GLENN L. BRUDVIG
Head, Bio-Medical Library
University of Minnesota
Minneapolis, Minnesota

# The Development of a Minicomputer System for the University of Minnesota Bio–medical Library

The University of Minnesota Bio-Medical Library received a three-year grant of $361,729 from the National Library of Medicine in June 1972 to develop a low-cost, stand-alone, library-controlled computer system which would handle book ordering, serials check-in and control, accounting, cataloging, circulation, and reference assistance—a complete, integrated library data management system. The project, as of April 1974, has one year of developmental work before the system becomes fully operational. The design of the system has been completed, but procedures for staff use of the system and display and printing formats are still under development. Part of this paper therefore describes procedures which may be modified before the project is completed.

## Background

The minicomputer system will be based on automated procedures which have been in operation in the Bio-Medical Library for over six years. The first automation program in the library was a serials system which went into operation in January 1968. This system, soon to be replaced, handles all aspects of serials control in a batch processing operation using a CDC 3300 computer. It produces a monthly check-in list of predicted journals, monthly journal holdings lists with daily supplements for staff and patron use, binding slips, and special lists of various kinds.

In July 1969 a second automated system went into operation for

acquisitions, again using batch processing and the CDC 3300 computer. The acquisitions system produces periodic lists of all materials in process, including titles requested but not ordered, ordered but not received, received but awaiting cataloging, or cataloged but cards not yet filed. It prints purchase orders and handles accounting operations.

In 1970 procedures for handling the payment history records for serials were added to the automated system so that accounting records for both books and journals could be handled through one operation. These batch procedures have operated very successfully, with few problems, full staff acceptance, economy, and improvement of public services. The minicomputer system is designed to expand automated procedures to all library operations, particularly to circulation and cataloging.

The systems which have been in operation do not have a direct relationship to the design of the minicomputer system since a complete new design is necessary to achieve an integrated system for operation on a minicomputer. The crucial importance of these batch operations to the mini system is in providing a background of experience for library staff, and some of the systems people who worked on them, so that staff members can make meaningful contributions to the development of the mini system. The transition to the mini system should therefore be relatively easy to make in terms of staff acceptance and involvement.

Although none of the software used in the present operations will be used in the mini system, as much of the data as possible will be captured for the new system; some of it, however, may have to be rekeyed or edited. For example, the data in the present serials system are all in upper-case while the mini system will use both upper and lower case. To convert the data we may either convert all records to lower case and edit them to upper case as needed or pull the Bio-Medical Library serials records from the Minnesota Union List of Serials, which has a full ALA character-set. Coded information, holdings statements, payment history information, vendor name and address files, and other data in the serials system will be converted to the new system and some additional information will have to be added.

For the acquisitions system, we may run the old batch operations in parallel with the new on-line system for a period, possibly long enough to let most of the old records pass completely through the ordering process, and manually convert the records at the point of cataloging. Or, we may convert the acquisitions file to the new system at once and edit the records in the cataloging portion of the system; but this is still to be resolved.

We have no cost figures for manual operations to compare costs of the mini system with—only the costs of the present batch systems. We expect

significant savings of staff time once the system is fully operational, but have not attempted to predict them. Our present batch processing costs for computer time for serials averages $400 per month for 3,002 current titles, and the acquisitions and accounting operations averages $500 per month. Keypunch rental and punch card costs will be eliminated under the new system and paper supply costs will be considerably reduced. We expect to eliminate as many paper forms as possible and all in-process manual files. The minicomputer system has been purchased and, therefore, the only continuing costs for the system will be for maintennace, which should be only a few hundred dollars per year.

Under the present automated operations we experienced a reduction in both clerical and professional staff needs, but an increase in paraprofessional staff. Clerical positions were upgraded and some duties previously handled by librarians were shifted to paraprofessionals. We expect much the same shift in personnel costs to occur under the mini system. However, most costs benefits will occur in catalog card production and circulation records management.

## Staff

After we received the grant to develop the minicomputer system, the first order of business was to recruit staff. The project staff assembled had a good working knowledge of the Bio-Medical Library operations, a total familiarity with our present systems, and a wide range of experience in systems design. All of the people on the project are part of the library staff.

## Equipment and Space

After the staff was recruited, the selection of the equipment became the next priority. This process is discussed by Grosch elsewhere in this volume. The total cost of equipment purchased for the Bio-Medical Library system will come to about $125,000. The first equipment components were delivered in April 1973 with the second portion in May and June 1973. The first visual terminal was received in December 1973 but the communication equipment needed to connect it to the computer was not installed until March 1974. The delays in getting the equipment have been a constant problem and have slowed the development of the project to a certain degree but not to the point of creating a serious problem. Heavy orders for minicomputers and components have made it difficult for dealers to meet delivery schedules.

The library converted a conference room of 304 sq. ft. into a computer room. Additional wiring and phone outlets were required, but that was the extent of remodeling costs. The area was already air conditioned.

## Acquisitions

Although we have not yet completed the design of the display and print formats, nor the detailed procedures for staff use of the system, I will cover in a general way the procedures which will be followed in processing materials, to present an idea of how the system will work from a librarian's point of view. (The design of the system is covered by Lourey elsewhere in this volume.)

Starting with a request to order a book, the acquisitions assistant will first check the systems files to see if the item has already been requested, ordered, received, or cataloged. (Until such time as the entire card catalog is on-line, we will have to check the card catalog either before or after searching the automated file to avoid possible duplication.) To access the system, the acquisitions assistant enters an identification code on the CRT terminal and indicates which file she wants to see. For a book request she will search the file by either author, title, series, or LC or International Standard Book Number to see if the title is in the file. If she does not find it, she can then proceed to enter the request into the system. Figure 1 shows a screen display for a monograph order. This display and figure 2 illustrate the different data

```
NAME:   Isaacs, Nathan
        1928 -

Title:  (Specify main title 1, additional titles 2) 1. Brief introduction
        to Piaget; the growth of understanding in the young child

Title:  2.  Growth of understanding in the young child
Edition:  2nd ed.
Place:  New York
Publisher:  Agathon Press
Date:  [c1974]
Collation:  121 p.
Notes:  Earlier ed. has title:  The growth of understanding in the young child
Dashed on Entry:
Notes:
L.C. Subject:
MeSH Subject:  Child psychology
MeSH Subject:  Mental processes - in infancy and childhood
MeSH Subject:  Piaget, Jean, 1896 -
Lib. Status:  R (Req)                              Destination:  B
Verification Source:  NLM
CIP Pub?:  Yes                              Expected date:  9/74
Claim Dates:  1. _____ to:  _____
              2. _____     _____
              3. _____     _____

Requestor's Name and Address:  Dr. Ossey
                               Box 430
                               Mayo

Record Numbers and Order Information:  Order No. _____
                                       ISSN         0
                                       ISBN 0-87586-029-X
                                       LC 75-168547
                                       Pub. Cat. No. _____  Item No. _____
```

**Fig. 1. Screen Display for a Monograph Order**

```
Vendor's Name:   Login

No. Copies:  1                No. of Vols.:

List Price:  $4.95

Order Notes:

Subaccount:  201

Fund:  (specify if other than state)

Donor:

Type of Item:  M
          (M = Mono   S = Ser.   C = Cont.   D = Doc.   DS = Doc. Ser.)

Category:   N
          (N = New book   AC = Added copy   AE = Added edit   AV = Added val.
          R = Replacement)
Payment:    N
          (N = New   SO = St. Ord.   G = Gift   E = Exch.   M = Memb.
          X = Paid as part of other order   DA = Deposit account)

Invoice No.:   34568                              Date:    11/12/74

University No.:   845967

Expenditure:
```

**Fig. 2. A Continuation Screen Display for a Monograph Order**

elements in the book ordering portion of the system. These are not the way
the final display formats will look, however, since a series of displays for this
information will be used. The acquisitions assistant inputs data into the
system by filling in the information, such as name, title, publisher, place, etc.,
and selecting from a list of data categories, such as type of item, category, or
payment.

If the acquisitions assistant has full cataloging information available, she
will enter all the information that she has, including a verification source, and
will indicate that the status of the record is a request. If the information she
has is incomplete, she can enter what she has and collect the rest of the data
and add it later. When the record is complete, the acquisitions librarian will
call up the record, possibly correct or add information, such as the vendor or
fund number, and indicate that the item is ready for order.

On a regular basis, the system would print out purchase orders, either
on a purchase order form or possibly in a list by dealer. Initially the purchase
orders will be printed on the system's high-speed printer, but eventually we
hope to have a slow-speed, remote printer adjacent to the acquisitions
terminal so that purchase orders could be printed whenever the librarian
wanted them, with rush orders printed on demand. The system would update

the accounting records, encumber funds, and adjust financial records whenever orders were generated.

When the book and invoice are received in the library, the record is again called up on the screen and additional information added to it, such as price paid, invoice number, and university number (see figure 3). The invoice is then cleared for payment and the book is ready to go to cataloging.

```
Isaacs, Nathan, 1928
        Brief introduction to Piaget; the growth of understanding in
        the young child.  New York, Agathon Press, c1974.
        0-87586-029-X  75-168547
                    Correct book?  Enter Y or N

Y

Library Status:  Received/approve invoice

List Price:  $4.95

Subaccount:  201

Fund:  State

Type of Item:  Monograph

Category:  New book

Payment Type:  New

Invoice No.:  34565

Date:  11/12/74

University No.:  845967

Expenditure:  $5.50
```

**Fig. 3. Screen Display for Clearing Monograph Order for Payment**

## Cataloging

When the cataloger gets the book, she calls up the same data on the screen to see if the cataloging information is correct but now the acquisitions data is formatted for the cataloger (see figure 4). The data which are missing in the record, for example the size of the book and call number in figure 4, are added and the record is checked for accuracy. Cataloging worksheets would be printed on demand to provide the cataloging staff with a means to collect data from other sources, such as from the card catalog, shelflist, subject authority, LC catalogs, etc. The cataloging assistants would probably do most

```
Personal Name:   Isaacs, Nathan, 1928 -

Title:    1.   Brief introduction to Piaget; the growth of understanding
               in the young child
Title:    2.   Growth of understanding in the young child
Edition:   2nd ed.
Place:   New York
Publisher:   Agathon Press
Date:    [c1974]
Collation:   121 p.
Size:    ̲ ̲ ̲ ̲ ̲ ̲
Notes:    ̲ ̲Earlier ed. has title:   The growth of understanding in the
         young child

MeSH Subject:    Child psychology
MeSH Subject:    Mental processes -- in infancy and childhood
MeSH Subject:    Piaget, Jean, 1896 -
Destination:   3
Call No.:        ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲

ISBN 0-87586-029-X
LC 75-168547
Language of pub.
Orig. Lang. of pub.
Country of pub.
```

**Fig. 4. Screen Display of a Catalog Record for Data Entry and Editing**

of this work and the cataloger would edit the final cataloging record for accuracy. She would check the final record which would appear in a format similar to figure 5. If the cataloging record was incorrect, the cataloger would add or correct data as required. If the record was correct, or after it was corrected, she would so indicate on the terminal, and a slow-speed, remote printer which would sit beside the cataloger's terminal would print out a complete set of cards in upper and lower case and with all diacritical marks required to meet full ALA cataloging standards.

## Serials

New journal arrivals would be checked in by the serials assistant by calling for a display of a check-in record for the title in hand using a title search key, i.e., the first few letters of the first words in the title.

The serial check-in record would indicate which issues were predicted to arrive, which issues claimed or ordered, and which volumes were at the bindery (see figure 6).

The display format for serials check-in has not yet been designed and would not be the same as illustrated in figure 5, but the data elements would be the same. Figure 5 shows two predicted issues, and one that has been

```
Final card proof (unit card)

        If incorrect request --
            return to cataloging proof
        If correct request -- print cards


610.4   Isaacs, Nathan, 1928 -
Is2a        Brief introduction to Piaget;
        the growth of understanding in
        the young child.  2nd. edition.
        New York, Agathon Press [c1974].
            121 p.  23 cm.


            Earlier edition has title:
        The growth of understanding in the
        young child.


1.   Child psychology.   2.   Mental pro-
cesses -- in infancy and childhood.
3.   Piaget, Jean, 1896 ▾          Title.
Title:   Growth of understanding in the
young child.

ISBN 0-87586-029-X     75-166547
SRN 0000287
```

**Fig. 5. Screen Display for a Catalog Card Record
for Proofreading Before Cards are Printed**

American Journal of Diseases of Children

| Ser. | Vol. | Issue | Part | Date | Loc. | Circ. | Cat. | Disp. |
|------|------|-------|------|------|------|-------|------|-------|
|      | 126  | 6     |      | Dec 1973 | CPR-011 | 5 | S | Claim |
|      | 127  | 3     |      | Mar 1974 | CPR-011 | 5 | S |       |
|      | 127  | 4     |      | Apr 1974 | CPR-011 | 5 | S |       |

**Fig. 6. Screen Display for Serials Check-in Record**

claimed. The check-in procedure would consist of entering an abbreviated code for each issue which matches the predicted issue. If a date or issue number were different than predicted, the record could be corrected on the CRT terminal and the prediction of the next issue would be adjusted automatically. When a journal is checked in, the holdings statement for that title would be automatically updated.

## Binding

The system would produce lists of materials ready for binding for the binding assistant to use for collecting journals from the stacks. The binding information and instructions would be displayed in a way similar to figure 7.

| European Journal of Pharmacy | | | | | | | |
| Vol. | Date | Title Page | Index | Tab. Cont. | Loc. | Circ. | Disp. |
| 23 | 1973 | First | Last | None | 053 | 5 | Bind |
| 24 | 1973 | First | Last | None | 053 | 5 | Bind |

**Fig. 7. Screen Display for a Serial Binding Record**

If the volume collected for binding was complete, a code would be keyed in on the terminal. The system would then print out binding instructions forms, either upon demand or periodically. The serials holding record would be adjusted to indicate that the particular volume was at the bindery. When the bound volume was returned from the bindery, it would be checked in through the serials check-in procedure in the same manner as a new journal issue arrival. This operation would be very similar to our present bindery operation except that it would use an on-line visual screen rather than printed listings.

## Reference

The reference librarians would be able to search the acquisitions and cataloging files in response to a patron request to see if an item was on order or in process, or if the cataloging had been completed. If necessary, the reference librarian can add the name of the patron to the record so that he would be notified when the book was received and cataloged.

As cataloging records are completed and added to the file, an on-line catalog would be built up which would be searchable by author, title, series, call number, and subject, or in any combination of these elements. Eventually we would hope to convert the records in the card catalog to provide a complete on-line catalog, but this will have to wait until funds are secured.

Serials would probably be the most common record called up at the reference desk. Figure 8 illustrates a display of serials record showing complete holdings, both bound and unbound, indicating that the one issue has been claimed, and which is expected next. Volumes at the bindery would also be displayed in this record. Printed lists for patron use would be run periodically.

```
American Journal of Diseases of Children


Copy 1.   Bound holdings:  V.1-125 (1911 - Jun 1973)
          Unbound holdings:  V. 126 no. 1-5 (Jul 1973 - Nov 1973)
                             V. 126 no. 6 (Dec 1973) claimed
                             V. 127 no. 1-3 (Jan 1974 - Mar 1974)
          Next expected:  V. 127 no. 4 (Apr 1974)


Location:  Current issue in Current Periodical Room
           Stack 011
```

**Fig. 8. Display of a Serials Record for Reference**

## Circulation

A circulation system will be developed for the mini system, but we will not be able to put it into full operation because we do not have funds for converting back records. We plan to develop the system just the same and use it for the reserve collection until it can be expanded to a full circulation system. The circulation system would use bar-encoded labels which would be affixed to the book or journal and to the borrower's ID card. A book would be checked out by passing a light-sensitive wand reader over the label on the book and the label on the borrower's ID card.

The circulation system is planned to handle overdues, fines, recalling of materials, statistics, and all circulation file management functions. We plan to link the wand reader to a CRT terminal so that records could be displayed, if desired, as materials are checked out. For example, if the borrower had materials overdue this could be displayed on the screen to remind him that they should be returned.

## Potential Future Developments

The project has one more year to go before it becomes operational. The project has opened up many new opportunities for further systems development; one of the most promising is the potential for linking minicomputers together so that one library would be able to gain access to the records of another and vice versa. For example, if a search of the journal file in one library did not locate the title wanted, the system could automatically switch to a sister library, or to another library in a network, to see if it held the title wanted, and so on in a round robin search of linked systems. This problem is beyond the scope of the project, but it illustrates a potential of the minicomputer for regional library networks.

Another potential future development, mentioned above, would be to put the complete card catalog records of the Bio-Medical Library into the system. A preliminary analysis of this problem has been completed and an estimate has been made that it would cost $144,000 to add the 230,000 volumes in the library to the system. These costs would include staff and purchase of additional disks and terminals.

The system also has the potential to maintain a full-scale management information system for the library. If the total library records were in the system, statistics on all library operations could be readily collected, such as circulation statistics by subject category and type of user which could be related to costs of purchasing and servicing materials. This would enable the system to determine the costs for providing service to different kinds of users or for different subject areas. The management system could also help determine where duplicate titles were needed, what parts of the collection needed further development, which titles should be retired to storage or withdrawn, which user groups were putting heavy pressure on the library's resources and which are not. It could also provide information on peak periods of use and provide a variety of data to justify and defend budget requests and allocations.

The minicomputer should reduce costs of library automation to the point where libraries of reasonable size can afford their own system. Both equipment and software, tailored to the particular needs of a library, should be available as a package in the not-too-distant future so that a library could purchase a complete system and avoid expensive developmental costs.