PRODUCTION NOTE

University of Illinois at Urbana-Champaign Library
INTRODUCTION

For more than twenty years the Index to Periodical Articles by and about Negroes has been compiled and edited by members of the library staff at Central State University. Until 1972 the preparation of the Index was accomplished by manual methods. As the result of the need to both improve the quality of the Index and, at the same time, reduce unitary compilation costs, computer-assisted indexing was initiated during that year. This article describes an updated version of the processes and procedures presently being used in the preparation of this index.

HISTORICAL BACKGROUND

The Index to Periodical Articles by and about Negroes (IPAN) succeeded the Guide to Negro Periodical Literature, compiled and edited by A.P. Marshall, formerly librarian of the Winston-Salem Teachers College and of Eastern Michigan University. The Guide, initially published in 1941, was first interrupted during Marshall's service in the armed forces and later when he was engaged in graduate study at the University of Illinois. The final issue of the Guide was published in 1946.
The first compilation at Central State University (Wilberforce, Ohio) appeared in March 1950. It was entitled Index to Selected Negro Periodicals Received in the Hallie Q. Brown Library and was issued quarterly in March, June, September and December. The December issue cumulated the indexing of the previous quarters. The first issue was published by the College of Education and Industrial Arts Press at Wilberforce; subsequent issues were published by Edwards Brothers of Ann Arbor, Michigan, from 1950 to 1959, and by the G.K. Hall Company of Boston since 1960. With the Spring 1954 issue, the title was changed from Index to Selected Negro Periodicals to Index to Selected Periodicals. The Index was then published in spring, summer, fall and winter. The format was revised in 1960 to include ten periodicals indexed by members of the staff of the Schomburg Collection of Negro Literature and History, a branch of the New York Public Library. The Schomburg collection's involvement with the Index continued for eleven years. G.K. Hall published decennial cumulations for 1950-59 and 1960-70. Beginning in 1961, the Index was published on an annual basis. With the 1966 publication of volume seventeen, the Index received its present title, Index to Periodical Articles by and about Negroes. Charlotte W. Lytle served as editor from 1950 to 1968. Thelma G. Harper is the present editor.

During its existence, the Index has and continues to be a labor of love of those who contribute to it. In the past it was felt that the Index would help to: (1) improve the accuracy and soundness of scholarly research in the broad area of black studies, (2) prevent duplication of research effort in this area and reduce concomitant costs, and (3) promote better racial and human understanding. Although these feelings still inspire the preparation of the Index, other factors, including the costs associated with the preparation of the Index and the quality of the product, have necessitated changes in the production procedures of the Index.

SYSTEMS APPROACH

The present approach to index preparation differs from the former in at least two respects: the indexing task is more objectified, and the job responsibilities are more specialized. In the first case, a manual for index preparation was created, detailing each step in the index process. Formerly the indexing process was learned and managed in apprenticeship fashion. In the second case, three divisions of labor have been established: (1) a single clerical assistant provides all of the descriptive indexing for six to eight subject indexers; (2) professional librarians perform all subject indexing; and (3) computer programs generate and compile all index entries and format the final camera-ready file. Formerly, professional librarians performed nearly all aspects of the indexing operation, including the creation, hand printing and compilation of entries prior to typing, editing, shingling and photographing.

The work flow of the current approach is illustrated in functional terms in figure 1, and in temporal terms in figure 2. This approach has permitted an increase in the coverage of the literature, greater efficiency in index preparation (i.e., reductions in unitary compilation costs), greater consistency and subject depth in index output, and more rapid dissemination of the index.
FUNCTIONAL FLOW OF INDEX PREPARATION

1. Acquisitions
   Periodical List
   Periodicals

2. Descriptive and Subject Indexing
   Periodical Article
   Data Sheet

3. Data Conversion
   Data Sheet
   IBM Cards

4. Error Listing
   IBM Cards
   Error List

5. Subject Heading Listing
   IBM Cards and
   Disk Storage
   Subject Heading
   List

6. Entry Generation
   IBM Cards
   Disk Storage

7. Entry Listing
   Disk Storage
   Printed Index

Figure 1
TEMPORAL FLOW OF INDEX PREPARATION

1. Prepare periodical for indexing:
   a. determine the article code
   b. write article code on first page of each article to be indexed.

2. Complete descriptive indexing for each article and fill in data sheet, including:
   a. article code
   b. author(s)
   c. title
   d. series title
   e. imprint.

3. Complete subject indexing for each article descriptively indexed and fill in data sheet, including:
   a. subject(s)
   b. cross-references.

4. Assemble data sheets for keypunching.
5. Keypunch data sheets.
6. Run cards through error listing component of computer programs.
7. Proofread listing and make error checks.
8. Assemble two data decks: one which contains errors, the other which is error-free.
9. Correct and rerun data deck with errors through error listing component.
10. Run error-free data decks through authority development component of computer programs. Sort and merge headings.
11. Format and list headings.
12. Run error-free data decks through entry generation component of computer programs. Sort and merge entries.
13. Format and list entries.
THE ENTRY

IPAN is a file of alphabetically ordered units. The entry is the basic unit of the index. An entry consists of an obligatory heading and either a citation or a connective and a referent. The heading is a word or group of words which either provides a point of access to at least one citation, attempts to initiate the finding of an acceptable point of access to one or more citations, refers to a related point of access in the file, or refers directly to the location of a journal article. Headings which refer to an acceptable point of access, a related point of access, or directly to the location of a journal article always include an expression indicating the form of the reference: see, see also and see issues of, respectively. Such headings are never followed by citations. Headings which do not refer to other headings are always followed by at least one citation.

A heading may be the name of an author, including but not limited to the names of editors, reviewers and translators; the name of a subject; or the title of a journal article. When a heading is the title of a journal article, it always refers to either the author of the article or, in the case of a department, to its general location. A citation must include the title of the article, the name of the journal in which it appears, and sufficient imprint information to allow its unambiguous location. The citation may also include one or more article descriptors, the abbreviated names of authors when there are more than one, the series title, the series title number and a variety of imprint parts.

It is obvious that problems arise in treating entries when (1) an entry element is missing or is incomplete, e.g., when there is either no author, no title or only a partial imprint; (2) an entry element is ambiguous, e.g., when there are two or more authors or more than one type of author or more than one type of title; (3) the material under scrutiny fails to fit neatly into the category of an article, e.g., when the material is a set of apparently miscellaneous pictures; or (4) the entry information, although processed through a logical sequence of steps, is productive of undesirable results, e.g., when the title will be a repetition of the subject under which the entry is found.

In the first case noted above--if an entry element is missing--it is usually possible to find or invent the missing element. A missing title, for example, may be created; a missing volume number may be ascertained through a study of previous issues of the journal being indexed; a missing name of an author may be located with some research effort. In the second case--if an entry element is ambiguous--it is necessary to overcome the potential difficulty through the judicious use of rules of descriptive indexing. An article of joint authorship, as a result of such rules, is headed or entered under the name of the first listed author; authors other than the first listed are referred to the first listed author. Likewise, an article which was minimally revised by a person other than the original author, as an abridgment or translation, is entered under the name of the original author; the secondary author, in this case, heads an entry which refers to the name of the original author.

A review article, e.g., a book or drama review, is apt to be the most troublesome of the articles in which an entry element is ambiguous. A review may have an author of the review, an author of the article under review, a title of the review, and a title of the item reviewed. These conditions may be complicated by
joint authorship of the review and/or the item under review, or by the review covering more than one item. It is clear that each of these potential factors must be considered in the rules both for descriptive and subject indexing. Authors of review articles, for example, are distinguished from the authors of the items being reviewed by labeling the latter group "by subjects"; this allows for entry under both groups. The title of the item under review is used as the title of the review article even when the article has a distinct title. When two or more items are reviewed in the same article, each item is indexed as a separate and distinct review.

In the third case—if the material under scrutiny fails to fit neatly into the category of an article—it is frequently necessary to make a judicious decision. A pictorial essay, for example, with no text or other unifying feature, must have at least one specifiable subject or theme before it can properly qualify as an article.

In the fourth case—if the logical processing of entry information is productive of undesirable results—it is necessary to resort to both arbitrary rules of descriptive indexing and arbitrary computer rules for entry generation. It is pointless in the case of an obituary, for example, for the title of the obituary to be anything other than the name of the deceased or to have the citation include the name of the deceased when the entry is under that name.

Below are some general observations on entry, covering articles in general, pictorials, translations, reviews, belles lettres, and several miscellaneous types of articles. These observations are intended to describe various types of entries.

**General articles.** An article is defined as a part of a periodical having a typographically distinct beginning and end and being further distinguished by author, title or subject matter, exclusive of such material as advertisement, business information, decoration, table of contents, etc. An article is entered under the name of its author, and under as many relevant subjects as possible. It is also entered under as many cross references as necessary for clarity and rapid location.

If an article has more than one author, it is entered under the name of the first listed author with individual references from the names of the additional authors to that of the first. This rule applies to joint authors, compilers, editors, illustrators, panelists, reviewers, translators, etc.

If an article has no author, it must have at least one specifiable subject or the material under consideration is, in effect, not an article. If an article has no title, then a brief descriptive title is prepared.

A series consists of a number of articles, usually related by subject, published in successive issues of a periodical, normally but not necessarily by the same author, and with a collective title. Each part of a series has a distinct title and is treated as a separate and distinct article.

**Pictorials.** An article which is primarily or entirely pictorial is entered under the name of the illustrator or photographer. If the article has some text and the name of the author of the text is given, the article is entered under the name of the author of the text with a cross reference from the name of the illustrator to the name of the author of the text.
Revisions and translations. An article which is a revision, translation, abridgment, or for any reason has both a primary and a secondary author is entered under the name of the primary or original author; otherwise, entry is made under the name of the translator or other secondary author. A cross reference is made from the name of the secondary author to that of the primary author when necessary.

Reviews. A review article, whether concerned with books, motion pictures, musical compositions, plays or records, is entered under the name of the reviewer or critic. Entries are also made under the names of all authors, composers, etc. of items being reviewed. Such names are called by subjects; standard subjects, as BOOK REVIEWS, DRAMA REVIEWS, etc.; and other subjects including the names of actors, producers and other persons prominently discussed in the review. The title of the item under review is used as the title of the review article even when the article has a distinct title. If two or more items are reviewed in the same article, each item is indexed as a separate and distinct review.

Belles lettres. Belles lettres articles include dramas, fiction, musical compositions, poetry, etc. A belles lettres article is entered under the name of the author, composer, dramatist, etc., with a cross reference from the title of the article to the name of the author, dramatist, etc. It is also entered under the appropriate standard subject, such as DRAMAS, POETRY, etc. Anonymously written belles lettres articles are entered under title.

Abstracts. An abstract is entered under subject only.

Regular departments. A department, defined as a regular feature of a periodical with a distinct title but with or without a distinct or regular author, excluding editorials, book review sections, etc., is entered under its title with a reference to issues of the periodical in which it appears and the dates of its publication. Certain departments and certain issues of a department are of sufficient interest to be indexed discretely as general articles rather than as departments.

Interviews and Symposia. An interview, panel, symposium, etc. is entered under the name of the reporter if the report is given largely in his words. If the report is a verbatim transcript, it is entered under the name of the first listed participant with cross references from the names of the other participants to that of the first.

Obituaries. An obituary is entered only under the name of the deceased and the standard subject OBITUARIES.

DESCRIPTIVE INDEXING

Just as the entry is the basic unit of the index, the entry record is the basic input unit to the system. Each entry record describes one and only one journal article, although one journal article—e.g., a review of several books—may necessitate the preparation of several entry records. A single entry record will generate at least one but usually several output records or entries. The one-to-many relationship between one input and several output records is illustrated in figure 3.
THE ONE TO MANY RELATIONSHIP OF AN INPUT RECORD TO OUTPUT RECORDS

OUTPUT RECORDS

African People's Party
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

African Relations
See
Pan-Africanism

Ahmed, Abkar Muhammad
See
Stanford, Max

Carmichael, Stokley

About
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

Economic Development, National
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

Little, Malcolm
About
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

Malcolm X
See
Little, Malcolm

Pan-Africanism
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

Revolutionists
The Roots of the Pan-African Revolution.
M. Stanford. Black Scholar 3:49-55 (May 72)

Stanford, Max
The Roots of the Pan-African Revolution.
Black Scholar 3:49-55 (May 72)

Figure 3
The first step in creating an input record is the filling in of a data sheet. The data sheet has the general appearance of an IBM coding form, and serves as the descriptive and subject indexers' worksheet and the keypunch operator's guide. The data sheet is divided into lines, dedicated in the following manner:

<table>
<thead>
<tr>
<th>LINE</th>
<th>CONTENTS</th>
<th>LINE</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Primary Author</td>
<td>501</td>
<td>Subject(s)</td>
</tr>
<tr>
<td>102</td>
<td>Joint or Secondary Author(s)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>108</td>
<td>.</td>
<td>508</td>
<td>.</td>
</tr>
<tr>
<td>199</td>
<td>.</td>
<td>599</td>
<td>.</td>
</tr>
<tr>
<td>201</td>
<td>Title</td>
<td>601</td>
<td>From Cross Reference(s)</td>
</tr>
<tr>
<td>202</td>
<td>Title (Continued)</td>
<td>602</td>
<td>To</td>
</tr>
<tr>
<td>301</td>
<td>Series Title</td>
<td>615</td>
<td>From</td>
</tr>
<tr>
<td>302</td>
<td>Series Title (Continued)</td>
<td>616</td>
<td>To</td>
</tr>
<tr>
<td>401</td>
<td>Imprint</td>
<td>697</td>
<td>From</td>
</tr>
<tr>
<td>402</td>
<td>Imprint (Continued)</td>
<td>698</td>
<td>To</td>
</tr>
</tbody>
</table>

Each line of the data sheet is divided into columns which are grouped into fields, including the article code (columns 1-8), the line or card number (columns 9-11), the entry information (columns 12-72), and the descriptor codes (columns 73-80).

A preliminary item is the completion of the article code--a unique identifying number of each article indexed. It consists of the last two digits of the year of issue of the periodical being indexed; the periodical code number, obtained from a sequential list of arbitrarily chosen two-digit numbers, each associated with one of the journals indexed; the true annual issue number, not to be confused with the volume or issue number cited in the periodical, but found by an actual count of the journals issued up to that time beginning with the first issue in January of that year; and the article number, found by counting the articles appearing in a given issue of a periodical. For example, the article code 73/09/12/16 refers to a 1973 Ebony, the twelfth issue and, within that issue, the sixteenth article. The article code is important for several reasons. It allows a fairly simple method for the manual retrieval of the entry record associated with a specific article, computer deletion or correction of all headings extracted from that record when necessary, computer deletion or correction of all entries generated by that record when necessary, and a computer check for certain types of errors.

The first area of descriptive indexing is the author part. The author is the person or agency who wrote, compiled, edited, photographed or otherwise prepared the article for publication. If more than one person is indicated as author, the names of these persons are listed on successive lines of the author section of the data sheet in the same order as they appear in the periodical. Since personal names which are inverted require a second inversion and abbreviation during entry generation, these names must be transcribed in a precise manner: last name, followed by a comma; first name or first initial, the latter followed by a period; second name or initial, the latter followed by a period; and the agnomen, as Jr., Sr., I, II, etc. Each of these parts must be followed by a blank; only the last transcribed part may be followed by more than one blank.
In cases of joint authorship, a joint or secondary author code is placed in columns 73-74 of line 101, indicating:

<table>
<thead>
<tr>
<th>Code</th>
<th>Relationship to First Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Joint author</td>
</tr>
<tr>
<td>02</td>
<td>Joint compiler</td>
</tr>
<tr>
<td>03</td>
<td>Joint editor</td>
</tr>
<tr>
<td>04</td>
<td>Joint translator</td>
</tr>
<tr>
<td>05</td>
<td>Secondary author, not a joint author</td>
</tr>
</tbody>
</table>

An author code is simply a two-digit number clarifying the roles of the authors in the production of the article.

The second area of descriptive indexing is the title part. The title is the descriptive name given to an article, usually in distinctive typography, including a subtitle but excluding the name of the author, biographical information, abstract of the article, etc. Three types of titles require distinction: department, series and subtitle titles. A department title is the caption given to a regular feature of a periodical, such as "Date with a Dish," a feature which has regularly appeared in *Ebony*. Excluded from the department category are such regular features as the book review, editorial, record review and similar features of certain periodicals; these materials are generally considered worthy of discrete indexing. A series title is one which is used to describe a series of articles appearing in successive issues of a periodical, each part having both an individual title and a shared series title, as "White Servitude," a series which also appeared in *Ebony*. A subtitle is a brief explanatory part of the title usually set off by punctuation or less distinctive typography.

A title is transcribed beginning on line 201 and continuing on line 202, if necessary, in columns 12-72. It is transcribed, if possible, exactly as it appears, although minor modifications are allowed for punctuation and spelling; capitalization is ignored. When a title is longer than 120 characters, it is abridged without loss of essential information. Codes for article descriptors—brief descriptions about the article generally specifying its form—follow the title of the article in columns 73-80, line 201. A partial list of article descriptors appears in figure 4.

The series title, if any, follows the title on lines 301-302 and is transcribed in the same manner as a title. The series title number is given in arabic numerals in columns 73-74 of line 301.

The final area of descriptive indexing is the imprint part. The impart of the data sheet is found on lines 401-402. It has the following layout, repeated three times on each line:

<table>
<thead>
<tr>
<th>VOL</th>
<th>NO</th>
<th>PAGINATION</th>
<th>DAY</th>
<th>MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This layout provides for six parts of a continuation, explained below. The volume number is transcribed, like all other numbers in the imprint, in arabic
PARTIAL LIST OF ARTICLE DESCRIPTORS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTOR</th>
<th>EXPLANATION</th>
<th>CODE</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>General</td>
<td>Not a Belle Lettre, Department, Interview, Obituary or Review.</td>
<td>00</td>
<td>73-74</td>
</tr>
<tr>
<td>Department</td>
<td>Department</td>
<td>A regular, specifically titled feature article, excluding book reviews, editorials, etc.</td>
<td>01</td>
<td>73-74</td>
</tr>
<tr>
<td>Interview</td>
<td>Interview</td>
<td>An article written in question answer format with both interviewer and the person interviewed identified.</td>
<td>02</td>
<td>73-74</td>
</tr>
<tr>
<td>Obituary</td>
<td>Obituary</td>
<td>A brief statement reporting a death and possibly presenting the vital statistics of the deceased.</td>
<td>03</td>
<td>73-74</td>
</tr>
<tr>
<td>Belle Lettre</td>
<td>Drama</td>
<td>A play of any sort.</td>
<td>04</td>
<td>73-74</td>
</tr>
<tr>
<td></td>
<td>Music</td>
<td>A musical composition of any sort.</td>
<td>05</td>
<td>73-74</td>
</tr>
<tr>
<td>Review</td>
<td>Book Review</td>
<td>Review of a book, including critical review, plot outline, summary, etc.</td>
<td>09</td>
<td>73-74</td>
</tr>
<tr>
<td></td>
<td>Drama Review</td>
<td>Review of a play of any sort, excluding motion pictures and musical plays.</td>
<td>10</td>
<td>73-74</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Abridgement</td>
<td>A condensed version of another work, produced by reduction of detail.</td>
<td>14</td>
<td>75-80</td>
</tr>
<tr>
<td></td>
<td>Abstract</td>
<td>A brief restatement complete in a single paragraph or two.</td>
<td>15</td>
<td>75-80</td>
</tr>
<tr>
<td></td>
<td>Tables</td>
<td>Charts, graphs, tables, etc.</td>
<td>25</td>
<td>75-80</td>
</tr>
<tr>
<td></td>
<td>Translation</td>
<td>An article originally written in one language rendered in another.</td>
<td>26</td>
<td>75-80</td>
</tr>
</tbody>
</table>

Figure 4
numerals and justified right. For example, if the volume number is 1, then a 1
is placed in the right-hand cell and is, optionally, preceded by a 0, as [01].
The volume number is followed by the issue number. The issue number is included
only (1) if there is no volume number, (2) if only the year part of the date is
given, or (3) in place of such time periods as "first issue," "first quarter,"
etc. The issue number is followed by the pagination. If the article is complete
on a single page, only one page is cited: [00000000000000]. If the article extends
beyond a single page, the inclusive paging is cited: [0003014]. If the
article starts on one page and is continued to another page with other material
intervening for at least a full page, then a + sign is used to indicate a break
in the inclusive paging: [392401].

The date is next transcribed, including the day, if any, according to the following code:

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>01</td>
</tr>
<tr>
<td>February</td>
<td>02</td>
</tr>
<tr>
<td>March</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>14</td>
</tr>
<tr>
<td>Fall</td>
<td>15</td>
</tr>
<tr>
<td>Winter</td>
<td>16</td>
</tr>
</tbody>
</table>

An asterisk indicates the continuation of the imprint. Infrequently, imprint
data does not fit this layout, for example, when the periodical has issued a
supplement to its regular issues. In this case, a free form may be used in the
imprint area of the data sheet, such as: Special Supplement, v. 15 (Oct. 73)
pp. 310-24. When a free-form imprint is used it is indicated by the placement
of an 01 code in columns 73-74 of line 401.

Occasionally, an article is continued from one issue of a periodical to others.
When an article is given a title for the entire series as well as a distinct
title for each individual installment, the article is considered a series and
each installment is indexed separately. When the set of articles is given a
single title, the set is considered a continuation; the installments are in-
dexed collectively as a single article. For that reason, a single data sheet
may be used for the transcription of a continuation of up to six installments;
supplementary data sheets may, of course, be used for continuations of more than
six installments. With each successive installment until the conclusion of the
article or of the indexing period, the imprint information is brought up to date.

SUBJECT INDEXING

One of the essential purposes of the current approach to index preparation is
to relieve the subject indexer of as many clerical responsibilities as possible
so that he can give his full attention to the subject indexing aspects of index
preparation. The subject indexer is relieved of all responsibilities of des-
crptive indexing except any necessary revision. He no longer needs to be con-
cerned with format; that is handled by machine functions. His task is further
simplified since the creation of standard subject headings is initiated by the descriptive indexer through the use of article descriptor codes. Considerable cross referencing is handled by machine functions. Even the task of transcription in the subject and cross reference areas of the data sheet is simplified, since the indexer may repeat anything previously stated in the entry information section of the data sheet merely by entering the line number of the previous statement in the data area of the line on which the information is to be repeated.

The first area of subject indexing is the subject part. Articles are cited under as many subjects as are relevant within the limits of the subject authority. Main headings may be divided into subdivisions (limited to five), including period, local and form. Certain types of articles are always entered under standard subject headings, including:

<table>
<thead>
<tr>
<th>Type of Article</th>
<th>Standard Heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book review</td>
<td>BOOK REVIEWS</td>
</tr>
<tr>
<td>Drama review</td>
<td>DRAMA REVIEWS</td>
</tr>
<tr>
<td>Drama</td>
<td>DRAMAS</td>
</tr>
<tr>
<td>Fiction</td>
<td>See NOVELS or SHORT STORIES</td>
</tr>
<tr>
<td>Interview</td>
<td>INTERVIEWS</td>
</tr>
<tr>
<td>Motion picture review</td>
<td>MOTION PICTURE REVIEWS</td>
</tr>
<tr>
<td>Music</td>
<td>MUSIC COMPOSITIONS</td>
</tr>
<tr>
<td>Music review</td>
<td>MUSIC REVIEWS</td>
</tr>
<tr>
<td>Novel</td>
<td>NOVELS</td>
</tr>
<tr>
<td>Obituary</td>
<td>OBITUARIES</td>
</tr>
<tr>
<td>Opera</td>
<td>See MUSIC REVIEWS</td>
</tr>
<tr>
<td>Play</td>
<td>See DRAMAS</td>
</tr>
<tr>
<td>Record review</td>
<td>PHONORECORD REVIEWS</td>
</tr>
<tr>
<td>Poem</td>
<td>POEMS</td>
</tr>
<tr>
<td>Short story</td>
<td>SHORT STORIES</td>
</tr>
</tbody>
</table>

Subject headings are transcribed in a list in the subject area of the data sheet beginning in column 12, line 501. Double hyphens are used to indicate subdivisions of headings, as Banks and Banking--Xenia, Ohio. In columns 73-74, "about subjects" are distinguished from "by subjects" through the use of the subject codes 01 and 02, respectively. Recall that an about subject is a person or corporate body potentially an author; a by subject is an author of an item being reviewed. No subject descriptor codes are used with subjects which are abstract ideas, places or things.

The second area of subject indexing and the final indexing area is the reference section. There are two kinds of reference: see, e.g., from Attorneys see Lawyers, and see also, e.g., from Communications see also Language and Languages. Each reference requires two lines on the data sheet. The first or odd numbered line is the "from" line; the second or even numbered line is the "to" line. The type of reference is indicated in columns 73-74 of the second line of each reference. The reference descriptor code 01 is used to indicate a see reference; the reference descriptor code 02 is used to indicate a see also reference.
As noted above, certain cross references are handled by machine functions in order to simplify the task of the subject indexer. The reference tasks which are handled by machine function include all see references: (1) from joint authors, compilers, editors and translators to the principal author, compiler, etc., (2) from secondary authors, as an illustrator, to the principal author, (3) from the title of a creative work or belles lettres article, i.e., a drama, musical composition, poem, etc., to the name of the dramatist, composer, poet, etc., (4) from the name of the author to the title of a department, (5) from the title of a department to the name of the periodical in which it appears, and (6) from a series title to the name of the author.

The general requirement that there must be at least one additional citation under a heading created by a see also reference can be ignored. Such references and their headings are eliminated by machine following the final alphabetization of the index.

COMPUTER FUNCTIONS

At this time the computer function has been developed only to the extent of permitting index production. There are five basic components of this function: error listing, authority development, entry generating, sorting for both headings and entries, and formatting again for both headings and entries. Both the error listing and authority development components are quality control features of the system. The error listing component is necessary for checking certain kinds of logical errors in the input data, for listing the input data, the errors and their location, and for gathering several types of quality control information. The authority development component is necessary for extracting headings from the input data, for cumulating these headings, and for indicating their relationships to other headings. The entry generating component reorganizes input data, translates codes data into words and phrases through dictionary look-ups, makes cross reference assignments, creates entries, and collects other quality control information. The sorting component orders entries and headings into alphabetic lists. The formatting component is necessary for page production and for the output of headings and entries. The relationship of these components is outlined in figure 5.

ERROR LISTING COMPONENT

The error listing component produces a list of the input records exactly as they were keypunched. This permits a visual search for errors. The listing is accompanied by a listing of computer-detected errors.

Two types of error comments are issued by the computer: card error comments and record error comments. Card error comments are numbered 1 through 29; record error comments are lettered A through G. Card errors are marked by an asterisk (*) at the point where they occur. Record error comments follow the input list and the card error comments. A record containing several errors might yield the output shown in figure 6. A record having no errors would yield the output shown in figure 7. Figures 8 and 9 are partial lists of card and record error comments.
EXAMPLE OF RECORD WITH SEVERAL COMPUTER-DETECTED ERRORS

<table>
<thead>
<tr>
<th>73</th>
<th>5</th>
<th>8</th>
<th>101</th>
<th>WILLIAMS, JOHN H.</th>
<th>5 0 0 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 11.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 9.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 14.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 17.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 23.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERROR 24.</td>
<td></td>
</tr>
</tbody>
</table>

ERROR 1.  MISSING OR INVALID ARTICLE CODE.
ERROR 11. MISSING OR INVALID AUTHOR DESCRIPTOR
ERROR 9.  TWO OR MORE BLANKS WITHIN TEXT OF ENTRY INFORMATION ETC.
ERROR 14. MISSING VOLUME AND NUMBER CODE IMPRINT.
ERROR 17. PAGINATION IS NOT LOGICAL.
ERROR 23. MISSING OR INVALID REFERENCE DESCRIPTOR.
ERROR 24. INVALID NUMERIC REFERENCE.

****** CARD NUMBERS WITHIN A CARD TYPE ARE NOT SEQUENTIAL. ******

Figure 6

EXAMPLE OF RECORD HAVING NO ERRORS DETECTED BY COMPUTER

<table>
<thead>
<tr>
<th>73</th>
<th>5</th>
<th>8</th>
<th>12</th>
<th>101</th>
<th>WILLIAMS, JOHN H.</th>
<th>1 0 0 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>201</td>
<td>HIGH FIDELITY</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>301</td>
<td>117-117 12</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>501</td>
<td>PHONODISK EQUIPMENT</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>604</td>
<td>100</td>
<td>3 0 0 99</td>
</tr>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>601</td>
<td>PHONOGRAPHS</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>73</td>
<td>5</td>
<td>8</td>
<td>12</td>
<td>501</td>
<td>501</td>
<td>1 0 0 99</td>
</tr>
</tbody>
</table>

$$$$$$ COMPUTER DETECTED NO ERRORS IN THIS RECORD. $$$$$$

Figure 7
PARTIAL LIST OF CARD ERRORS

ERROR 1. MISSING OR INVALID ARTICLE CODE.

EXPLANATION: One or more elements of the article code is missing; or, the first element is a number which does not equal 73, i.e., the last two digits of the index year; the second element is greater than 28; the third is greater than 52. (A check on the fourth element of the article code is pointless.) This error relates only to the article code appearing on the first card of a record. If there is an error in the first article code of the record no further checks are made on the article codes appearing on the cards in the remainder of the record.

ERROR 2. DISSIMILAR ELEMENTS OF ARTICLE CODE IN THE SAME RECORD.

EXPLANATION: An error of this type occurs only when the article code on a subsequent card fails to match exactly the article code on the first card within a record.

ERROR 3. END OF RECORD MARK PROBABLY MISSING.

EXPLANATION: When more than one dissimilar elements of an article code is found in cards of the same record, a missing end of record mark is presumed. When this situation occurs the computer skips over the remaining cards of the record being processed, finds the next end of record mark, then starts processing a new record. Error 3 overrides Error 2.

ERROR 27. CARD CONTAINS AN INVALID CHARACTER IN COLUMN XX. NO FURTHER PROCESSING OF THIS CARD IS POSSIBLE.

EXPLANATION: An alphabetic character is found in a numeric field, either in columns 1 through 11 or in columns 73 through 80.

ERROR 28. INVALID CODE FOR A FREE-FORM IMPRINT

EXPLANATION: The only valid free-form imprint code is the number 1.

ERROR 29. INVALID CONTINUATION MARK IN IMPRINT FIELD.

EXPLANATION: Either a continuation mark—an asterisk in column 31, 51, or 71—is absent when there is imprint information in the next imprint field or a continuation mark is present when there is no further imprint information in the next imprint field.

Figure 8
RECORD ERRORS

A. COMPUTER IS SEARCHING FOR NEXT END OF RECORD MARK.

EXPLANATION: This situation develops either as a result of Error 3 or when a record has more than 30 cards.

B. RECORD HAS MORE THAN 30 CARDS.

EXPLANATION: No record may contain more than 30 cards. This error is probably the result of a missing end of record mark.

C. CARD NUMBERS IMPROPERLY SEQUENCED.

EXPLANATION: Card numbers within a record are either duplicated or not in ascending order.

D. CARD NUMBERS WITHIN CARD TYPE ARE NOT SEQUENTIAL.

EXPLANATION: A card number within a number series, as 101, 102, 103, 105, is missing; i.e., card number 104.

E. EITHER OR BOTH A TITLE OR AN IMPRINT CARD IS MISSING.

EXPLANATION: Every record must have both a title and an imprint card.

F. RECORD HAS MORE THAN 5 CITATION PARTS.

EXPLANATION: No record may have a combined total of more than five title, series title and imprint cards.

G. RECORD IMMEDIATELY PRECEDING END OF FILE MARK FAILED TO HAVE END OF RECORD MARK.

EXPLANATION: No explanation required.

Figure 9
The following are the kinds of visual error checks which, along with the computer-detected error comments, provide error-free input records: correct spelling in entry information, correct grammar in entry information, correct spacing in entry information, and correct form and information in a free-form imprint field. When either a computer or visually detected error has been found and corrected, the record containing the error is rerun through the computer error listing program.

Five types of quality control statistics are gathered in the error listing component and printed at the end of each run: the number of records processed in the run, the number of records having no computer-detected errors, the percent of records having no computer-detected errors, a frequency distribution of card errors by type, and a frequency distribution of record errors by type. These data are used as feedback to indexers to aid them in maintaining a low frequency of occurrence of logical types of errors.

AUTHORITY DEVELOPMENT COMPONENT

The authority development component, like the error listing component, is a quality control feature of the system. It is intended to ensure inter-indexer consistency in the use of index headings. A heading may consist either of a heading standing alone or a heading with a connective and a referent. As previously noted, a heading may be the name of an author--including the names of editors, reviewers, translators, etc., the name of a subject, or the title of a belles lettres article, department or series. Since titles of articles should not present difficulties to indexers in consistency of usage, they are not processed by this component. A connective indicates the relationship between the heading and the referent. There are four types of connectives: see, see also, X (see from), and XX (see also from). A referent, like a heading, may also be the name of an author or a subject.

The first task of the authority development component is to extract the names of all authors and subjects from each record of an error-free data deck. These headings are stored on disk. The names of authors and subjects which appear among the references of a given record are skipped over during this initial pass. This eliminates the need for deleting the headings common to the list of references and the lists of authors and subjects. The second task is to replace all numeric references with their alphameric equivalents. The final task is to correlate each authorized author or subject name with its variant and related forms, then store these headings, connectives and referents on disk.

The headings gathered in this manner are alphabetized in a temporary file by a sorting routine. During the sorting process, duplicate headings are deleted. The sorted file is then merged with a previously sorted permanent file. Again, all duplicate headings are deleted.

Since both the descriptive and subject indexers need the latest version of the authority file, this file is listed at frequent intervals. The listing is initiated by a formatting program, which creates a two-column page of sixty lines. The heading BLACK STUDIES might appear in the list in the following forms and places:
Since errors may be found in the authority file listing, it may be necessary to initiate a revision routine prior to the next scheduled running of the authority development component. This routine makes it possible to correct, delete or replace faulty headings. The revision routine accepts as input punched cards indicating the action to be taken, the location of the faulty heading, and the corrected or replacement heading. It produces a list of article codes for each action taken, so that all faulty headings in the error-free data decks may also be corrected.

ENTRY GENERATING COMPONENT

The principal purpose of the entry generating component is the creation of index entries. Under normal circumstances we anticipate a one-to-many relationship between the input record of an article and the number of index entries generated from it. That is, from any given record, we expect at least one and probably several types of entries to be generated, including author, title and subject entries, probably with several entries of each type. A secondary purpose of this component is the gathering of quality control data, including the number of records indexed, the number of entries generated, and the number of subject entries generated per run. This feedback, along with information produced in other parts of the system, may then be used by the indexers as a check on the quality of the index. Subject indexers, for example, may be made aware through these data that the number of subject headings being produced per record is less than some minimal standard.

The first stage of the entry generating program counts and stores in a readily accessible place the number of elements of each type, as well as the number of characters in each element, such as the author, title, and characters in the series title elements. Through dictionary look-ups the various codes used by the descriptive indexer are transformed into the standard words and phrases which
appear in the printed index, such as the expressions which show the relationships between or among authors, the abbreviated journal names, the months of the year, etc. Certain elements—e.g., personal author and by-subject names and numeric references—are reformatted during this stage. All personal names written in inverted form on the code sheets must be reversed, with all forenames reduced to initials. Numeric references must be replaced with their author or subject referents. In addition, several parameters necessary for guiding the entry generation of this program are created during this stage. For example, records with such special features as belles lettres articles, departments, obituaries and reviews are identified and flagged.

The second stage of this program formats the imprint data. All imprint information is formatted according to the following pattern. The elements and their order in the imprint are abbreviated periodical title, volume number, issue number, pagination, plus sign, day, month and year. A colon sets off the volume and issue number from the remainder of the imprint; a hyphen separates the parts of the pagination when there is more than one part; a hyphen also separates the parts of the month when there is more than one part; parentheses set off the date from the remainder of the imprint. Whenever the issue number is used, it is preceded by an N to distinguish it from the volume number; whenever the plus sign is used, it immediately follows the pagination without a space. When there is a volume number, the issue number is not used unless there is no date other than the year. When the imprint for a continuation is being compiled, the abbreviated journal title is replaced by a semicolon in all parts of the imprint after the first. Following the completion of these tasks the program is ready to generate the various author, title and subject entries.

For purposes of discussion, it is best to talk about two forms of entry: those having a heading and a citation, and those having a heading, a connective and a referent. Entries of the first kind combine the following elements during entry generation:

<table>
<thead>
<tr>
<th>Heading</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>Title</td>
</tr>
<tr>
<td>Title (obituaries only)</td>
<td>By-subject(s)</td>
</tr>
<tr>
<td>Standard subject</td>
<td>Article descriptor(s)</td>
</tr>
<tr>
<td>Subject (about subjects only)</td>
<td>Series title and descriptor</td>
</tr>
<tr>
<td></td>
<td>Author(s)</td>
</tr>
<tr>
<td></td>
<td>Imprint</td>
</tr>
</tbody>
</table>

The following restrictions limit to precisely thirty-eight the number of possible combinations of these elements. For each entry only one type of heading may be selected. Following the selection of a heading, parts of the citation are chosen in the order in which they appear above. Only belles lettres, interview and review articles are entered under standard subject headings. A title is required in all citations except obituaries, where the heading is the name of the deceased. By subjects are used only with review articles. A by subject is omitted from the citation when it is used as the heading. When an article descriptor is similar to the standard subject heading used as the heading, it is omitted from the citation. A single author is omitted from the citation when the heading is the author. An imprint is mandatory in all citations.
In entries of the first kind, marks of punctuation include semicolons, which set off the title from article descriptors or authors, by subjects from article descriptors or authors, and article descriptors from authors; parentheses, which distinguish the series title from other citation parts; and periods, which follow and separate all preceding parts of the citation from the imprint.

Entries of the second kind—having a heading, a connective and a referent—combine the following elements in only nine ways:

<table>
<thead>
<tr>
<th>Heading</th>
<th>Connective</th>
<th>Referent</th>
</tr>
</thead>
<tbody>
<tr>
<td>First author</td>
<td>See</td>
<td>First Author</td>
</tr>
<tr>
<td>Author, not first</td>
<td>See also</td>
<td>Authorized author name</td>
</tr>
<tr>
<td>Variant author name</td>
<td>See issues of</td>
<td>Abbreviated citation</td>
</tr>
<tr>
<td>Title of belles lettres</td>
<td></td>
<td>Authorized subject name</td>
</tr>
<tr>
<td>Title of department</td>
<td></td>
<td>Related subject</td>
</tr>
<tr>
<td>Series title</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each entry one and only one type of heading, connective and referent may be selected. An author descriptor follows the name of the first author in a see reference from the name of an author other than the first, except when the secondary author is neither a joint author, a compiler, an editor, nor a translator. Article descriptors, if any, follow the title of a belles lettres article or department.

Each entry requires 375 bytes of core and 383 bytes of disk storage. The first 9 bytes of core storage and the first 17 bytes of disk storage provide information about the entry. The remaining 366 bytes of each contain the entry. Of the 366-character entry total, 61 characters are allocated for the heading and 305 for the citation or the connective and referent. The 305 characters used in the citation may be distributed allowing no more than 122 characters for the title and no more than 122 characters for the series title; the difference between 305 and the sum of the characters used in the title and series title, up to a maximum of 244 characters, may be used for the imprint.

Following the entry generating phase, the entries are sorted in a manner similar to that for headings, and then merged with the file of previously sorted entries on disk. The listing of entries is initiated by a formatting program, which creates a sixty-line, consecutively numbered page with running headings. Citations, connectives and referents are distinguished from headings and from each other by indentation; subject subdivisions are distinguished from each other by successive indentations. Entries continued from one page to another are so noted. The added expense of lower case lettering is not presently deemed worthwhile. The various job phases in generating and listing entries is shown in figure 10.

CONCLUSION

Even if this project had not been conceived as a labor of love with virtually no financial support, there would remain much continuing work for development and refinement. For example, it was and still is desirable to undertake a careful comparative study of manual versus computer-assisted production costs. A preliminary analysis indicated that the unit costs entailed by the former method
JOB PHASES IN GENERATING AND LISTING ENTRIES

1. Clear Disk Storage Areas
   - Used only when creating a new permanent file.

2. Generate Entries From Error-Free Data Decks

3. Sort Entries & Delete Duplicate Entries
   - Used only when updating permanent file; 2 - 4 must always be used together in this sequence.

4. Merge Sorted Entries & Delete Duplicate Entries

5. Format and List Ordered Entries
   - Used only when a printed list of entries is desired.

Figure 10
are considerably greater than those entailed by the latter. Likewise, it is highly desirable to compare the quality of the product achieved through the manual, as opposed to that achieved through the computer-assisted, approach to index production.

A frequent experience of computational work is the unexpected appearance of by-product capabilities. Computer assistance in the production of IPAN is no exception. Since the number of journals being indexed in the library of Central State University has more than tripled with the advent of computer production, thought was given to the possibility of providing a copy service, at cost, for articles referred to in the Index. Consideration was also given to the publication of IPAN in a KWIC format with abstracts. Not unrelated was the idea of providing annual indexes of each of the journals to the publishers. Another type of by-product under consideration is the issuance, with annual updates, of a listing of biographies of authors of articles indexed in IPAN.

One concern which greatly influenced the design of the IPAN system was remote input capability. Since a previous attempt had been made to involve at least one other group in the preparation of the Index, it seemed reasonable in designing the new system to think in terms of remote input through terminal linkage. Sober reflection revealed a prohibitive cost for such linkage at this time. A simpler and far less costly alternative merely requires the availability of copies of the IPAN manual at the remote site, code sheets, a selection of journals to be indexed, and a group willing to contribute resources to this project. Completed code sheets and updated authority lists would be interchanged through the mails.

Another consideration in the design of IPAN was generality of application. Although the system was developed to give coverage to a specific corpus and type of literature, it was developed with sufficient modularity to allow ready application not only to different bodies of literature, but also to differing types such as books and parts of books, newspapers, pamphlets and so forth.

It is possible that service demands in conjunction with limited finances will force academic and research libraries jointly to produce their own specialized index services for their own specialized clienteles. If this is the case, the IPAN project may give some insight into one among many potential methods and procedures.

VITA

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