MARCIVE: A Cooperative Automated Library System

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The MARCIVE Library System is a batch computer system utilizing both the MARC tapes and local cataloging to provide catalog cards, book catalogs, and selective bibliographies for five academic libraries in San Antonio, Texas. The development of the system is traced and present procedures are described.

Batch retrieval from the MARC records plus the modification of these records costs less than twenty cents per title. Computer costs for retrieval, modification, and card production average sixty-six cents per title, between seven and ten cents per card. The attributes and limitations of the MARCIVE system are compared with those of the OCLC system.

In San Antonio, Texas, a unique cooperative effort in library automation has developed, involving the libraries of five diverse institutions: Trinity University, The University of Texas Health Science Center at San Antonio (UTHSCSA), San Antonio College (SAC), The University of Texas at San Antonio (UTSA), and St. Mary's University. These institutions are utilizing the MARCIVE Library System which was developed by and for one library, that of Trinity University. The MARCIVE system is a batch, disc oriented computer system utilizing both local cataloging and the MARC tapes to produce catalog cards, book catalogs, selective bibliographies, and other products.

DEVELOPMENT

The Trinity University Library has been involved in library automation since 1966.[1] When the library reclassified its collection from Dewey to the Library of Congress classification in 1966, a simplified machine-readable format was developed and used for storage on computer. This format contained the following bibliographic elements: accession number, call number, author, title, and imprint date. In 1969 the library decided to reformat the computer data base into a MARC II compatible format in order

to build a data base of bibliographic records that could be the basis for all future automated systems within the library. The resulting system, MARCIVE, was designed jointly by the head cataloger, Ruby B. Miller, and the library programmer, Paul Jackson, a graduate student in Trinity's Department of Computer Science. Since in 1969 literature on completed library automation projects was sparse, no other system was used as a guide. The MARCIVE format was based on the designers' interpretation of the 1969 edition of the MARC manual.

The name, MARCIVE, evolved when the programmer facetiously claimed that his format was so advanced he would call it the MARC IV format. The computer room operating staff, ignoring the space between the MARC and IV, combined the two, producing MARCIV. An E was added later for ease of pronunciation.

The MARCIVE system was designed initially as a system for data storage and retrieval. The UPDATE, SELECT, and ACQUISITIONS LIST programs were operative in September 1970. The next month UTHSCSA inquired as to the possibility of producing catalog cards as part of the MARCIVE system. Within the brief span of three months, by January 1971, Trinity University Library produced 4,289 catalog cards and UTHSCSA produced 1,719 catalog cards via MARCIVE. In February 1974, the five participating libraries produced a total of 29,000 catalog cards, with Trinity accounting for 10,740 cards.

Continued development of the MARCIVE system was delayed in 1971 by changes in Computer Center personnel and equipment. In 1972 new programs were developed to incorporate the MARC tapes into the MARCIVE system. The size of the MARC data base, which is now held on three discs, was a major problem. Modifications were included to accept input from magnetic tape and typewriter terminals using the APL language as well as keypunched cards. The original restriction of the system to classifications with one to three alphabetic letters followed by numbers, such as used by LC and NLM, was modified to accept Dewey Decimal Classification to accommodate San Antonio College. This restriction had been incorporated in an attempt to insure that the call number would be properly formatted, thus simplifying retrieval in the SELECT program and grouping in the ACQUISITIONS LIST and UPDATE programs.

COMPUTER CONFIGURATION

The MARCIVE system is a disc oriented system which was programmed for an IBM 360/44 using the MFT operating system. This computer model was designed for scientific programming and was manufactured in limited quantities. The programs were written in basic assembly language since adequate higher level language compilers for the 360/44 were not available at the Trinity Computer Center. In 1971 the programs were converted to run under DOS, and in 1972 they were converted for processing on the IBM 370/155 using the OS processing system. Since the initial pro-

grams were written in basic assembly language, the subsequent programs have also been written this way.

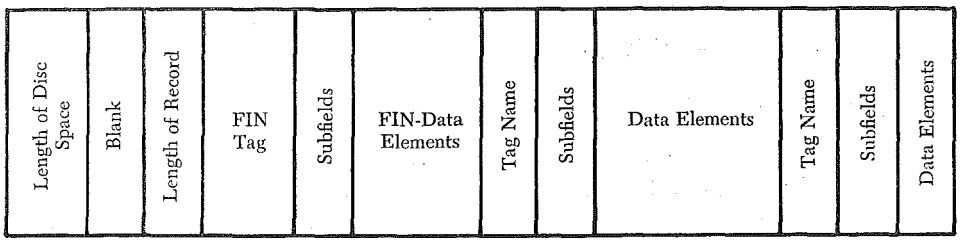
MARCIVE FORMAT

The MARCIVE format is an adaptation of the MARC II format. The definition of the MARC II format is a ". . . format which is intended for the *interchange* of bibliographic records on magnetic tape. It has not been designed as a record format for retention within the files of any specific organization . . . [it is] a generalized structure which can be used to transmit between systems records describing all forms of material capable of bibliographic descriptions . . . the methods of recording and identifying data should provide for maximum manipulability leading to ease of conversion to other formats for various uses."[2] Adaptation of the MARC II format is common among users. An analysis by the RECON Task Force found much variation among the use of the fixed fields, tags, indicators, and subfields.[3] The OCLC system can regenerate MARC II records from OCLC records although they contain only 78 percent of the number of characters in the original MARC II record.[4]

The developers of the MARCIVE system studied the MARC manual and decided that the leader and directory were not necessary for program manipulation. Such information can be generated by a conversion program. The MARC mnemonic codes were chosen instead of the numeric ones because all bibliographic data were being coded locally and it was felt that mnemonics would be easier to work with. The mnemonic codes are the ones designated in the MARC manuals except that "SI" was substituted for "SE." Rules for assigning indicators, subfields, and delimiters are those described by MARC.

The basic structure of the MARCIVE format is illustrated in Figure 1. The differences between MARCIVE and MARC are as follows:

1. MARCIVE's leader consists of three fields: length of disc space, status code, and length of record. In converting MARC the following elements of the MARC leader are incorporated in the MARCIVE leader fields: length of disc space, status code, and length of record.
2. MARCIVE does not contain the MARC record directory, but rather places the tags and subfield codes in front of the actual data.
3. In the conversion from MARC II to MARCIVE, fixed fields such as date of publication are omitted.
4. All data elements in MARCIVE are treated as variable tags even though they contain fixed field data.
5. MARCIVE uses the mnemonic code names for the input of data rather than the numeric MARC codes. For example "MEP" is used for coding a person as main entry rather than "110." The mnemonic tag names are stored in the machine format and not the numeric MARC tags.



Length of disc space. This identifies the number of seventy-two byte blocks a record uses. The MARCIVE records average 350 characters or three to six blocks.

Blank. This field is used by the UPDATE program.

Length of record. Identifies the actual number of characters a record contains.

FIN tag. This is the MARCIVE control tag and must precede each record. It contains four subfields: accession number, type of material, location of material, and call number.

Tag name. After the FIN tag, any of the MARCIVE tags may be input as long as they conform to the proper sequence (i.e., main entry must precede title). Each tag is followed by its subfield codes and the data elements.

Fig. 1. MARCIVE Format Structure.

6. All first indicators are input except for the first indicator in the contents note.
7. Most of the second indicators are not input, except for the filing indicators which are included in the MARCIVE format.
8. MARCIVE adds one variable tag to the MARC format called "FIN." It serves the function of the MARC 090 local holdings tag. The FIN tag must be the first variable tag in each MARCIVE record and must contain four data elements: (1) accession number; (2) type of material code (monograph, serial, etc.); (3) location of material within library (reference, reserve, etc.); (4) local call number.

Even though MARCIVE is not a pure MARC format, there has been an attempt to code most of the data elements into MARCIVE. A MARCIVE to MARC conversion is being written by one of the MARCIVE libraries in order to merge its MARCIVE data base with a purchased MARC data base.

MARCIVE MASTER DATA BASES

Each of the MARCIVE users maintains a separate data base of its holdings, which is called its MARCIVE master. This master file contains a complete bibliographic record for each title cataloged by the library, including MARC cataloging and local cataloging. When a library modifies a MARC record, the modified record is recorded in that library's MARCIVE master. The various libraries' MARCIVE masters have not been merged, although this is being considered. Each library has prefaced all of its accession numbers with a unique library code just in case a merged data base is desired.

MARC-CON DATA BASE

The largest data base in the system is the MARC-Converted data base,

hereafter referred to as MARC-CON. This data base contains only pure MARC data that have been converted into MARCIVE machine format. No original cataloging or local modifications of MARC are contained in the MARC-CON data base.

MARCIVE PROGRAMS

CONVERT—This program reformats the weekly MARC tapes into the MARCIVE machine format.

MARC-UPDATE—This program merges the weekly converted MARC tape with the MARC-CON disc file. An index sequential (ISAM) file containing LC card number, fifty characters of the title, and the disc address of the MARC record is generated. The ISAM file is in LC card number order. In 1974 the MARC-CON data base filled three 3330 disc packs. There are three tape back-up files: one file consisting of original MARC records, one of the MARC-CON records, and a third with the ISAM file. Deleted records and replaced records are annually purged from the MARC-CON files. A new set of back-up tapes for the disc packs is created every three months in order to facilitate regeneration of the disc packs should damage occur.

MARC-LIST—This program lists MARC records in title sequence from the tape. Once every six to eight weeks the list is cumulated and printed. These lists are used for searching until the annual cumulation of the *NUC* is received. This provides current listings of records on the MARC tapes that are not easily available in the *National Union Catalog*. This listing will be eliminated in 1974, when access by title to the MARC-CON data base is available.

MARC-SEARCH—This program searches for LC numbers on the MARC-CON file using the ISAM file. A file of the matched records is produced on tape or disc as specified along with a listing of these records. This listing contains the MARC-CON complete bibliographic entry (Figure 2). Although access is currently only by LC card number, access by title algorithm (3, 1, 1) is expected in 1974.

REPLACE—The purpose of this program is to modify MARC-CON records to fit the needs of the individual library. These modifications can be done automatically to all records or on a single record basis by the library. The automatic changes are specified on a control card and include twenty-two options such as assignment of accession number, usage of Dewey class number instead of LC, and changing "U.S." in subject headings to "United States." An example of a single modification would be the changing of a series entry from traced to untraced. Most MARCIVE participants use a combination of automatic and single changes. The output from the REPLACE program may be input to all other MARCIVE programs, such as EDIT, CATALOG CARD, UPDATE, etc.

EDIT—This program verifies the format of the input. Valid tags and subfields as well as correct sequence of tags are checked. Multiple spaces

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LIBRARY CODE    .

        T0000100FIN AB¬PA3877.A1¬D5¬
        T0000102LCN A¬70-022854 ¬
        T0000104LANG A¬eng¬
        T0000106LANT A¬enggrc¬
        T0000108DDC A¬882/.01¬
        T0000110MEPF A¬Aristophanes.¬
        T0000112TILN AC¬Plays;¬newly translated into English verse by Patric Dickinson.¬
        T0000114IMP AABC¬London,¬New York,¬Oxford University Press,¬1970-¬
        T0000116COL AC¬v.   ¬21 cm.¬
        T0000118PRI AA¬LB.0.75 (v. 1)¬($2.95 U.S.)¬
        T0000120SIRU A¬Oxford paperbacks, 216-¬
        T0000122NOC A¬1. Acharnians. Knights. Clouds. Wasps. Peace.¬
        T0000124AEPS ADE¬Dickinson, Patric,¬1914-¬tr.¬


        T0000200FIN AB¬NB1097.W4¬M613¬
        T0000202LCN A¬73-437272 ¬
        T0000204LANG A¬eng¬
        T0000206LANT A¬engita¬
        T0000208DDC A¬731.7/5/096¬
        T0000210MEPS A¬Monti, Franco.¬
        T0000212TIL AC¬African masks;¬[translated from the Italian by Andrew Hale].¬
        T0000214IMP AABC¬London,¬New York,¬Hamlyn,¬1969.¬
        T0000216COL ABC¬3-157 p.¬69 col. illus.¬20 cm.¬
        T0000218PRI A¬15/-¬
        T0000220SIRU A¬Cameo¬
        T0000222NOG A¬Translation of Le maschere africane.¬
        T0000224SUT AZ¬Masks, African¬- Africa, West.¬
```

Fig. 2. SEARCH listing of MARC-CON data.

are compressed to one, implied subfields are added, and a limited number of punctuation marks are generated. Actual bibliographic data are not checked so spelling errors are not detected by the program. Those titles which do not conform to specifications are rejected and an explanatory message is generated. A library may choose one of three forms of listings of output: (1) Full-Edit, (2) Mini-Edit, or (3) Error-Edit. The Full-Edit

```
 950564  FIN¬CB6950564¬M¬RP¬ QS,4,|K49T,1961;¬
 950564  MEPS A¬ KIMBER, |DIANA |CLIFFORD¬
 950564  TIL AC¬|ANATOMY AND PHYSIOLOGY¬ <BY> |DIANA |CLIFFORD |KIMBER
 950564  <ET AL.>¬
 950564  EDN¬14 TH ED. BY |LUTIE |C. |LEAVELL,  <ET AL.>¬
 950564  IMP ABC¬|N.|Y.,¬ |MACMILLAN¬ <1961>¬
 950564  COL A¬779 P.¬
 950564  NOG¬|EARLIER EDS. HAVE TITLE: |TEXTBOOK OF ANATOMY AND PHYSIOLOGY¬
 950564  SUT A¬|ANATOMY¬
 950564  SUT A¬|PHYSIOLOGY¬
 950564  AEPS A¬|LEAVELL, |LUTIE |C.¬
FIN ATLC¬cb6950564¬m¬rp¬QS,4,K49t,1961;¬MEPS A¬KIMBER, Diana Clifford¬TIL
AC¬Anatomy and physiology¬[by] Diana Clifford Kimber [et al.]¬EDN A¬14 th ed.
by Lutie C. Leavell, [et al.]¬IMP ABC¬N.Y.¬Macmillan¬[1961]¬COL A¬779 p¬NOG
A¬Earlier eds. have title: Textbook of anatomy and physiology¬SUT
A¬Anatomy¬SUT A¬Physiology¬AEPS A¬Leavell, Lutie C¬


QS
4          KIMBER, Diana Clifford.
K49t         Anatomy and physiology [by] Diana
1961         Clifford Kimber [et al.]  14 th ed.
             by Lutie C. Leavell, [et al.]  N.Y.,
             Macmillan, [1961]
               779 p.

             Earlier eds. have title: Textbook of
             anatomy and physiology.




             1. Anatomy.  2. Physiology.
             I. Title.  II. Leavell, Lutie C.

6950564                                   MARCIVE

             Anatomy and physiology

             ANATOMY

             PHYSIOLOGY

             Leavell, Lutie C
```

Fig. 3. Full-Edit listing from the EDIT program showing the input, keypunched data, data in MARCIVE file format, data in catalog card format, and tracings.

lists every title processed in the following forms: the input data, the data as retained in the MARCIVE file, the data in catalog card format, and the tracings (Figure 3). The Mini-Edit lists the input for each title and any error messages. The Error-Edit lists only the input form and the error message of those titles which do not conform to specifications.

A library might use the Error-Edit for cataloging data from the MARCON file as the proofreading has occurred after the SEARCH phase. However, for original cataloging in which all data have been input locally, the Full-Edit would be most beneficial.

ACQUISITIONS LIST—This program produces listings arranged by classification in a format suitable for printing on 8½-by-11-inch paper. These listings include the following data elements for each title: main en-

try, title, imprint, collation, call number. The items are sorted by author within classification.

CATALOG CARD—This program produces catalog cards on one-up stock. The IBM TN train is used and the printing is eight lines to an inch. The program has many options including number of cards produced by type of entry, and whether or not the tracings will print on the tops of the cards. The cards may be printed in filing order in the following arrays:

1. Shelflist arranged by call number.
2. Main entry-title-series-added entries in one alphabet arranged alphabetically by the first eight characters of the first word, excluding designated prefixes.
3. Subject entries in one alphabet arranged alphabetically by the first eight characters of the first word.

The alphabetizing is intended to be a prefiling aid and not to be used as the absolute filing arrangement since each library adapts the filing rules for its own collection. The cards may also be printed in set order. Examples of typical catalog cards are shown as Figure 4.

BOOK CATALOG I—This is a modification of the ACQUISITIONS LIST program in which the classification does not print. It is used to list faculty publications.

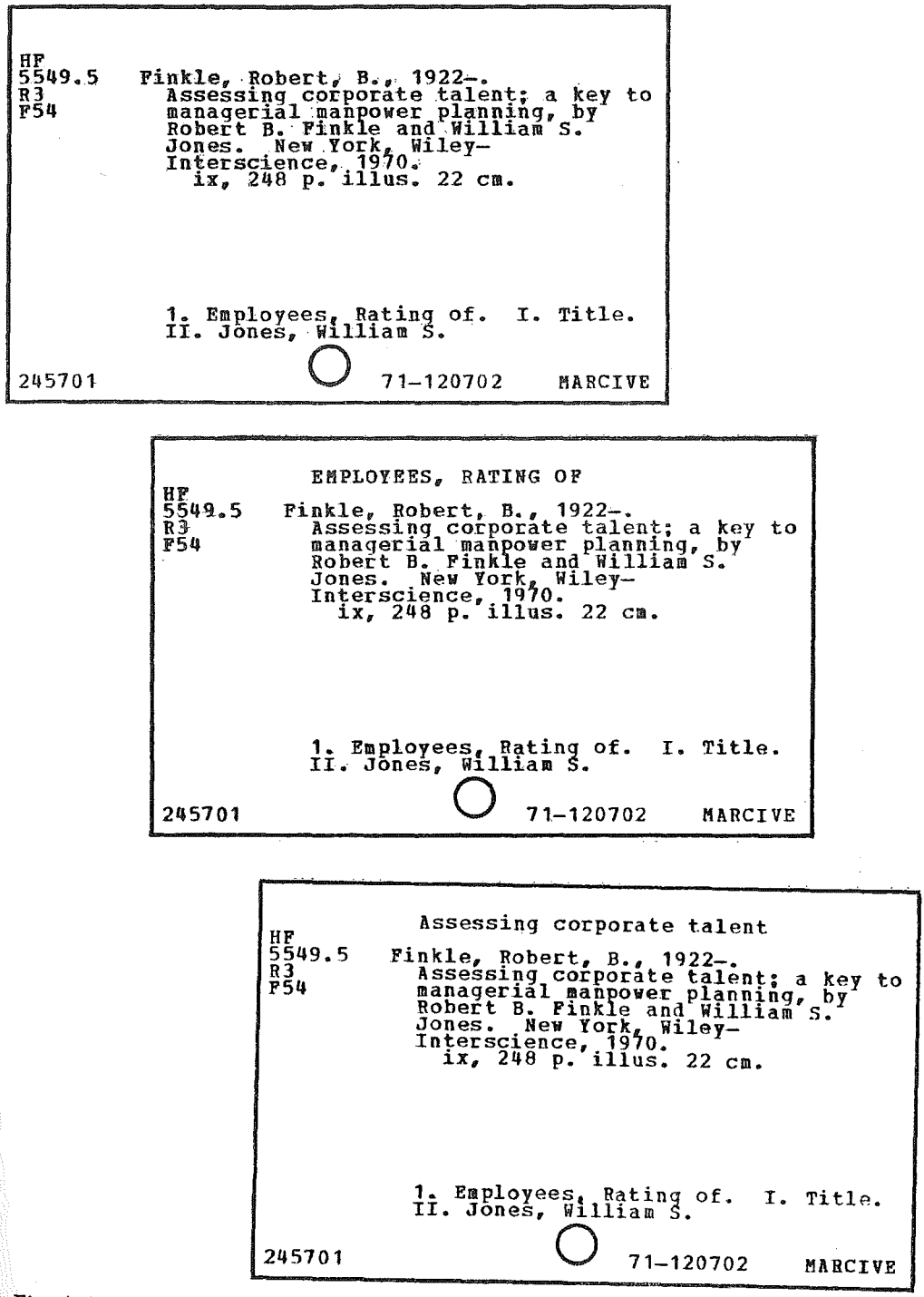
BOOK CATALOG II—This is a modification of the CATALOG CARD program in which the cataloging information is printed with all blank lines compressed. Since it is a variation of the CATALOG CARD, any type of catalog can be created by specifying the type of entry and then having it prefiled accordingly. Trinity produces an author-title book catalog which is used in the interim period between the production and the filing of the catalog cards. Thus, the public has a listing of new titles added to the library.

BOOK CATALOG III—This program generates a book catalog arranged by classification. It is similar to BOOK CATALOG II but tracings are not printed (Figure 5). Indexes by added entry, title, and subject are also generated.

UPDATE—This program merges the additions and deletions to the MARCIVE master file, producing an updated master and a listing in classification sequence of the additions. The MARCIVE master is in accession number order. Duplicate accession numbers are rejected.

SELECT—This program generates bibliographies from the MARCIVE master files (Figure 6). Any tag and its subfields can be searched. The output can be sorted by call number, main entry, title, or any other bibliographic element in MARCIVE. The program can be a powerful search tool for a library. However, the program's method of retrieval is by comparing input data with each record on the file, which can be a very expensive process. There have been discussions of building ISAM files for various points of entry.

BUILD MISAM—This program builds an ISAM file to the MARCIVE



HF
5549.5 Finkle, Robert, B., 1922–.
R3 Assessing corporate talent; a key to
F54 managerial manpower planning, by
Robert B. Finkle and William S.
Jones. New York, Wiley–
Interscience, 1970.
ix, 248 p. illus. 22 cm.

1. Employees, Rating of. I. Title.
II. Jones, William S.

245701 71–120702 MARCIVE

EMPLOYEES, RATING OF

HF
5549.5 Finkle, Robert, B., 1922–.
R3 Assessing corporate talent; a key to
F54 managerial manpower planning, by
Robert B. Finkle and William S.
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Assessing corporate talent

HF
5549.5 Finkle, Robert, B., 1922–.
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F54 managerial manpower planning, by
Robert B. Finkle and William S.
Jones. New York, Wiley–
Interscience, 1970.
ix, 248 p. illus. 22 cm.

1. Employees, Rating of. I. Title.
II. Jones, William S.

245701 71–120702 MARCIVE

Fig. 4. Sample set of catalog cards.

VT
244
-1 THE PHYSICAL examination (Video Tape). Paul Cutler, Dept. of Medicine. San Antonio, The University of Texas Medical School, 1972.
50 min. sd. color.

The complete physical examination is presented and done on a patient in an orderly precise method, systematically covering the general inspection of head, neck, eyes, ears, nose, mouth, glands, chest, lungs, heart, abdomen, external genitalia, rectum, and extremities.

VT
248
-1 MINIMUM dosage - local anesthesia (Video Tape). Astra Pharmaceutical and Adrian Cowan, Dept. of Oral Surgery. Houston, The University of Texas Dental School at Houston, 1965.
45 min. sd. color.

Anatomical drawings and clinical demonstrations are used to show upper and lower incisor, premolar and molar infiltrations as well as palatal injections. Infra-orbital, palatine, mandibular, mental nerve blocks together with anatomical landmarks for each are demonstrated clinically.

VT
248
-2 THE POSTERIOR cervical triangle (Video Tape). Vick Williams, Department of Anatomy. San Antonio, The University of Texas Dental School, 1972.
7 1/2 min. sd. color.

The procedure for the dissection of

115

Fig. 5. Page from UTHSCSA Video Tape Catalog produced by BOOK CATALOG III.

G. MENDEL MEMORIAL SYMPOSIUM, 1865 1965, BRUENN, 1965. PROCEEDINGS, EDITED BY MILAN SOSNA. PRAGUE, ACADEMIA, 1966. 287 P. (SYMPOSIA CSAV) 1. GENETICS CONGRESSES. 2. GENETICS HIST. I. MENDEL, GREGOR, 1822 1884. II. SOSNA, MILAN, ED. III. PROCEEDINGS, G. MENDEL MEMORIAL SYMPOSIUM, 1865 1965.
QH,431,G66P,1965

GALTON, FRANCIS, SIR, 1822 1911. HEREDITARY GENIUS AN INQUIRY INTO ITS LAWS AND CONSEQUENCES. LONDON, MACMILLAN, 1869. 390 P. TABLES (PART FOLD.). 8VO. GARRISON AND MORTON, NO. 226. REYNOLDS HISTORICAL LIBRARY CATALOGUE, NO. 1593.
1. GENETICS. 2. CREATIVENESS. 05 72.
BF,418,G181H,1869

GARDNER, ELDON JOHN, 1909 . PRINCIPLES OF GENETICS. 4TH ED. NEW YORK, WILEY, C1972 527 P. ILLUS. 1. GENETICS. 07 72.
QH,431,G226P,1972

GATES, REGINALD RUGGLES, 1882 . HEREDITARY IN MAN. NEW YORK, MACMILLAN, 1930. 385 P. ILLUS. DIAGRS. 1. GENETICS, HUMAN. 07 72.
QH,431,G259H,1930

GIBLETT, ELOISE R. GENETIC MARKERS IN HUMAN BLOOD. PHILADELPHIA, DAVIS, 1969 629 P. 1. BLOOD CELLS. 2. PHENOTYPE. 3. PLASMA. 4. POLYMORPHISM (GENETICS)
QH,431,G446G,1969

GRUBB, RUNE. THE GENETIC MARKERS OF HUMAN IMMUNOGLOBINS. NEW YORK, SPRINGER VERLAG, 1970. 152 P. ILLUS. (MOLECULAR BIOLOGY, BIOCHEMISTRY, AND BIOPHYSICS, 9) 1. AMINO ACID SEQUENCE. 2. ANTI ANTIBODIES. 3. GAMMA GLOBULIN. 4. IMMUNOGENETICS.
QW,504,G885G,1970

HAMBERT, GUNNAR. MALES WITH POSITIVE SEX CHROMATIN AN EPIDEMIOLOGIC INVESTIGATION FOLLOWED BY PSYCHIATRIC STUDY OF SEVENTY FIVE CASES. GOETEBORG AKADEMIFORLAGET, 1966 98 P. (ST. JOERGEN'S HOSPITAL, GOETEBORG. PSYCHIATRIC RESEARCH CENTRE. REPORTS, 1) 1. MENTAL DISORDERS ETIOLOGY. 2. SEX CHROMOSOME ABNORMALITIES.
QH,431,H199M,1966

HARRIS, HARRY. HUMAN BIOCHEMICAL GENETICS. CAMBRIDGE ENG. UNIV. PRESS, 1962 C1959 310 P. 1. GENETICS. 2. BIOCHEMISTRY.
QH,431,H314H,1959

HARRIS, HARRY. PRINCIPLES OF HUMAN BIOCHEMICAL GENETICS. N.Y., AMERICAN ELSEVIER, 1970. 328 P. (FRONTIERS OF BIOLOGY, V. 19) 1. GENETICS, BIOCHEMICAL. 2. GENETICS, HUMAN. I. HUMAN BIOCHEMICAL GENETICS.
QH,431,H314P,197C

HARRIS, MORGAN, 1916 . CELL CULTURE AND SOMATIC VARIATION. N.Y., HOLT, RINEHART & WINSTON, 1964 547 P. 1. GENETICS. 2. TISSUE CULTURE.
QH,401,H315C,1964

Fig. 6. SELECT listing arranged by main entry. Retrieval was based on call number QH 431, subject "genetics" and "genetics" as first word in title.

data bases by accession number. This ISAM file is then used by the MARCIVE SEARCH program. This ISAM file is built only on demand.

MARCIVE SEARCH—This program searches for accession numbers on the MARCIVE ISAM file. A disc file and a listing of the MARCIVE records is generated. This file can be corrected by using the REPLACE program, thus creating a corrected disc file which can be input into the various MARCIVE programs.

USING THE MARCIVE SYSTEM

The original MARCIVE programs used only keypunched card input. The cataloged data were coded with the MARC mnemonic codes and then keypunched. The resulting decklet of cards was the input to several programs. If in the EDIT program an error was detected, the appropriate punched card could be corrected and the decklet resubmitted to the EDIT program, or that program could be bypassed and the decklet input into the CATALOG CARD program. These same decklets were saved for the monthly acquisition list. They were not stored on disc until recorded on the MARCIVE master disc file in the UPDATE program. Although this may seem awkward, it was easier for the library staff, who thus did not worry about change codes and deletes, but could work with their prime input, the keypunched cards.

The UTHSCSA library still uses the keypunched card method of input, since its cataloging is based on the National Library of Medicine's cataloging. Citations are manually coded with the MARC mnemonic codes at a rate of one to three minutes per title. Keypunching takes approximately five minutes per title and is much easier than typing a catalog card because placement on the catalog card is not a consideration. The keypunched data are input to the EDIT program and the Full-Edit listing is used for proofreading. Correct data are input to the CATALOG CARD program, then saved for input to the monthly ACQUISITIONS LIST and the UPDATE programs.

The other libraries in the MARCIVE system use the MARC-CON portion of the MARCIVE system. With the addition of the MARC tapes it became possible to bypass the coding and keypunching steps, thus saving both time and effort and reducing the chance of error.

At Trinity University Library when books arrive for processing, a library clerk keypunches the LC card number for each book published after 1968. These keypunched cards are then submitted to the MARC SEARCH program. The books are matched against the SEARCH listing of MARC data and any cataloging changes in addition to certain automatic changes are noted on the listing. When the books on a SEARCH listing are checked and classified, the books are sent for further processing for the shelves. Unmatched books are held for later input to the SEARCH program.

The corrected SEARCH listing is sent to the IBM 2741 typewriter terminal operator. The operator types an input file of changes to the MARC

records, such as a series entry change. Trinity uses the following automatic options in the REPLACE program: (1) the call number used is the LC call number without the period; (2) a sequential accession number is generated; (3) the date entered on the file is added to the record; (4) library location code is generated; (5) "U.S." and "Gt. Brit." in subject headings are spelled out.

The change file plus the automatic options control data are transmitted via telephone line to the computer and submitted to the REPLACE program. The REPLACE program modifies the records on the SEARCH file and creates a file of records which can be used by any of the MARCIVE programs to produce catalog cards, book catalogs, or updates to the library MARCIVE master. Since many automatic options have been included in the REPLACE program, the correction required on MARC SEARCH records is minimal and a great many catalog cards can be created with little or no input required from the library.

Books published before 1968, unless one of the MARC popular titles, must be fully coded and input by the Trinity University Library staff. This represents about 25 percent of the books cataloged by the library, with the percentage varying from month to month depending on the cataloging priorities in the department.

Trinity University Library is the only MARCIVE user that inputs via an on-line terminal. This is a much more expensive though versatile method of input. All of the other MARCIVE users who modify MARC SEARCH records follow the same procedure except all input is via punched cards.

One potential MARCIVE user is experimenting with producing catalog cards without any interim editing of the MARC records other than the automatic options available through the REPLACE program. This method of catalog card production is quicker and less expensive and would be useful for many libraries.

BENEFITS

The benefits of the MARCIVE system must be compared to the manual system which it replaced. Clerical staff time to type tracings and call numbers has been eliminated. Trinity has effected major time savings by eliminating the maintenance of proof slips. UTHSCSA has reduced the typical three-week period during which the unit card was reproduced by a commercial firm to one week. The production of the monthly acquisitions list which formerly took days is now accomplished in a matter of minutes. Production of bibliographies is also now an easy task, whereas in the manual phase it was done only by manually searching and copying the card catalog.

UTHSCSA has also utilized the MARCIVE system for the cataloging of local products—the videotapes produced by its television department, the citations of publications of its faculty and staff, and most recently the cataloging of computer assisted instruction programs, a project funded by

the National Library of Medicine. The MARCIVE system was used to produce book catalogs for each of the above.

COSTS

The costs of developing the MARCIVE system were borne by Trinity University Library and the Trinity University Computer Center. There was no outside funding for the development. No records were kept of the computer time used to test the MARCIVE programs since all computer time was charged to a university-wide academic budget. During the various development periods of the MARCIVE system there were never more than 1.5 full-time employees engaged in the project. Table 1 is an estimate of the manpower and time spent in the various phases of the system. The library paid the salary of the librarian and the Computer Center paid the salary of the programmer. MARCIVE evolved as the result of the cooperation of both departments within the university and would not have been possible if the administration had not supported the project.

Table 1. Estimated Time and Manpower Involvement

		Months	*Librarian*	*Programmer/Analyst*
1969–1970	Development	12	.5	.5
1971	Hiatus	6	.5	
1971–1972	Conversion to DOS & OS	9	.25	1.25
1972–1973	Addition of MARC capability	12	.25	1.00
1973–	Maintenance		.25	.25

PRODUCTION COSTS

Charges to a MARCIVE library are presently determined by the number of programs that the library uses and the method of input. A program's cost is based on CPU time, cards read, number of lines printed, and online data storage. Commercial rates which reflect overhead and salaries are used. Method of input can be keypunched cards, typewriter terminals, or magnetic tape.

The computer costs for producing a set of catalog cards depend on the method of input, whether the MARC tapes are searched, which EDIT listing is used, and the length and number of cards produced. An additional $0.02 per card is charged for the cost of card stock and the maintenance of the system. In 1974 this charge will be increased to $0.03 per card to cover the rising costs of paper.

UTHSCSA has kept records of the cost of each computer job since 1971. The average cost per card for 65,217 cards in finished form produced between April 1972 and August 1973 was $0.024 per card. Considering that the average set had ten cards and a surcharge of $0.02 per card was added, the cost for producing a set of cards was $0.44. For the average 400 titles cataloged by UTHSCSA in each month, the MARCIVE system charge would be $246.00. The same input can be used to produce the monthly ac-

quisitions list at a cost of $0.015 per title, or $6.00 per list. The addition of a title to the MARCIVE master disc file is an additional $0.03 per title. An average monthly bill for MARCIVE computer services is $262.00. To this should be added the $40.00 prorated cost of the UTHSCSA keypunch which is also used for other projects, giving a total of $302.00, or $0.755 per title. A library assistant codes and keypunches the data as one half of the job assignment. An average of fifteen minutes per title is involved in the coding, keypunching, proofreading, and handling of data. At a salary rate of $4.00 per hour, this amounts to $1.00 per title. Transportation costs for delivering data average $17.00 per month at $0.10 per mile.

Trinity University retrieves 75 percent of its cataloging data from the MARC tapes via the SEARCH program. The per title cost of this retrieval varies according to the number of items searched and reflects the fact that the more records a computer processes, the less expensive the process becomes. During September 1973 a search of 723 LC numbers resulted in a $0.025 computer charge per retrieved title. A search of 10 LC numbers cost $0.05 per retrieved item. Trinity edits each retrieved title to make local changes and to add an accession number. The average cost for this using the REPLACE and EDIT programs is $0.12. Thus batch retrieval from the MARC tapes combined with the modification of these records costs from $0.145 to $0.17.

THE MARCIVE SYSTEM AND THE OCLC SYSTEM

It is useful to compare the attributes and limitations of the MARCIVE system with those of the Ohio College Library Center (OCLC) system. The two were developed fully independently of one another during the same period of time.[5]

OCLC is an on-line system with access to the cataloging input of its member libraries in addition to the MARC tapes. This access is by author-title and title algorithms in addition to LC number. MARCIVE is a batch system with access to the MARC tapes by LC card number. Even though it is a batch system, the libraries in the MARCIVE system enjoy high priority which enables immediate usage of the computer, and jobs are executed throughout the day. The turnaround time for jobs other than SEARCH is one to two hours. Because of the large size of the MARCCON file, SEARCH programs are executed only at night, so the turnaround could be as much as twenty-four hours.

The importance of the access to the OCLC member libraries' original cataloging in addition to the MARC tapes has not been evaluated. OCLC reports that 71 to 76 percent of new requests run against the MARC file produce hits. An eventual success rate approaching 100 percent was predicted.[6] It would seem that the MARC tapes would be sufficient for all but the larger or more esoteric libraries.

Printed copy is generated from a MARCIVE search of the MARC tapes,

thus allowing a library which does not accept LC cataloging unaltered to do its checking and revising off line. OCLC displays the retrieved item on a CRT screen. Printed copy would be generated only if a special attachment at additional cost could be hooked to the terminal. If a library accepted LC data as displayed, only one retrieval would be necessary. If, however, the procedure was similar to that described by Walsh College Library, two retrievals would be made. In this procedure, some manual transcribing from the OCLC CRT screen is made in order to check the entry in the library catalog.[7] However, OCLC does not presently charge for a retrieval with no other transaction.

The costs for catalog cards produced by OCLC and MARCIVE are similar. Kilgour has reported that OCLC cost for formatting but not printing catalog cards is $0.0221 using commercial rates. A printing cost of $0.0033 was also given.[8] UTHSCSA reports a cost of $0.024 for the average catalog card, including formatting and printing. OCLC charges a fixed price of $0.035 per catalog card.[9] MARCIVE takes the commercial cost of producing the cards and adds an additional $0.02 per card for card stock and system maintenance, thus causing the average card to cost $0.044. In 1974 the surcharge will increase to $0.03 per card to cover the increased cost of card stock, thus causing the average card to cost $0.054.

It is in retrieval charges that a significant difference occurs between the MARCIVE and OCLC systems. It has been difficult for the authors to know the precise costs of OCLC to participants as these vary according to the structure of the agreement and the location. We have chosen to compare the MARCIVE costs to those of the IUC/OCLC system which has recently negotiated a contract. These costs do differ in structure from the OCLC member libraries.

In the agreement between OCLC and the Interuniversity Council (IUC) of the North Texas Area, the charge for service is based upon the calls made upon the OCLC system for *catalog card production where the cataloging data requested are found within the OCLC data bank.* Such a call, referred to as a "hit," is charged at the rate of $0.875. To this must be added such items as leased line costs, terminal hardware and maintenance costs, local training and administrative costs, etc. The total of these costs is approximately $1.70 per hit.[10] No charge is made for retrieval from the OCLC system unless catalog cards are requested, or for material input by the requesting library. If a library were to catalog 1,000 books using retrieved data from the OCLC system, the charge would be $1,700 plus the cost of catalog cards and postage. If a library were to catalog an additional 200 titles not found on the OCLC data bank and input these titles into OCLC, the charge for the 1,200 titles would still be $1,700 plus the cost of catalog cards and postage.

In the MARCIVE system there is a charge each time the MARC tapes are accessed, regardless of whether catalog cards are produced. Retrieval from the MARC tapes via the MARCIVE system costs between $0.025 and

$0.05 per title, depending upon the quantity and percentage of matches in a batched search. Costs vary according to the mode of input from the $80.00 monthly rental for a keypunch machine to the $120.00 rate for an on-line typewriter terminal. Using the maximum $0.05 per title retrieval cost and the $120.00 terminal cost and adding another $0.12 for the REPLACE and EDIT programs, the cost for 1,000 titles is $290.00 plus on-line data costs. Using the minimum $0.025 per title and $80.00 for the keypunch machine and adding the $0.12, the cost for 1,000 titles is $225.00.

Although all the factors which account for this charge variation are not known, the following appear to be significant. First, the costs inherent in an on-line system may be higher than in a batch procedure. Second, the size of the OCLC data base, which in 1972 had 181,209 member records in addition to the 229,807 MARC records, may increase search time and thus costs. Third, overhead costs of the OCLC staff and their developmental projects in other areas may be a factor, although the substantial grant support OCLC has received should have offset some of such costs.

MARCIVE presently serves five libraries within a twenty-minute driving area that are responsible for picking up their own output. MARCIVE has minimal overhead costs. The present pricing structure of the Computer Center has covered its overhead costs. All new development is separately funded. Mrs. Miller's salary has been totally absorbed by Trinity University Library even though she is the MARCIVE liaison for the Computer Center in addition to her responsibility as head of Trinity Library's cataloging department. It is probable that if MARCIVE were to expand the number of participating libraries, additional administrative support would be required. The present pricing structure used by MARCIVE would then be reevaluated.

CURRENT DEVELOPMENTS

Continued development of the MARCIVE system is in progress. One of the MARCIVE libraries is programming a MARCIVE to MARC conversion which will allow it to merge its MARCIVE holdings with a purchased MARC data base. Programming is underway to create book labels. Additional access indexes to the MARC files are also being programmed.

Some procedures which are feasible now were not feasible when the original programs were written. For example, it would be logical for the UPDATE program to generate both an updated master and an ISAM file, instead of the latter requiring the BUILD MISAM program. The CATALOG CARD program will be rewritten for output on two-up card stock using the ALA print train. A union catalog and a joint circulation system for the participating libraries are also possibilities.

In January 1974 the MARCIVE Users' Group was formed as a special interest group of the Council of Research and Academic Libraries. Its purposes are: (1) to share information among users regarding problems, procedures, and needs pertaining to the MARCIVE Library System; (2)

to establish guidelines, standards, and manuals for input, output, and reporting procedures of user libraries; (3) to maintain a sound financial policy for the MARCIVE system; (4) to explore and develop new ideas for programs, techniques, and procedures to further enhance the MARCIVE system; (5) to recommend changes and/or new programs for the MARCIVE system; and (6) to assist libraries in the installation of any MARCIVE programs. A major project of the Users' Group has been the writing of a detailed procedure manual for the MARCIVE system.

CONCLUSION

The MARCIVE system is an excellent example of library cooperation in which the sharing of facilities, interest, and expertise has had great benefit for all concerned. In 1971 only Trinity University and The University of Texas Health Science Center at San Antonio used the MARCIVE system. With the addition of accessibility to the MARC tapes, San Antonio College joined in 1972 and The University of Texas at San Antonio and St. Mary's followed in 1973. One factor which made this cooperation possible was the formation in 1968 of a consortium of libraries in the San Antonio area, the Council of Research and Academic Libraries (CORAL). Its membership is comprised of the academic, public, and special libraries in the area. Another factor has been the Trinity University Library and Computer Center staffs' enthusiasm and graciousness, which have been of great importance in fostering the desire to cooperate. Too many projects fail because of lack of communication between participants. Such communication can be as important a consideration as economic benefit in the decision to enter into a consortium.

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