Mechanization in some degree has existed in libraries for many years. The typewriter, or possibly the book truck, represented the first phase; duplicating, book charging, and even punched card tabulating machines have followed. But before there can be said to be automation, the idea of system—the interrelating of separate entities so that they operate as a single organism—must be added. A duplicating machine operated by turning a crank is mechanized but is not automatic, nor does adding an electric motor make it automatic. Adding a counting device which will stop the machine when a predetermined number of copies has been duplicated creates a low level of automation. Addition of a device to cause the machine to stop when the paper is exhausted constitutes an essential element of a truly automatic system. Once started, the machine will run until either of two conditions causes it to stop! Various components of the machine are working together as a system.

Development in the last fifteen years of a systematic approach to office management and record handling may well be spoken of as a paper revolution. For want of a better term, let us call this procedure "integrated data processing," the term used by computer manufacturers to include the total cycle of input and processing of information and the output of results. Before 1945 most planning was in terms of applications: using a typewriter to prepare an invoice, an adding machine to obtain the total, a posting machine to maintain the ledgers, and the typewriter again to address monthly statements.

Since conversion from one data system to another is a monumental undertaking, few organizations dare to make immediate complete changes. Most first convert existing applications into subsystems which will eventually be part of the new over-all system. This evolutionary approach has been followed by the University of Missouri Library. The sections which follow will describe briefly
the applications of punched card and similar equipment in this library
and will attempt to show how they have been developed into sub-
systems. It is appropriate at this time to point out that the automa-
tion program is limited to records and does not include physical
handling of books, for example.

Catalog Statistics

In 1949 it became obvious that the operating statistics kept by
the Catalog Department did not provide the facts necessary for man-
agement of the library. The variance between the record of acquisi-
tions by the Order Department and the statistics of cataloging made
both suspect. It was not possible to ascertain the form or language
or source of the material acquired. No one could answer the question,
"How many titles were cataloged last year without the aid of Library
of Congress cards?"

To answer such questions and to keep all the statistics which
had been kept in the past, it was decided to utilize a mark sensing
IBM card to be inserted in each volume as it begins the processing
operation. It was also decided that the cards would be consecutively
numbered and provided with the accession number to assist in main-
taining a processing control. As a volume passes from station to
station the appropriate items are recorded by marking the card.
These include: source, branch, form, type of addition (that is, new
title, new addition, added volume, added copy, etc.), type of cataloging,
type of cards used, and the basic language of the publication. Upon
completion of cataloging, the card is removed from the book. From
time to time the cards are processed, and from them all of the cata-
loging statistics are compiled.

Since accession numbers are assigned essentially in chron-
ological order, it is possible to analyze uncataloged arrearage in
terms of length of delay. This elementary form of processing control
has been expanded in another operation which will be described later.

Such an application of punched cards can hardly be called a
system or even a sub-system. It is not at this time related directly
to any other segment of the Library's operations, but plans for eventu-
tial integration of this application into the total system will be de-
scribed later.
Subscription Records

That financial records of periodical subscriptions and standing orders for serials are difficult and vexatious cannot be denied. This fact together with the recurring nature of the operation makes them a natural for adaptation to data processing equipment. Preparation of basic records for conversion to punched card operation was begun at the University of Missouri Library in 1950. Had the records been in such condition that the cards could be punched directly the conversion could have taken place within two or three months. In actuality, the records were not completely transformed for about five years.

The basic problem revolves around the fact that many manually kept records are ambiguous, and it is necessary to make interpretations at the time any activity occurs. Since machines will accept only yes and no answers, it is necessary for records of each title to be absolutely complete and definite.

Before beginning to punch subscription record cards, it was necessary to define the items which would be needed. Because of limitations of card capacity and the cost of maintaining records, it was necessary to eliminate a number of items which might have been desirable, such as language, country of origin, and frequency of publication. Those eventually included were: title, a subscription number for machine control operations, estimated cost, the actual expenditure, codes for the address to which the serial should be sent, for the supplier, for the mode of payment (that is, advance payment of subscription, billed on receipt, received on membership, gift, etc.), renewal period in years, the expiration date, and finally the account to be charged. By 1952 enough items had been coded and cards punched for renewal subscriptions to American periodicals to be placed by machine.

As the operation continued and expanded, situations arose which had not been anticipated and which necessitated a few changes in the content of the cards and a number of changes in the program. For example, it was originally assumed that an item number assigned to each subscription, which would be used in alphabetization of entries on the machines, would be adequate for both bibliographic and fiscal purposes. It soon became apparent that this was not the case. For accounting purposes it was desirable to have all publications received on any one society membership coded with the same subscription number even though the titles might be scattered throughout the alphabet. To prepare lists for use of faculty and library staff it was necessary to establish a title code for each publication.

Similarly it appeared logical that, for purposes of encumbering funds, the actual expenditure for the previous year could be used. We
did not know that perhaps half the publications commonly called continuations have no charges in any one fiscal year. It was necessary to modify the program so that in these cases the estimate for the previous year would simply be carried forward. This, at the time, seemed to be a solution, but we had not taken into account the failure of some suppliers to send invoices for subscriptions until long after they had expired. Another program modification was required.

Ordering and Accounting

By early 1955, even before all of the subscription and standing order records had been converted, it was becoming evident that the utilization of punched card equipment should be extended to all ordering and accounting work. A study was begun which resulted in a punched card installation in the Library itself. Although the equipment was ordered in December 1955, it was not installed until January 1957. Since our fiscal year began July 1, we had six months in which to develop procedures, to train personnel, and to convert records to the new system.

The serials records procedures which had been in use for a number of years were reviewed and further improvements were made. Forms were developed which would articulate closely with the records of one-time orders.

It is neither necessary nor desirable at this point to describe in detail the ordering procedure which is used at the University of Missouri Library. Basically it consists of purchase orders prepared on the Cardatype machine from IBM cards which have in turn been prepared from data supplied on book purchase requests which have been checked and approved by the Order Department. The documents prepared, in addition to purchase orders, include Library of Congress card orders and a slip which is filed in the public card catalog indicating that the book is on order.

Regular orders are prepared weekly, usually on Wednesday. All related documents, except the punched cards which were used to prepare the orders, are sent to the Order Department for processing and for mailing by late Friday afternoon. At the same time the IBM section has prepared a ledger statement for the week. Thus should any account become overdrawn it is possible to cancel items before the order is actually mailed.

The book fund is subdivided into approximately 150 sub-accounts on which balances are maintained. Incoming invoices are processed through the IBM section so that any variations in cost from preliminary estimate are taken into account and the corrections entered in the ledger.
The nature of punched cards is such that it becomes possible to maintain more active control over deliveries and to claim undelivered books and invoices, with minimum human effort. These same potentialities for control extend also to books being cataloged. The IBM card which had been created to record the invoice payment is filed in a "Paid but not cataloged" file. The IBM card which had been used to create the original purchase order, together with the catalog statistics card mentioned earlier, is inserted in the volume as it enters the processing track. The two cards travel together until the book has left the processing division. Each month they are collected and sorted; the statistics cards are retained for compilation of cataloging statistics and the order cards are matched by collator against the "Paid but not cataloged" cards. Since the payment record card shows the date on which the invoice was paid (not too much different from the date of receipt), it is possible to maintain effective control over the cataloging process.

The greatest unexpected dividend from the new ordering and accounting system was the ability to maintain an active desiderata file. The University of Missouri Library, like most research libraries, had many titles in desiderata files but nothing much happened to them. If a book ordered from a second hand catalog was undelivered because of prior sale and if it appeared desirable that it should be pursued further, an inquiry would be sent to some likely dealer. If the dealer should offer the book, well and good; but if he did not, the card probably remained in the file inactive from then on.

Often the professor who originally requested the item would, on seeing it in a catalog again, reorder it; we repeated the process of bibliographic verification and placed a new order unaware that it was still in the desiderata file. This situation led us to recognition of the fact that, although automating operations does eliminate intellectual activity, it also makes possible the effective storage and retrieval of the results of such activity, thus eliminating duplication of personal effort.

Want list procedures therefore evolved quite naturally. With only a few exceptions, undelivered items are merely transferred from the order procedure to the desiderata procedure. All necessary information is already stored in the punched cards which had been used to prepare the original purchase order. They are now used to prepare requests for quotation and are subject to the same systematic control as is applied to outstanding purchase orders.

Immediately after cancellation of an order with a dealer, the IBM section prepares request for quotation forms. The Quotation Section (actually the secretary to the Director of the Acquisition Division, supervising a student assistant) sends one copy to a prospective supplier or uses the copy to prepare an advertisement for one of the media which we use. Another copy with the legend "Recommended
for purchase," is filed in the public card catalog replacing the "On order" slip which had been there. The third slip becomes the permanent desiderata record in the Quotation Section.

Whenever a volume is offered, the information is passed to the ordering section of the Order Department which puts it back into the order procedure if the price is deemed satisfactory. Everyone concerned has been instructed that, in checking book purchase requests, one for an item already in the quotation procedure should be sent immediately to the Quotation Section. If the request is based upon another potential source, it is possible to complete the purchase order with little delay, since the bibliographic verification is done and the IBM cards for preparing the purchase order are already punched.

Circulation Records

In May 1958, the University of Missouri Library began using IBM records for circulation control. The application was considered an interim solution to the circulation record problem. It involves a call slip composed of an IBM card with a tissue and carbon overlay. The borrower fills out this call slip for each volume to be borrowed. The tissue overlay is inserted in the book pocket, the card itself is manually filed in a classed file after having certain information punched into it. For loans to students, the information consists only of the date of loan and the date due. For loans to faculty and graduate students, who are permitted indefinite loan periods, the call number, the author's name, and the borrower's identification number are also punched.

The collator is used to pull the cards for overdue books each week. Notices are prepared manually. Graduate student loans are pulled each semester, and lists of books on loan are prepared on the Cardatype for mailing to the borrower in advance of the close of the semester. Similar lists are prepared once each year for members of the faculty.

Because we are on the threshold of installing a completely automatic book charging system, let me jump forward to a description of it and then return to other matters which are already in operation.

It has been our hope for many years that a data collection system economically feasible for the control of book circulation would become available. The system installed in the Montclair, New Jersey, Public Library in 1942 performed the functions desired, but involved
equipment too expensive to make the system economically advantageous. Furthermore, it was satisfactory for the central library but could not be applied to branch operations.

The system which we are planning to install will consist of a transmitter at each point where books may be issued, connected to a central punch in the IBM section. Each borrower will carry a badge into which will be punched his identification number. Each book will be equipped with an IBM card which shows the call number, accession number, and abbreviated author and title. The lending operation will be completed by inserting the book card and the badge into the transmitting unit and depressing a key to indicate the type of loan. A transaction card will be created showing the borrower identification, the book identification, the station from which the loan was made, the time of the transaction, and the date due. Returns will be recorded similarly except that it will be necessary to use only the punched book card.

The circulation file will be maintained by machine, up-dating all loans and returns once each day. Machines will also be used for selecting overdue records and preparing notices, and for preparing lists of books placed on reserve by individual professors, etc., as desired.

The most serious objective usually raised to this system is the enormity of the task of creating the punched book cards. There is an alternative to a complete and instantaneous conversion; we propose to follow that alternative. It is well known that many books in the library are used only infrequently. We need not be concerned with them if we could but identify them.

By making a book card for each book as it is circulated for a period of time prior to the initiation of the data collection system and by making a book card for each new book added to the collection, it would be possible to have cards prepared for that segment of the collection which supports a large proportion of home use circulation.

At the University of Missouri, we are planning to insert book cards in all of the books which are now in the Library of Congress classification system. As will be explained, we are now in process of reclassifying our books from Dewey to Library of Congress. In the less than three years after we started using the Library of Congress system, the circulation of books in that system represents more than one-fourth of our total home use loans. Reserve loans are, by our priorities in reclassification, much more nearly completely Library of Congress. After we have proceeded somewhat further in the reclassification of sections of the Dewey books which create other problems, we propose to reclassify books on the basis of observed use.

The present limited record system will be used parallel to the new automatic system until the reclassification project is complete.
Of course if a library were not involved in reclassification it could simply make a temporary record of the loan and create the new type book card while the book was on loan. Upon its return the new book card would be removed from a special file, used to discharge the book, and then be placed in the card pocket.

We hope that eventually the circulation system will be connected either directly or indirectly with a computer. When this is done there will be no card sorting or collating; overdue notices can be prepared automatically, and fines and charges for lost books can be billed automatically. The computer can be programmed to refuse a loan to an individual who is delinquent. When the return of a book is being recorded, should it be wanted for reserve, the operator will be signaled. But these benefits are still in the future.

**Catalog Production**

Let us return to here and now. As a part of the pre-automation planning it became apparent that much professional effort was being wasted in our cataloging procedures. We were using a modified Dewey classification system which resulted in one out of each four books falling into a classification not consistent with the printed schedules. This situation became critical when, in 1957, the University administration decided that the library would be expanded and made truly a research library, with the result that the book fund was more than doubled in a single year. Our installation of punched card equipment which had just been completed made it possible to handle the ordering and accounting with only minor difficulty, but in 1957-58 we were able to catalog fewer than two-thirds of the volumes acquired. Naturally the volumes which were uncataloged were the more difficult ones.

Analysis of the situation indicated that the solution might well lie in the adoption of the Library of Congress classification and in utilizing it essentially without modification. We would thus undertake to eliminate the duplication of cataloging effort. There were many ramifications of this idea. One was that the catalogers were to handle only books which required original cataloging. The processing of titles for which there were printed cards would become essentially routine. In setting up this factory type operation, the Catalog Department was divided so that the department itself was concerned only with the creation of copy for books not yet cataloged by anyone else.

The Catalog Maintenance Department was established to handle those aspects of the cataloging process which involve the editing and creation of the card catalog itself. Into this department flowed the
copy from the catalogers, printed cards, proof slips, or photographic reproductions from the printed book catalogs of the Library of Congress. All these items were to be transformed into our own card catalog by the Catalog Maintenance Department through creation of the necessary structure of cross references, guide cards, and the like.

The Library had never maintained an official catalog but had a subject authority file which was used extensively. In the new quarters into which the Library moved in 1961, the processing division was adjacent to the public card catalog. It was decided that the authority file could be combined with the subject section of the public card catalog, if the subject catalog were separated from the author-title section.

We therefore decided that for the books in Library of Congress classification the subjects would be filed in a separate catalog while the author and added entry cards would continue to be filed in the old dictionary catalog. For each subject, there would be a guide card which would also be the authority card. Subject headings would not be typed at the top of the cards. It thus become possible to file cards for all subjects which had been previously used, without prior checking. If there is no guide, the card is given to a supervisor who prepares the guide card and the necessary cross references.

Let us look now at the actual preparation of catalog cards. Copy is obtained from four sources. First are the printed cards ordered from the Library of Congress. Second are proof slips from the Library of Congress. The University of Missouri Library had discontinued its depository catalog when the printed book catalogs appeared; but a decision was made in 1960 to order proof slips beginning in January 1961, and to file them, not by main entry, but by LC card number. The maintenance of the file would thus be much less expensive and would serve our purpose of providing copy equally well. The third source of copy is from the printed book catalogs of the Library of Congress, of value mostly when cards are out of print. Fourth is locally prepared catalog copy.

Because of the card work involved in the reclassification project, we were particularly interested in the possibility of using the Xerox Model 914 for direct card reproduction. On the basis of preliminary estimates, we decided that it would be more economical to select the cleanest card, usually the shelf list card, obliterate the old call number with white opaquing compound, and retype the new call number, and then to reproduce a complete set of cards, rather than to erase the numbers from all the old cards and retype them. The procedure would be feasible only if the Xerox method would work satisfactorily.

A long period of trial and experimentation followed. We found that by using card stock approximately 15 cm. × 26.5 cm., cut with the
grain running crosswise of the card, cards could be reproduced satisfactorily. The copies to be duplicated were mounted on a blank card, using rubber cement. The card could be used about a dozen times without new application of cement.

At the same time we were considering the use of Flexowriters in preparing cards for which there was no copy that could be photographed. From their delivery in the summer of 1962 until February 1963, the machines were used in a manner similar to that of a number of other libraries. A preliminary copy of the card was typed and a by-product tape produced. After correcting the tape for proof errors, it was used to duplicate the number of cards necessary for a set. Headings were added manually.

It was apparent that production could be increased greatly if a procedure could be developed for automatically producing in a single operation complete sets of cards with all headings typed. Experiments in programming for the more completely automatic procedure demonstrated that the undertaking was feasible. The system now in use involves three basic steps. The first is typing the complete unit card, including all tracings, accession number, etc. and the creation of a by-product tape with the same information. The card is then proofread for accuracy.

The second step involves superimposing a program from a master instruction tape for the creation of the set of cards. This operation is performed simultaneously with correcting any errors which may have been discovered on proofreading the content of the card, and results in two tapes: one includes the instructions for the typing of each card required for the set; the second includes the content of the card plus certain additional codes which articulate it with the instruction tape.

The third step is the production of the complete set of cards. Using continuous card stock, the machine will run until the complete set is made; the operator merely changes the tape, depresses the Start key, and starts on the next set. Typing at the rate of approximately one card per minute can be maintained throughout an entire day. Two operators, performing the three steps, can produce more than 650 cards in an 8-hour day.

We have not yet programmed all of the possible variations in card format, so that the Xerox machine is still being used to reproduce certain types of cards for which we are typing original copy. We have not yet, for example, begun making cards which involve serial publications. This as well as other variations will be done in due course.

On the basis of preliminary estimates of time required, we decided that we would not utilize the Flexowriters for creation of cards if more than thirteen are required for a set. With our system of
auxiliary catalogs, this means that only cards with four or fewer tracings would be put into the Flexowriter system. Those with more tracings continue to be duplicated by Xerox, but further studies may cause us to change the division point.

In analyzing card production operations, we have found that the greatest losses occur from non-continuous processes. The time consumed in shifting from the typewriter, which prepares the original copy, to the Xerox machine, from the Xerox machine to the card cutter, and from the card cutter back to the typist who manually adds the headings is at least as great as the time used by the productive portion of the cycle. The virtue of the Flexowriter system, despite the fact that each card is produced by typing a letter at a time, is that the cards when typed are complete and ready for filing.

Conversion to Computer

The punched card equipment, at the time it was installed in 1957, was considered adequate for a book budget of $250,000 per year and an annual acquisition rate of approximately 30,000 volumes. Since that time the rate of acquisition has almost doubled. The equipment is still performing well but is at a peak of utilization. Analysis of our needs has led to the conclusion that the next expansion should be in the installation of a small scale computer in the Library itself. This is now being discussed with the University administration, and it appears likely that such an installation will be approved within another year.

The next step in the development of a truly automated record system will be the conversion of present operations from punched cards to the computer. This will not be a radical change. Outside of the machine room itself, the members of the Library staff will hardly be aware of a change at all. Punched cards will continue to be used, since they are the primary form of data input for a computer system.

I have indicated earlier the effects of a computer on our circulation control system. It will also make possible the accomplishment of a number of other objectives which could perhaps have been performed with our punched card equipment, but would have required considerable expansion of human effort.

A number of years ago we published and distributed to the faculty and other interested persons a book containing the titles of serials currently received by the Library. To this we had hoped to add holdings records, so that we would in effect have our own small union list. The holdings records thus prepared would have been a supplementary and off-line operation and would not have been connected with normal
acquisitions procedures. With the computer we can record current receipts in the computer memory, thus eliminating other serial checking records. The publication of complete serials holdings for distribution to the faculty will become a by-product of regular operation.

We have also felt the need for establishing a binding schedule and record control system, using punched card equipment. This has not been done, largely because of problems arising from the reclassification program. It should be included in any computer programming.

We are now ready to begin tying together a number of aspects of our serials operations into an integrated whole. The programming which is used to create the record of current serials receipts and later the bound volume record will also include the cataloging statistical information for the particular title. Thus for serials a single record will be available for controlling the renewal and payment records, the receipt of current issues, binding of volumes, and finally the statistical analysis of the Library's acquisitions.

Computer Compiled Book Catalog

At this point we are ready for the near final step to an integrated automated record system, the computer compiled book catalog which would replace the card catalog. The system we would use is not far different from that described by the Chicago branch of the University of Illinois. Perhaps by the time we are ready to undertake it there will be improvements in equipment to make the format of the catalog more acceptable to librarians. When this day arrives we plan to reproduce the catalog for those books in the Library of Congress classification. Books remaining in the Dewey classification will continue to be represented by the card catalog.

Many of the problems of conversion have already been anticipated in the way the card catalogs have been set up. The subject catalog, as it stands, could be transformed into a book catalog almost without change. The Flexowriter procedures which are utilized for the creation of tapes would be equally usable as the input medium for the computer catalog. Many of our specific decisions have been made on the premise that eventually this will occur.

How long will it take? It has been almost fourteen years since the first step was taken. We are talking now of beginning computer catalog production by the middle of 1965; but the installation of our circulation system, which we think is almost here, is already nearly two years behind the original schedule. Pioneering is a slow business. The trip from St. Louis to Columbia over the Boonslick Trail 150
years ago took considerably longer than the trip today over the same route, which is now called Interstate 70.

Discussion

Ralph E. McCoy*

My remarks on Ralph Parker's paper are those of a newcomer to the world of automation, appraising the work of an old pro. Ralph Parker has been talking and writing about the library use of punched cards and computers when many of us were still charging out books by a pencil with an attached date stamp. While his library at the University of Missouri was installing electronic equipment to handle book ordering and accounting, most of us were solving our technical problems by adding another sheet of carbon paper.

Today there is a rush to climb on the bandwagon of automation, and our library has recently joined this parade. I expect that before long library schools will permit their doctoral candidates to substitute a machine language, say "FORTRAN," for the traditional French or German.

Dr. Parker begins his discussion with the appropriate point that automation must be preceded by the idea of system—the inter-relating of separate entities so that they operate as a single organism. Such an analysis of tasks to be performed, whether made by a stop watch, by statistics, by flow charts, or by a combination of these devices, will force us to re-examine procedures and may well save us from devising a more efficient method of doing something that need not be done at all. The very act of work analysis will reveal flaws and duplication of effort that have crept into our technical processes through piecemeal development.

Dr. Parker speaks of two ways of approaching automation of a library: by revolution or by evolution. Few libraries can afford the turmoil of revolution, or can close down long enough to retool. We must settle for the slower and perhaps tortuous evolutionary development of sub-systems. The point that Parker makes here and that has been graphically revealed in Mr. Heiliger's project, at the Chicago

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campus of the University of Illinois, is that some awareness of the total implication of automation for library routines must precede the creation of these sub-systems. Otherwise, a library might be faced with costly modifications later in attempting to join together the various sub-systems into a continuous assembly line production. Can the bibliographical information acquired in the book ordering process, for example, and stored on punched cards and perhaps on magnetic tape, be utilized by catalogers in establishing entries? Can the cataloging and classification process be translated to punched card for a printed catalog? Can a portion of this information, in turn, activate a record that can serve as the basis for book circulation? And, finally, can meaningful statistical data be extracted at any point in these processes?

I should like to point out that the lure of automation can result in over-mechanization, in devising expensive and complex methods for doing what really are simple jobs, best performed manually. I think the study of circulation control systems made by Fry and Associates brings out this fact very clearly.\(^1\) When a brief news item on our automated circulation system appeared recently in the Library Journal, I received more than a score of letters of inquiry, many from small libraries where the simplest kind of hand processing circulation system should be adequate.

One of the considerations in determining the desirability and extent of automation, of course, is the present and projected volume of work and its concentration in both space and time. A further consideration is the relationship of the library’s operation to the business and institutional research facilities of the total university. The library may be a sub-system of a university-wide system of automation, just as it may have its own sub-systems.

On our campus we have a Data Processing and Computing Center with strong support from the university administration for campus-wide automation. We are also fortunate in having a Systems and Procedures Office that has worked closely and sympathetically with the Library in automation planning. A library that must assume the entire burden of developing and maintaining a system may find the cost prohibitive.

Speaking of costs, and we generally are in our library, we have been cautioned by our systems people that automation will not necessarily produce an immediate savings in dollars. It may merely shift the burden of cost from one campus agency to another. In the case of our circulation system, for example, we expect the cost of mailing overdue notices to be shifted from the library to the bursar’s office. Greater accuracy, the potential for handling increased work loads, and convenience to the library’s public may be more appropriate arguments for automation than reduced budgets.
Business records of libraries are natural subjects for automation, especially where they relate to the general business and accounting procedures of the University. It is in this area that the University of Missouri began its automation efforts, which Dr. Parker indicates took some fourteen years to perfect. At Southern Illinois we have used punched cards for some ten years to handle financial accounts, subscriptions, and the ordering of books, commodities, and services.

I would like to make some specific comments on Dr. Parker's system of business records, in the light of our experience. Our IBM cards for subscriptions include an "item number" by which titles are alphabetized; a code number to designate source, that is, whether it is from dealer or direct, by membership or by gift; and a code for the location of the journal in the library. Most of our subscriptions have a December 31 expiration date, and most are paid for in advance. Serials that are "billed on receipt" are classed as continuations, not periodicals, and are paid for from book funds. The encumbering problem for continuations, their irregularity of issue, and the length of the entries for so many of them have discouraged us from trying to put them on punched cards. For example, we have not discovered a way to get the IBM system to re-encumber automatically for future receipts of a series at the time it records payment for one of them. We do not punch in subscription prices on cards used for the print-out of our public list, because it is irrelevant and because a price change would necessitate punching a new card for each title affected.

The University of Missouri makes use of purchase orders prepared on the Cardatype machine from IBM cards which have, in turn, been prepared from data on book order requests. The multiple order receipts created by Cardatype serve much the same function as the multiple order cards that in our library are created from a Multilith master. It is difficult for me to assess here which is faster, or more economical. We place orders daily, rather than weekly as in the case of Missouri. We find we cannot rely on the weekly punched card ledger sheets supplied by our data processing office to prevent over-encumbering an account, but must manually record orders placed between runnings of these ledgers. Perhaps here is a reason for the library to have control over equipment scheduling.

Our monthly IBM ledgers are easy to check for orders requiring claims or cancellations. The order number shows when an order was placed, but the date showing when an item was cataloged is not too useful for control purposes. A long time-lag between receipt and cataloging, revealed by the ledger, means that the item has been in the precatalog stacks, rather than on someone's desk awaiting cataloging. If cataloging were on a relatively current basis, the "date cataloged" would be more useful as a control device.
Parker notes that one of the multiple order forms goes to the public catalog when an item is ordered from a secondhand dealer catalog. We spare ourselves the bother and expense of preparing a purchase order on such an item until we have actually verified by letter, telegram, or cable that the item is still available. Only if it is available and is being held for us do we prepare a purchase order. This saves initiating an IBM cancellation and withdrawing a card from the public catalog.

One of the most interesting features of the Missouri system is the creation of a desiderata record intended to eliminate a second bibliographic verification. However, we question the advisability of scattering such records throughout the public catalog as opposed to keeping them together in the order department.

Incidentally, our multiple order system provides the following cards, nine in all, each in a different color and with appropriate pre-printed instructions. Two cards go to the vendor (one to be returned with the book); one card goes immediately into the public catalog as evidence that the title is ordered; one card goes to the subject librarian; one card goes to the Library of Congress to order a set of catalog cards; one card (in sheet form) goes to Data Processing for the encumbrance record. When the book arrives, an "invoice copy" initiates payment; one card becomes the cataloger's work card; another card bearing the pre-catalog serial number is used to replace the order card in the public catalog and to serve as a temporary author card; and the card it replaces is used to notify the faculty member that the book he ordered has arrived.

The completely automated book circulation system that Dr. Parker plans for the future is quite similar to that now being developed at Southern Illinois University. Let me comment on some of the similarities and differences. In both systems a transaction card will be created at the circulation desk by the insertion of the borrower's card and a prepunched master book card permanently located in the pocket of each book. Our installation at the central circulation desk calls for six #357 IBM units, each with manual input facilities, three keypunch units, and other necessary components. Only the variable date due will be manually punched at the time of the transaction. The Missouri system includes an abbreviated author and title and an accession number as well as call number. By limiting our punching and print-out to call number only we are able to use a short IBM card that will not protrude above the top of the book. In both systems it should be noted that there is little carry-over from this card to a full scale book catalog. It seems to me that in a research library, unlike a public library, there would be limited value in the preparation of a book catalog with abridged bibliographical information.

A university library imposes a requirement in circulation records not generally demanded by a public library. The university
library must know at all times who has a given book so that, if necessary, the book may be recalled before it is due. A daily print-out of book charges, arranged by call number and giving borrower's number and due date, will give us this information. Copies of this record, available in the various reference rooms, will eliminate calls to a central desk.

In order to speed the job of discharging returned books, we shall prepare two transaction cards at the time the book is borrowed. One is sent immediately to Data Processing for conversion to magnetic tape and serves as the record of the charge and the basis for sending out an overdue notice; the other card is a "date due" card which goes into the book pocket along with the master card when the book is given to the borrower. Prompt discharging can be accomplished merely by pulling the "date due" card and sending the book to the shelves. This card then goes to Data Processing to up-date the circulation record.

The task of preparing master book cards for a half-million volumes was not as enormous as we had anticipated—largely because of a speed-up device, a simple code sheet, designed by Science Research Associates, that could be marked by a pencil. Each sheet, containing the coding for eight books, is then put through a machine that converts the information to tape. The tape, in turn, activates the punching of the master book cards. The code sheets can be marked much faster than a card can be punched by hand, and the process eliminates the training of keypunch operators and the tying up of equipment for many months. Our problems have related largely to the original design of the code sheets to provide for a variety of book notations in the library. The Dewey classification lends itself very well to the scheme, much better than the Superintendent of Documents' classification which we use for federal documents. Still unsolved are the handling of bound volumes of unclassified periodicals and the devising of a simple system for flagging a returned book for which there is a class or personal reserve.

One of the arguments for using the IBM circulation system in our library was that the entire volume of circulation was concentrated at one point in the main library. I doubt whether this particular system would lend itself to a library with many branches or separate circulation points. It would be very costly to install the expensive input and card punch equipment at every station.

The entire cataloging operation at the University of Missouri appears to have been developed carefully and reappraised frequently. It is complicated by the reclassification project and by an increased level of book buying in recent years. We are particularly interested in the mechanics of using the 914 Xerox for direct card reproduction. I hope also that we can learn more about the use of the Flexowriter and compare it with our own use of Multilith stencils.
I do not see the operation of the Flexowriter as a sub-system in the preparation of a completely automated book catalog. Perhaps it is the procedures only and not the equipment that would be utilized in the conversion. In order to achieve a continuous flow, how would the catalog production be joined at one end with the order process, and at the other end with the circulation process? All the efficiency and speed achieved in photo-copying of LC cards, it seems, would be lost in the manual operation of typing or key-punching. I am sure that both Missouri and the University of Illinois at Chicago have given thought to these matters. The possibility of a machine printed book catalog, capable of being maintained by machine filing and available in multiple copies, is one of the most exciting prospects in the future of libraries.

Dr. Parker speaks of the possible installation of a computer in the library itself at the University of Missouri. One of the advantages that we saw in automated business records and circulation at Southern Illinois was the shifting of a clerical burden to another agency—a central data processing office that would do the detailed work of filing, typing, bookkeeping, mailing overdue notices, compiling hold-up lists, and performing many other related chores. This would eliminate bulky files in the library and the need for staff to maintain them. We are counting on this service from a central campus agency being prompt and reliable. If it is not, we may be sorry that we converted to this system. It is also possible for machines to make errors or, to state it properly, for the men that run them to make errors. We received quite a shock last fall to learn from the computer that for the first time since the Korean war enrollment at SIU had leveled off. This situation was changed, however, within a few days when Data Processing located a box of enrollment cards that had not been fed through the machine.

One of the advantages of tying into a university-wide automation system is the potential to analyze library usage—to correlate reading patterns with grade averages, with subject majors, with high school records, with dropouts, with IQ or other test scores, all of which will be recorded and stored on tape. It will also be possible to gather frequency-of-use data on certain classes of books or to make quantitative studies of book holdings, useful for the many questionnaires we are called upon to complete. The Decatur Public Library has made many analyses from the punched card records of its circulation.

I think the application of automation to the operation of a library should be pushed with vigor, not only because it can make a real contribution, but as a matter of self defense—to protect us from the pressures of university administrators, equipment dealers, and data processing zealots who wish to push us into the never-never-land of information retrieval.
At a recent conference on our campus, an outside consultant gave the impression to our top administrators that a complete system of information retrieval for university libraries was just around the corner and that only the backwardness of librarians plus a few bugs in the equipment stood in the way.

I was glad to note that a more reasonable claim was proposed by Dr. John R. Pierce of the Bell Telephone Laboratories, speaking at the recent dedication of the John Crerar Library. He said: “It is clear that if our objectives are modest, we can put machines to profitable use in libraries today. We can use machines to reduce cost, to minimize clerical drudgery, to offer better service; in short, to help improve the whole process of information communication.”

But, he warned that until the computer can be made to “think” and to separate materials, library users “... would smother under the flood of information and misinformation it would produce ...” What the person who consults the library needs is not everything about a subject, but the best information about it or about the part of it in which he is interested.” And only human beings, he concluded, can make this judgment.

I believe that librarians should combine an alert and eager interest in the future of automation with a healthy skepticism to the panacea of automation. Data processing experts and librarians have much to learn from each other.

REFERENCES


3. Ibid., pp. 19, 22.