding items in the recent acquisitions. Whenever a sufficient number of terms between the two lists matched, the computer would print out a notification to be mailed to the borrower. Such a system of automatic notification of new items of special interest should be a tremendous service to a library and stimulate circulation considerably. Thus, the library assumes an active role by informating patrons of new items rather than the traditional passive role of waiting until patrons come into the library before offering service.

Today, a library can obtain machine readable indexes to publications and activities in many fields, and the computer can scan them to answer specific requests. Indexes, available on a one-time purchase basis or by subscription from various sources, provide the ability to perform machine searches by subject, journal reference, author, or keyword. The search is fast, flexible, and complete.

Properly equipped with the necessary indexes and availability of a data processing system, the research library can insure the highest degree of effectiveness in satisfying the needs of a chemical research project in providing the latest information for a graduate student in electrical engineering, or in supplying socio-economic data for the surrounding community and its businessmen.

BENEFITS

The use of data processing equipment for the mechanization of the clerical jobs in a library makes possible the following advantages:

1. Integration of book ordering, technical processing, circulation control and statistics, serials and accounting.

2. Release of professional staff from clerical routines to work with books and patrons.

3. Availability of complete, up-to-the-minute financial picture at all times.

4. Availability of complete information on books that are being read.

5. Simplification of book ordering.

6. Easy maintenance of accurate circulation control statistics.

7. All of the above result in a cost and personnel reduction over a period of time as volumes of circulations and acquisitions increase.

8. Last, and perhaps the most important of all, better service to the library patrons:

   a. New books get processed sooner.
   b. Returned books get same-day shelving—no slipping.
   c. Book selection can be made more responsive to patrons' reading habits.
   d. Union book catalogs are available for all branches, bookmobiles, departments.
   e. Full control and information is available on the whereabouts of all books.
   f. More money is available for books, since operating costs are lower.

CO-OPERATIVE LIBRARY SERVICES OF THE FUTURE

It is natural to suppose that there will be interchanges of machine readable information among libraries. Reels of magnetic tapes containing entire shelf lists or serials holdings can be sent through the mail; or even more exotically, the information can be transmitted from computer to computer via micro-wave or high-speed co-axial cable. This flow of information could reduce the original cataloging load on individual libraries considerably.

Perhaps regional associations of libraries will be organized to handle efficiently the interchange of machine-readable library information. Each regional association might have its own computer with a union catalog of its members stored and available via terminals in each library. Library of Congress cataloging information could be transmitted daily from Washington to each center for ready availability to all member libraries. The regional computer might also store the on-order lists of its members. This would assist the librarians in making buy-or-loan decisions about expensive, seldom-read books.

The Book Catalog Program of the Austin Public Library: The Librarian's Viewpoint

MAY LEA McCURDY, *Assistant Director*
Austin Public Library
Austin, Texas

When we began planning our book catalog program at the Austin Public Library, no person on the library staff had any experience with the tools of automation. Without the patient and whole-hearted co-operation, assistance, and direction of the City's data processing staff, this project never could have been realized.

By the same token, the data processing staff were quite unfamiliar with library practices and problems. We spent many hours learning to talk to each other about the problems involved. From the beginning, however, the computer people were confident the computer could do the job and encouraged us to go forward. The fact that none of us knew how to do it kept us reading, studying, and searching for reports which might guide us.

The book catalogs were designed specifically to index the headquarters book collection which services the Extension Division branches, stations, and mobile units. This is a rotating collection consisting of approximately 120,000 volumes, including some 25,000 titles. It serves five branches, three stations (one of them a mobile unit), and three bookmobiles. Each of these units has on its shelves or circulating in its service area a segment of the total collection. Books read-out at one location are returned to headquarters to move on to another location. Books not currently in demand at any location are held at headquarters for occasional calls. Books are exchanged monthly or more often if desired. Such movement of books is highly impractical if catalog cards are involved; hence, extension agencies had no catalogs until the advent of the book catalogs. With the book catalogs, all titles in the extension collection are brought to the attention of readers at any library agency, and any title desired may be requested if it is not available on the agency's shelves. Daily deliveries from headquarters to each agency expedite this service.

The book catalogs are in six volumes: three for children's books, three for adult books. Each set of three consists of an author catalog, a title catalog, and a subject catalog.

The equipment required at the Library and used by library personnel included a card punch machine and a verifier. The equipment in the City's data processing center will be described by Mr. McCaslin, director of the center and Assistant Director of Finance. Other equipment required was that of the City print shop, where the multilith mats prepared by the computer were printed and the books bound.

Library staff members were trained to operate the card punch and the verifier, and 100,000 cards were punched and verified at the Library.

Before we could go to the machines, however, much preparation had to be made. The following is a list of the preliminary operations involved in our program:

1. Review subject heading list to improve consistency and to develop the cross references.

2. Scan shelf list cards of the extension collection to select titles to be included in the book catalog. Generally, we eliminated titles no copy of which had been purchased since 1956.

3. Determine the exact format of the book catalogs.

4. Plan the use of punched cards to produce this format.

5. Develop field definitions for the IBM cards and set up the card code.

6. Adapt the information on each shelf card to make it fit the desired format and stamp a serial number on the card.

Shelf cards were used as the source documents for the keypunching.

After the cards were punched and the information was transferred to magnetic tape, a proof copy was printed out by the computer. This was the first real evidence to the library staff that this bizarre operation really could produce a book catalog! Many hours were spent proofreading and preparing corrections and changes. Because of our lack of experience, the changes were many—so many, in fact, that some of them were postponed until the second edition is published.

It is much easier in retrospect to describe the process of producing the catalogs than it was to initiate it. When we plunged into the program, we did not know exactly what would be required, and we had to learn as we went along. We know now at least part of what we needed to know when we began.

The library staff who have gone through the fire have urged me not to understate the job of preparing the materials, proofreading at every step, and learning the new skills of punching and verifying. Revising the subject heading list and selecting the titles to be included took months of slow, thoughtful, detailed work, consuming far more time than did the actual machine work. Proof reading also required much time and care.

The first week we ventured into punching and verifying was almost a total loss. Our typists had been given about two weeks of training at the data processing center, but we had to adapt this training to a very different type of material. Also we had to establish that indescribable rapport between man and machine which all of us have experienced in handling typewriters, adding machines, and automobiles. It was a most discouraging week, but after that the work went unexpectedly well.

The time element in the procedure may be of some interest. We began our investigation of the possibilities of a book catalog in the spring of 1964, immediately beginning the work of revising the subject list and selecting titles for inclusion. In midsummer we had our first conference with Mr. McCaslin. Thereafter we went from conference to further investigation to conference until we could clarify and sharpen our thinking to the point of making decisions. During all this time, the preparation of materials was continuing.

We began keypunching the first of March and completed the children's titles in two months. The process of programming and proofreading required about three months more. It should be pointed out that neither data processing personnel nor Library staff were doing this work only. It all had to be fitted into schedules already full.

Keypunching for the catalogs for adult books began the first part of August and required two months. October was spent in final proofreading, printing the multilith mats, and the final printing and binding. Approximately a year and a half elapsed between first plans and finished product.

The major problems we encountered fall into three groups: first, format of the catalogs; second, card coding; and third, sorting or filing.

We found many approaches to format. Some catalogs were closely related in form to the printed catalog card, others resembled indexes; in some the computer-produced page, printed in a double column, was photographed, reduced in size to fit an 8½ by 11 page; others printed straight across the page.

For a number of reasons, we determined to seek the simplest possible approach. The fact that we were inexperienced led us to believe we would have all the problems we could manage in producing as simple a catalog as we could design. Since upper-case letters only were available to us and a very limited number of punctuation marks, we felt brief entries would be easier to comprehend, and would produce a more compact book. The catalogs are designed for use in neighborhood branch libraries where the approach is general rather than specialized, and the complete bibliographical information desirable in research or special libraries is not required. For all these reasons, our decision was to prepare a finding list.

In typical library cataloging, the author card is the unit or main card. We made the title our major entry. One IBM card was made for each title. On this card were included the call number, the title itself, and a by-line for the author consisting of surname and initials. The information on this card prints out on one line in all three catalogs. In the title catalog, this single line for each title is the only entry.

In the author catalog, each author's name appears once with the titles of his works alphabetized under his name. In this catalog, the by-line is dropped and replaced with the publisher and date, which appear in this catalog only.

In the subject catalog, each subject is listed once with the titles of works dealing with the subject alphabetized under it.

To produce the format described, a set of cards was prepared for each title, each set being identified by its own unique serial number. A set includes the following cards:

1. An author card with the author's name in the same fullness used in our present card catalogs, except that this name must fit on one IBM card with 70 columns allowed for it

2. A title card with 14 columns in the call number field, 54 columns in the field for title together with the by-line

3. A publisher card giving publication date and publisher's name in brief form, the length being tailored to fit on a single line with the title when the by-line is dropped

4. One to four subject cards, 70 columns being allowed for each subject. No more than four subjects are used with any one title.

The set of cards for a title having no subject entries would require three punched cards; the set for a title having four subject entries would require seven.

The card coding which is basic to the programming will be covered in detail by Mr. McCaslin. This coding is perhaps the most important item in the book catalog production operation.

It cannot be emphasized too strongly that these initial plans about format and card coding are vitally important. Once made and the cards punched, there can be little change. We found also that we were dealing with an accuracy and consistency requirement far beyond that we were accustomed to. If a comma is out of place, the entry involved will not file in its proper place. If there are two spaces following U.S. in a corporate entry on one occasion and only one space on another occasion, the computer refuses to file the two entries together.

Sorting (the name the computer people give to what librarians call filing) presented many problems, perhaps more than any other factor. We decided that we would try to follow the computer's sorting pattern as closely as possible. Our "Mac" and "Mc" names do not file together, nor do "Saint" and "St.", "Mister" and "Mr."

The computer sorts, not word by word or letter by letter, but column by column within a given field. An empty or unpunched column files first—the old library rule of nothing before something. Then the filing order is period, dash, comma, the letters of the alphabet from A to Z, and numerals. This giving of filing value to punctuation marks was difficult for us to work with since our filing has been alphabetic without reference to punctuation.

Subject subdivisions posed our most difficult problem. As you know, subject headings come in several forms: a single word, "Medicine;" subdivision following a dash, "Medicine — Dictionaries;" inverted heading, "Medicine, Popular;" a phrase, "Medicine as a profession." Each type of heading sorted by computer forms its own group, the types do not interfile in alphabetic order.

We tried to achieve alphabetic order without reference to punctuation by standardizing the headings, using a dash after the entry work, "Medicine," in all types of subject headings. Even the phrase heading had the dash inserted, "Medicine—as a profession."

In this matter there still remain many inconsistencies in our present book catalogs which we hope to improve in the second edition.

Before going into the book catalog program, we analyzed the potential cost of card catalogs for the larger extension agencies with the idea of giving each of them a card catalog for the entire extension collection. Six catalogs would have been required, approximately 100,000 cards to each catalog. The production alone of 600,000 cards are estimated to cost over $25,000. Our costs for keypunching, verifying, and proofreading plus the programming and computer time costs and the printing and binding costs were less than $7,500.

The advantages of the book catalog to us have already been pointed out. It is possible for each branch to have access to titles in the entire extension collection. Movement of books among the branches remains uncomplicated. Bookmobiles and small stations with no room for card catalog cases now have a catalog. Cards for multiple card catalogs do not have to be produced, files, sorted, withdrawn. Space formerly required for catalog cases is available for other uses.

There are disadvantages. One often-mentioned is the fact that the book catalog begins to be out of date by the time it is published. By the time our supplement is published, the original catalogs will be six months out of date. Some libraries publish supplements more frequently. We plan to do so next year. Others point to their estimate that at any given time their card catalogs are thirty per cent in error.

Another disadvantage is lack of punctuation marks—no apostrophes, colons, semicolons, quotation marks, etc. The use of upper case letters throughout is considered monotonous.

For us, advantages far outweigh disadvantages. The book catalogs have been warmly welcomed in the extension branches where no catalogs had been available. In the Central Library, the staff of the Young People's Department have come to prefer it to their own card catalog, and we are moving in the direction of a book catalog for the children's books of the entire library system. We believe we have a bargain, both from the point of view of cost and of satisfactory results in use.

The Book Catalog Program of The Austin Public Library: The Programmer's Viewpoint

O. R. McCASLIN, *Assistant Director of Finance*
City of Austin
Austin, Texas

The City of Austin's Data Processing Division feels extremely grateful for Mrs. McCurdy's most kind words. However, her adjectives describing the library staffs' role in the book catalog, I feel, did not express totally their tremendous task in learning to communicate and create the desired input data. This was a project extremely well done by people heretofore totally void of the idioms of data processing and its workings. So to them I wish to give 99% credit for the project's success.

You here today deserve a special applaud from the field of data processing. Throughout the past few years all electronic data processing management has fought a battle to break the gregarious attitude of people. You show the knowledgeable desire to break away and be one of the first to be a part of this tremendous tool, which as time progresses, will be a necessity, not an aide.

I wish to make clear that library automation is and will not be a process of pushing a button but a long and hard coordinated effort by the electronic data processing and library personnel. Primarily library personnel will be the key to success, as theirs will be the greater task. The simulation of data will always continue to be the major portion of any project.

We in electronic data processing do not and can not, in most cases, go out and determine each and everyone's needs and problems. They must come to us. The Austin Library did just this; they came to us. To communicate a totally foreign problem between two groups was, and always will be, the initial problem. Through many sessions we toiled trying to define the problem and the desired end result. When this problem had been breached, the remaining steps for electronic data processing personnel were minor, as qualified systems and programming personnel were available.

A simple approach to a problem does not always reiterate the acceptance of output that will do, but could be better. Usually the end result is more than adequate. In creating the systems and programming for the book catalog, simplicity was the key word.

Mrs. McCurdy has very adequately described the card formats and primary functions. The card formats were firmed as to data requirements, but logic controls were still necessary for programming.

A set of cards for one book had to be recognized as a single unit. Therefore, a serial number was assigned to each book, requiring that each card relevant to a book contain the serial number in order to create a single unit. Also we had to define by some process the type of card we were reading at the time the definition was necessary. This required a card definition as follows:

01 - The author card.
21 - The title card.
41 - The publisher and date card.
61, 71, 81, and/or 91 - subject card or cards.

In order to print the author and each related book title, the author's name had to be exactly the same on each and every punched card, as these were compared character by character. This was another tedious task for library personnel.

The title card was not as difficult, except standard sorting and filing procedures had to be followed.

The subject was the most difficult to program. It can easily be understood by each of you that one book record can be filed in but one place or sequence; therefore one book record was required for each subject.

The subject and author cross references were extremely difficult to handle logically in programming. Through many conferences, systems analyzation dictated the use of the demanded sorting technique which in effect placed these references in the collating or desired location sequence. This approach was a success and as accurate as the human element.

The completed system called for four programs and three tape sort routines:

1. Program 1 was to build the master book file from cards which were punched by the Austin Library personnel. At this point the card codes were used to determine where on the tape record the data in the punched card was to be placed. For each book or subject record the following data created the master catalog record:

   Serial number from card 01
   Author name from card 01
   Title from card 21
   By author from card 21
   Call number from card 21
   Publisher and date from card 41
   Subject from card or cards 61, 71, 81, and/or 91.

2. Program 2 was to print on multilith mats, the adult and children's book catalog by title, by author, and by subject. Like an old-fashioned elixir, you will please note that this program does everything. This combining of many tasks in one program is more efficient and expeditious.
3. Program 3 was to add records (or books), delete books, and/or change any part of an existing book record.
4. Program 4 was to print serial numbers or title control list or lists for reference and maintenance purposes. The sorts involved were by author, by title, and by subject.

The programming required two man-months to complete the four programs and sort procedures. This related time includes extensive program testing and program corrections, which normally require the majority of a programmer's time. It is indeed necessary to understand that all automated equipment can not create or *destroy* data without detailed programmed instructions. The correcting, (or de-bugging as we call it), testing, recorrecting, retesting of the programs was rather tedious and in some cases time-consuming.

To lighten the hard copy and invoke a boredom conditioner at this point in time I should like to quote the following short poem printed in the January, 1966, issue of the *Journal of Data Management* which I feel is revelant to the present problem and point:

THE LAST BUG

"But you're out of your mind,"
They said with a shrug,
The customer's happy—
What's one little bug?

But he was determined.
The others went home.
He spread out the program,
Deserted, alone.

The cleaning men came, the
Whole room was cluttered
With memory-dumps, punch cards,
"I'm close," he muttered.

The mumbling got louder,
"Simple deduction,
I've got it, it's right, just
Change one instruction!"

It still wasn't perfect
As year followed year
And strangers would comment,
"Is that guy still here?"

He died at the console
Of hunger and thirst.
Next day he was buried,
Face down, nine-edge first.

And the last bug in sight,
An ant passing by,
Saluted his tombstone
And whispered, "Nice try!"

We have been fortunate not to have had such happen to us, but during some program problems we shared a slight doubt. In any event the story relates that not only "bugs" occur which were never considered, but through combinations of input data the monster of programming will rear its ugly head. This requires program maintenance to correct the instruction logic. To date we have not found this dormant bug, but rest assured it is only in hibernation and will greet us some day in the future.

As our highway to a book catalog is verbally built, please keep in mind that we do not consider this the ultimate approach. When time permits, the entire project will again be closely scanned, this time with retrospect, to search out the sick trees which we could not see for the forest. We have found on our second return to a project, such as the book catalog, that situations like the old farmer (sometimes called alumni of a certain agricultural and mechanical college whose name I will not repeat) wanted to be able to distinguish between his two horses.

After much thought he decided the answer would be to cut off the mane from one so he could tell them apart. But the mane grew back, and the old farmer again thought and thought and finally decided to try cutting off the tail of one. "This would make the difference," he said. But the tail grew back. So the old farmer started again to think and think (using the term loosely). All of a sudden he came up with a brilliant idea! He decided to measure them, hoping that they were not the same height. Sure enough, the black one was one hand shorter than the white one.

Even though horse distinguishing is not an exact science apparently, programming of computers is an exact science, which is moving at a rate greater than medicine and equal, due to demand, to space technology.

The book catalog was indeed a new and different challenge and was a gratifying experience for all involved.

Such a task could be compared to building a house. First, the blueprints or systems must be designed. If you do not know drafting or how to read blueprints, you must learn this before you supervise the building. This compares to the ability to communicate readily. The programmers then take the blueprints and build the structure, or, in this case, instructions in order to build a desired result.

The title catalog was primarily the easiest to program. All requirements were met with a sort on title and one line of print per title. Since there were many records for the same book (due to many subject references) it was necessary to delete many records by comparing on title before printing. This eliminated any possible duplication in printing.

The author catalog was slightly more complicated than the title catalog, in that again we had the duplicated records due to multi-subjects. In addition, the sort was more extensive. Here it was necessary to sort the titles in alphabetical order under each author and print the author's name only once, except on overflow to a new page, and all titles following in order under the name. The author references, as stated previously, were input so they would sort in each location desired.

The subject catalog, being the most used, was carefully studied and programmed. The catalog could be compared to the author catalog pertaining to sorting but required many more references and much more printing. The programming logic was much more difficult than the other catalogs.

The computer sort time required for each catalog was approximately one hour each. Print time was approximately one and one-half hour for author and title and two hours for the subject catalog.

The outdating of the book catalog due to deletions and/or additions is dictated by reason, expediency, and costs. We could without effort due to a now created master file, print new catalogs monthly or supplements as needed. This could mean catalogs only days out of date. The major disadvantage thus disappears into a maze of "can" or "cannot do" cost wiz.

The equipment use by Austin Electronic Data Processing in completing this project was an IBM 1401 computer. The configuration involved was a central processing unit containing 16,000 positions of core memory, five tape drives, printer, and a card read-punch unit. This type of computer is very efficient in a project such as this.

It has been stated that the total book catalog costs were under $7,500. Of this, slightly over $2,300 was electronic data processing cost, 90% of which was one-time costs for system, programming, and computer testing. The electronic data processing cost estimate for the next complete printing of a new updated catalog should be approximately $250.

Even though we feel that we have not reached the ultimate, we realize that a serial tape system has its restrictions. Yet, we feel that the library has a tool, in the catalogs, which could have only been accomplished on the computer.

There are, and you will see, other hardware which will print upper and lower case and all desired punctuation. These are well for a huge volume operation where total utilization is possible and speed is not adherent in the output. Upper case letters are read by you every day and, in the majority, without your actual knowledge. This has been proven in many other applications to be adequate and even more legible than the old combination case structure.

The horizons of the present and, for us, the future holds unlimited prospects for library automation. With unrestricted real time—on-line computers such as the new IBM system 360 series—nothing will be wanted or impossible. The systems analyst and programmer is sitting with pencil and desire, poised to enter into the 360 orbit.

All library files, except the required patron hard copy reference catalog, will be immediately reduced to computer access files. All manual housekeeping you must now maintain will be accomplished by a simple typewriter keyboard—technically known as a teleprocessing station. This of course is easy to state but will require complaisant labor to place dreams into reality.

Detail has been impossible for me to attempt to set forth here today, as here again the idioms of the trade and technical know-how of automation make this impossible. However, do not be afraid of automation, it will not bite you. Mrs. McCurdy and her staff are graphic illustrations of learning the basic knowledge in order to communicate as well as to gain enough technical know-how to aid adequately in creating the systems for this project.

If you should like a more graphic or detailed understanding of any phase of the electronic data processing book catalog concept, we at Austin Electronic Data Processing will be more than happy to assist you. We should like to invite you to visit our installation or write us requesting any pertinent information.

Thank you for your interest and attention.

The Circulation System of the Fondren Library, Rice University

FREDERICK RUECKING, *Head*
Data Processing Division
Fondren Library
Rice University

Use of the IBM 357 Data Collection System as a library charging system seems to have captured the imagination of librarians all over the United States. In 1963, just three year ago, there were only one or two such installations. Today, according to Don Kraft's latest tally there are forty, with more on the way. The utilization of machine processing for routine, manual tasks is not only commendable and encouraging but also essential if libraries are to keep pace with our technology-oriented society.

At the same time, however, there are some indications that a few of these applications are not properly suited to the local conditions. You simply cannot take a system designed for Rice, or Texas A & M, or Southern Illinois, and expect it to provide the kind of control you need. Each installation is unique, no matter how closely it may resemble another.

One of the questions I am frequently called upon to answer is "why did you do it this way?" A complete and comprehensive answer would require more time than we have this afternoon, but there are some important factors we can examine — factors which directed us to the system we installed at Rice. The most important part of the answer came from an analysis of the circulation system. Another important element was the expectation of the departmental staff. The long-range plans of the Fondren Library were also considered.

THE CONCEPT OF A SYSTEM

One word will be used more and more frequently, today, tomorrow, and in the years to come. It is important that librarians understand what that word means. The word is "system." This is a common library term, but it is not properly defined. Library literature, for example, indicates that the phrases "charging-system," "circulation-control system," and "circulation system" are interchangeable. The system concept does not permit this loose interpretation. The word must be used specifically and appropriately.

What is a system? I am not a systems specialist—I am a librarian. Consequently, my definition will reflect a librarian's viewpoint. To me, a system is that specific complex of procedures, data, and/or equipment which is required and used to accomplish a specific task. The generality of this definition makes it possible to erect a system structure based on the ideas that any system may have two or more lesser systems, and that two or more systems may share one or more lesser systems.

Use of a system concept and a structural framework produces a significant alteration in viewpoint, particularly when it is applied to a library system. You learn very quickly that there are at least five ways of looking at a library system. These are as follows:

1. What you think it does.
2. What I think it does.
3. What it is supposed to do.
4. What it actually does.
5. What it should do.

I would like to point out that use of these five viewpoints do not, by any means, necessarily produce the same information.

A university may be classified as a total educational system. Within that system are a whole host of lesser systems, including the library system. Within the library are six readily-identifiable systems: acquisitions, cataloging, reference, serials, special materials, and circulation. The totality of this set of interlocking systems suggests that we may diagram the library system as a circle. Within that circle we may add smaller circles to represent each of the systems we have identified. The overlapping areas of these smaller circles indicate the interaction between these systems. This diagram, which I think represents more traditional attitudes, is erroneous. One important element has been omitted—public contact. Therefore, the diagram must be altered to allow each of these systems to extend beyond the limits of the internal system.

Before anyone gets up and says "So what?" let me point to one item which surprised me. The lack of a central, unifying element or unifying system clearly suggests that one or more of these systems could be excluded from the total library system, and the diagram would still indicate the existence of a functioning library. For example, it is possible to have a functioning library without a circulation system. It would be possible to have a library which had no serials. It would be a little difficult to imagine a library which did not add to its holdings, but it is a possibility. A reference system is not required, but it is an asset. Cataloging, important as it is, is still not absolutely essential. Think about it. Remember I am not saying that any of these systems should be eliminated—I am merely pointing out that libraries could exist withour them, although I'm not too sure how effective such libraries would be.

The interconnections between these systems make it difficult to study each one independently. This difficulty is one of the reasons why many people believe that libraries are not susceptible to machine-methods and systematic analysis. The systems illustration does suggest considerable difficulty in adding machine methods, particularly if that structure were to be superimposed on a machine application.

However, the application of machine methods, especially the application of computers, inevitably necessitates a change in that structure, adding a new library system —the machine system. The location of the computer or machine system as the heart of a library system is justified, because of the peculiar potential of machine control. I think a few examples of that potential can provide enough justification for anyone. Under a full-blown machine system, the generation of an order could automatically make that information available to the public and the cataloging department. Completion of the cataloging process could automatically generate the card required for the charging system. The preparation of materials for binding could not only update the outstanding serials record, but could also generate a loan charge to show the latest status of those items. Loss of a book while in circulation could produce an acquisitions query concerning the need to replace the lost copy.

In other words, the machine system becomes the unifying element of the library, passing information back and forth between systems as the need arises. I think it is recognized that the library is a part of the social system. One facet which has escaped notice is that the existing library pattern lacks the one feature which characterizes established patterns of social systems — a unifying element. I think the machine system is destined to become this unifying element.

Now that we have a frame of reference within which we can operate, we can examine the task of analyzing a library system.

ANALYZING A SYSTEM

The initial problem is to locate a starting point. This is always a difficult decision and is highly dependent upon local conditions. That one phrase "dependent upon local conditions" is the basic reason why Rice started in circulation, A & M in serials, the University of Houston in acquisitions, and the Library of Congress in cataloging. One point must be stressed over and over and over again. Because one library has found it necessary to begin mechanization at one point is no reason why another library must start at that same point. It is, of course, possible that two libraries may have similar problems and seek to solve them in like manner, but each library should know why its analysis is starting at that point. Each library must determine, for itself, its own problems, its own needs, its own goals, and its own developmental program. After this analysis is done, it will be worthwhile to examine what other libraries are doing and have done.

Once the decision has been made as to where to begin, the problem of "how" enters the picture. There are some alternatives here also, but we must bear in mind those five viewpoints I mentioned earlier. If the person doing the analysis is familiar with the procedures of the chosen start point, some preliminary observations on the manner in which the system operates can be set down, and they are very useful. However, let us assume that we know nothing about the system to be investigated.

In this case, we must become involved with the system—even to the point of working within it to become familiar with those features which characterize its operation. The initial goal is the development of flow charts which indicate operational patterns, describing the transfer of information to and from various parts of the system. The degree of detail specified in these flow charts depends upon the complexity of the system, the training of the investigator, and the attitude he has, which is purely personal.

In conjunction with the people who normally make the system go, the flow charts are analyzed for errors, omissions, revisions, and duplications of effort. The product of this stage of the study will be a picture of what constitutes common information, where the information is used, and how it is manipulated by the system. The points which show contact between systems and contact between subsystems will be clearly identified. The analyst will be able to detect the formation of system patterns which are frequently not recognized by the people operating the system.

One of the features of this approach, and one which bothers many librarians, is the challenging of all procedures with "why?" This is one of the really important obligations of the analyst—to ask "why" at every step of the way. When the question is asked, the last answer the analyst wants, and the one too frequently heard is, "we've always done it this way."

After this flow chart stage, the analyst should be able to construct a model diagram of the system and to indicate, at least to himself, the various patterns which exist, the information used, where that information comes from, where it goes, what is done with it, etc. He must also bear in mind the possibility of multiple utilization of the data, the addition or deletion of procedures which can produce information not currently available, etc. Finally, he must determine what form the data is in, or should be in, to activate the system and the form in which the system should produce the necessary information. Once these decisions have been made, some conclusions can be drawn which will control the approach to be used with a machine application—if the analysis indicates a gain in efficiency or a better utilization of staff time.

I would like to turn now to the circulation system at the Fondren Library and describe in some detail the structure of that system and its supporting systems.

THE CIRCULATION SYSTEM

What is a circulation system? In the context of our definition of a system, we can say that it is the process of controlling the items being extracted from or returned to the book collection. Since the Fondren Library is an open-shelf library, borrowers have direct access to the book collection. Consequently, the circulation system provides control for that part of the collection allowed to leave the building.

Generally, circulation systems are well-defined, probably best defined of all library systems. The information utilized, the general procedural framework, and the departmental organization are similar from library to library. This similarity makes analysis much simpler. The circulation system of the Fondren Library provided specific lesser systems to be brought into play when the main system is activated. Thus, one borrower may utilize system A, for example, but cannot gain excess to system B.

At this point, we can anticipate the existence of a structure, and the initial problem will be to determine the arrangement of this structure and to determine the relationships between the systems which comprise it. If we eliminate the stack or shelving system from consideration, we can characterize this structure as having five systems. These are the loan system, carrel system, reserve system, interlibrary-loan system, and borrower-control system.

We might examine this a little to gain an idea of the application of a structure concept to the system. When someone comes to the desk, the circulation system can be activated and it will interpose a system to clarify the relationship of that person with the library and the contact points available to him. This is the borrower control system. One output of that system is the designation of access paths through the circulation system which are to be used. For example, a non-campus organization may send one of its staff members to the library. In such cases, control is automatically shifted to the interlibrary-loan system. Direct contact with the loan system is generated by the interlibrary-loan system. An undergraduate student at Rice may gain contact with two systems—the reserve and loan systems. His contact with the reserve system can produce an indirect contact with the loan system to which he also has direct contact. Faculty members and graduate students have three points of contact in the system: the carrel, the reserve, and the loan systems. An indirect contact is created through contact with either the carrel or reserve system. Alumni and non-campus borrowers are permitted restricted contact with the loan system only. The other component systems cannot be contacted by borrowers in the latter two categories.

This provision for access paths and contact points is the manner in which the circulation system is structured— not the way it operates. I would like to analyze each of these component systems, and examine the supporting lesser systems, with the idea of developing the design criteria of the circulation system at the Fondren Library.

The borrower control system.—As I mentioned above, a technique exists by which we can recognize the various categories of borrowers served by the library. The loaning of material to other libraries is governed by interlibrary loan agreements. Persons not directly associated with the Rice community can obtain borrowing privileges by submitting an application for, and obtaining approval of, such privileges. Students acquire borrowing privileges as a direct product of registration. Faculty members are automatically accorded borrowing privileges but are asked to supply the library with an application card for record keeping purposes. We can establish borrowing privileges from (1) agreements, (2) applications, and (3) registration. For convenience, we can call this an *authorization system.*

It is necessary to know who these borrowers are and where they live. Consequently, we must have a name and address file. If we have such a file we must also have a means of maintaining it. Ergo, the borrower control system is supported by a *file-control system.*

If we organize such a file and maintain it, we must provide a *retrieval system.* This system provides the rules governing access when one piece of information is known but not another. At Rice, a direct output of the authorization system is the generation of an identification card which the approved borrower uses with the loan system. In some cases, it is necessary to obtain information from the borrower files during the activation of the loan system; therefore, a cross-connection is made to the loan system.

The loan system. — The internal supporting elements of the loan system are similar to those of the borrower-control system. The loan system has three components. The first of these is the *charging system* which is based on the IBM 357 Data Collection System. The basic purpose of the charging system is to obtain or to generate raw data concerning the materials borrowed from the library. Generally speaking, all charging systems gather the same kinds of information—book identification, borrower identification, and the loan date or due date.

The mere collection of this data does not fulfill the needs of the library. The data must be organized into a recognizable form. This is the function of a *file control system.* At the Fondren Library the data is organized by call number.

As mentioned above, the organization of data permits the utilization of a *retrieval system.* The loan system has such a system, but its functions extend beyond the limits of retrieving pieces of information. It is this system which permits the selection of overdue loans. This system also is used for the processing of "holds" and "recalls."

The carrel system. — The number of available carrels is considerably less than the number of persons seeking carrel space, as is usually the case in libraries. The Fondren Library superimposes a control on carrel use through the utilization of a system which specifies which individuals obtain space and which carrels are to be used. We may call this an *assignment system.*

Since carrels are used as research and study areas, carrel occupants have permission to hold library materials in these areas as long as necessary. Naturally, controls are essential, and a *carrel charging system* is utilized to collect the basic information. As we will see a little later, the carrel charging system is directly connected with the loan system.

The specific requirements at Rice make it necessary to maintain, for the present at least, two file control systems. One of these is identical with that of the loan system. The other produces a file of library materials arranged by carrel number. By utilizing the retrieval system of the carrel and loan systems, it is possible to determine (1) if a given item is in a carrel, (2) which items are in a specific carrel, and (3) which person has a specific carrel.

The reserve system. — The reserve system is somewhat more complicated. The library does not determine the combination of materials placed on reserve. This is a product of faculty request and library searching. The process of bringing library materials together for reserve purposes may be called a *selection system.*

Before the selected materials can be utilized for reserve purposes, several procedures are required to prepare the material for that use. Reserve materials must be marked to provide rapid identification. Appropriate cards must be prepared for the *reserve charging system.* A location record must be produced for the convenience of the staff at the main desk. Finally, a list of current reserve holdings must be prepared and made available to the public. This precedural complex can be called the *preparation system.*

The restrictive periods of reserve loans preclude the use of the loan system for charging, file control, and retrieval, at present. Consequently, a separate reserve charging system, a simplified file control system, and a rudimentary retrieval system are provided.

The interlibrary loan system. — A new set of supporting systems is encountered when we look at the interlibrary loan system. The first of these supporting systems involves searching and decision making. The last procedure of this *determinant system* is the decision—can it be loaned or must it be copied. Depending upon the decision made, it is possible for the interlibrary loan system to transfer control to the loan system, feeding the appropriate information into the charging sytem, and to allow manipulation by the loan system's file control and retrieval systems.

When the material is to be copied, control is passed to the second of the new lesser systems, the *photoduplication system.* The initial procedure produces a special order form required for accounting control by the Photoduplication Department. This process transfers control to that department. The product of the photoduplication system (Xerox copy) is given to the requestor, and the accompanying statement from Photoduplication activates the *accounting control system* of interlibrary lending. Copying charges and bills are generated by this system which also produces monthly statistical reports and statistical records for the annual report of the Interlibrary Lending Section.

Summary. — We now have a fairly detailed picture of the operating framework of the circulation system. We can assemble the lesser supporting systems and set forth the relationships of those systems.

The carrel assignment system is very similar in concept to supporting systems of the authorization system. It would appear reasonable to merge the assignment system with the authorization system and to delete the former as an independent element. The carrel charging process utilizes the loan system's supporting systems. Therefore, we can merge part of that process with the main charging system and allow the differing elements to stand apart.

The structure is identical with the one produced in 1963 as a result of the analysis of the old manual system and the new processes we wished to include. It should be quite clear that the charging system is the integrative element of the total circulation system. We can, now, retrace our steps to the decisions, considerations, and characteristics of our proposed system design.

SYSTEM DESIGN

I think it is obvious that the selection of a charging system must make the integrative role of that system the primary consideration. It is also clear that to take advantage of that integrative role will require machine-readable information. Furthermore, the potential inherent in the structure can be tapped only with computer assistance. With computerization the integrative force of the charging system can be exploited, producing a more cohesive combination of supporting systems.

To prepare for the increasing integration of the circulation system, we found it necessary to re-examine some of the conventional needs of a loan system. The first of these was the question of speed. If all supporting systems were to utilize the main charging system, optimum speed at the charging point would be a very important condition. We also felt that the information obtained from the charging system must contribute to an increase in speed in the file control and retrieval aspects of the loan system. The provision for random retrieval of loan information is required for a university library. Any loan system which did not provide for such retrieval of information could not be considered—despite any other advantages the system might offer.

We finally realized that the speed factor was not related to any single supporting system. The determining criterion would be the increase in speed of the total system. I might point out at this point that there are several charging systems faster that the 357. There are some filing systems which are faster than the machine-controlled application we have. There are even some retrieval systems which are faster than ours. However, none of these applications can produce the system speed generated by the 357 approach. I might also add parenthetically that I am equating the 357 with the 1030 system.

A second factor at the Fondren Library was the possibility of multiple-use of equipment and information. We felt that the installed devices for the charging system should provide flexibility to permit their use for purposes not limited to the loan system. The equipment required for file control and retrieval should be flexible to permit the use of those machines for other purposes.

A third factor was the relationship of people and machines. Any new charging system would have to be dependable, easy to operate, and easy to learn. At the same time, we concluded, any machine system would be oriented toward the people who would operate it, and not the reverse.

Finally, we had to consider growth. We interpreted growth as occurring in two directions. The first was horizontal and represented growth in the number of loans processed each year. The second was vertical and indicated a growth through four stages: a mechanized 357 system, a computerized 357 system, a computerized 1030 system, and an automated system.

The characteristics and requirements we imposed on our selection quickly reduced our range of choice to three well-established charging systems: IBM Plain Charge (such as used at Texas), IBM Brooklyn College, and IBM Montclair. With closer analysis it was obvious that only the Montclair approach would serve our needs. Our 357 charging system is derived from the Montclair application.

Approval in the spring of 1964 of our recommendation for the introduction of a 357 charging system led to a summer project for conversion of the book collection. At the same time this project was being carried out, a procedural system was evolved, and staff training started. Before turning to the operating system, I think it would be advisable to talk about costs.

COSTS

Let me first warn you that the use of the figures for estimating purposes by another library may produce errors. The cited figures *must be used* in the context of the quantities, methods, and requirements of the Fondren Library, and not those of another institution. The data is provided as a guide only.

One immediate decision was required almost immediately. Was the conversion to occur piece-meal or all at one time? The absence of a summer session, the size of the book collection, the availability of part-time personnel, and equipment delivery schedules indicated that the conversion would be a one-time job. We also determined that it would be possible to complete the process in three months. In view of this decision, cost estimates were prepared for a complete conversion of the book collection.

In establishing the estimated costs, we were really working in the dark. Important —I might even say crucial—information simply could not be located. We were able to specify anticipated expenditures for card stock, plastic badges, equipment, and other needs. The total budget request was $26,000, intended for use in three aspects of the application. The first was for the conversion process, the second was for operating expense for one year, and the third and last was for alterations to the building. We terminated the year $1,600 over the estimate.

THE OPERATING SYSTEM

The one card or remote system is basically an automated charging system being operated as an off-line, mechanized system. It is oriented toward a transaction concept. A loan card is created when the item is checked out, and a return card is generated when the book is returned. Technically, the procedures for charging a book and returning it are the same. The basic difference is that a borrower card is used for charging and a return card is used when it comes in. Control is more heavily dependent on the panel lights. Holds are a little more difficult to handle, since returns and loans are intermixed in the output punch. The chief advantage of the one card application is the increased speeds which can be obtained at the charging point. Six books per minute is normal under adverse conditions, and a good desk attendant can usually surpass this speed regularly. With appropriate changes in the 357 station itself, which we will install this summer, charging speeds approaching the capacity of the machine are possible, i.e. ten to eleven items per minute. Another advantage is the facility for expending the mechanized system upward to an on-line, automated system, without extensive modifications in the charging system's desk procedures.

The outstanding feature of these applications is procedural simplicity. Any machine system needs to have a back-up system which can be utilized, just in case. I would now like to review rapidly the current operating system.

The borrower control system. — Records of student registration and interlibrary lending agreements are forwarded to Data Processing for the preparation of name and address cards and identification cards. Non-campus borrowers fill out two application forms, one of which is sent to Data Processing when approval has been given. From time to time certain corrections are necessary for the borrower file, to correct spelling errors and address changes and to remove names from the file.

These two decks—sorted by the identification number—are read into the computer with the existing tape file. In one pass, all corrections are made and the new additions to the tape file are added, creating a new tape file. Whenever necessary, this newly created tape is mounted on the computer and a numeric list of approved borrowers is printed by the computer. If an alphabetic list is required, the new tape is sorted by name and then printed.

The loan system. — The input cards for the charging system are prepared daily. Only the call number (34 characters) and the loan period code are punched. The remaining punches in the input card are control punches for the 357 station.

A typical loan record produced by the charging system contains the call number, loan period code, borrower identification number, and the date of the loan.

Data collected through the manual support system are manually punched to correspond with the machine generated loan record. The combined daily transactions of the support system and the main charging system represent the input information to the file control system. These transactions are counted and sorted by call number. The daily cards are then compared with the circulation file through the use of a collator. In one pass new loans are added to the file and returns are extracted.

The current overdue procedure requires the transfer of the circulation file to magnetic tape. The contents of that tape are examined for overdue status, and overdue items are written out on another tape. The computer sorts that overdue tape, arranging the outstanding loans by borrower number. The borrower file tape is mounted, and both tapes are read by the computer to produce the printed notice. The name and address of the notice are printed so that the information is visible in a window envelope.

The tape created by the transfer of the circulation file from cards to tape is sorted and printed, producing a list of current loans arranged by borrower.

The carrel system. — The instruction sheet provides carrel users with the basic ground rules for the carrel system. The comments card is used for noting specific carrel problems and for carrel materials taken from the building on an overnight basis.

The instruction flag is the feature of the carrel system. This is a communication device between the carrel occupant and the carrel monitor. The position of the flag provides a rapid visual means of determining what procedures the carrel monitor will use to control carrel holdings.

The reserve system. — As new items are added to the reserve collection, a reserve book card is keypunched and a duplicate copy is immediately generated. The originals and duplicates are separated. The originals are inserted in the book pockets of the newly-added items and the books are shelved in the reserve area. The duplicates are stored.

Each day there are alterations in the reserve holdings, and these corrections are prepared each day. When the Reserve Section requests a new set of lists, the stored additions cards and the corrections cards are taken to the computer.

The old reserve file is mounted and a new file is created, based upon the corrections, the new additions, and the existing holdings. In rapid succession, a series of four sorts and four printing runs is made, producing the set of lists.

I might point out, here, that the reserve charging system could be transferred to machine control almost immediately, once we have on-line capability.

Interlibrary loan system. — Xerox copying is initiated by the preparation of the special order form, required by Photoduplication. When the copy is returned an accounting control card is prepared. Daily tabulations of loans to institutions are also punched into cards, creating a statistical report for institution.

A set of institutional control cards is maintained as a separate supporting deck, but the cards comprising that deck are obtained as a by-product of the borrower control system. Each month the three decks—loan statistics, accounting control, and reporting deck—are taken to the computer.

The three decks are read into the computer together with the borrower tape file. There are three products from the computerized accounting system. The first is a monthly institutional statistical card, showing the number of loans and pages copied during the month for each institution. In addition, certain other information for accounting control is generated. Incidentally, I might add that these cards subsequently form the input data to produce the Interlibrary Loan Section's annual statistical report.

The second output provides billing statements and accounting returns. The forms are sent to the institution. The upper half of the form is retained by the Interlibrary Loan Section, while the lower part is sent to our Accounting Office.

The third and last product is a monthly report showing the number of loans made and pages copied for institutions. The report is organized by the kind of institution and the geographic area.

EXPERIENCES

I'm sure that some of you are interested in our experiences over the last year and one-half. I think there are three outstanding features which characterize our experience. The first is the reliability of the charging system. The Circulation Department is open for service some ninety hours each week. We have found that the effective use of the machine over the year and one-half period has averaged about 88.5 of the ninety hours. This is about 98% efficiency. We would also estimate that about 90% of the down-time has been produced by problems involving the output punch. Most of these problems have been slight, and most of the down-time has occurred in two to five minute periods. Time losses of the magnitude of one hour or more have not been frequent, but it seems that these always occur on Saturdays or Sundays.

A comparative examination of the statistics for 1963-64 and 1964-65 is a second feature. The enrollment at Rice did not increase appreciably, nor was the faculty enlarged to any extent. Yet, the circulation jumped from 92,000 to 124,000 in one year—a 35% increase. I recently tabulated our current statistics and found that we can expect an annual circulation for 1965-66 to reach some 108,000. The drop may mean that we will return to the former rate of annual increases, but at a much higher level of total loans—probably about one year ahead of our original estimate of 1963.

I think the third feature is the problem we have had with overdue selection and overdue production. Our initial efforts to produce an overdue notice directly from the loan card itself proved to be very troublesome. We finally traced the problem to the lack of appropriate supporting equipment. Selection was not a major problem, but obtaining name and address information by hand was almost more trouble than it was worth. I don't believe we paid enough attention to this specific problem in the beginning, or at least we underestimated the attendant problems.

Those of you who may be planning a 357 installation, and who plan to operate it on a mechanized basis, i.e. with a sorter and collator, are well advised to consider adding other pieces of equipment to help overcome this specific problem.

THE ADVANCED LIBRARY SYSTEMS PROJECT

The Advanced Library Systems Project is the research organization which is investigating the problem of library automation on the Rice campus. The Data Processing Department, created last July, is the operational arm of that project. As I have noted above, a large proportion of the circulation system is now under computerized control. The last program of this particular series is the transfer of the file control and retrieval systems of the loan system to the 7040 computer. Once this program has been tested and evaluated, we will turn our attention on other library problems.

CONCLUSION

Where does the professional librarian fit into a machine oriented library? What role will the librarian be called upon to play in the automated library of the future? One conclusion is obvious: the manual, painstaking methods so familiar to everyone are going to go down the drain. The elimination of these menial tasks will produce a role which will be much more important to the university and its educational aims.

It is highly probable that the librarian will become a decision maker. Librarians will be challenged as they have never been challenged before to provide the linkage between the bibliographic apparatus, the information stored in the library, and the public. It is equally certain that no one will be cast loose as a product of library automation.

I would like to conclude with one observation. There can be little doubt that librarianship is entering a new period of its history. It is going to be an interesting period and an exciting one. It will certainly be challenging, and it is my earnest belief that this period will be the start of our golden age. Thank you.

The Influence and Impact of Mechanization on Libraries and Society Today and Tomorrow

DONALD H. KRAFT, *Industry Representative*
IBM Corporation
Chicago, Illinois

It is a pleasure to be here in Austin, Texas, the birth place of library data processing. It was on February 1, 1936, that the University of Texas installed a sorter and key punch in their library. Dr. Ralph Parker, now Librarian at the University of Missouri, conceived the system and installed it here.

I think it is very appropriate that we are meeting here tonight, almost on the thirtieth anniversary of this landmark event. You might be interested to know that last week Parker installed a computer in the University of Missouri library.

LIBRARY DATA PROCESSING CAPABILITIES TODAY

Today the librarian has at his disposal a variety of new tools with which to tackle the problem of better patron service. Everything else is subsidiary to this. Service can be improved by proper use of data processing equipment to speed up the book ordering process, cataloging functions, handling of circulation so that records are more accurate and the books get back on the shelves sooner, serials records, and accounting control. This is easy to say, more difficult to implement, and not at all obvious for many librarians to see! It reminds me of two hunters and their retriever dog. They were in their blind when some ducks flew over. They fired and one of the ducks fell dead in the water. The retriever walked out on the water, picked the duck up and brought him in. A few minutes later more ducks flew by. Again they shot one out of the sky. Again the dog retrieved the duck by walking on the water of the lake, picking the duck up and walking back. Finally after a third duck was shot and was retrieved in this same astonishing manner by the dog, who walked on top of the water to get the bird, the first hunter turned to the second hunter and said "Did you notice anything different about our dog?" The second hunter replied, "Yes, he can't swim!"

Admittedly the tools of data processing are new to the librarian. However, a start has been made in that approximately 80 to 90 public, university and college libraries in this country are using data processing equipment for some phase of their program to improve patron service. Most of these libraries are using punched card equipment. A few public libraries and many university libraries are using computers. I believe it is safe to say that without exception all of these libraries are processing their data in batches. This means that a certain amount of work of a similar nature is collected together and processed through the machine at one time. In a circulation application, batching would probably entail updating the loan file once or twice a day. A more sophisticated way to process data is to process it at the time it is being recorded in machine readable form. We call this "on-line processing." There is a hooker in my use of the word "sophisticated." It requires more powerful data processing equipment, more involved systems design and programming, and, of course, it costs more. In general, it is applicable only where the volumes of work are large enough and requirements for speed and tight control are great enough to warrant the additional expense. This technology of on-line processing is in use in many industries today.

In order to appreciate the impact of on-line processing on libraries it is necessary first to understand a little about how libraries would apply this technology to their needs. This discussion is predicated on the availability of a computer to the library.

The computer may physically be in the library or may be merely available to the library though it may be many miles away. The library's communication with the computer would be through terminal devices connected by telephone lines. These terminal devices consist of typewriter consoles, video display tubes with typewriter keyboards, and punch card reading devices. Let us now see how a library with these extremely powerful facilities can use them in the areas of:

1. Capturing machine readable information as a by-product of typing.
2. Storing and retrieving information.
3. Transmission and display of information.

Let us assume that the library has a typewriter terminal or two in the acquisitions department, the cataloging department and also the circulation desk. At the circulation desk we would also have a card reading terminal for charging and returning books.

Personnel in the acquisition department use a typewriter or video terminal to key in information on books to be purchased. The computer then makes a search of its on order file and shelf list to determine whether or not this is a duplication. If not, the computer records the purchase order. The purchase order might be printed on the computer's high speed printer and sent to the book dealer for publishing. Both publishers and dealers who receive a great deal of business from a particular library might actually have their computers or printers connected to the computers of the ordering libraries so that purchase orders would print-out directly in their own installation. A number of wholesalers (not of books) have installed at their own expense, card transmission terminals in their customer's offices. The customers are furnished a file of punched cards, one for each item they might order. The terminals are connected by dial-up telephone line to receiving units in the wholesaler's office. Orders are placed by removing the appropriate punched cards from the file and transmitting them through the terminal to the wholesaler's office, thereby reducing the order time by several days. You might be interested to know that many hundreds of card reading terminals are installed around the country for this purpose now. If this practice were adopted by book sellers, it would be another way to save two or three days off the book ordering cycle.

When the book comes into the library, the title page information is checked against information recorded at order time. Changes and cataloging information are entered into the computer by catalogers using the terminals. The computer is then instructed to print out catalog cards or store in its memory entries for a book catalog. A new book list would then be prepared automatically by the computer. Preparation of the books for shelving would be expedited since the system would produce spine labels, book pocket labels, and machine readable book cards.

Circulation would be regulated by having each patron identify himself with a machine-readable identification card. Each book would be identified with a punched book card. Data from the patron's identification card and the book card would be read automatically by the terminal, which would transmit the information directly into the computer's memory. The computer would then search a small list of "delinquent" patron numbers. If the borrower were on the list, the typewriter terminal located at the circulation desk would type a message to the clerk at the desk requesting him to take appropriate action. When a book is returned, the book card would be read by the terminal at the circulation desk. The computer would take this information and cancel the circulation record. If any fines are due or if the book is on "hold" status, the typewriter console would tell the desk clerk what action to take.

The use of terminals is contemplated by some advanced-thinking librarians today. In fact, the Illinois State Library with one and a half million volumes will install an on-line circulation control system this Fall. On-line library systems will require great effort in the computer programming and human engineering of the man/machine communication techniques. I look upon the use of terminals and on-line systems as the next logical step for library mechanization. As computer prices come down and performance goes up, I believe it will be possible for large- and medium-sized public libraries to have their own economically justified computer system with on-line terminals. They certainly might have terminals connected to a computer located in a municipal government installation, a data center or a service bureau.

Once the techniques of on-line terminal use have been developed by the pioneer libraries, I believe it is natural to expect to see a trend towards the centralization of computer facilities. It is certainly reasonable to imagine regional centers each with a central computer connected to its member libraries by terminals. Each regional computer would be connected to a computer center located at the Library of Congress. Cataloging information for all acquisitions of the Library of Congress would be automatically transmitted to regional computers, which would make the information available to the member libraries. This would reduce the duplication of cataloging that exists around the country today, since the individual cataloger would have access to LC cataloging information instantly through his terminal.

As more and more information is stored into the computer, there becomes less and less need for the conventional card catalog. It might be maintained in its present shallow depth of indexing with the computer maintaining much deeper and more subtle index entries. Perhaps cataloging information would be stored in the computer to a depth of ten subject entries or more! Coordinate indexing techniques can be used to apply the power of Boolean logic to the searching process. The computer index would be interrogated first by librarians using video terminals and later on in time by patrons. Of course, this implies strides in the development of man/machine communication techniques.

IMPACT OF MECHANIZATION OF LIBRARIES, LIBRARIANS, AND PATRONS

I wish to stress that computers which are being delivered today have the capabilities of performing all of the services mentioned in the previous section. The state of the art of programming a computer to perform these functions in such a way that the "average" librarian and even the "average" patron can use them still has to be developed. Now let us consider the impact all of this will have on libraries, librarians and patrons.

Professional upgrading. — Library mechanization with data processing equipment will result in a professional upgrading of librarians, since the machines will assume more and more of the routine clerical jobs performed by many librarians. One librarian timed the work in technical processing and determined that basic punched card equipment he used saved 30 hours of librarian time per 100 items catalogued in his library. Imagine the savings possible with the power of an on-line terminal system!

Expanded service. — The proper use of data processing equipment in the library will result in an expanded service level to the community at large. This will result in even greater demands by the users on the library system, since, I believe, many potential library patrons do not use available library services because they do not come up to user-requirements. Among other things, expanded service means *faster* service. Things will get done faster with less human effort in a library such as we have described. For instance, the technical processing cycle, which starts with bibliographic service and includes purchase order writing, accounting, and preparing the book for shelving, has been reduced from an average time of three months to three weeks at the University of Maryland by the use of punched card equipment. Improved patron service also means getting things done *smarter*. Public libraries operating on a limited book budget will be able to do their purchasing in a more business-like fashion, because they will have factual data available about their readers' habits. Current budgetary accounting figures will be available through terminals so that there will be no need to worry about over-buying, or even worse yet, about not spending all the available money by year's end!

Book catalogs will enable the library to reach a service level unattainable with conventional card catalogs. Book catalogs can be printed by a computer at the rate of 66,000 lines per hour. Multiple copies of the book catalog make it possible to have index information available in many locations. Book catalogs can be placed in departmental offices of a university, in high schools, grade schools, bookmobiles, hospitals, branch libraries, etc. They can be available for borrowing also. Union book catalogs are particularly helpful in county- and city-wide library systems. *Specialized book lists* can also be prepared automatically from the computer's basic file of information. These may be seasonal in nature (books on "travel" in the summer) or subject oriented (books on "business management") or language oriented (books in "Polish"), etc.

A new and fascinating expanded service area for the library is one of *selective dissemination of information.* The library will be able to inform its patrons about acquisitions, which are in their particular spheres of interest. The computer would store in its memory interest profiles of certain library patrons. A profile would contain Dewey or LC classification numbers, authors' names, subject headings, and keywords which might occur in titles of interest to the patron. The computer would match the patrons' interest profiles against recent cataloging information. Whenever a sufficient number of terms match between a profile and a book classification, the computer would print a notification which would be mailed to the patron. The patron might return a tear-off stub from the notification to the library and request that the item be reserved for him.

Standardization of cataloging will become the order of the day as a result of the instant availability of machine readable information for LC and regional centers. Standardization of computer oriented library procedures will enable many libraries to share costly computer programs. When the trade-off between relatively unimportant procedural differences and the time and cost of programming them is evaluated, I believe that the librarian will surrender some of his individuality.

A more *business-like* approach to library management will be taken as the influence of data processing spreads. As facts and data for decision-making become available, the library director will learn to use them in running his operation in a more professional manner. An analogy with a department store or supermarket is fitting at this point. How long can you imagine a store staying in business if the managers did not know what merchandise he had in stock or what items were selling or what his clientele wanted but couldn't find?

Browsing would be considerably improved by the use of video terminals connected to a computerized catalog. Dr. Don Swanson once said that browsers now operate at walking speed, not thinking speed.

National network of bibliographic tools. — A national network of bibliographic tools might be established. Swanson spoke to this point in his paper entitled "The Library of the Future," which was presented at a conference held at the Airlie Foundation in 1963. This would place at the patrons' disposal the entire bibliographic reference tools of an entire library region— or even the entire country.

Information centers. — With the expanded capabilities of data processing, the library of the future may very well assume the character of an information center. Research libraries are approaching the stage now, but I believe, public libraries might also move towards this goal. Being an information center implies more than merely being a store house of material. The material, whether it be printed, recorded micro-images, etc., is of no value to the library community unless it is well indexed. This implies more cataloging time. Since catalogers are in very short demand, any addition to their workload can be accomplished only if the catalogers can perform their work faster and more efficiently. We have already discussed how this might be done through use of terminals, computers, and shared cataloging.

Indexes in machine readable form (magnetic tape) are becoming more available each year. They can be had today in the fields of chemistry, biology, petroleum, metalurgy, atomic energy, engineering, law, and medicine. As publishers integrate data processing procedures into their operations, they will be able to offer not only machine-readable indexes but also full text in machine-readable form. It will be natural for information center-type libraries to store this information, search it, and display it upon demand.

Anyone can make a lot of guesses as to what the future holds. If he makes enough of them, he will probably be right a certain per cent of the time. I have tried to base my conjectures upon a base of activities which I *know* can be accomplished with today's technology. It was not too difficult to polish my crystal ball to the extent that I could look down the road a short way to see what the natural extensions of today's applications might be. The pioneering librarians are working now towards these goals in simple logical steps. They recognize the fact that they must walk before they can run. They must mechanize their routine clerical chores before they can become an information center. And if you must be left with a message, let this be it. You have to start with simple things first. You have to get involved and get your hands dirty. Data processing does not come easy; you will have to study and learn it just as you learned cataloging in library school. I have no doubts that the librarian who can wade through Dewey and LC classification systems will be able to face up to this challenge!

The Acquisitions Program of the Centralized Processing Center of the Texas State Library

JOHN B. CORBIN, *Director*
Technical Services Division
Texas State Library

At this time I would like to tell you about the automatic data processing program of the Texas State Library and its Centralized Processing Center. This has been operational for almost a year, and we are purchasing into our second half-million dollars worth of books on the machines.

For this first phase of mechanization, we have chosen unit record equipment for its economy, its flexibility, and its simplicity. After we have established the feasibility and desirability of automatic data processing in the State Library and have gained some familiarity with handling punched cards in our day-to-day routines, we hope to convert to magnetic tape. All phases of the system have been designed to make this conversion, which should take place within five years, as easy as possible. By then, all acquisitions, budgetary control, serials routines, inventory control, and statistics will be on punched cards, and we will be ready to extend our program into circulation, book catalogs, interlibrary loans, communications, and other probable areas.

As acquisitions is the logical starting point for any conversion to automated library procedures, we began there. Here is where and when the first permanent record is made of materials coming into a library. Once bibliographic and other information is captured into a punched card, this same card can be used as input for automated cataloging and classification, book catalogs, circulation, shelf lists and other permanent records, subject and series authority files, budget control, and virtually any other aspect of a library's operations pertaining to its collections.

Since we are concentrating in the first phase of our program on acquisitions, I shall confine myself today to book acquisitions and its budgetary control, even though we currently are using the machines for serials bid lists, subject and series authority files, an attempt at a book catalog, and statistics of public libraries which we publish annually.

Our system is used to purchase books and produce and maintain permanent records for over sixty library units. The monies involved include state and federal funds for five divisions of the State Library, federal funds for eleven metropolitan libraries under Title I of the Library Services and Construction Act for which we order books, and federal and local funds for forty-one member libraries of the Centralized Processing Center, for which we order, receive, process and ship books. Our combined book budget for this budget year is approximately $525,000.

At present we lease an IBM 403 accounting machine, an 026 keypunch, a 526 summary punch, and an 082 sorter. The accounting machine prints both alphabetic and numeric information, in upper-case only, onto card or paper stock from standard eighty-column punched cards. It has the capability of printing three lines from one punched card, utilizing a multiple-line punch feature.

When cards pass under its reading stations, metal brushes complete an electrical circuit with a metal roller each time a punch in a card allows these to pass through. Current then flows to a prewired control panel. Wires connect the brushes to the internal wiring of the machine which activates the typebars or cause the internal counters to compute in some manner. Of course, the panel is planned, or programmed if you please, to follow the set pattern for the function we want it to perform, and I'll explain several of these functions shortly.

The 026 keypunch is used solely to punch and to duplicate eighty-column cards. The

526 summary punch is used not only for keypunching and duplicating, but for punching summary information into cards as the accounting machine prints or computes. I'll explain this also in a minute. The 082 sorts 650 cards per minute on any column.

Our particular group of machines with the features we need leases for approximately $520 per month.

Our acquisitions process begins with a request for purchase submitted to us by a library unit, each which has its own unique three-digit code number. The request form is especially designed with all information blanks being sequenced roughly into the order in which they are to be keypunched, to avoid errors and to speed the punching. The information supplied by a library unit is converted into machine-acceptable form; for example, the author's name is cut to fourteen spaces and the title to twenty-two; the publisher's name is replaced with a special alphabetic code sequence supplied to us by our contract jobber, A. C. McClurg. All information except the author, the title, and the publisher code is converted into numerical codes.

As we must provide accountability for all funds expended, requests from each library unit are kept completely separate, with requests from federal, state, and local funds being further separated. To this end, coded requests are sent to the keypuncher in batches, with an instruction card atop each. This card has enough information to identify any one batch readily and to aid in processing the forms.

Before requests are keypunched, an adding machine tape is run on the list prices of all the slips in a batch, and the total is noted on the instruction card for a later control check.

A card then is punched for each bibliographic title. As the groups are completed, the decks of cards are placed into the 403 and a proofing register or list is printed.

All keypunched information is proofed against the original request slips. Errors are circled in red to have the cards repunched. After the 403 printed the proofing register, it totalled all the list prices of the books in the group and printed the total at the bottom of the sheet. This total must agree with the total taken by the adding machine earlier.

Orders are placed once a week, except for emergency and confirmation orders and orders with especially complicated instructions or bibliographic information. These constitute less than one percent of our total orders.

The decks of cards ready to be placed on order now are placed into the sorter and sorted down by title, by publisher code, by the area letter designating the location of the publisher in our jobber's warehouse, by vendor, by library unit code, by fund, then by type of binding, such as trade or prebinding.

Vendor name and address cards are pulled from a file of prepunched cards and placed in front of the proper decks. You will notice that these are of a different color for easy handling.

The orders are now ready for printing. The proper control panel is inserted into the 403; the purchase order forms are inserted; the paper tape that controls the number of lines of a page is placed into position; the cable connecting the 403 and the summary punch is connected and the summary punch set up to accept the information for the budget forward cards; the cards are inserted into the hopper; and the "start" button is pushed.

Each order is thus printed, including the vendor name and address at the top of the first page of each order and the order number and date of the order on each page. If there are more items than can be printed on one page, the control tape causes the extra lines to spill over onto the suceeding pages. When one order is completed, the total amount of the list prices of the items on the order and the number of items on the order are printed at the bottom. The machine automatically skips to the next order form, progresses to the next order number, and begins the next deck of cards.

At the same time the 403 is printing an order, the 526 summary punch is under its control by the cable connecting the two. Only selected information being printed by the 403 is fed to the summary punch. This includes the library unit code for which the order is placed, the order number, order date, the fund, and the total amount of the order; in other words, only enough information necessary to prepare a budget report. The control panel of the 403 is wired to tell it exactly when and what information is to be summary punched. The summary punch itself also has a prewired control panel that tells it where to punch in the budget card the information fed to it by the 403.

After the 403 prints its last order, it prints a total dollar amount of all the orders prepared during the run. This is checked against the adding machine tapes run previously. Thus we have another control check.

After dispatching the orders, the original request forms of the units of the State Library are forwarded to the order files to be used by the Cataloging Section of the Technical Services Division. The request forms of the metropolitan libraries for which we order but don't process books are destroyed. The request forms of members of the Centralized Processing Center are sent to my catalogers for precataloging prior to the receipt of the books.

The decks of cards for the ordered books are filed numerically by order number in a rotary tub file to await the receipt of the books. The budget-forward cards are filed to await the printing of a report once a month.

When a shipment of books is received, the deck of cards for the order is pulled from the tub file and sorted into the particular sequence of the items on the invoice. The cards for the items received are pulled from the deck and the remainder filed back into the file.

As the books are invoiced, the discounted prices are pencilled on the punched cards. A budget slip including the date of the invoice, the library unit code, the fund code, the order number, the total amount of funds to be disencumbered, and the total amount of the invoice is made for each invoice. This information is later punched into cards for use in preparation of the budget report.

After the books have been processed and are ready to be shipped out to a member library, the deck of cards for the group is given to the machine operator, who substitutes the discounted prices for the old list prices, adds the Dewey classification number, adds the dates of receipt and shipment, and duplicates the rest of the information into a new card; the old cards are filed for statistical purposes. The new cards are sorted by author, by library unit code, then by fund, prepunched name and address cards are placed in front of the new decks, and shipping reports printed by the 403 for the books to be shipped.

To prepare a budget report, four types of documents are needed: the budget cards that were punched at the beginning of the fiscal year which included the total amount of funds budgeted for each library unit by fund; any balance-forward cards for previous months which have punched in them the total amount of orders outstanding, paid year-to-date, and total free and encumbered balance at the end of the last budget report period; the balance-forward cards that were summary punched for all orders placed since the last budget report; and the cards punched from the budget slips made out for all invoices received since the last budget report.

These are sorted down by library unit code, by order number, by fund, and a header card for identification placed in front of each deck. The prewired control panel for the budget report is placed into the 403 and the budget report run. As the report for each library unit is printed, a new budget-forward card is summary punched.

Has this system saved us money? I don't know. It's difficult to evaluate the costs of radically different and new services that we perform now against services that didn't exist a year ago. I do know that without the equipment we would need right now a minimum typing staff of two to type the orders, one to handle, coordinate, and dispatch them, one or two to handle the budget accounts, and one to prepare the shipping reports—a minimum total of six. Instead, we are performing all these functions with two machine operators. The machines can absorb a much greater amount of work than we are now performing with the addition of another keypunch machine and/or operator. Thus we can keep the staff quite stable whereas without the machines we would have to add staff members each time our book budget increased. A complete cost analysis is now underway that I hope to have completed by the end of this summer.

I do know this too: we are convinced that automation has an integral role in solving our problems of rising costs, shortage of good personnel, low salaries, and the deluge of work we have. We are not attempting by any means to replace librarians but to supplement them, to give them accurate supporting data and auxiliary information, and to aid in their interpretation of public library development in Texas—our legal responsibility.

We have a long way to go, but we have begun.

The Serials Mechanization Program of the Texas A & M University Library

BRUCE W. STEWART, *Data Processing Supervisor*
Texas A&M University Library
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As every librarian knows, serials pose some of the most difficult control and service problems in a library. Their sheer volume tends to bog down handling, and their bibliographic instability creates endless identification and record keeping problems. At the same time, the library user's need for specialized up-to-date information demands efficient serials control.

Texas A&M University Library's decision to attempt automation of its serials record operation was made early in 1965. At that time a report outlining basic concepts of the system was prepared, based on the results of a Master's Thesis investigation.[1] Initial programming and experimental operation of this proposed system was delayed, however, until January of 1966 because of our complete design and implementation of an automated circulation control system, which is now operating very smoothly.

When the system which I will describe is fully operational, we expect our automated serials system to perform three major tasks: (1) recording arrivals and flagging delinquent arrivals, as well as keeping track of all serial holdings to date in the collection; (2) ordering and renewing the subscriptions and recording payment for each; and (3) providing the information required for more efficient control and analysis of operations. The data in the computer's records will also be used to produce listings in various formats for use in public service areas. In addition, we expect the high-speed mechanized system to be far more responsive to charging requirements than our present manual system.

This expected flexibility is extremely important at A&M, when our student population is expected to swell rapidly in the next few years, and the Library will be called on to provide even stronger support for our many graduate and research programs. At present the Library's serial holdings encompass approximately 7,000 titles, with about 4,000 being actively received through subscription or gift and exchange.

To set matters straight at the beginning, let me make it clear that I will not be describing an automated system which is completely operational. As a matter of fact, we are at this moment just beginning in earnest the mass record conversion of selected portions of our serials data. We have, however, made significant strides, which I will discuss a little later, and our initial success encourages us to continue our present approach. It is also important to remember that each stride forward is part of a carefully conceived total system design for our serials operation.

From the experience we have had, I believe that serials is by far the most difficult area to automate. A basic axiom in mechanizing routine clerical functions is that only the exceptions to the mechanized routine will then need attention by staff personnel, whose time is then free to effectively deal with such "snags." The area of serials almost seems to be composed entirely of exceptions, and it seems rare that we catch a glimpse of a merely "routine" task.

The problem with serials is, of course, the many variables and the lack of consistency. Very few serials seem to be published in a like manner, and in fact, they often vary from issue to issue within the same title. Another aspect of the same problem is that it is almost impossible to plan

[1]Stewart, Bruce W. *A Computerized Serials Record System For the Texas A&M University Library.* College Station, Texas, 1965.

in advance for all possible variations because of the enormous quantity of them hidden in the enormous quantity of serials themselves. The problem thus becomes very critical in a computer system where consistency and uniformity become most important. This all means that a tremendous amount of effort must go into the basic planning of a serials system, and those planning it must be free to concentrate all their efforts on the system. They must also learn to expect frequent upsets and frustations that will send them back to the drawing board.

During our initial planning and design stage, all the various aspects of our serials operation were taken into consideration. Any system which evolved would need to provide for checking-in and claiming, binding and inventory control, subscription renewal and financial records, serial lists for public service areas, and operating statistics. Each aspect was analyzed and flow charted as an integral part of the whole system. All the variables within each aspect were identified, as much as possible, and provision made for each.

This evaluation of our present manual system proved very interesting. Our manual method of operation seems exceedingly complex and time consuming and provides only very limited achievement of our desired goals for the serials control operation. Merely "routine" operation requires nearly all available staff time, and extensive analysis of operations is completely lacking. Many desirable management information reports are lost either because they are not feasible due to the cost and time required or because they simply cannot be accurately obtained from our present files. When completely operational, we expect the automated system to provide solutions to these problems.

I will now outline generally the planned operation of our automated system, then I have come comments on present accomplishments and our experience with conversion.

OUTPUT

The output produced by the computer can be divided into two categories: punched and printed. Printed outputs include both the working files for the Serials Department as well as the various listings for public service areas. The working files will be produced monthly and will consist of four physical files: (1) subscription information, (2) bound holdings and bibliographic data, (3) current and unbound items, and (4) a want list. The bound holdings file, for example, will describe each bound volume individually, indicating accession number, inclusive dates, and published volumes included. The computer will produce an item-by-item shelf list record for inventory control by the Serials Department while any holdings information produced for public service areas will probably be printed as inclusive holdings in the form of a union list.

In addition to regular monthly output the number of special reports and statistical listings which can be easily produced from the machine records is limited only by the ingenuity of the programmer and the amount of storage space in the Serials Department.

Direct subscription renewals will be initiated by a monthly listing indicating those titles requiring attention. The annual list of domestic serials required for bidding purposes in selection of a state contract jobber will also be printed on continuous multilith masters and reproduced in the required number of copies. The possibility of completely automatic subscription renewal with computer printed purchase orders seems remote, however, considering the complexity of existing state regulations.

The punched card output is used for inventory control and check-in of expected arrivals. The operating procedure that has proven itself most efficient in other operational computer-based serials systems revolves around what has become known as the "arrival card". At the beginning of each month, one card is produced for each item expected during the month. Prepunched into each card will be the serial identification number, and a description of volume and date for the serial issue. Information printed on the arrival card for use by clerical personnel will include this data, plus title, call number, and all other information required to check-in and distribute the issue.

This information may also include an optional forty character note, such as "route" or "check loose inserts".

Arrival cards are maintained in two separate card files: cards for expected arrivals and cards for received arrivals. Clerical procedure involves matching serial issues and marking for distribution as well as transfer of the corresponding arrival card to the received file. The arrival cards for received materials are then returned as input to the computer processing run and are used to update the current unbound holdings records in the computer's file. Library files thus show serial holdings as issues expected or issues received in the card files, as issues recorded in the unbound holdings record, as bound volumes, or as missing items appearing in the want list.

One arrival card will be produced for every anticipated individual item. An index, for example, will have a separate arrival card if it arrives separately or it will be indicated on the arrival card for the issue in which it is bound. Predictable arrivals of supplements will be indicated by separate arrival cards. Each copy of a serial subscription would also require separate arrival cards. A serial subscription for two copies with index separate, for example, would require four arrival cards for the last issue. I should mention that other libraries' experience has shown that no appreciable time is saved during the check-in operation by using arrival cards; the real advantage is the automatic updating and maintenance of serials files by processing the machine readable arrival card.

All active subscriptions will be coded as regular or irregular arrivals. A regular subscription is by definition any predictable pattern of publication for which arrival cards can be produced. All other irregular serials with completely unpredictable frequency will be indicated by a printed list. When received, these unexpected items will require manual keypunching of an arrival card to update the master file.

Claiming of delinquent arrivals will be aided by inspection of the arrival cards remaining in the file at the end of each month. The decision to claim missing material, however, must be based on the knowledge and judgement of an experienced staff member. "Claimed" cards are flagged and returned to the expected arrivals file.

A second punched output planned is a bindery "tickler" card. This card will be produced in a preassigned month so that binding loan is staggered evenly over a twelve-month period. The bindery clerk will receive a card at the beginning of each month for each title to be bound. The card will list receipts as recorded by the computer, and will contain punched information to allow a bindery charge for the volume to be made through the automated circulation system. These cards constitute a "tickler" file only, and if visual inspection indicates missing issues or insufficient bulk for binding the card will be refiled until the missing material is received or until the next bindery card for the title is produced.

Serial issues are normally bound into physical volumes of a size to "fit the hand." The decision to bind a given number of issues into a physical volume must be based on the judgement of the bindery clerk. In addition, physical size of individual issues may change drastically and unexpectedly, requiring an exception to the normal routine frequency of binding. The backlog of cards in the bindery file will also aid the clerk in estimating the backlog of unbound material in the collection.

INPUT

Input of information and data handling procedures are designed to accommodate library personnel, and we will attempt to involve the Serials Department staff as little as possible in data processing lore or systems of special abbreviations and other confusing requirements. The automated system is therefore divided logically into two subsystems; the clerical system and the computer system. Only very limited familiarity with the computer system is required on the part of serials personnel, and the two systems will meet only through the "interface" necessary to convert data to machine-readable form.

This interface is presently punched cards, and clerical procedures revolve around mimeographed data collection forms. When completed, these forms are batched and sent to a keypunch operator who keypunches the data into IBM cards. The forms are designed so that data is recorded in a familiar manner; months, for example, are entered as common three letter abbreviations and converted by the machine to the numeric representation required for calculation.

As soon as practicable, we intend to substitute a paper tape typewriter in the Serials Department for the data collection forms/keypunching step just described. The typed copy will serve both as verification of the punched information and as the necessary audit trail until the master file is updated. The punched paper tape produced simultaneously will then be used as direct input to the computer. Eventually, then, we plan to return the clerical personnel to a traditional typing operation, except that each item of data will need to be typed only once to provide the machine-readable tape which is then used to produce all other records required.

The master tape file is composed of a master unit record for each serial entry, and individual items of data can be retrieved and grouped in any desired printouts. Each master record is identified by a unique six digit serial identification number (SIN). The number is assigned so that numerical arrangement by SIN will produce alphabetical filing of entries. This number is initially assigned at intervals of 100 to allow future insertion of new entries in proper alpha sequence. Whenever an individual interval becomes full, the computer renumbers the entire master file, re-establishing the required intervals.

Individual elements of the master record are recorded uncoded and full-length and are identified and retrieved by a descriptive keyword. The keyword is an English language word, which must be in the computer program's "dictionary," and is the normal descriptor for clerical usage. In addition, some keywords are used solely for control purposes and do not identify a data element. A second class of keywords, called operation codewords, are used to instruct the program to perform one of several operations, such as "update," "change," or "delete."

To effect a serial title change in the computer file, for example, it would only be necessary to record for keypunching the SIN for the serial entry, what should be done—"change," what element is affected—"title," and the information which should replace the previous title in the file:

778301 CHANGE. TITLE MANAGEMENT REVIEW $

The dollar sign is a system reserved symbol, and indicates the end of the line to the computer.

THE DATA PROCESSING SYSTEM

When fully implemented, the computer system will automatically compile operating statistics in addition to routine maintenance of the master file. The Serials Department annual report can fairly bristle with statistics of all kinds: (1) the number of serials by subject, language, country of origin, (2) the number of volumes bound by departmental libraries, (3) the number of issues checked-in, (4) the number of titles duplicated and by whom, and so on indefinitely. No one or no thing can surpass the computer's ability to compile statistics. It should also be possible to analyze serials expenditures almost endlessly, and certainly easily, to determine, for example, average unit cost for domestic periodicals, for annuals, for irregular publications, or to compare price increases in one year with those in another year. This type of analysis should eventually make possible intelligent projection for budgeting in future years.

Our system is being programmed for an IBM 7094-1401 system, which includes a model 1404 printer off-line. All non-1401 programs are being written in COBOL whenever possible to insure compatability both for our expected expansion to IBM System 360 equipment and for the different computer configurations available to other libraries who might wish to use our programs in developing their own systems.

The computer facility is made available to other University departments by the Data Processing Center at a reduced rate, and the Center operates as a service facility for University operations as well as serving as an educational facility. For present purposes our need is paramount, and no attempt is being made to present a solid economic justification for the system which we are developing.

PRESENT ACCOMPLISHMENTS

In preparation for the approaching conversion of the serials record a serials data processing clerk was employed as a full-time staff member in the fall of 1965. This young lady, working under the direction of the Serials Librarian, acts as the interface between the sometimes unintelligible serials record files and the keypunch operators by re-ordering and organizing the information on a form suitable for keypunching.

Any data input to a machine records system must be complete and accurate, particularly bound and unbound holdings information used for inventory control. To achieve this lofty goal the Library also employed last fall a crew of full-time clerks to begin a physical inventory of holdings to verify our existing but unreliable records. Holdings information will be converted to machine-readable form only after being verified by the inventory crew. We can see that this project will last at least another year.

The conversion of other serials record data to machine-readable form was begun in February of 1966. Initially, serial identification number, location, call number, title, and the control keywords, "serial" or "periodical" and "active" or "inactive" are being coded for each of the approximately 7,000 entries in the serials holding file and transferred to a magnetic tape file. All cross references are also being keypunched and added to the file. In addition, the necessary procedure was established in the Serials Department to insure that the title changes and new subscriptions would henceforth be keypunched so that an updated file could be maintained.

All keypunching is being done as much as possible by our regular full-time keypunch operator during the day, who is also responsible for keypunching for Circulation as well as all other library work. A second keypunch operator will soon be employed part-time on second-shift basis to cope with the volume of data waiting to be keypunched.

One serial listing immediately planned is what might be called a union list of serial titles for Texas A & M University Library. No holdings information whatsoever will be reflected, but all cross references will be included. This listing will be printed on multilith masters and reproduced for campus distribution, and then reprinted only as the need dictates.

A second listing already being produced includes only current periodical subscriptions by current title and location. This listing contains the approximately 3,500 titles which are available in the current periodical reading rooms in both main and branch libraries, and in main library reference. It is available in several copies in public service areas in both main and branch libraries and is reprinted presently on a twice monthly basis.

A little imagination will suggest numerous other uses for the presently limited amount of data now available in machine-readable form. It is quite easy to get simple statistical counts by selected characteristics or listings arranged by call number or location, or combinations of the above. Our only problem here is answering the subjective question "Do we really want this particular breakdown at this point?" The temptation to bury the operation in mounds of needless printouts of unwanted information is not something that can be ignored in the hope it will go away.

Our next step is the complete conversion of financial and subscription information, as well as beginning in earnest the conversion of the verified holdings records for the inventoried portion of the collection. The data processing clerk records ordering and subscription data on mimeographed forms which are sent to the keypunch operator. Meanwhile, holdings information is keypunched directly from shelf list cards in their catalog trays. As the ordering and subscription data is converted the computer will immediately begin to flag subscription renewals, and the periodicals list required by the state for bidding purposes will be produced in August from the information in the magnetic tape file.

Our approach to conversion and to the associated experimental programming and debugging is that each mass conversion of any segment of the serials record will justify its own existance by immediate utility. Long before complete holdings information is available in machine readable form, we expect the automated serials system to be performing nearly all of the other functions just described.

CONCLUSION

We are frankly astonished at the progress we have been able to make in applying data processing techniques to library operations in less than two short years. We have an automated circulation system which operates beyond our expectations and are hopeful of successfully automating a second major operation within the next year or two.

We have also learned several lessons in the course of the last two years. There is no such thing as a completely accurate record where our serials are concernned. We found that attempting to convert data for a computer operation tends to spotlight any weakness in accurate recording of information and, for that matter, in the procedures which supposedly insure that this accuracy is maintained.

There is an old axiom that a computer can best be considered as exceedingly stupid, but letter-perfect where repetitive filing and record maintenance are concerned. We are convinced that perfection is a gift with which mere humans are not yet ready to cope. We cannot present the perfect error-free input called for, and consequently we spend quite a bit of time correcting mistakes that we created ourselves only the run before.

We have also discovered the great need for rethinking what must be done. It is extremely easy to merely mechanize existing processes, without reviewing the "whys" of the operation or, in many cases, its usefulness in the first place.

Now one final word. . .We believe that our progress can be substantially increased if our staff is given instruction in basic punched card and computer concepts and then kept abreast of our immediate as well as our overall objectives. To accomplish this, a continuing program of lecture and demonstration meetings has been established in which our professionals and most of our clericals participate. Our people are encouraged to read, and they have called to their attention new publications of potential interest. In the past, representatives of area libraries have also been invited to attend our two major staff seminar meetings.

A great deal has been said about acceptance of automation in libraries by librarians. I can safely say none of our people at Texas A&M still resist automation in the library because of fear of putting their jobs in jeopardy or because of fear of the unknown. Instead, everyone embraces it as seeming to offer some hope that they can in the forseeable future crawl out from under the piles of paper and unprocessed publications, meet the library user occasionally, and give him help with his problems without the gnawing feeling that they should be getting back to library problems.

Biographies of Speakers

John B. Corbin

Mr. Corbin received his BA degree from North Texas State University and his MLS degree from the University of Texas. He was acquisitions Librarian at Arlington State College from 1961 to 1963 and since 1963 has been the Director of Technical Services and Director of the Centralized Processing Center of the Texas State Library

Donald H. Kraft

Mr. Kraft attended Vanderbilt University as a Founder's Scholar and graduated in 1949 magna cum laude with a BA degree in Mathematics. He received a Master's Degree from Vanderbilt University and received two additional years of study at Ohio State University. He has been active in computing since 1951, when he was stationed at the Computation Laboratory of Wright-Patterson Air Force Base. Mr. Kraft came to IBM in 1957 as an applied science representative, and since has held positions as senior applied science representative, sales representative, district manager of systems engineering, and for the last four years, as an industry representative specializing in information retrieval. His research interests and publications are in the areas of automatic indexing, selective dissemination of information, and the field of library mechanization. He travels extensively, giving lectures and conducting seminars on these subjects

O. R. McCaslin

Mr. McCaslin has a degree in Business Administration from the University of Texas and has received extensive training through IBM from 1951 to date. Before becoming the Assistant Director of Finance and EDP Controller for the City of Austin, he had been an accountant for the State Comptroller, Auditor for the State Auditor, Fiscal Officer and EDP Controller for the Texas Department of Agriculture

May Lea McCurdy

Mrs. McCurdy received her BA degree from the University of Texas and attended the Graduate School of Library Science at the University of Texas. She was a cataloger at the Austin Public Library from 1951 to 1955 and has been the Assistant Director and Head of Technical Services since 1955.

Frederick H. Ruecking

Mr. Ruecking received a BA degree in Anthropology and an MA degree from the University of Texas and an AMLS degree from the University of Michigan. His first library employment was as a page in the University of Texas Library, then as a staff clerk and as Administration Assistant in charge of Circulation at the Undergraduate Library of the University of Michigan. He came to the Rice campus in 1963 as Head of Circulation and in 1965 became the Head of the Data Processing Division

Bruce Stewart

Mr. Stewart has a BBA degree in Accounting and an MBA degree in Computer Science from Texas A & M University. He joined the staff of Cushing Library at A & M in 1964 as Data Processing Supervisor. He is a member of a national university-college Committee on Library Automation and was on the program of the joint IBM-SMU Conference on Mechanization held in Dallas in 1965

TEXAS STATE LIBRARY
MONOGRAPH SERIES

Number 1: A Technical Processing Manual for Small Public Libraries: Cataloging, by John B. Corbin. 1962. Out-of-print

Number 2: Catalog of Genealogical Materials in Texas Libraries

Part 1, Virginia, compiled by John B. Corbin. 1965

Part 2, Kentucky, compiled by John B. Corbin. 1966

Number 3: A Technical Services Manual for Small Libraries: by John B. Corbin. 1965. Out-of-print

Number 4: Directory of Public Library Board Members and Friends of Library Presidents, compiled by Madeline Owens. 1966

Number 5: A Survey of Archival Material in Texas Libraries. In preparation

Number 6: Proceedings of the First Texas Conference on Library Mechanization, edited by John B. Corbin. 1966