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AUTHOR Van Orden, Richard
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ABSTRACT

To improve bibliographic access to the individual works contained in "Landmarks of Science" and "Landmarks II," two comprehensive microform collections of materials related to the history of science, the staff of the University of Utah Libraries cataloged the individual titles. Staff members with backgrounds in Renaissance studies, history, philosophy, and science, and language capabilities in Greek, Latin, German, French, Italian, and Spanish, entered the monographs and serials into the OCLC database according to the standards of the second edition of the Anglo-American Cataloging Rules. Entry in OCLC has provided search capabilities not only to University of Utah Library patrons, but also to users at any of the 4,000 libraries using this bibliographic utility. This five-part project report comprises: (1) a discussion of the grant proposal; (2) an explanation of the organization of the project; (3) a description of the methods used for cataloging the microforms titles; (4) a discussion of the historical value of the "Landmarks Set"; and (5) footnotes to the body of the document. (THC)

LANDMARKS OF SCIENCE

MICROFORMS CATALOGING PROJECT

September, 1981 - December, 1983

Report on Grant Number G008101211

Awarded to the University of Utah Libraries

Under Title II-C of the Higher Education Act of 1965

by Richard Van Orden, Project Coordinator

The writing of this report was funded by a Title II-C grant of the Higher Education Act of 1965, Strengthening Research Library Resources

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A REPORT OF THE LANDMARKS OF SCIENCE MICROFORM CATALOGING PROJECT AT THE UNIVERSITY OF UTAH LIBRARIES

I. Grant Proposal

From October of 1981 to December of 1983, staff of the University of Utah Libraries cataloged the titles contained in the Landmarks sets published by the Readex Microprint Corporation. The project was funded by a grant under Title II-C of the Higher Education Act for Strengthening Research Library Resources. The objective was to improve bibliographic access to the individual works contained in this valuable collection of science imprints. The monographs and serials were entered into the OCLC database according to the standards of the second edition of the Anglo-American Cataloguing Rules as interpreted by the Library of Congress.

Providing bibliographic control of microforms has been a major concern of the Association of Research Libraries since 1960. In a study commissioned by the association in that year, Wesley Simonton recommended that every title in a microform set should be fully cataloged as if the original item was acquired by the library. Robert Grey Cole, the chair of the American Library Association Subcommittee on Bibliographic Control of Microforms, wrote in a 1976 issue of Illinois Libraries:

> Until adequate bibliographic control is established for micropublications all other efforts toward effective utilization of microforms in libraries will be frustrated or wasted. No matter how fine an environment is created for reading microforms, no matter how precise the standards of production, and no matter how important the information in microforms, if adequate bibliographic control is lacking, patrons of libraries will not read microfilms simply because they will never know what is in them.[1]

In a 1980 ARL report, librarians gave first priority to the Landmarks of Science for retrospective cataloging.[2] Several years earlier, the science cataloger at the University of Utah's Marriott Library started a project to provide full bibliographic information in the OCLC database but was forced to abandon cataloging Landmarks because of the pressure of current materials. Through activities such as the Microforms Committee, the library maintained a commitment to cataloging microforms as shown by its ranking in the upper quarter of research libraries in the number of such units processed annually. While a grant proposal from the Marriott Library in the 1970s to coordinate a national effort at the bibliographic control of microforms was not funded, the environment for a Utah application to catalog the Landmarks set was right. The Department of Education approved the grant. Two years later, machine-readable cataloging for each title in both sets is available through OCLC, and cards are also filed in the Marriott catalog.

Landmarks of Science and Landmarks II constitute two comprehensive collections of materials relating to the history of science. The first Landmarks program was begun by the Readex Corporation in 1966 and was primarily based on the science works housed at the University of Oklahoma supplemented by materials from the British Museum. Scientific monographs dating from the beginning of printing comprise the first set. Such books as Newton's Opticks published in 1704 and Euclid's Elements printed in Latin in 1482 are included. Landmarks II is an ongoing project to add significant items to the collection, particularly journals which became a major method of scientific communication after 1650.[3]

The Marriott Library Title II-C grant proposal was prepared by Dr. Robert Holley early in 1981. The application addressed such selection criteria as significance as a major research library, breadth and uniqueness of collections, and the demand of outside scholars for using the library's materials. The proposal emphasized the University of Utah's national ranking of twenty-ninth in federal research funds for 892 projects in fiscal year 1980. The federal research funds expended at the University that year totaled $47,845,744, and the total research budget exceeded $80,000,000. Interlibrary loan requests to borrow were 10,651. The 14,500 Rand reports and 125,000 maps and atlases were cited as unique collections in addition to material related to Western history and the Middle East. Sue Raemer, library administrative assistant, compiled the statistics. The plan was to catalog the titles in Landmarks on OCLC and to make automated tapes and catalog cards widely available to interested institutions.[4]

The Higher Education Act containing the authorization for strengthening library resources was passed under President Lyndon Johnson. When signing the Library Services and Construction Act in 1964, the only school teacher to become president stated, "The central fact of our times is this: books and ideas are the most effective weapons against intolerance and ignorance."[5]

Title II, part C of the Higher Education Act of 1965 provided project grants to enable the major research libraries of this country to purchase materials or make what they had more accessible. With this funding, for example, the Boston Public Library enhanced the 7,500,000 cards in its Research Library Catalogue and distributed the catalog on microfilm.[6] The final regulations for the implementation of this law as amended in 1976 contained the following description:

> The purpose of the program under this part is to promote research and education of higher quality throughout the United States by providing financial assistance to: (a) help major research libraries maintain and strengthen their collections; and (b) assist major research libraries in making their holdings available to individual researchers and scholars outside the primary clientele and to other libraries whose users have need for research materials.[7]

The funding level in fiscal year 1979 was $6,000,000. The grants ranged from $70,216 to $675,000 with an average of $250,000. The total amount awarded in 1981 was still $6,000,000 with thirty grants in twenty states averaging $150,000.[8] Such areas as preservation and acquisition as well as cataloging were beneficiaries of the various projects. The program is administered by the Office of Libraries and Learning Technologies within the Department of Education. Some commentators on the initial regulations argued against helping the richer libraries get richer.[9] However, such was the intent of the law which recognized the importance of the large, research libraries to the cultural life of the nation.

Why did the administrative staff of the University of Utah Libraries want the Landmarks of Science cataloged? The foremost consideration was to give researchers across the country bibliographic access to this significant, scientific collection. Entry in OCLC provided search capabilities to not only Marriott Library patrons but also to users at any of the 4,000 libraries using this bibliographic utility. In support of the grant application, Dr. B. Gale Dick, professor of physics, wrote:

> Such a tool to be used with this valuable collection would be a godsend to me and a number of my scientific colleagues who have been involved over the last six years in the ongoing development of a course for undergraduates which combines study of the history of ideas with the history of science. This two year course is based on the reading of original science material... We and our students are precisely the sort of people who could benefit from the help that could be provided by making Landmarks of Science more useful to the non-specialist.[10]

The grant proposal, entitled "Strengthening Library Resources: Improved Bibliographic Access to the Landmarks of Science", succinctly stated the library's objectives.

> We plan to enter all cataloging data into OCLC. By using OCLC's MARC subscription service and its card printing capabilities, we will build a complete file at the University of Utah of these bibliographic records both in machine-readable and catalog card format... We hope for the widest distribution possible of the bibliographic records.[11]

The intention was to either distribute the cards and records from the University of Utah upon request or to encourage the bibliographic utility to do so at a low cost.

II. Organization of the Project

Four LA IV library assistants were hired on October 1, 1981 to begin cataloging the set. One of these staff members was paid out of library funds as both the project coordinator and

supervisor were paid out of grant money. All of the Landmarks catalogers held undergraduate degrees, and one had a master's in library science. They brought to the project backgrounds in Renaissance studies, history, philosophy, and science. Camille Sparkman, Elaine Howlett, Alice Hornbeck, and Cathy Marchant did the majority of the cataloging and data entry. Language capabilities in Greek, Latin, German, French, Italian, and Spanish enabled the staff to read materials from many different countries. Martha Miller worked as a part-time assistant for a year. During the second half of the project, an LA III position was added to assist with the searching and data entry into OCLC. Richard Clements, B.A. in anthropology, initially filled this slot. Camille left in November of 1982 and was replaced by Mark Hufstetler, a history graduate. As the staff started finding permanent jobs toward the end of the project, other individuals worked on the grant for short periods of time. Hazel Busterud, Reid Sweatman, and Pat Maryon contributed to completing the cataloging. In all, thirteen people were paid out of grant funds at one time or another.

Several individuals were administratively involved with the project. Joseph Potts was designated as the project coordinator and Ruth Hanson as the supervisor. Three project members had experience in cataloging. Joe was the science cataloger before heading copy cataloging. Ruth worked in conversion and as the transfer clerk before becoming an online cataloger. In addition to doing graduate work in linguistics, she had a reading knowledge of five languages. Camille's assignment was in catalog support before transferring to Landmarks. The extensive library experience of these three team members was a key to the success of the endeavor.

Roger Hanson was the project director, and Robert Holley handled much of the communication with outside agencies such as OCLC and the Department of Education. Richard Denman, library business manager, took care of the financial accounting, and Yasuko Kao provided supervisory support as the Cataloging Division Head. Richard Van Orden switched positions with Joe Potts in 1982 and assumed his responsibilities for the Landmarks project.

The instantaneous creation of a new area within the Cataloging Division was one of the more challenging aspects of the grant. Equipment had to be ordered, new staff trained, and processing procedures developed. Not surprisingly, the first few months were hectic. A few lessons were learned during this period. A longer planning phase would have allowed for detailed testing of procedures and a chance to prepare fuller, written documentation. More lead time would also have enabled the rather complicated negotiations with OCLC to be completed before the beginning of the project. Nevertheless, these obstacles caused only temporary delays. As the staff became familiar with online cataloging policies and OCLC record requirements, monthly production reached the level needed to finish the cataloging before the end of the project. Robert Holley, Joe Potts, and Ruth Hanson made the sacrifices required to get such a complex project through the initial phases.

III. Cataloging of the Microforms Titles

The availability of cataloging records in an automated environment was a crucial part of the Landmarks planning. For the Landmarks of Science series cataloged during the first year of the project, copy of some kind was found in the OCLC database for 82.2% of the titles. Manual searching in such reference tools as the National Union Catalog and Mansell's Pre-1956 Imprints yielded information for another 8.7% of the total. The remaining 9.1% of the titles were given original cataloging. More than three-fourths of the records were keyed into OCLC as original input because few records were in the database for the microform edition. The large majority of edits of matching records occurred in the early part of the alphabet, an indication that some institutions began cataloging the set in alphabetical sequence by the authors' last names.

All cataloging conformed to the I level input standard of OCLC. The project followed Library of Congress specifications for bibliographic description in that the original edition of the work was emphasized for cataloging purposes. Microform publishing information appeared in a 533 photoreproduction note rather than as a part of the imprint statement. An 007 field was inserted containing coding which identified the type of microform reproduction. Research in some older scientific dictionaries to identify full forms of the names was included as a part of the name authority process even though the full form was not always the AACR II heading.

Training included such standard procedures as group explanation, individual instruction, and testing. The supervisor also sat alongside of a new employee to give guided, "hands-on" experience in using the terminal. Written documentation was prepared as time allowed and need dictated. Manual workslips were developed to serve as a processing checklist, although they were completely filled-out only in complex cases. The project supervisor prepared numerous samples and step-by-step, written instructions on how to catalog both straight-forward and difficult titles. Group meetings were usually held on the first day of the month.

The concept of profile-matching was new and untested when the Marriott Library approached OCLC with the news of the grant award. In his ARL report on the cataloging of microforms, Richard Boss suggested the need for a mechanism whereby a library could order cards or records for all of the titles in a microform set by simply notifying the bibliographic utility of the desire to have them.[12] This would eliminate searching each title individually. Staff at the Bibliographic Center for Research (BCR) in Denver conducted the complicated negotiations between OCLC and the Marriott Library to determine how the project would be handled technically at OCLC. The University of Indiana, having received a Title II-C grant to catalog another microform set, went through a similar process at the same time. These two projects and the influence of the

Association of Research Libraries helped provide the stimulus for OCLC to develop this important capability of providing machine-readable records or cards at low cost. Dr. JoAn Segal, director of BCR, wrote a letter describing the agreements. She stated, "Although there will not be a formal contract associated with the initiation of work on the Landmarks of Science project, I feel it is important to put in writing the results of the numerous conversations involving BCR staff, University of Utah staff, and OCLC staff."[13]

The maintenance of a separate file of Landmarks records with a unique holding symbol enabled the project staff to enter and correct their own records during the course of the project. However, one inconvenience was the rekeying of all changes if a master record already existed in the OCLC data base. If additional changes were needed later, the master record did not contain the earlier modifications. A problem with an improper default that required rekeying of the holdings symbol before record production was corrected during the second year of the project.

Many of the titles in the set were published prior to 1800 making "Early works to 1800" a frequently used, topical subject subdivision. Approximately one-third of the books from the first series were in English. The monographs' percentages by language were: English-34.3%, Latin-24.9%, French-18.8%, German-15.5%, and others-6.5%. Detailed statistics on language and type of cataloging copy were not kept until the fourth month of the project so the above figures are based on the actual totals for 95% of the titles.

Each Landmarks cataloger did all of the work associated with the cataloging and data entry of the titles from an assigned set of letters reflecting the authors' last names. Initial processing began with the letter "D". The cataloger first determined the correct form of the main entry, assigned the subject headings, and formulated a call number. In most cases, either manual or online cataloging records were available to assist in these tasks. Library of Congress cataloging was accepted as an accurate reflection of the content and description of the item. Old subject headings were upgraded to conform to current practice. Online records entered by OCLC libraries were checked against any existing LC copy. If no LC copy was available either in printed or online sources, then the cataloger was responsible for verifying the quality of the contributed record. Original cataloging, though it constituted only 10% of the statistical workload, was given a priority in processing.

All records were revised by the project supervisor, with particular care given to original cataloging. Quality control of the project was multi-level. The cataloger did all of the research and data entry associated with a particular title. A printout was made of every record and sent to the project supervisor for revision. Any corrections were returned to the cataloger for data entry. After any changes were added to the online record, the

printout was passed on to one of the other catalogers for producing the cards from the terminal screen. This procedure served as another quality check since the producer was asked to double check the record for any typographical errors that had been missed earlier in the revision process. The final verification occurred while preparing the records for publication of a comprehensive index. Through the use of a library computer, the records were stored online and various kinds of editing and index lists were printed. One program, for example, listed the unique occurrences of names from the main and added entry fields of the OCLC record. Another listed all occurrences of subject headings. Spacing or keying errors show up dramatically when lined up next to each other. A third editing list was a printout of the full MARC record. These lists expedited a last check on the quality of the data. If the project were being done again, this automated, editing capability would be used earlier to help identify input problems soon after keying.

All items in the Landmarks of Science set were given the same call number of Q111.H3 with H35 as the cutter number for Landmarks II. An alternative call number was provided in the "a" subfield of the 090 field based on the subject content. Geographic area codes were included when appropriate. Title, imprint, and physical description were based on the original publication of the work. Microform publication information was given in a 533 note including the number of microprint cards. The series was not traced to avoid the futility of calling up 10,000 records in an automated search and to eliminate the additional filing that would have been required in a card catalog. Visual observation of the Landmarks file in the library shelflist indicates a generous use of optional notes reflecting careful attention to cataloging detail.

The following sample record for A Treatise on the Nature and Property of Fire displays on two OCLC screens and includes sixteen fields. Although not displayed in the master record, catalogers' initials were entered in the 910 field along with a date and two "at" signs (@@) which created a code unique to the project that could be used in automated sorting of Landmarks records. The workflow was organized according to categories of material: 1. LC copy for the original publication, 2. exact copy for the microform edition, 3. contributed copy for the original, or 4. no cataloging copy available. The various steps such as establishing the proper form of the name, manual searching, assigning subject headings and call numbers followed. Once the cataloger completed the description of the item, then the information was keyed into the OCLC database and a printout made. The record itself was stored in an online save file while revising was completed.

Identifying the subject content of early scientific works was not always an easy matter. One favorite example was fixed air. Because this work was in Italian, Elaine Howlett did a dictionary translation of several pages to find out what the author meant. The microprint cards sat on her desk for several days without a resolution. Finally, she decided to consult with an Italian professor. Because of its stability, fixed air was the medieval

OCLC: 8770577 Rec stat: n Entrd: 820914 Used: 820914
Type: a Bib lvl: m Govt pub: Lang: eng Source: d Illus:
Repr: c Enc lvl: I Conf pub: 0 Ctry: nyu Dat tp: r M/F/B: 10
Indx: 0 Mod rec: Festschr: 0 Cont:
Desc: a Int lvl: Dates: 1970,1752

1 010

2 040 UGR ǂc UGR

3 007 h ǂb g ǂc r ǂd a ǂe o ǂf c--- ǂg b ǂh u ǂi c ǂj u

4 090 Q111 ǂb .H3 ǂa QC19

5 090 ǂb

6 049 UUMM

7 100 10 Freke, John, ǂd 1688-1756.

8 245 12 A treatise on the nature and property of fire ǂh microform : ǂb in three essays ... / ǂc by John Freke.

9 260 0 London : ǂb Printed for W. Innys and J. Richardson, ǂc 1752.

10 300 vii [i.e. viii], 196 p.

Screen 2 of 2

11 505 0 (from t..) Shewing the cause of vitality and muscular motion, with many other phenomena -- On electricity -- Shewing the mechanical cause of magnetism, and why the compass varies in the manner it does.

12 533 Micro-opaque. ǂb New York : ǂc Readex Microprint, ǂd 1970. ǂe 3 cards ; 23 x 15 cm. ǂf (Landmarks of science)

13 650 0 Physics ǂx Early works to 1800.

14 650 0 Electricity ǂx Early works to 1850.

15 650 0 Magnetism ǂx Early works to 1800.

16 650 0 Fire ǂx Early works to 1800.

nomenclature for carbon dioxide. The contemporary subject heading was selected, and the entire staff enjoyed discussing the topic. Avicenna, a physician who flourished about 950 A.D., was another difficult assignment. His treatise was translated from Arabic to Latin, so the specialist in Latin did the cataloging. Later, the original was found in the set, so another Landmarks cataloger who happened to read Arabic did the necessary translation. Everyone was encouraged to tackle the difficult languages, but material could be referred to the language specialist if help was needed to understand the subject content or to determine important information from the title page.

One of the more distinctive features of the Landmarks project was the use of lupes. This small, hand-held magnifying glass with a magnification of ten times was the key to the world of microprint. A $15 lupe was purchased for each staff member and became a badge of honor for those working on the project. Lupes were dropped, bent, and lost temporarily. These durable pieces of modern technology survived two years in most cases, although lots of tape was required to keep plastic and glass together. One of the great failures of the project was an attempt to replace the old lupes at the beginning of the second year. The focal point of the new magnifiers was different and they did not have the familiar feeling of the old ones. Most of the new lupes went unused. Microprint readers from Readex were used for more detailed reading, but title page transcription was normally done with the little lupe.

By September 25, 1982, the nearly 4,000 titles in the Landmarks of Science set were cataloged and input, one week before the deadline. The Landmarks staff felt a great relief when the library director was able to announce at the general staff meeting in October that the project had been completed with one week to spare. Seven serials and a few "extracted froms" were included in the first series in addition to the thousands of monographs.

Preparation for cataloging in-analytics during the second half of the project was started three months before the end of the first year. Estimating the number of titles in Landmarks of Science was difficult. Even more problematic was predicting how many serials including title changes would be involved in the cataloging of Landmarks II. New serial and monograph segments are being added to the second series, so the unexpected shipment of new titles was an unknown factor for the second year's planning. However, once the actual cataloging was done, there were fewer titles in the set than originally anticipated. The remaining months of the second year grant were used to produce in-analytic records for selected scientific journals.

Establishing a format for the in-analytic records was difficult because OCLC had not implemented the changes in field requirements made by the Library of Congress. Correspondence with the Library of Congress yielded a detailed document which described the specifications as recommended by the MARBI (Machine

Representation of Bibliographic Information) committee of the American Library Association. A letter from an OCLC representative described the lengthy process involved in preparing the necessary documentation at OCLC, getting the programming done, and informing all of the system users of the modifications through technical bulletins. She said that the in-analytics format would not be operational in time for the project.[14] A provisional format was developed at the Marriott Library that allowed for later machine-manipulation to set up the proper linking fields within the in-analytics records.

Of the estimated 600,000 articles in the journals published in Landmarks II, the science reference librarians designated seven serials titles as high priority for analyzing. One of the selected journals was in French, and the others in English. Three thousand six hundred and sixty-eight in-analytics records were created from eleven titles, representing about 0.6% of the total number of articles. The highest number of titles per volume was sixty-eight and the lowest, one. The average number of articles per volume was thirty-three. No copy was found in OCLC, but searching in printed sources yielded seven titles. Thus, nearly all of the in-analytics records involved original cataloging though the process was repetitious for similar articles from the same volume or title. Searching for cataloging copy was not productive. Six months of cataloging in-analytics made the job less challenging toward the end of the project. The insignificant percentage of the total number of articles completed is a reminder of the processing time required to include other than standard materials in the database of an integrated library system.

The second series of Landmarks contained a total of 1,495 monographs and 350 serial titles on January 1, 1984. The percentage of English monographs titles fell in Landmarks II from the 34.3% in Landmarks to 27.7%. German and French titles were more numerous in the second set. The largest percentage of the serial titles were in English and German. Several journals from the Royal Academy of Science are included such as Memoires de l'Academie Royale des Sciences from 1666 to 1699 and the Memoires de Mathematique et de Physique from 1750 to 1786. The Dublin Quarterly Journal of Science and The London Journal of Botany are samples of the kinds of scientific journals which comprise this extensive collection. The Linnean Society of London was also the publisher of several serials.

During two weeks of the in-analytics phase, a time study was conducted by the project supervisor to determine the time required to accomplish the various tasks. These results reflected the job mix associated with the more routine work of analyzing but were also indicative of time allocations throughout the entire project. Since no online records were found for the in-analytics, the assignment of subject headings was a more time-consuming task. Minutes were rounded off to the nearest quarter of an hour for the ten work days. If eight minutes were spent on an activity, it

was counted. If only seven minutes were occupied by the task, it was not tabulated. The inexactness of having an individual keep track of how he or she spent the time was recognized, but obtaining some measurement seemed worthwhile.

The four LA IV Landmarks catalogers participated in the study. Of the twenty-four categories, data entry on OCLC was the largest with 21.3% of the total 320 hours. Activities involving the determination and assignment of subject headings took 11.9% of the time. Searching for name authority information occupied 10.3%. Correcting one's own mistakes, problem-solving, assigning call numbers, and producing records on OCLC were other major activities. Perhaps because of the difficulty of keeping track of such small increments of time, the staff took twenty-eight hours of personal leave during the study. Also, some of the catalogers had accumulated vacation time that they wanted to take before the end of the project. Interestingly, the total reported break time was less than the allowable six per cent. The percentages for all recorded tasks were as follows:

1.	searching OCLC for bibliographic records	1.6%
2.	searching OCLC for name authority records	3.8%
3.	searching print sources for bibliographic records	2.3%
4.	searching print sources and files for name authority records	6.5%
5.	determining main entry	0.8%
6.	determining and transcribing title	4.3%
7.	determining physical description	2.7%
8.	composing notes	0.5%
9.	determining subject content	3.8%
10.	assigning subject headings	6.5%
11.	verifying form of subject headings	1.6%
12.	assigning call numbers	4.4%
13.	entering bibliographic records into OCLC	21.3%
14.	revising another cataloger's records	2.6%
15.	making corrections on own records	4.2%
16.	producing cards on OCLC	4.2%
17.	filing cards	1.6%
18.	communication	1.1%
19.	personal leave	8.8%
20.	supplemental tasks related to cataloging	2.7%
21.	planning	0.8%
22.	problem-solving	5.6%
23.	breaks	5.8%
24.	miscellaneous other activities	2.6%

The approximately $240,000 of grant money received by the University of Utah went towards creating 9,474 bibliographic records in the OCLC data base. Thus, the cost per title was $25.33. This total includes personnel benefits, the purchase of equipment and supplies to support the project, and administrative overhead. Therefore, this is an indication of the comprehensive cost of microform cataloging from initial searching to filing cards.

Toward the end of the second year of the project, the availability of some unused Landmarks funds made possible a three month follow-up period. The primary objective of this phase was to prepare a publishable index to the Landmarks of Science and Landmarks II sets. The major task was to do the programming and editing necessary to produce an index derived from the machine-readable records generated by the project. Using an inhouse Wang VS data processing computer, three editing lists were produced. An alphabetical listing of all unique names and subjects enabled the staff to do a visual check on the quality of the data. Similar, but different forms of the same name, for example, usually lined up one above the other. If an extra space or a typographical error was in the record, the two forms were both listed; and the correct one could be identified quickly. A spot check was also done on the printouts of the full MARC records. Finally, three indexes to the holdings of the Landmarks collection were developed by Joseph Potts in his new role as the library's systems and operations analyst. A name, short title, and subject list will assist future users who do not have access to a catalog for determining what material they want to read. Readex is considering the publication of the index and selling it along with the set.

Was the project worth doing? Yes, this was a valuable endeavor in many respects. Scholars doing research in the Landmarks microprint set at the Marriott Library said that better bibliographic control was essential. From her experience on the project, Ruth Hanson wrote an eighty-five page microforms cataloging manual that will help integrate microforms processing into the regular cataloging workflow at the Marriott Library. On a broader scale, few, if any, institutions could afford or would decide to provide full AACR II cataloging to the set on a national bibliographic utility out of regular library funds. By cataloging Landmarks on OCLC, the data will be available to the largest possible number of libraries. Non-OCLC libraries can purchase magnetic tapes with the records or have the cards duplicated. The development of the profile-matching capability at OCLC will expedite the cataloging of other microform sets. Equal opportunity for the important Landmarks microform sets to be used by patrons is finally accomplished!

IV. Historical Value of the Landmarks Set

Recently, the Eccles Health Sciences Library at the University of Utah was given a valuable copy of Icones Anatomicae written by Vesalius. The original woodcuts done by skilled artisans for the 1542 edition were rediscovered in an attic storeroom at the University of Munich in the late 1920s. In 1934 the drawings were hand-printed on parchment using the old wood blocks. The bombing of Munich during World War II destroyed the blocks. The library acquisition is from the 1934 printing. The university's student newspaper described the facsimile in a front page story. "Vesalius was professor of anatomy and surgery at the University of Padua, near Venice. In 1542, at the age of 28, he published the first accurate book on human anatomy. Before that time, all human anatomy books were based on animal dissections because of a religious ban on human dissections during the Middle Ages."[15] The local newspapers also enthusiastically noted the gift of the rare book.

The drawings and nearly 700 pages of text were actually on campus for several years in the Landmarks of Science microform set. The material was included in the 1543 printing of Vesalius' De Humani Corporis Fabrica which is a part of the first Landmarks series. The excitement over obtaining a copy of the original is not inappropriate, but the scholar's need for access to the information itself is met by the micropublication. Two other works by Vesalius are also in the first set, one of which is over 1,300 pages long. What a disappointment that librarians and library users have not overcome more of the difficulties in using microforms to make them as useful as printed monographs!

Dr. Harold Bauman, a history of science professor at the University of Utah, stated the need for bibliographic control of microforms in a letter that accompanied the grant application.

> This project is one that needs to be done, as all users of the collection will attest. We have had this valuable collection in our library for some years now, and the absence of an index has been a considerable handicap to those of us who work with history of science materials. The collection has never had the degree of use that it would have had if an index had been available. An index would not only facilitate access to individual titles, it would also provide immediate information on the scope and nature of the collection that would serve to guide students and mature researchers. I strongly urge that the funds be made available to accomplish a task that many of us have long recognized as one that would have to be done some time.[16]

No serious observer living through the current revolution in information technology can doubt the importance of the effect of science on the lives of individuals. The names Hippocrates,

Newton, Priestly, Darwin, Pasteur, and Archimedes conjour up impressions of significant contributions to the understanding and quality of life on this planet. These and other scientists such as Galileo, Agassiz, Fleming, Kepler, and van Leeuwenhook are represented in this singular collection of original documents in the history of science. The wedding of physical and bibliographic access in the Landmarks sets is a major accomplishment in the study of both history and science.

Prior to beginning publication of the Landmarks of Science in 1966, the Readex Microprint Corporation planned for many years to produce a set incorporating important source documents of scientific development. Sir Harold Hartley, chairman of the British National Committee for the History of Science, and Duane Roller, Professor of the History of Science at the University of Oklahoma, were members of the project's editorial board. The first Landmarks series required a decade to complete.[17] A large portion of the materials came from the history of science collection at the University of Oklahoma library. Books and journals on the topic are still being added to the collection as a part of Landmarks II under the managing editorship of Nancy Larsen.

What types of documents are included in the set? The material covers the spectrum of printed works such as articles, letters, and monographs. As one would expect, charts, diagrams, and formulas were common in the scientific writings. All that is missing from any original pictures is the color. John Freke, a surgeon at St. Bartholomew's Hospital in London in 1746, stated in a letter to a colleague what became the rationale for the microform industry. "I was going to give you my Thoughts concerning it, when I last saw you at Child's Coffee-house; but, on Reflection, I chose rather to do it in writing: For, in all novelty, till the Relator is quite understood, Words are forgotten easily; but Things of this sort in Writing may again and again be consider'd."[18] Freke did not suspect the far-reaching truthfulness of his assertion. Because the letter is preserved in microform, his ideas can be considered again and again for many generations.

Freke's letter was addressed to Sir William Watson and attempted to explain some electrical phenomena that Watson had earlier reported observing in an experiment involving a large, spinning wheel. Freke's comments are hard to understand without knowing the nature of the experimental device. Included in the Landmarks of Science is an address given by William Watson to the Royal Society of London in 1746. The title of the speech was "A Sequel to the Experiments and Observations Tending To Illustrate the Nature and Properties of Electricity: Wherein It is Presumed, by a Series of Experiments Expresly for that Purpose, that the Source of the Electrical Power, and Its Manner of Acting are Demonstrated."[19] Between pages sixteen and seventeen of the pamphlet there is a diagram of the apparatus used by Watson and his associates to test the components of electricity. The meaning of Freke's narrative becomes clear when one can also read Watson's explanation of the experiment.

Watson described the experimental apparatus thusly:

> At the beginning of last summer, I caused a machine to be made for electrical purposes; the wheel whereof was four feet in diameter. In the periphery of this wheel, were cut four grooves, corresponding with four globes of ten inches distance from each other. One, two, or the whole number of the globes might be used at pleasure. They were mounted on spindles of two inches diameter, and their mean motion round their axis was about eleven hundred times in a minute. As it is next to impossible to have these globes blown and mounted perfectly true, I order'd the leather cushions, with which they were rubbed, to be fluffed with an elastic substance(curled hair) that the globes in their rotations might be equally rubbed as possible. You might likewise cause the globes to be rubbed by the hands of your assistants; but under a certain treatment (of which hereafter) the cushions excite equally strong. The leather cushions were now and then rubbed with whiting. As a minute detail of the parts of this machine would take up too much of your time, I have herewith laid before you a draught thereof.[20]

The drawing mentioned by Watson shows a glass vial suspended from a gun barrel attached to one of the spindles and a sword hooked to another of the spindles. This eighteenth century scientist tested the electrical shock of several experimental conditions by touching the gun barrel, glass, or sword with his hand or finger after spinning the wheel. He measured the electrical charge by observing how strong of a shock he felt. This method caused difficulties such as recounted in the following experience:

> I have felt a very great stroke, when I hung two vials to the gun-barrel, and grasping them both, brought my forehead near it. The shock then was so violent, that I seemed stunned, as though struck on the head with a great stick, and I have never since chose to repeat this experiment.[21]

Watson closed his treatise with a plea for others to continue studying the phenomena and to correct his mistakes.

> I am desirous, that what is contained in these papers, you will be pleased to regard, rather as the rude outlines of a system, than as a system itself; which I am in hopes, men of better heads and more leisure will prosecute: and if hereafter from being possessed of more observations than we at present are masters of, any opinions in these papers shall be found erroneous; I at all times shall be willing readily to retract them. I rely upon your wonted candour;[22]

In the 1846 pamphlet that sold for one shilling, John Freke responded to his friend's invitation to comment on the nature of electricity. Mindful of his potential critics, Freke wrote:

> It is very probable, that those who pretend to know everything, will be so good as to say, if they like what I have advanc'd, that it squares exactly with what they thought before concerning it: And those who set up for Criticks will try their Hands at this Performance, and, if they can, will condemn it.
>
> It would be a great Wonder, indeed, if this should escape the Censure of some, when the great Dr. Harvey had his implacable Adversaries to his Account of the Circulation of the Blood; and even Sir Isaac Newton met with Opponents to several of his Theorys. What I have said opposes no one's Scheme, that I know of; it offers no Sentiments which can hurt any Man.[23]

One wonders if Freke's statement that electricity and lightning possessed similar properties was read by Benjamin Franklin before his famous escapade of flying a kite in a thunderstorm.[24]

Differing somewhat from successors, the personalities of the early scientists tended to be more visible in their writings. Nonetheless, the reports of findings were often lengthy and substantive. From the first century geographic writings of Strabo to Benjamin Silliman's nineteenth century, geology course outlines at Yale, the breadth and variety of the Landmarks set is of inestimable value to the historian of science. Adding full bibliographic access increases the scholar's opportunity to identify important titles. Now, more library patrons will know of the existence of this remarkable source of information. Numerous theses and dissertations topics are hidden within the Landmarks of Science and Landmarks II collections. What chemical experiments were being conducted on the continent during the revolutionary era? What effect did European scientists have on the development of American science in the eighteenth century? More complete answers to these and other questions are contained on the microprint cards.

The observation of Isaac Newton on the importance of research applies to the history of science. "...as in Mathematics, so in natural philosophy, the investigation of difficult things by the method of analysis ought ever to precede the method of composition."[25] The writing of the history of science should be better because of the availability of the Landmarks microform sets and good bibliographic support.

V. Notes

[1]Robert Grey Cole, "Bibliographic Control of Microform Publications", Illinois Libraries 58 (March, 1976), p. 211.

[2]Robert P. Holley, "Strengthening Library Resources: Improved Bibliographic Access to the Landmarks of Science" (University of Utah Libraries Title II-C Grant Application), p. [5].

[3]Science in Microprint: Landmarks of Science, Landmarks II (New York: Readex Microprint), p. [1].

[4]Holley, p. 13.

[5]Redmond Kathleen Molz, Federal Policy and Library Support (Cambridge, Massachusetts: MIT Press), p. 19.

[6]Evolution of a Catalogue (Boston Public Library, 1981), p. 35.

[7]Federal Register 42, number 249 (28 December 1977), p. 64,840.

[8]Renee B. Jasper, Catalog of Federal Education Assistance Programs-1980 ([Washington, D.C.]: U.S. Department of Education), p. 243.

[9]Federal Register 42, number 249, p. 64,839.

[10]B. Gale Dick, letter to the U.S. Department of Education, 25 February 1981.

[11]Holley, p. [5].

[12]Richard Boss, Cataloging Titles in Microform Sets (Washington, D.C.: Association of Research Libraries, 1983), p.44.

[13]JoAn S. Segal, letter to Robert Holley, Roger Hanson, and Mary Ellen Jacob, 22 October 1982.

[14]Penny G. Mattern, letter to Ruth Hanson, 26 October 1982.

[15]Daily Utah Chronicle, 27 February 1984, p.4.

[16]Harold Bauman, letter to the Grants Award Committee, 4 March 1981.

[17]Landmarks of Science, ([Readex Microprint]), p. [1].

[18]John Freke, An Essay to Shew the Cause of Electricity; and Why Some Things are Non-electricable (New York: Readex Microprint, 1969), p. 2.

[19]William Watson, A Sequel to the Experiments and Observations Tending to Illustrate the Nature and Properties of Electricity (New York: Readex Microprint, 1974), pp. 1-80.

[20]Ibid., pp. 2-3.

[21]Ibid., p. 17.

[22]Ibid., pp. 79-80.

[23]Freke, pp. 7-8.

[24]Ibid., p. 4-5.

[25]Watson, p. 78.