COMPUTER

CENTRE

BULLETIN

THIS EDITION

September is traditionally the first month of Spring, the season of poets, pastoral melodies, garlands of flowers - and romance. We in the Computer Centre refuse to accept the age-old cleavage between the arts and the sciences, and present to the reader, in this issue, our impression of the Spring activities (and celebrations) of our two computers!

To return from the ozone-blue heights of Spring, the Bulletin also brings to light a case-study of the Computer and its contribution to library work, described by Mr. John Row working in conjunction with the Thatcher Library. Other items of news include the Australian Computer Conference in Adelaide, and a clarification of the new arrangements for clients wishing to consult programmers.

STAFF OF THE COMPUTER CENTRE

In this month's Bulletin, we farewell two members of staff, *Leonard Mor* and *Mrs. Dianne Neill*.

Len, who has been with the Department since April this year as a Senior Demonstrator, has left for England. We wish him "Bon Voyage" and a happy stay.

Dianne was one of the new Machine Operators who were appointed in May. To Dianne, go our sincere wishes for much future happiness.

ADELAIDE COMPUTER CONFERENCE

The chief topic of conversation among both staff and students last month was the Australian Computer Conference held in Adelaide from August 11th - 15th. This was the fourth conference convened in Australia, the first three at Sydney (1960), Melbourne (1963), and Canberra (1966) being sponsored by the Australian National Committee on Computation and Automatic Control.

The Adelaide Conference offered three broad streams of discussion: scientific, technical and commercial. The commercial aspect, in particular, was stressed, each day concluding with a panel discussion of questions arising from the papers delivered. Broadly, the commercial, industrial and management stream researched management information systems, data processing administration, and the application of scientific methods in commerce and industry. The technological side encompassed topics such as hardware, software, and computer languages, while the scientific and professional'stream discussed subjects including simulation, contour mapping,and medical, educational and engineering applications. There was, however, a considerable amount of overlapping and cross-referencing which tended to reduce the effectiveness of these three divisions.

Films were screened on various applications of computing, and several displays of computer components and books were offered for general interest.

The Department of Computer Science was ably represented by two speakers as well as a host of student spectators. *John Noad,* Lecturer in the Diploma in Information Processing, presented a paper entitled *A File Organisation for Single Disk Drive Systems*. On behalf of *Ian Oliver,* formerly a Lecturer in the Diploma in Automatic Computing, *Dick Kelly* presented a paper *Command, File, and Task Structure for a Medium-sized Time-shared System*.

The fifth Computer Conference will be held in Brisbane in 1972. We have merely three years to prepare for an influx of perhaps 2,000 people who must be wined, dined, accommodated, assembled together for lectures and discussions with ease, comfort, and no hint of over-crowding. In the absence of better facilities, we suggest the hire of an air-craft carrier.
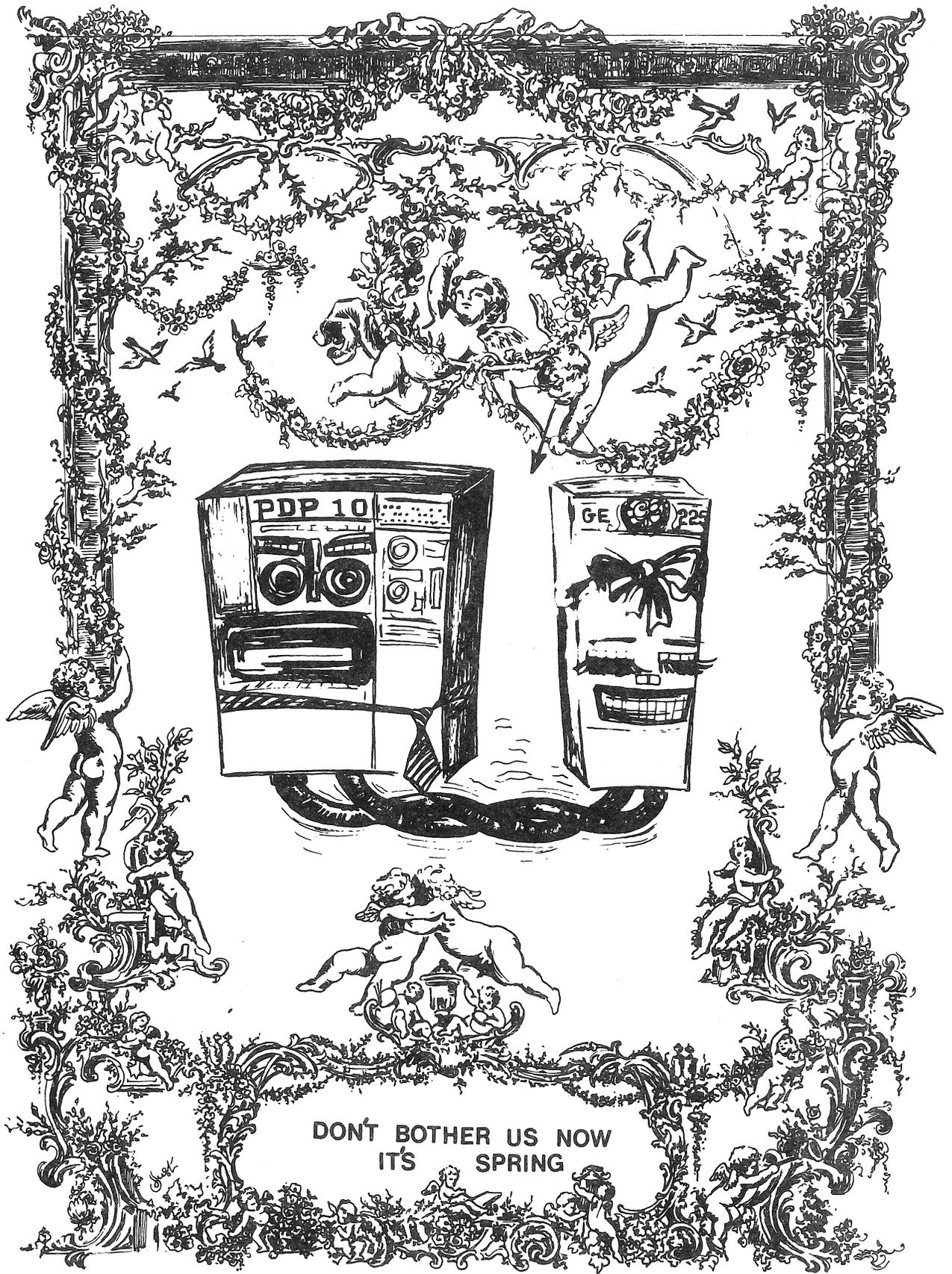
DON'T BOTHER US NOW
IT'S SPRING

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CONSULTATION WITH PROGRAMMERS

Because of the extreme shortage of staff this year, it has been difficult for programmers to set aside specific periods for consultation with clients about their programming problems. As a result, a somewhat confused arrangement has existed for most of the year.

To avoid inconvenience to both clients and programmers, we ask that clients seeking advice first contact the Administrative Officer (Mr. John Jauncey, extension 8471). He will then arrange an appointment with a programmer at a time suitable to both parties.

We hope that this procedure will prevent awkward interruptions, and give the maximum amount of assistance to clients.

PDP 10 FORTRAN IV ERRORS

1. Checking of Array Subscripts

In PDP 10 FORTRAN IV, no check is made of the value of any subscript at execution time. The same situation applies also to the GE 225, but it is interesting to note that in CARD FORTRAN, checking is done for any array reference using more than two subscripts.

In PDP 10 FORTRAN, the use of an out-of-range value may result in the depositing of data outside the addressed array, or, even worse, over program locations. Such an error may not be detected until later in the program where it may manifest itself through improbable results, or as an illegal instruction if the data were deposited in a program location.

To summarize briefly, be on the guard for the three most likely ways in which such an error will be revealed, viz:

(a) an illegal memory reference

(b) an illegal instruction or UUO

(c) invalid results

2.   The use of a function in a Double Precision or Complex array subscript may result in the function name replacing that of a mathematical utility routine such as CFDV used later in the expression. For example, incorrect coding is generated by the following:

```
DOUBLE PRECISION D(5)
R = 1/D (IFIX(R))
```

Thus, never use a function in the subscript of a Double Precision or Complex array.

The problem can be avoided quite simply. The following coding would be acceptable for the above example:

```
I = R
R = 1/D(I)
```


3.   Octal constants greater than 2**35 give a constant overflow message at compilation time when defined in assignment statements.

For example:

```
B = "777777ØØØØØØ
```

The situation can be remedied by using the DATA statement, i.e.,

```
DATA B/"777777ØØØØØØ
```

4.   A literal constant composed solely of two adjacent single quotes, generates
no error and refers to the previous constant generated.

For example:

       A = 'A'
       B = ''

It is advisable to take note of this feature.

       Users are reminded to report any suspected errors to the Administrative
Officer (Mr. John Jauncey, extension 8471).

PROJECT THATCAT

J. Row

BACKGROUND

       This article describes a computer cataloguing project undertaken by
Mrs. J. Guyatt of the Thatcher Memorial Library. The system analysis and
programming were done by the author on a part-time basis while studying towards
the Diploma in Automatic Computing. Mrs. Guyatt has described the Library
aspects of this work in an article to be published this month in the Australian
Library Journal. This discussion will be confined to the programming and
systems aspects of the work.

THE PROBLEM

       The Thatcher Memorial Library provides a library service for the external
students of the University. For a number of years, it has produced a comprehensive,
annotated catalogue to aid external students in the selection of suitable books for
study. The catalogue is intended to substitute, as far as possible, for the

opportunity internal students have of browsing among the shelves of the Library. To accomplish this purpose, the catalogue has three main sections:

(1) AUTHOR LIST has an entry for each book with the following information:

AUTHOR   TITLE   DEWEY NUMBER

(2) DEWEY LIST has an entry for each book:

DEWEY NO.   AUTHOR   TITLE   DATE OF PUBLICATION   NUMBER OF PAGES   ANNOTATION

(3) SUBJECT LIST. Under each subject is a list of DEWEY NUMBERS of relevant books. Subjects can be sub-divided where applicable, and a particular book may be included under a number of subject headings.

A two volume edition was completed in 1965. Since then, supplements have been produced on three occasions. This means that four separate lists might be examined before a particular book is found. The Library staff were then faced with the formidable task of accumulating approximately 25,000 titles, by hand, in the traditional manner:-

1. Sort shelf lists under Dewey Number

2. Type the Dewey List from the shelf cards

3. Sort shelf lists by Author

4. Type the Author List from the shelf cards

5. Sort the shelf list by Subject, one subject at a time, type, sort the next subject, type, etc. (One book may appear under a number of subjects).

Mrs. Guyatt decided to investigate Computer methods.

PROBLEM DEFINITION

At first sight, the problem appeared to be a straight-forward one that would be adequately handled using GECOM and FORWARD-SORT-MERGE Programs on the GE 225. Unfortunately, closer examination revealed a number of difficulties, viz:

1. Most of the information (including keys for sorting) could not be restricted to fixed fields.

2. Field lengths vary dramatically. For example, a particular book might have an annotation 20 lines long (≃2000 characters), or no annotation at all! Most of the relevant fields vary in a similar way. In one notable example, the title of a book extended to 1000 characters, with an annotation a mere 20 characters. (The book itself was only 12 pages.)

3. Difficulty in automating complex library filing (sorting) rules. For example, we are all familiar with a Dewey number of the form

    322.4 PAR

but the following Dewey numbers are also legitimate, and must be sorted correctly to the last level of significance:

    332.6730994 FIT
    810 DICKE(E) 3A BIN
    364.1430973 UNI WAS
    370.10973 DEW 3 WIR

The first (numeric) field of the Dewey number (i.e. the 322.4 part) may also have an alphabetic suffix. These must be sorted in the following way:

    820
    820.9
    829.1
    820A
    820.9A
    820NZ
    820.93NZ

Characters such as "(", ")", ".", "-", have special significance to the computer, and therefore must be eliminated from the sorting key. Clearly, special keys need to be generated in order to obey filing rules. The generation of these keys inevitably requires basic character manipulation at a machine instruction level.

Library staff were adamant that, if the computer could not learn to perform all these tricks, it was no use to them.

From this initial study evolved a set of considerations for the system design:

1. For all purposes, fields should be completely free on input and output and have no practical limit on size.

2. Because of the large amount of information involved, efficiency of input, output, and tape storage is very important.

3. Standard library rules for filing should be obeyed as closely as possible.

4. The Input program should perform extensive error checking and produce meaningful diagnostics.

5. Because of the limitations on character set, attention should be paid to the layout of information on printout, for maximum legibility. The output from the High Speed Printer should be suitable for photographic reduction and direct printing without an intermediate stage.

6. Sorting and Merging should be done by programs generated by the FORWARD-SORT-MERGE package. Sorts should be tape to tape, with minimum complication.

7. Programs should be written in the Assembly Language of the GE 225 (GAP) for maximum flexibility and efficiency.

8. All required character manipulation should be done in the input and output programs which are certain to be bound by slow input/output devices.

DESIGN CONSIDERATIONS

The requirements of the system can be summarized as follows:

1. Produce annually a cumulative catalogue containing the three sections

AUTHOR

DEWEY (ANNOTATED)

SUBJECT

2. At intervals during the year, produce an accession list of all books
    received in the interval between the last accession list or catalogue
    (probably every 3 months). The accession list should have only the Dewey
    section.

3. The process of preparing information for the computer should be part of the
    day-to-day operations of the Library; it should not necessitate a concerted
    effort by a number of staff.

    The three sections of the catalogue are maintained as three separate tape
files which are multi-reel, although initially, a single reel for each file will
be sufficient.

    The system has four broad phases, (see Figure 1):

1. Input
2. Sorting
3. Merging with Master File
4. Output

    When the library acquires a book, a shelf card is created, containing all the
information required for the catalogue. At certain intervals, these shelf cards
are sent to the Computer Centre for punching. The information is punched directly
from the shelf cards onto computer cards in accordance with the card input format.

    When an accession list is required, the cards are run with the input program
to produce an unsorted Dewey tape. This phase is usually repeated several times
until all errors have been eliminated. The tape is then sorted and run with the
Dewey Output Program to produce the Accession List. The tape is not stored for
future use. Tapes and handlers are allocated so that this operation can proceed from
card input to printing in one run. Typically for 2000 cards (about 400 books), this
would take about 14 minutes.

    At the end of the year, all the cards are run with the input program to
produce Dewey, Author and Subject transaction tapes, which, after sorting, can be

merged with the master files. The Output programs then produce the catalogue from the updated master files. Only one Input run should be required at this stage because the cards have been "debugged" and checked on a previous occasion.

Broadly speaking, the design of the system depends very much on the design of the tape formats. A great deal of the work of formatting the catalogue is done by the output programs. The tape formats are designed to increase efficiency in sorting and storage and to preserve the integrity of the information for ease in updating.

INPUT PROGRAM

Here is an example of the cards punched for a particular book:

```
$370.973 KAR/KARIER, C.J./MAN, SOCIETY AND EDUCATION/1967/334//          B763
A HISTORY OF EDUCATION FOCUSED ON THE CONCEPTS OF HUMAN NATURE AND COMMUNIT B764
Y WITH CHAPTERS ON A FASCIST AND COMMUNIST VIEW OF THE FUNCTION OF THE AMER B765
ICAN  SCHOOL AND THE UNITED STATES SUPREME COURT AND EDUCATION.//           B766
EDUCATION/U.S./HISTORY//EDUCATION/PHILOSOPHY///                             B767
```

1. Fields are delimited by /

2. The three main sections of the input are:

        DEWEY NO/AUTHOR/TITLE/DATE/PAGES//
        ANNOTATION//
        SUBJECT ENTRY//SUBJECT ENTRY///

3. The sequence number is used by the input program only as a check of the integrity of cards belonging to a particular book, (e.g. a missing card will produce an error).

4. The $ at the beginning of a book gives a certain amount of redundant checking and allows recovery in case of an error.

5. Words can be split from one card to the next.

6. A field may extend over any number of cards up to 30.

7. There may be any number of subject entries, each delimited by //. (The single / within a subject entry indicates a sub-heading.)

8. There can be up to 2 sub-headings for a subject.

9. Because subject entries are used directly as keys, they are restricted to 45 characters.

The Input Program checks the format of input and rejects any book which has errors. A listing of all input data and error messages, where applicable, is produced. There are 35 different error messages. (See Figure 2 for an example of the input listing.) The special sorting keys are generated and tape records written.

1. Dewey file.

The records are of fixed length (41 word) to simplify sorting.

SORTING KEY	BOOK SEQ.NO.	CARD IMAGE
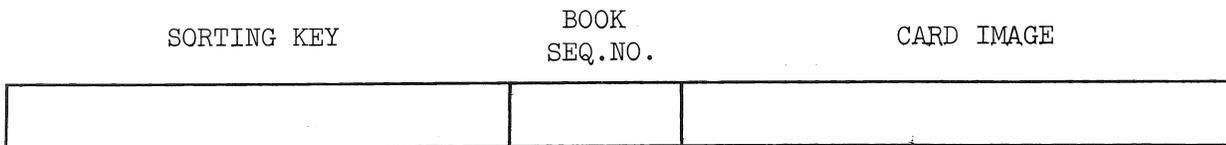
Text information is stored on tape in the same format as input cards. The sequence number ensures that the records belonging to a particular book will remain in the correct sequence after the sort. It is generated by the Input Program and bears no relationship to the card sequence number. A book may occupy as many records as are needed.

2. Author:

Same format as Dewey.

3. Subject

A record is written on the subject tape for each subject entry for each book.

SUBJECT	DEWEY KEY	DEWEY NUMBER
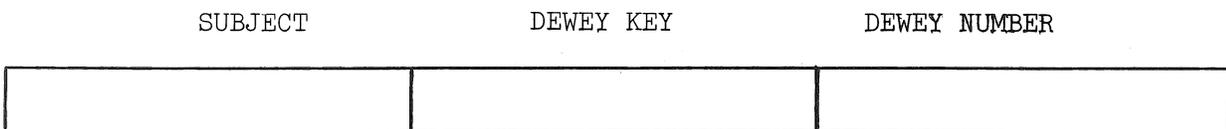
The subject tape must be sorted under subject first, then Dewey number. It is therefore necessary to include the Dewey sorting key. The card image of the Dewey number (with "(", ")", ".", etc.) is also included for final output in the catalogue. All interpretation of subject lists is done by the Output program.

At the end of an input run, a summary of the run is printed.

SORT & MERGE

The SORT and MERGE programs used were generated using the FORWARD SORT MERGE package on the GE 225. They include Input, Output, and Squeeze Coding Elements to check for errors and effect deletions. Sorting times are quite fast. For example, 1200 books sorted in 6 minutes for a Dewey list.

OUTPUT PROGRAMS

The Output Programs do a large amount of the work in formatting the catalogue.

Compacted information from tape is unpacked and reformed to improve readability. Page numbers are also printed. Input from tape is considered to be a string of characters rather than a series of card images. This allows the program to select line lengths, spacings and indentations consistent with readability. Words can be split across records on the tape, but this is not allowed on the printed output. [For each line of output, a line length is found so that the last word is complete. Blanks are then skipped so that the next line is left justified.] In general, the format of the printed page bears no relation to the format on the cards at input.

Available page space is also checked so that the entry for a book is not split over two pages. If there is insufficient room for an entry, a new page is started. (For examples of the Author, Dewey and Subject listings produced, refer to Figures 3, 4 and 5 respectively.)

In particular, the Subject Output Program does a lot of work interpreting the Subject file. Sub-headings are placed on a new line, indented depending on the level and preceded by a "-". If more than one book appears under a subject heading, the heading is not repeated. If more than 10 books

appear under a heading, the program looks for a common term in the Dewey number so that a general number covering a group of books can be inserted. Books are grouped under main headings and sub-headings as shown in Figure 5. A broad outline of the unpacking algorithm is given in Figure 6. Use is made of a recursive formatting routine.

CURRENT STATUS

The only part of the system which has not been used at present is the merging section. A catalogue was produced from the books received in 1968. Two accession lists have been produced from the 1969 books, and these will be merged with the 1968 tapes at the end of the year.

CARDS

INPUT

PHASE

INPUT PROGRAM

SUBJECT

DEWEY

(THREE TAPES

WRITTEN)

AUTHOR

LISTING

(ERRORS etc.)

ANY SORTED TAPE

e.g.

UNSORTED

OUTPUT PROGRAM

SORT PROGRAM

SIMILAR PROCESS

FOR AUTHOR, DEWEY

& SUBJECT FILES

CATALOGUE

SORTED

NEW MASTER

MERGE PROGRAM

OLD MASTER

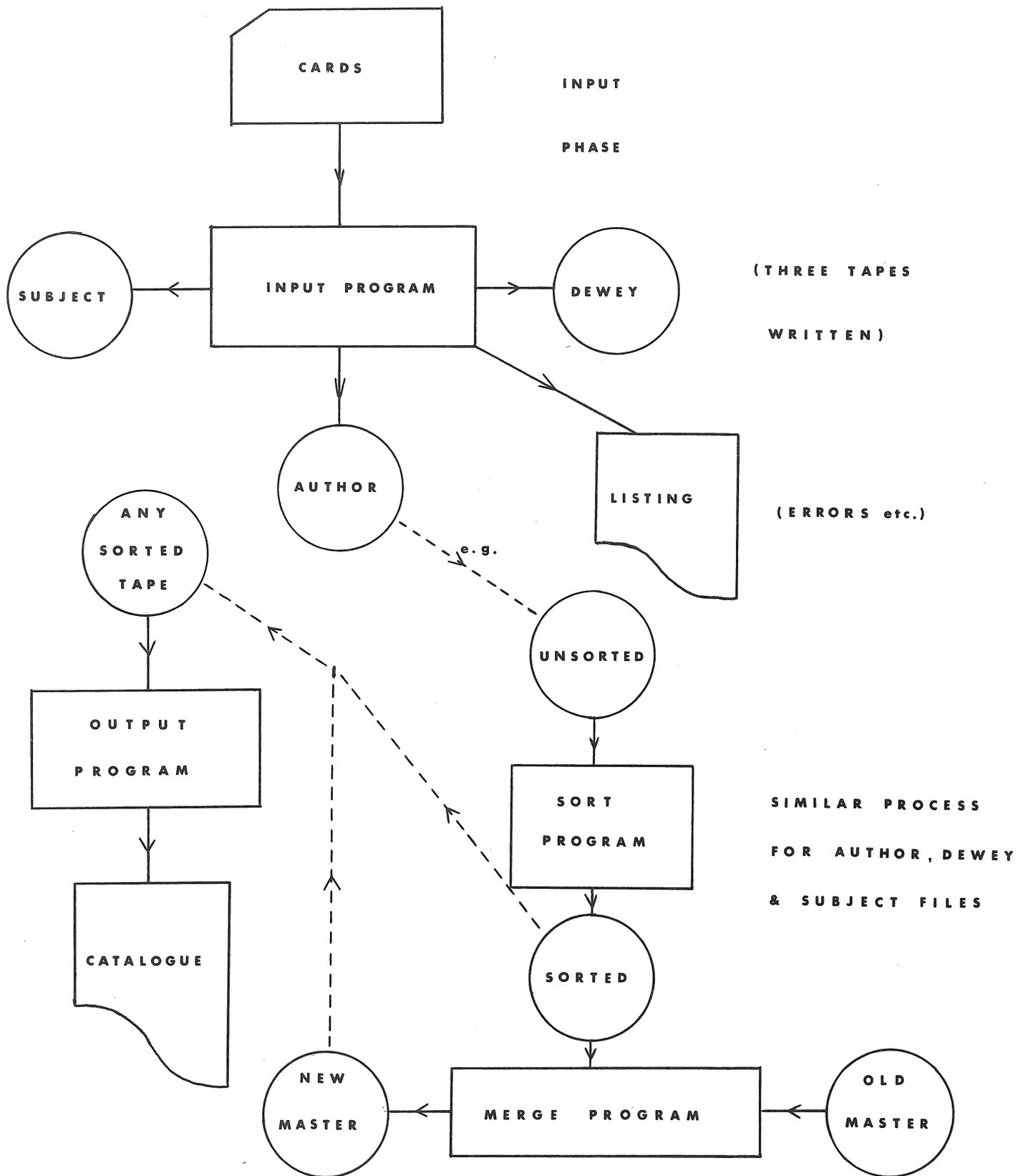FIGURE 1. SYSTEM FLOW-CHART

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$338.1 WIL/WILLIAMS, D.B./AGRICULTURE IN THE AUSTRALIAN ECONOMY/1967/349//   C330
FROM 1788,//   C331
AGRICULTURE/AUSTRALIA//AGRICULTURE/ECONOMIC ASPECTS/AUSTRALIA///   C332

$338.40994 BIR/BIRCH, A./WEALTH AND PROGRESS/1967/190//   C333
THE RISE OF THE BRITISH-AUSTRALIAN SHIPPING TRADE 1810-1827, MACMILLAN. THE   C334
 BATHURST LAND CONVEYANCE COMPANY, 1836-1838, TEALE. BUSINESS AND INVESTMEN   C335
T IN SYDNEY, 1838-1851, DYSTER. THE AUTOBIOGRAPHY OF WILLIAM BROOKES, BIRCH   C336
. THE RISE OF BURNS, PHILP, 1873-1893, BOLTON. JAMES TYSON, DENHOLM. SOME B   C337
ACKGROUND TO THE HISTORY OF A PASTORAL COMPANY, LINTON.//   C338
AUSTRALIA/INDUSTRIES/HISTORY//CORPORATIONS/AUSTRALIA/HISTORY///   C339

$339.3 DEN/DENISON, E.J./WHY GROWTH RATES DIFFER/1967/494//   C340
POSTWAR EXPERIENCE IN NINE WESTERN COUNTRIES.//   C341
EUROPE/ECONOMIC CONDITIONS/1945-   //U.S./ECONOMIC CONDITIONS/1945-   //I C342
NCOME/U.S.//INCOME/EUROPE///   C343

$339.3 USH/USHER, D./RICH AND POOR COUNTRIES/1966/44//   C344
A STUDY IN PROBLEMS OF COMPARISONS OF REAL INCOMES.//   C345
INCOME//COST AND STANDARD OF LIVING//UNDERDEVELOPED AREAS///   C346

$341.184 POL/POLITICAL AND ECONOMIC PLANNING, LONDON/EUROPEAN UNITY/1959/51 C347
9//   C348
A SURVEY OF THE EUROPEAN ORGANISATIONS.//   C349
INTERNATIONAL AGENCIES IN EUROPE//EUROPEAN FEDERATION//EUROPE/POLITICS/1945 C350
-    ///   C351

$347.9 FOR 3 CUR/CURREY, C.H./SIR FRANCIS FORBES/1968/586//   C352
A BIOGRAPHY OF THE FIRST CHIEF JUSTICE OF THE SUPREME COURT OF NEW SOUTH WA C353
LES.//   C354
FORBES, FRANCIS///   C355

$353 STA/STANLEY, D.T./MEN WHO GOVERN/1967/169//   C356
A BIOGRAPHICAL PROFILE OF U.S. FEDERAL POLITICAL EXECUTIVES - PERSONAL AND   C357
OCCUPATIONAL BACKGROUNDS AND TENURE.//   C358
GOVERNMENT EXECUTIVES/U.S.///   C359

$354.42 WIL/WILLSON, F.M.G./THE ORGANIZATION OF BRITISH CENTRAL GOVERNMENT, C360
 1914-1964/1968/521//   C361
THE CENTRAL ADMINISTRATION, 1914-1956. FINANCE, TRADE AND INDUSTRY. LAW, JU C362
STICE AND PUBLIC ORDER. SOCIAL SERVICES. EXTERNAL AFFAIRS. DEFENCE. SCIENTI C363
FIC RESEARCH. COMMON SERVICES. THE CENTRAL CO-ORDINATION OF GOVERNMENT. DEV C364
ELOPMENTS, APRIL, 1955 TO OCTOBER, 1964. THE HANDLING OF ADMINISTRATIVE CHA C365
NGE.//   C366
GT. BRIT./POLITICS AND GOVERNMENT///   C367

$370.1 BAN/BANDMAN, B./THE PLACE OF REASON IN EDUCATION/1967/200//   C368
SEEKS TO DEMONSTRATE THE RELEVANCE OF PHILOSOPHY TO EDUCATION BY UNDERTAKIN C369
G A PHILOSOPHICAL EXAMINATION OF THE QUESTION, WHAT SHOULD BE TAUGHT.//   C370
REASONING//EDUCATION/PHILOSOPHY///   C371

$370.1 PET/PETERS, R.S./THE CONCEPT OF EDUCATION/1967/223//   C372
WHAT IS AN EDUCATIONAL PROCESS, PETERS. THE LOGICAL AND PSYCHOLOGICAL ASPEC C373
TS OF LEARNING, HAMLYN. THE LOGICAL AND PSYCHOLOGICAL ASPECTS OF TEACHING A C374
 SUBJECT, HIRST. CONDITIONING AND LEARNING, VESEY. THE CONCEPT OF PLAY, DEA C375
RDEN. RULES AND ROUTINES, BLACK. TEACHING AND TRAINING, RYLE. PHILOSOPHICAL C376
 MODELS OF TEACHING, SCHEFFLER. INSTRUCTION AND LEARNING BY DISCOVERY, DEAR C377
DEN. LEARNING AND TEACHING, OAKESHOTT. INDOCTRINATION, WHITE. ON TEACHING T C378
O BE CRITICAL, PASSMORE.//   C379
EDUCATION/PHILOSOPHY///   C380

Figure 2. Example of the Listing Produced by the Input Program

BROGDEN, S.	AUSTRALIA & TWO-AIRLINE POLICY	387.720994 BRO
BRONOWSKI, J.	WILLIAM BLAKE, 1757-1827	820 BLAK 3 BRO
BROOKE, S.A.	STUDIES IN POETRY	820.91 BRO
BROOMAN, F.S.	MACROECONOMICS	339 BRO
BROUDY, H.S.	EXEMPLARS OF TEACHING METHOD	370.109 BRO
BROWN, H.	RABELAIS IN ENGLISH LITERATURE	820.9 BRO
BROWN, I.J.C.	DR JOHNSON AND HIS WORLD	914.21037 BRO
BROWN, J.R.	MODERN BRITISH DRAMATISTS	820.92 BRO
BROWN, S.W.	THE SECULARIZATION OF AMERICAN EDUCATION	377 BRO
BROWN, W.R.D.	EXPLORATION IN MANAGEMENT	658 BRO
BRUMBAUGH, R.S.	PHILOSOPHERS ON EDUCATION	370.109 BRU
BRUSENDORFF, A.	THE CHAUCER TRADITION	820 CHAU 3 BRU
BRYAN, W.J.	WILLIAM JENNINGS BRYAN, SELECTIONS	973.91 BRY
BRYER, J.R.	THE CRITICAL REPUTATION OF F. SCOTT FITZGERALD	016.81 FIT 3 BRY
BUCHANAN, D.H.	THE DEVELOPMENT OF CAPITALISTIC ENTERPRISE IN INDIA	338.0954 BUC
BUGG, J.L.	JACKSONIAN DEMOCRACY	973.56 JAC 3 BUG
BULLOCK, H.A.	A HISTORY OF NEGRO EDUCATION IN THE SOUTH FROM 1619 TO THE PRESENT	370.19344 BUL
BUNGE, W.W.	THEORETICAL GEOGRAPHY	910 BUN
BURENSTAM LINDER, S.	TRADE AND TRADE POLICY FOR DEVELOPMENT	382.3 BUR
BURKE, K.	ATTITUDES TOWARD HISTORY	901 BUR
BURK, M.C.	CONSUMPTION ECONOMICS	339.4 BUR
BURLEY, K.	BRITISH SHIPPING AND AUSTRALIA 1920-1939	387.50994 BUR
BURROUGHS, P.	BRITAIN AND AUSTRALIA 1831-1855	994.02 BUR
BURTON, D.L.	TEACHING ENGLISH IN TODAY S HIGH SCHOOLS	420.7 BUR
BUSH, M.L.	RENAISSANCE, REFORMATION AND THE OUTER WORLD, 1450-1660	940.2 BUS
BUSIA, K.A.	AFRICA IN SEARCH OF DEMOCRACY	320.96 BUS
BUSINESS INTERNATIONAL CORPORATION, NEW YORK	WORLD WIDE EXECUTIVE COMPENSATION	658.407 BUS
BUTCHER, M.J.	THE NEGRO IN AMERICAN CULTURE	810.9 BUT
BUTTS, D.	R.L. STEVENSON	820 STEV 3 BUT
BUXTON, G.L.	THE RIVERINA 1861-1891	994.48 BUX
CALIFORNIA. STATE COLLEGE, SAN JOSE, DIVISION OF EDUCATION	TELEVISION UTILIZATION IN THE OBSERVATION PROGRAM FOR TEACHER EDUCATION	371.3358 CAL
CALLEO, D.P.	EUROPE S FUTURE	320.94 CAL
CAMERON, B.	NATIONAL INCOME	339.394 CAM
CAMPBELL, O.J.	THE READER S ENCYCLOPAEDIA OF SHAKESPEARE	850 SHAK 5 CAM
CAMPBELL, R.F.	ADMINISTRATIVE BEHAVIOR IN EDUCATION	371.2 CAM [1]
CAMPBELL, R.F.	INTRODUCTION TO EDUCATIONAL ADMINISTRATION	371.2 CAM [2]
CAMUS, A.	LYRICAL AND CRITICAL	840 CAMU 1B EBS THO
CANADIAN CONFERENCE ON CHILDREN, 2ND, MONTREAL, 1965	ROADS TO MATURITY	301.431 CAN
CAPELLE, J.	TOMORROW S EDUCATION, THE FRENCH EXPERIENCE	370.944 CAP

A-4

Figure 3. Example of Author Listing

370.973 KAR
        KARIER, C.J. *MAN, SOCIETY AND EDUCATION* 1967. 334P.
                A HISTORY OF EDUCATION FOCUSED ON THE CONCEPTS OF HUMAN NATURE AND COMMUNITY WITH
                CHAPTERS ON A FASCIST AND COMMUNIST VIEW OF THE FUNCTION OF THE AMERICAN SCHOOL
                AND THE UNITED STATES SUPREME COURT AND EDUCATION.

370.973 PUL
        PULLIAM, J.D. *HISTORY OF EDUCATION IN AMERICA* 1968. 122P.

370.973 SCO
        SCOTT, C.W. *THE GREAT DEBATE* 1959. 184P.
                PRESENTS FOR THE LAYMAN CRITICISMS OF AMERICAN EDUCATION AND THE RESPONSES THERETO.

370.994 PAR
        PARTRIDGE, P.H. *SOCIETY, SCHOOLS AND PROGRESS IN AUSTRALIA* 1968. 246P.
                SOME HISTORICAL INFLUENCES. THE ORGANISATION OF PUBLIC EDUCATION. SCHOOLS AND SOCIETY.
                THE PATTERN OF HIGHER EDUCATION. TECHNICAL AND ADULT EDUCATION. TEACHERS. EDUCATION
                AND NATIONAL GROWTH.

370.994 TAS
        TASMANIA. DEPT. OF EDUCATION. COMMITTEE SET UP TO INVESTIGATE THE ROLE OF THE SCHOOL
        IN SOCIETY *THE SCHOOL IN SOCIETY* 1968. 7RP.
                THE AIMS OF EDUCATION. GENERALLY ACCEPTED FINDINGS ON CHILDREN AND LEARNING RELATED
                TO THE FUNCTIONS OF SCHOOLS IN SOCIETY. EDUCATIONAL OBJECTIVES AS A GUIDE TO CURRICULUM
                DEVELOPMENT. THE ROLE TO BE PLAYED BY THE SCHOOLS IN A DEMOCRATIC SOCIETY.

370.9946 REE
        REEVES, C. *A HISTORY OF TASMANIAN EDUCATION* 1935. -V..
                STATE PRIMARY EDUCATION FROM 1803 TO 1930.

371.2 GET
        GETZELS, J.W. *EDUCATIONAL ADMINISTRATION AS A SOCIAL PROCESS* 1968. 420P.
                PRESENTS EMPIRICAL RESEARCH DEALING WITH THE RELATION OF EACH OF THE FOLLOWING
                TO ISSUES IN ADMINISTRATION - CULTURAL VALUES, INSTITUTIONAL ROLES, INDIVIDUAL
                PERSONALITIES AND INTERPERSONAL PERCEPTION. FROM THIS ANALYSIS IMPORTANT IMPLICATIONS
                ARE DRAWN FOR COMMUNITY BOARD AND STAFF RELATIONSHIPS.

371.251 SPR
        SPRINGEL, M.J. *A REVIEW OF RESEARCH ON CLASS SIZE* 1964. 321P.

371.254 YAT
        YATES, A. *GROUPING IN EDUCATION* 1966. 314P.
                DESCRIBES AND EVALUATES COMMONLY PRACTISED GROUPING PROCEDURES, DISCUSSES GROUPING
                PRACTICES IN RELATION TO EDUCATIONAL ENDS AND MEANS AND GROUP SIZE AND BUILDING
                DESIGN.

371.26 PHI
        PHILLIPS, R.C. *EVALUATION IN EDUCATION* 1968. 122P.
                HISTORICAL DEVELOPMENT, TESTS AND TESTING, TEACHER-MADE TESTS AND STATISTICS IN
                EVALUATION.

371.3 AMI
        AMIDON, E.J. *INTERACTION ANALYSIS* 1967. 402P.
                CONTAINS SELECTED READINGS ABOUT EARLY AND CURRENT EFFORTS TO CODE VERBAL STATEMENTS
                DURING SPONTANEOUS CLASSROOM COMMUNICATION AND TO COMPARE THE FREQUENCIES OF DIFFERENT
                KINDS OF CODED STATEMENTS TO OTHER MEASURES OF THE CLASSROOM SITUATION.

371.3 CAR
        CARLSON, R.O. *ADOPTION OF EDUCATIONAL INNOVATIONS* 1965. 34P.
                CONCERNED WITH THE QUESTIONS OF RATES OF ADOPTION AND RATES OF DIFFUSION OF NEW
                EDUCATIONAL PRACTICES.

371.3 MEA
        MEANS, R.K. *METHODOLOGY IN EDUCATION* 1968. 122P.
                TECHNIQUES AND PROCEDURES - GROUP, DRAMATIC, STUDENT ORIENTED, TEACHER INITIATED,
                MATERIAL FOCUSED, EQUIPMENT CENTRED.

371.3 MOO
        MOORE, W.G. *THE TUTORIAL SYSTEM AND ITS FUTURE* 1968. 68P.
                PRACTICE AND THEORY.

371.3 OME
        O MEARA, P. *HOW TO STUDY BETTER* 1963. 48P.

371.3 OTT
        OTTO, W. *CORRECTIVE AND REMEDIAL TEACHING* 1966. 377P.
                CORRELATES OF LEARNING DISABILITY. FUNDAMENTALS OF DIAGNOSTIC AND REMEDIAL TEACHING.
                THE CASE STUDY. DIAGNOSTIC TECHNIQUES IN READING. WORD ATTACK SKILLS IN READING.
                VOCABULARY, COMPREHENSION, STUDY SKILLS AND READING RATE. SPELLING. ARITHMETIC.
                HANDWRITING. WRITTEN AND ORAL EXPRESSION. THE REMEDIAL TEACHER.

371.3 RAT
        RATHS, J.J. *STUDYING TEACHING* 1967. 490P.
                READINGS UNDER THE FOLLOWING HEADINGS - WHAT IS TEACHING. INTERACTION IN THE CLASSROOM.
                DECISIONS PLANNING, TESTING AND GRADING. TEACHING METHOD. TEACHING FOR VALUING
                AND THINKING. MEETING THE EMOTIONAL NEEDS OF CHILDREN. DISCIPLINE. MOTIVATING STUDENTS.
                RESEARCH AND TEACHING.

371.3 ROS
        ROSSI, P.H. *THE NEW MEDIA AND EDUCATION* 1966. 417P.
                ESSAYS BY 14 CONTRIBUTORS ON THE CONCEPT OF AN EDUCATIONAL MEDIUM AND TYPES OF
                MEDIA, THE PROBLEM OF THE ADOPTION OF MEDIA IN EDUCATION, MEDIA IMPACT ON EDUCATION
                AND THE IMPACT OF EDUCATION MEDIA AND EDUCATION ON WESTERN SOCIETY.

Figure 4. Example of Dewey Listing

EDUCATIONAL RESEARCH | 370.78 BES
 -METHODOLOGY | 370.18 WIS
 | 370.78 GRO
EDUCATIONAL SOCIOLOGY | 301.15 HOU
 | 370.193 HAN
 | 370.193 KIN
 | 370.193 MAY
 | 370.193 SEX [1]
 | 370.193 SEX [2]
 | 370.193 STA [1]
 | 370.193 STA [2]
 | 370.193 WIS
 | 370.973 WES
 | 373.42 HAR
 | 373.73 ALE
EDUCATIONAL STATISTICS | 370.182 HIL
 | 370.182 MEY
EDUCATIONAL SURVEYS | 370.193 WIS
EDUCATIONAL TESTS AND MEASUREMENTS | 371.26 GRS
 | 371.26 LIE
 | 371.26 LIN
 | 371.26 NOL
 | 371.26 PAT
EDUCATION AND STATE
 -ENGLAND | 370.942 HER
 -EUROPE | 370.94 ADA
 -U.S. | 377 RHO
 -USSR | 370.947 PUD
EDUCATION OF HENRY ADAMS, THE | 973.8 ADA 3 LIN
EDUCATION PHILOSOPHY | 370.1095 MOJ
EDUCATION TESTS AND MEASUREMENTS | 371.26 COL
EDUCATORS, BRITISH | 370.942 STE
EDWARD II, KING OF ENGLAND
 -DRAMA | 430 PREC 20
 | LEPE HEN
EGO (PSYCHOLOGY) | 370.15 BOW
EGYPT
 -ECONOMIC CONDITIONS | 330.962 HAN
 -ECONOMIC POLICY | 330.962 HAN
EICHENDORFF, JOSEPH KARL BENEDIKT | 830 EICHE 3 KUN
ELECTION LAW | 324.2 RAE
ELECTIONS | 324.2 RAE
ELECTIONS
 -U.S.S.R. | 324.47 MOT
ELECTRONIC CALCULATING MACHINES | 510.78 ADL
 | 510.78 HOL
ELEMENTARY SCHOOL TEACHERS | 372.130242 GOT
ELIOT, GEORGE | 820.03 LEW
EMANCIPATION PROCLAMATION | 301.451 COL
EMIGRATION AND IMMIGRATION | 301.32951 FRE
EMIGRATION AND IMMIGRATION LAW
 -AUSTRALIA | 325.94 WIL
EMOTIONAL PROBLEMS OF CHILDREN | 155.924 PRI
EMPLOYEES REP. IN MANAGEMENT
 -GT.BRIT. | 331.152 LAB
ENGLISH DRAMA
 -1500-1700
 -CRITICISM | 820.92 CEE
 | 820.02 KLE
 -19TH CENTURY
 -CRITICISM | 792.09421 REE
 | 820 SHAW 3 FRO
 -20TH CENTURY
 -CRITICISM | 792.0904 TYN
 | 320.92 BRO
 -COLLECTIONS | 820.82 WAT
 -CRITICISM | 820.92 NIC HAR
 | 820.92 WAI
 -HISTORY AND CRITICISM | 792.0942 HAZ
 | 820.92 TAY
 -RESTORATION
 -CRITICISM | 820.92 KRU
 | 820.92 LOE
 | 820.92 MIN
 | 820.92 ROT
 | 820.92 WIL
ENGLISH DRAMA (COMEDY)
 -CRITICISM | 820.92 WIL
ENGLISH DRAMA (TRAGEDY)
 -CRITICISM | 820.92 ROT
ENGLISH FICTION | 809.3 RAL
ENGLISH FICTION
 -18TH CENTURY
 -CRITICISM | 820.93 MAS
 -19TH CENTURY
 -CRITICISM | 378.4257 SPA
 | 820.93 COL
 | 820.93 MAS
 | 820.93 MIL
 -20TH CENTURY
 -CRITICISM | 820.93 CRO
 -CRITICISM | 820.93 DRE
 -HISTORY AND CRITICISM | 809 FOR

ENGLISH LANGUAGE
 -MIDDLE ENGLISH (1100-1500) | 820 CHAU 3 KER
 -RHETORIC | 808.06 BAI
 -STUDY AND TEACHING | 375.82 HOL
 -TEACHING (ELEMENTARY) | 372.6 SMI
 -TEACHING (SECONDARY) | 420.7 BUM
 | 420.712 NAT
 -VERSIFICATION | 426 MACA
ENGLISH LITERATURE
 -1500-1700
 -CRITICISM | 820.9 DOB
 | 820.9 DOW
 | 820.9 JOH
 | 820.9 ROU
 -18TH CENTURY
 -18TH CENTURY
 -CRITICISM | 820.9 DOB
 | 820.9 JOH
 | 914.20375 LEV
 -19TH CENTURY
 -19TH CENTURY
 -CRITICISM | 072 EXA 3 BLU
 | 820.9 HOF
 | 820.9 PRE
 | 823.9 RAL
 | 820.9 STE
 | 820.9 SUS
 | 809 FOX HUD
 -20TH CENTURY
 -20TH CENTURY
 -CRITICISM | 820.9 HAR
 | 820.9 STE
 -CRITICISM | 820.9 NEW
 -HISTORY AND CRITICISM | 801.9 BRE
 | 801.9 VAN
 | 820 SHE(P) 1R
 | PHO MACE
 | 820.9 CHU
 | 820.9 SPI
 -IRISH AUTHORS
 -CRITICISM | 820.9 EUL
 | 820.9 SKE
 -STUDY AND TEACHING | 375.82 HOL
 | 820.9 NEW
 -TEACHING (SECONDARY) | 420.7 BUM
ENGLISH NEWSPAPERS | 070.1 SIE
ENGLISH POETRY
 -19TH CENTURY
 -CRITICISM | 820.91 BRO
 | 820.91 JEN
 | 820.91 KUF
 -19TH CENTURY
 -CRITICISM | 820.91 HAR
 | 820.91 BER
 | 820.91 KUF
 -20TH CENTURY
 -CRITICISM | 820.91 HAN
 | 820.91 JAE
 | 820.91 KUS
 -CRITICISM | 820.91 BAR
 -HISTORY AND CRITICISM | 809 FOX
ENGLISH PROSE
 -19TH CENTURY | 809.3 LEV DAL
ENTREPRENEUR | 338.72 AIT
EPIC POETRY, ENGLISH
 -CRITICISM | 820.91 HAU
ERIKSON, ERIK HOMBURGER | 150.195 ERI 3
 | EVA
ETHICS | 170 BRA
ETHICS, CHINESE | 170.951 FHE
ETHNOLOGY | 301 MAT
ETHNOLOGY
 -CHINA
 -FUKIEN (PROVINCE) | 301.44209512
 | FRE
 -KWANGTUNG (PROVINCE) | 301.44209512
 | FRE
ETHNOPSYCHOLOGY | 150.195 ERI 3
 | EVA
EUROPE
 -HISTORICAL GEOGRAPHY | 911.4 SMI
 -HISTORY
 -1492-1648 | 940.2 LEV
 -1492-1648 | 940.2 RUS
 | 940.2 CAM
 -17TH CENTURY | 940.24 STE
 -18TH CENTURY | 321.6 SAG
 -MIDDLE AGES | 940.17 HAY
 -HISTORY, 476-1492 | 940.1 LOP
 -POLITICS
 -1945- | 320.94 CAL
 -RELATIONS (GENERAL) WITH GT.BRIT. | 942.06 JON
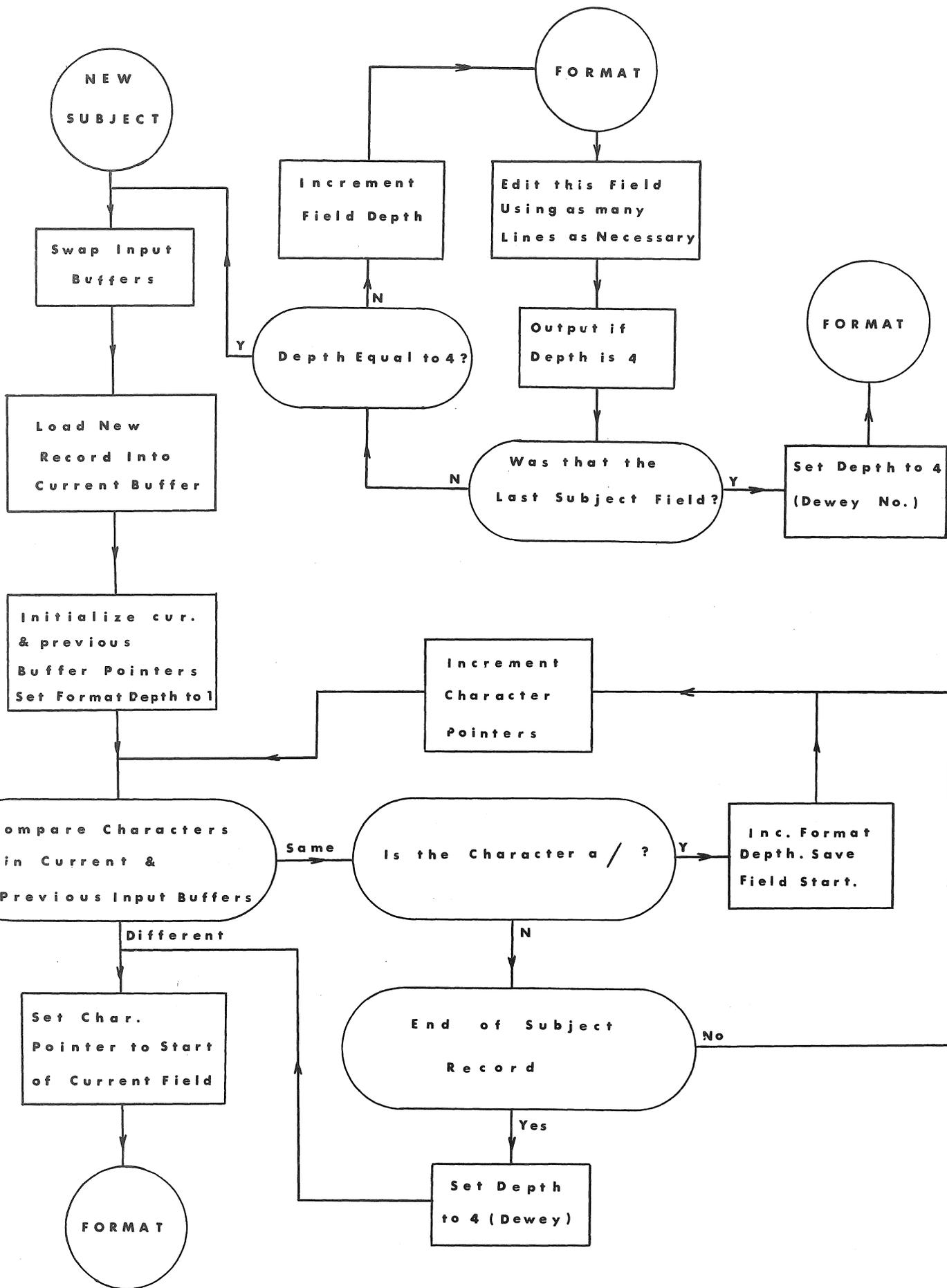EUROPEAN ECONOMIC COMMUNITY | 338.91 GRE
 | 382.6 TEW
 | 382.914 PIC
 | 382.9142 BAM

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FIGURE 6. SUBJECT UNPACKING ALGORITHM.