```
DOCMNTNO  CITATION
```

```
MA 444   SENECA, HARRY (COLUMBIA UNIV.):  CURRENT THERAPY OF IN-
         FECTIONS OF THE RENAL EXCRETORY SYSTEM.  J. AM. GERIAT.
         SOC.  12:1100-27, DEC. 1964.

MA 483   SENECA, HARRY (COLUMBIA UNIV.):  PYELONEPHRITIS;  CLINICAL
         AND EXPERIMENTAL.  J. AM. GERIAT. SOC.  13:947-66,
         NOV. 1965.

MA 820   ANON.:  METHENAMINE HIPPURATE (HIPREX).  MED. LETTER
         10:58-60, JULY 26, 1968.

MA 864   GERSTEIN, ALAN R., ET AL.  (UCLA):  THE PROLONGED USE OF
         METHENAMINE HIPPURATE IN THE TREATMENT OF CHRONIC
         URINARY TRACT INFECTION.  J. OROL. 100:767-71, DEC.
         1968.

MA 989   RODMAN, MORTON J. (RUTGERS UNIV.):  COMBATING URINARY
         TRACT INFECTIONS.  RN 31:59-68, NOV. 1968.


ITEMS RETRIEVED         5

PROCESSING TIME -       7.4 SECONDS
```

Figure 6. Inquire printout long-term use of Mandelamine vs. Hiprex

The query was phrased for the computer as follows:

FIND PRODUCT=MA AND MANDELAMINE
  OR METHENAMINE/MANDELATE AND
  'IN VITRO' AND SENSITIVITY AND DISK,
  SORT SEQUENCE, TAB DOCMENTNO 1
CITATION 9 FILLER 71, HEADER 'SENSITIVITY
  TESTING WITH MANDELAMINE DISCS'.

These commands order the system to locate all documents in the MA file which contain Mandelamine or Methenamine/Mandelate, in vitro, sensitivity, and discs as keywords. The results are to be sorted by sequence number (to give an alphabetic arrangement) and printed out so that the document number starts in print position 1, the citation starts in print position 9, but does not run beyond print position 71. The title of the listing is to be "Sensitivity Testing with Mandelamine Discs."

The system retrieved 39 items in 21 seconds, and a portion of the printout is shown in Figure 6. In this, as well as other instances, the printout can include the document number, the citations, and the keywords, singly or in any combination.

LITERATURE CITED

(1) Starker, L. N., and Cordero, J. A., "A Multi-Level Retrieval System. I. A Simple Optical Coincidence Card System," J. Chem. Doc. 8, 81-5 (1968).
(2) Starker, L. N., Owen, K. C., and Batson, B. C., "A Multi-Level Retrieval System. II. Medium-Sized Collections," Ibid., 9, 161 (1969).
(3) Starker, L. N., Kish, J. A., and Arendell, F. H., "Multi-Level Retrieval Systems. III. A Generic Chemical Search System Using Optical Coincidence Cards," Ibid., 10, 206 (1970).
(4) Infodata Systems, Inc., Arlington, Va. 22209.
(5) Bennett, R. E., and Frycki, S. J., "Internal Processing of External Reference Services," J. Chem. Doc. 11, 76 (1971).
(6) Stein, J. D. Jr., Delaney, F. M., Peluso, S. D., and Starker, L. N., "A Computer-Based Comprehensive Bio-Data Information Retrieval System." Presented at the 6th Middle Atlantic Regional Meeting, ACS, Baltimore, Md., February 1971.
(7) Arendell, F. H., Lengler, C. R., Goebel, C. L., and Starker, L. N., "A Pharmaceutical Data Handling System for Scientific and Management Reporting Functions." Presented at 31st Meeting, International Federation of Documentation, Washington, D. C., October 1965.

Atlas Biomedical Literature System—A Computerized Current Awareness and Information Storage and Retrieval System*

EMMA-JUNE H. TILLMANNS,** JOYCE B. BOYLEN, and MERWIN S. KENDIS
Atlas Chemical Industries, Inc., Wilmington, Del. 19899

The computerized Atlas Biomedical Literature System produces a semi-monthly current awareness bulletin for published biological, biochemical, medicinal-chemical, and medical literature pertinent to Atlas research interests and products, and also stores keywords and bibliographic material for retrieval. Sources of input to the system are evaluated. Access to the systems and examples of the format of the data retrieved are discussed.

Various methods have been described for computerized storage and retrieval of technical literature. Some are used for storage and retrieval of company reports but can be extended to other types of literature, such as the GAF document storage and retrieval system[1] and the Olin SWIFT method.[2] Others are intended for files of published literature references.[3-5] Of the latter, the system described by Teal and Greenburg provides for the computer-printing of bibliographies in answer to queries and also the printing of bibliographies in the format and sequence required by the Food and Drug Administration (FDA).[5] None of these methods makes possible computer storage and retrieval and also computer-printing of a current awareness bulletin. Flexibility in changing the format of the output is also lacking in these previously published methods. The Atlas Bio-

Table I. Osmotic Diuretics (1966)—Number of Citations in Secondary Sources

Number of Citations Reported in Common by Pairs of Secondary Sources	CBAC	Excerpta Med., Sect. 2C Pharmacol.	Index Medicus	de Haen[a]	Total No. Citations	Citations Found Elsewhere[b]	Citations Not Found Elsewhere[b]
CBAC	—	1	4	0	21	5	16
Exerpta Med., Sect. 2C, Pharmacol.	1	—	0	0	4	1	3
Index Medicus	4	0	—	0	32	4	28
deHaen[a]	0	0	0	—	1	0	1

[a]Includes both de Haen *Drugs in Research* and de Haen *Drugs in Prospect.* [b]"Elsewhere" = in one or more secondary sources *other* than the one being evaluated.

medical Literature System (ABLS) and the recently described Squibb System[6] do have these capabilities.

As Atlas biomedical interests expanded after the acquisition of the Stuart Pharmaceutical Co. in 1961, the need for increased coverage of the biomedical literature became apparent, and the limitations of manual retrieval of information were recognized. At first, information from current biomedical literature relevant to Atlas research interests was circulated by a special section of detailed abstracts in the semi-monthly *Atlas Abstract Bulletin.* Articles pertinent to products of the Stuart Pharmaceuticals Division were, and are still, cited in the Stuart Library *Daily Uniterm.* The latter gives bibliographic data and keywords (Uniterms) for the cited articles. A manual coordinate index of these keywords for retrieval of over 13,000 articles referred to in the *Daily Uniterm* is maintained by the Stuart Pharmaceuticals Division.[7,8]

In 1968, the Research Information Section at Atlas Chemical Industries, Inc., started work on a computerized system to provide readily accessible storage of pertinent biomedical literature—i.e., published literature in biomedical, medicinal-chemical, biological, and medical journals with a current awareness bulletin as an integral part of the system. The aim was to develop a system easily searched by personnel untrained in computer language and from which the output could be obtained in various forms which were readable and meaningful to other scientists. It was expected that the computerized system would augment and ultimately replace the Stuart Uniterm file.

The present Atlas Biomedical Literature System (ABLS) consists of two parts: a semi-monthly bulletin—*Atlas Biomedical Condensates*—to provide current awareness for Atlas biomedical research workers, and magnetic tapes from which printouts of keywords, bibliographies, etc., on selected subjects can be made periodically. Such printouts are useful in writing reports and in bringing research workers and clinical investigators up-to-date with the literature in specific fields. Software for the system consists of the Mark IV File Management System[9] for storage and retrieval of the data, supplemented by programs developed at Atlas for editing and printing the semi-monthly bulletins. Initially, computer operations were performed by the IBM 360 Model 30 computer. Later, a Model 40 was installed and now the IBM 360 Model 50 is in use. No significant changes in the ABLS were necessary for the changeovers.

SELECTION OF INPUT

The literature to be covered in the ABLS at first was selected on the basis of its pertinence to our biomedical research program, but has been expanded to include not only research interests in Wilmington, but also the product-oriented interests of the Stuart Pharmaceuticals Division in Pasadena. During 1967, just prior to the adoption of a computer system, a study was made to determine which of four

literature sources—i.e., *Chemical-Biological Activities* (CBAC), *Excerpta Medica* Section 2C, *Index Medicus,* and de Haen services *(Drugs in Prospect* and *Drugs in Research),* was the most useful for obtaining articles on osmotic diuretics, an area of interest to Atlas. Evaluation of these sources showed that while there was considerable overlap, no one source cited all the pertinent references (Table I). *Index Medicus* yielded 59% of the references, 76% of which were not cited by the other sources and CBAC gave 33% of the references, 76% of which were not cited by the others. Although only four references (6%) were obtained from the Pharmacology Section of *Excerpta Medica* and one reference (2%) was obtained from de Haen services, three of those from *Excerpta Medica* and the one from de Haen services were not found in any other source. Thus, it is evident that multiple sources must be used to achieve optimum coverage of Atlas biomedical interests in the ABLS.

Presently, selection of articles pertinent to Atlas research interests is made by scanning *Automatic Subject Citation Alert* (ASCA) printouts, printouts of searches made from *CA Condensates, Index Medicus,* de Haen services, and *Abstracts of World Medicine.* The ASCA printout, obtained from the Institute of Scientific Information, Philadelphia, cites articles selected by computer on the basis of keyword fragment, source author, or cited reference. Computer searches at Atlas were first made with CBAC tapes. However, when *CA Condensates* was obtained to provide information for Atlas' chemical research interests, the CBAC tapes were replaced by *CA Condensates.* Search of *CA Condensates* is made on the basis of profiles consisting of keywords and keyword fragments. Since it is difficult to judge the pertinence of articles from ASCA and *Index Medicus* on the basis of title only, more articles are actually ordered than are put into the ABLS. Selections are also made directly from periodicals scanned regularly by company personnel. Most of the articles entered in the system and pertaining to our research program and Atlas products are obtained from ASCA. At present, articles concerning Stuart interests and Stuart products are obtained mainly from primary journals. Table II shows the overlap of articles cited by various sources during a study made in 1968. Table III summarizes data concerning the number of articles obtained from each source during March through October, 1970. Control of article orders to prevent duplication is maintained by a card file sequenced alphabetically by first author and listing article title and journal reference as well as date ordered, date received, and accession number.

INPUT

As a copy of each article selected is received, a seven-digit accession number is assigned. This number is prefixed by the letter "B" if the article was obtained for Wil-

Table II. Effectiveness of Sources Used for Obtaining Articles for Atlas
Biomedical Literature System during March through October 1968

	Total Articles Obtained	Journals	Other Sources Citing Same Articles				
Source Scanned			ASCA	CBAC	de Haen[a]	Abst. World Med.	Index Medicus
Original journals	371	—	46	34	30	4	6
ASCA	275	46	—	11	17	0	3
CBAC	52	34	11	—	10	0	3
de Haen[a]	132	30	17	10	—	0	0
Abst. World Med.	19	4	0	0	0	—	0
Index Medicus	21	4	6	3	0	0	—

[a]de Haen Drugs in Research and de Haen Drugs in Prospect were used.

Table III. Number of Articles Obtained during
March through October, 1970, for the ABLS

Source Scanned	No. of Articles
Original Journals	364
ASCA	546
de Haen[a]	85
CBAC	125
Abstracts World Med.	1
Index Medicus	74

[a]de Haen Drugs in Research and de Haen Drugs in Prospect were used.

mington. A few internal reports have been entered with the prefix "I". Although numbers assigned at Stuart (S numbers) are consecutive from the start of the Stuart manual indexing system started 14 years ago,[7] numbers assigned at Wilmington are consecutive only within a year's period. The year is indicated by the first and second digits after the letter "B". For example, the number B701703 indicates that this is the 1,703rd article acquired by Wilmington for the ABLS during 1970. The different set of numbers used for articles from the Stuart Pharmaceuticals Division makes it possible to enter gradually articles already in Stuart files as well as current articles. Also, the use of "S" numbers

BIO-MEDICAL CONDENSATES DATA SHEET
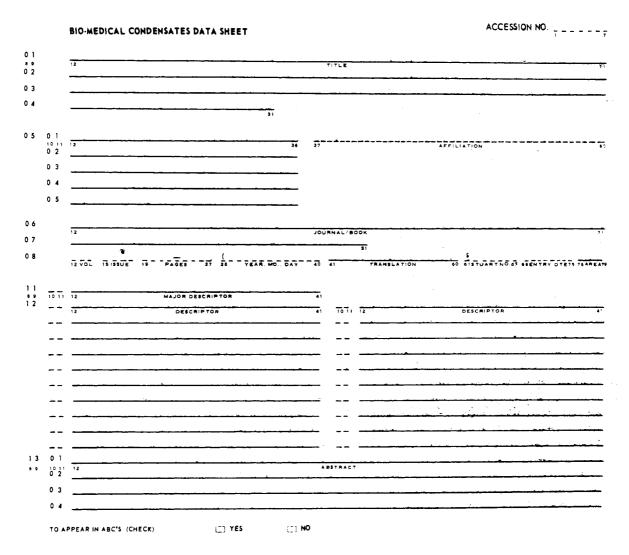
ACCESSION NO. _ _ _ _ _ _ _

Figure 1. Biomedical Condensates data sheet

enables computer production of special printouts and descriptor cards which will eventually replace the Stuart manual card file. The present combined rate of addition to the ABLS of both articles acquired by Wilmington and those acquired by Stuart is about 4,000 per year. Included in this number are not only current articles but also other articles from the Stuart file and articles in areas of special interest to Atlas, such as osmotic diuretics, TWEEN surfactants, etc. Condensates of these articles are added to the ABLS tape but do not appear in the current awareness bulletin. The number of Stuart condensates in the system is about one-third of the total. There is no limit to the total number of condensates the ABLS can contain.

As each article acquired in Wilmington is numbered, the article is quickly checked for relevancy. The next step is analysis of the article by a biologist, chemist, or biochemist. Information needed for entry into the ABLS is filled in on a Biomedical Condensate Data Sheet (Figure 1) designed so that each line represents a separate punched card. The small numerals appearing under each line indicate the columns on each punched card allotted for this information. For example, each descriptor may contain as many as 30 characters including spaces; each author's name may not exceed 25 characters including spaces.

About 10 to 15 descriptors are needed to index the average article. Some articles, especially review articles, may require as many as 30 to 35 descriptors.

All drugs reported in articles are entered into the ABLS by generic name or code name if possible, otherwise by tradename or chemical class name. However, whenever an Atlas tradename—e.g., SORBITRATE, MYLICON, etc.— is used in an article, the tradename as well as the generic name is used. Since the length of the descriptor field is limited to 30 characters or spaces, specific chemical names are almost never used. Some exceptions are gamma-aminobutyric acid, phenol, and dodecyl sodium sulfate. One or more chemical class names, such as benzothiophenes, amino acids, phenols, ketones, etc., are used to enter compounds which have no generic name, code name, or tradename.

In addition, the general pharmacologic or therapeutic class of these drugs is also entered—e.g., "vasodilators, coronary," "antiparkinson agents," etc. Descriptors giving the species (e.g., man, dog, etc.) and the condition of the species (e.g., fasting, anesthetized, conscious, etc.) are listed, as well as other descriptors describing the mode of administration, the disease being treated (e.g., angina pectoris, parkinsonism, etc.) and finally broad, general terms to indicate the general purpose of the investigation and the amount of information which may be expected in the paper. Examples of the last are words such as nutrition, pharmacology, therapy, review, editorial, news article, etc.

For articles which mention adverse reactions of selected Atlas products, a unique coded descriptor is used. For example, "ARISDN Headache" is used as a descriptor for articles which list headache as a side effect of isosorbide dinitrate. Such coded keywords enable complete and specific retrieval of all side effects for a particular drug. They are especially useful for articles which compare two or more different drugs—e.g., isosorbide and mannitol—and give side effects for each.

In rare cases where the title of the article and the keywords do not adequately describe the subject matter of the article, a one or two sentence abstract is added. To ensure consistency and accuracy of input, each condensate is edited before it is punched and entered into the ABLS. During editing, the expected date of entry into the ABLS is assigned. This date is frequently used in retrieving information from the ABLS.

Figure 2. Part of page in ABLS Vocabulary List

Figure 3. Part of page from first part of *Atlas Biomedical Condensates*

VOCABULARY

Although a controlled vocabulary is used to enable efficient retrieval of references, the vocabulary is open-ended. A sample page of the vocabulary showing notes, cross references and date of entry is given in Figure 2. Additions of new drug names and new concepts are constantly being made, presently at the rate of ~150 per month.

Two years of experience with the ABLS showed that in spite of supposedly careful editing about 5% of the descriptors in the system were misspelled or incomplete. It was necessary to eliminate such invalid descriptors by a semi-annual, page-by-page inspection of a complete printout of descriptors in the system and to replace them by valid ones. Since our vocabulary now contains over 6000 terms and the last semi-annual descriptor printout occupied 948 pages, it is no longer economical to do this manually. Hence, the system has been modified to enable computer validation of each descriptor before entry into the ABLS.

ATLAS BIOMEDICAL CONDENSATES

Twice a month a current awareness bulletin, the *Atlas Biomedical Condensates* (ABC) is published. It consists of two computer-produced parts. The first part is a listing of article titles appearing in accession number order and may be used as an order sheet to obtain copies of the articles listed from the library. It also cites the page in the second part of the ABC on which a condensate of the article appears (Figure 3). The second part gives the condensates with the information which will be placed in the ABLS (Figure 4). The condensates are grouped by subject to facilitate manual retrieval of condensates on specific subjects.

8710781

GABA AND PROLONGED SPINAL INHIBITION.

CURTIS, C.R.   ET AL.
AUSTRALIA NATL. UNIV., CANBERRA

NATURE
231   187- 188 (1971 JUN 9)

CENTRAL NERVOUS SYSTEM NOC*

SYNAPTIC MEMBRANES
NATURAL PRODUCTS
BICUCULLINE
ELECTROPHORESIS
ANIMAL STUDY
CATS
ANESTHETIZED
MOTONEURONS
NEURONS, AFFERENT
GAMMA-AMINOBUTYRIC ACID
MEMBRANE POLARIZATION
POST-SYNAP. POTENTIAL, INHIB.
ANTICHOMIC POTENTIALS
NEUROPHYSIOLOGY

8710797

RELEASE OF AN UNKNOWN SUBSTANCE FROM BRAIN STRUCTURES OF
UNANESTHETIZED MONKEYS AND CATS.

BELESLIN, D.B.   ET AL.
PURDUE UNIV., LAFAYETTE, IND.

NEUROPHARMACOL.
10   121- 124 (1971)

CENTRAL NERVOUS SYSTEM NOC*

BIOASSAY
MONKEYS
CATS
BRAIN
CEREBRAL CORTEX
THALAMUS
HYPOTHALAMUS
ISOLATED TISSUES
SEROTONIN
DRUG COMPARISON
METHYSERGID
SEROTONIN ANTAGONISTS
PROSTAGLANDINS
MUSCLE CONTRACTION
BIOCHEMISTRY

AN UNKNOWN SUBSTANCE ISOLATED FROM BRAIN TISSUE OF CATS AND
MONKEYS PRODUCES SMOOTH MUSCLE CONTRACTIONS SIMILAR TC THOSE
PRODUCED BY SEROTONIN. BUT IS NOT BLOCKED BY SEROTONIN
ANTAGONISTS. AUTHORS FEEL THIS SUBSTANCE IS POSSIBLY A
PROSTAGLANDIN.

AUTONOMIC NERVOUS SYSTEM

8710790

SPINAL EXCITATORY AND DEPRESSANT EFFECTS OF SODIUM
DIPHENYLTHIOHYDANTOINATE.

RAINES, A.   ET AL.
CORNELL UNIV. MED. COL., N.Y. CITY

J. PHARMACOL. EXP. THERAP.
177   350- 359 (1971)

CENTRAL NERVOUS SYSTEM NOC*

ANTICONVULSANTS
DIPHENYLHYDANTOIN
DIPHENYLTHIOHYDANTOIN
ANIMAL STUDY
CATS
SPINAL TRANSECTION
MONOSYNAPTIC REFLEX
POLYSYNAPTIC REFLEX
PRESYNAPTIC INHIBITION
POST.-SYNAP. POTENTIAL, INHIB.
ANTICHOMIC POTENTIALS
DRUG COMPARISON
PHARMACOLOGY

8710480

SPECIES DIFFERENCES IN AORTIC RESPONSES TC VASOACTIVE
AMINES--THE EFFECTS OF COMPOUND 48/80, COCAINE, RESERPINE
AND 6-HYDROXYDOPAMINE.

MALING, H.M.   ET AL.
NATL. INST. HEALTH, BETHESDA, MD.

J. PHARMACOL. EXP. THERAP.
176   672- 683 (1971)

ADRENERGIC AGENTS

NOREPINEPHRINE
TYRAMINE
HISTAMINE
SEROTONIN
ANIMAL STUDY
IN VIVO
CATS
GUINEA PIGS
RABBITS
RATS
AORTA
AORTA, ABDOMINAL
RESERPINE
HYDROXYDOPAMINE
COCAINE
POTASSIUM CHLORIDE
COMPOUND 48/80
EFFECTIVE DOSE
MUSCLE CONTRACTION
SPECIES SPECIFICITY
PHARMACOLOGY

---

* NOT OTHERWISE CLASSIFIED

Figure 4.   Representative page Atlas Biomedical Condensates

Printing of the ABC is by computer. IBM cards are punched to correspond to data lines on the edited Biomedical Condensate Data Sheets. By means of a special program, the IBM 1403 printer prints a proof copy and indicates invalid descriptors and missing or duplicate cards (Figure 5). Errors are corrected, additional descriptors added, if necessary, and the process is repeated (without the descriptor edit step) to obtain a final copy of the condensate and a printout of the article titles sequenced by accession numbers (Figure 3).

At this point, clerical personnel assume responsibility for cutting up the final copy and grouping the condensates by subject as indicated by the letter-digit code assigned to the key descriptor for each condensate. The condensates are pasted in 2-column format on 14 X 17 inch pages which are later photo-reduced to give multilith masters for duplication.

ENTRY INTO THE ABLS

After proof and final copies of the ABC have been prepared by the computer, all of the IBM cards used in this process are now used to update the ABLS tape. As the information is submitted to the tape, the computer again edits the descriptors and rejects invalid descriptors which are identified as such in the maintenance printout. Likewise, any articles with accession numbers identical to ones already on the tape are rejected and identified in the printout. At the time of each update, a program is submitted so that first author, article title, journal reference, and accession number are printed on continuous-form 3 X 5 cards sequenced by first author. These cards are given to the library together with the set of articles to which they pertain so that a card file can be maintained for access to these articles.

```
ACC  NO    CD    ITEM

B710030    01           CURRENT VIEWS AND MANAGEMENT OF STROKES

B710030    05    01     VALERGAKIS, F.E.G.
                        JERSEY CITY MED CT.

B710030    06           GERIATRICS
B710030    08           25        102- 108 (1970 JUL)

B710030    11    B6     CARDIOVASCULAR SYSTEM NOC*

B710030    12    01           ANTICHOLESTEREMIC AGENTS
B710030    12    02           ENZYME INHIBITORS
B710030    12    03           ANTICOAGULANTS
B710030    12    04           VASODILATORS, CEREBRAL
B710030    12    05      N    PAPAVERINE
B710030    12    06      N    CLOFIBRATE
B710030    12    07           MAN
B710030    12    08           STROKE
B710030    12    10    #      CEREBROVASCULAR DISORDERS
B710030    12    11    #      CEREBROVASCULAR CIRCULATION
B710030    12    12    #      CARBON DIOXIDE
B710030    12    13    #   #  CHOLESTEREOL
B710030    12    14    #      FATTY ACIDS
B710030    12    15    #      DIET THERAPY
B710030    12    16    #      THERAPY
B710030    12    17    #      REVIEW
```

B710030

71/01/28 Figure 5. Proof copy *Atlas Biomedical Conden-sates*

to right of numbers shows descriptor number 09 is missing

to left of descriptor indicates invalid descriptor, in this case invalid because misspelled

N calls attention to a note in the vocabulary list for this term

The accession number and the date of entry are at the upper right

RETRIEVAL FROM THE ABLS

Retrieved items from the ABLS are usually printed on five-part, $8\frac{1}{2} \times 11$, unlined paper or 3×5 cards, both in continuous forms, which are separated before distribution. The Mark IV System allows the form of the output to be varied with regard to the spacing, the information appearing on each line, and the information included in the report.

For maintenance of the system we have semi-annual listings of journal title abbreviations, author affiliations, and complete bibliographies of all the entries in the system sequenced both by first author and by accession number. The last two printouts are also used by the Research Information Service and by the Atlas Library for access to the system. Semi-annual cumulative and bi-monthly update lists (Figure 6) of all descriptors in the ABLS together with accession numbers are also useful tools for answering questions that may be asked by research personnel.

As a service to the Stuart Pharmaceuticals Division, the Research Information Section sends to Stuart each month a complete list of descriptors for articles which have been assigned accession numbers by the Stuart Pharmaceuticals Division as well as two sets of 3×5 cards for articles received during the month. By means of these descriptor printouts, that portion of the system pertaining to documents at Stuart can be searched with one descriptor or by coordinating two or more descriptors. These lists together with the two sets of computer-produced 3×5 cards will ultimately replace the coordinate index files at Stuart. One set of 3×5 cards is similar to that already described. The other set is sequenced by Stuart accession number and lists the first author and all descriptors for that article on one or more cards (Figure 7).

Services to the Clinical Investigation Section include routinely printed, updated bibliographies of Atlas products—e.g., SORBITRATE (isosorbide dinitrate). These bibliographies may be printed with citation only (Figure 8) or with the addition of all descriptors and an abstract, if present (Figure 9). The shorter version is widely distributed for use by both Atlas personnel and outside clinical investigators. The longer version, with descriptors forming an abstract, is used chiefly as a research tool by the clinical information unit. In addition to these routinely printed bibliographies, other bibliographies are produced on demand and may be selected by any descriptor or combination of descriptors. As many as seven descriptors have thus far been combined in "and" and "or" logic to produce these bibliographies.

```
SEP 01. 1971                                                    PAGE 1220
----------------------------------------------------------------------
    FILL1            DESCRIPTOR          ACC NO    DSCRPTR NO
----------------------------------------------------------------------
              NAFENOPIN                 B710681      01

              NAFIVERINE               B670312      03
                                        B670319      04
                                        B670320      04
                                        B670321      03

              NAFTIDROFURYL            B690611      02
                                        B690619      02
                                        S012187      03

              NALIDIXIC ACID           B660896      09
                                        S012203      07
                                        S013063      03

              NALORPHINE               B680407      07
                                        B691303      10
                                        B691317      05
                                        B702406      05
                                        B710031      13
                                        B710063      08
                                        B710565      11
```

Figure 6. Part of Cumulative Descriptor List

```
              SET OF    2 CARD(S)

BOELENS, P.A.                 ET AL.     S013173
   AMER. J. DIS. CHILD.
         THERAPY

              SET OF    2 CARD(S)

BOELENS, P.A.          ET AL.    S013173
  AMER. J. DIS. CHILD.
         ANTACIDS
         ALUMINUM HYDROXIDE
         MAGNESIUM HYDROXIDE
         MAN
         HYPERPHOSPHATEMIA
         HYPOPHOSPHATEMIA
         MUSCLE WEAKNESS
         HEMODIALYSIS
         INTESTINAL ABSORPTION
         DRUG LEVELS
         SERUM
         ETIOLOGY
```
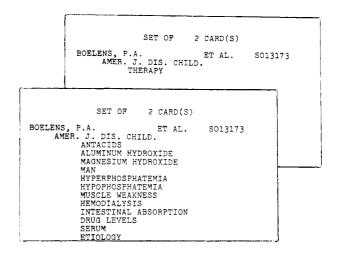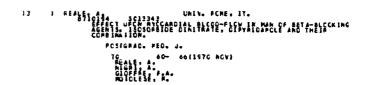
Figure 7. Descriptor cards (3 × 5) for Stuart Division

Figure 8. Part of bibliography with all authors but no descriptors (citation only)

Figure 9. Page of bibliography containing all descriptors

CONCLUSION

The Atlas Biomedical Literature System (ABLS) has been in operation for three years. It presently contains references to more than 7000 articles and is growing at the rate of about 4000 articles per year. There is no limit to the number of condensates the ABLS can contain. It is a flexible and useful information tool capable of producing bibliographies in various forms and of selecting citations from broadly or narrowly defined areas.

ACKNOWLEDGMENT

The authors are indebted to the following members of the Atlas Organization and Systems Planning Department: G. Ward Keever, III, for the initial work in planning the computer system and for adapting the Mark IV Management System to the special requirements of the ABLS; Charles W. Audette for expanding the system and providing additional computer programs for use in printing the semimonthly bulletins; Barbara K. Casey for writing the computer programs used for editing the proof copy of the condensates and validating the descriptors; and David L. Freese for help in preparing some of the retrieval programs. We are also deeply indebted to Frederic R. Benson for his support and encouragement.

LITERATURE CITED

(1) Starke, A. C., Whaley, F. R., Carson, E. C., and Thompson, W. B., "GAF Document Storage and Retrieval System," Amer. Doc. 19, 173-80 (1968).

(2) Ackermann, H. J., Haglind, J. B., Lindwall, H. G., and Maizell, R. E., "SWIFT: Computerized Storage and Retrieval of Technical Information," J. Chem. Doc. 8, 14-9 (1968).

(3) Gillis, C. N., "Biomedical Information Retrieval: A Computer-Based System for Individual Use," J. Chem. Doc. 7, 98-100 (1967).

(4) Horvath, P. J., Chamis, A. Y., Carroll, R. F., and Dlugos, J., "The B. F. Goodrich Information Retrieval System and Automatic Information Distribution Using Computer-Compiled Thesaurus and Dual Dictionary," J. Chem. Doc. 7, 124-30 (1967).

(5) Teal, T. W., and Greenberg, S. M., "Managing Literature in the Pharmaceutical Industry," Drug Inform. Bull. 2, 136-43 (Oct./Dec. 1968).

(6) Bennett, R. E., and Frycki, S. J., "Internal Processing of External Reference Services," J. Chem. Doc. 11, 76-83 (1971).

(7) Clark, G. M., "Co-ordinate Indexing of Pharmaceutical Information," Bull. Med. Lib. Ass. 50, 422-8 (July 1962).

(8) Kreiter, C. S., and Galindo, J. G., "Filing and Retrieving Pharmaceutical Information," Drug Stand. 26, 151-2 (1958).

(9) Mark IV Management System supplied by Informatics, Inc., Sherman Oaks, Calif.

An Experimental Computerized CBAC Search Project

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A literature search system for CBAC is described. Both SDI and retrospective searching techniques are available to the user. The system relies heavily on searching keywords from the CBAC text rather than the text itself and employs batch/tape and time-sharing/disk hardware.

An experimental Chemical Information System, consisting of the literature, substructure search, and property files is being tested at the Division of Computer Research and Technology of the National Institutes of Health.[1] One part of this experimental system, the literature project, is the topic of this paper.

THE DATA BASE

The major problem that confronts a new information center is what data base to use. Some data bases cover a limited area, some are broad, some contain only titles, some contain full abstracts, some are highly indexed with complex dictionary and index terms, some provide rapid literature indexing and abstracting, and some are slower but more thorough. One, or even two, data bases will not cover

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