

Lunar Data Information Center:

A Shortcut to the Riddle of the Moon

Frances B. Waranius and Jody H. Heiken

Lunar Science Institute, Houston, Texas 77058

■ The Lunar Data Information Center serves as a reference and lending collection to all those interested in lunar science—researchers, educators, and students, world-wide. Such methods as a classification scheme for mission-oriented

documentation, sample photo browse files, lunar feature index, and color coding, have resulted in an unusual user-oriented collection. A computer-based *Moon Literature Bibliography* provides search capability.

“I NEED a photo of Copernicus . . . the lunar crater.” “Where can I find some information on the Genesis Rock?” “What’s been written on age-dating of lunar samples?” “I would like to add a unit on lunar geology to my freshman geology course. What’s available?” “What lunar seismic activities were recorded in 1971?”

When most people ask a question about the Moon today, an answer can be found in the vast amount of data returned by the Apollo and other spaceborne programs which explored the Moon. The data resulting from the Apollo missions alone includes 843 pounds of samples from the lunar surface, nearly 30,000 photographs, numerous maps, a collection of magnetic tapes, and stacks of documents, reports, and published literature.

Jody H. Heiken was Photo/Map librarian at the Lunar Science Institute, Houston, Texas. She is presently living in Los Alamos, N.M.

In 1973, a proposal to establish the Lunar Data Center at the Lunar Science Institute (LSI) was made to the National Aeronautics and Space Administration (NASA). The Lunar Science Institute was organized at the direction of President Lyndon Johnson. The LSI, originally operated by the National Academy of Sciences and Rice University, is now operated by the Universities Space Research Association, a consortium of 43 universities. Funding is through a National Aeronautics and Space Administration contract.

An announcement of intent to establish this center was printed in several journals and an appeal was made to the community for lunar-related materials to be sent to the LSI. In November 1973, the collection of photography, maps and documents which had been housed at the NASA Johnson Space Center was transferred to the institute. It is divided into four inter-related elements. The library collection is oriented toward the published and unpublished literature of lu-

nar science; the Photo/Map Library contains all the photography and cartographic products of the Lunar Orbiter, Surveyor, Ranger, and Apollo programs; the Sample Information Library includes photographs and descriptive documents relevant to the study of the lunar samples; and, the Geophysical Data Library consists of the National Space Science Data Center (NSSDC) data sets resulting from the Apollo orbital experiments and the Apollo Lunar Surface Experiments Package (ALSEP).

Classifying Material

In the initial task of sorting and organizing the materials, user needs were the prime objectives. The first major classification is by lunar mission—Apollo, Surveyor, Lunar Orbiter, Luna, etc. The simple, but effective, method of color-coding was devised. A unique color assigned to each mission is used throughout the Data Center to correlate the various types of data in the collection. Bound documents, labeled drawers, lettered photo folders, and information packets are all color-keyed.

The lunar missions have produced a wide spectrum of photography ranging from the 35 in. panoramic frames to the 35mm slide. Black and white, and color, positive and negative imagery exists in a variety of formats: 8 in. x 10 in. prints, 70mm and 35mm slides, 70mm film, 35 mm film, 5 in. frame film, 16mm microfilm, microfiche and 16mm sound film. In many cases, a given photograph is available in several formats to anticipate different research purposes. The "browsing" concept is highly utilized in the Photo-library with some lunar surface photography displayed in kardex files. The 8 in. x 10 in. prints are grouped by mission and NASA photo number into ring binders and protected by plastic sleeves. Rolled film can be scanned by use of a film viewing light table equipped with a stereoscope. The Apollo photography indexes are bound in mission color code and housed near the film products. Maps are arranged by category into general map types, such as U.S. Geological Sur-

vey quadrangle maps, landing site maps, 1:250,000 quadrangle series, etc. Drawer labels are color-coded when maps refer to a particular mission area. The Photo/Map collection also includes some information on Mars, Mercury, Venus, and Jupiter. These photos and maps resulting from the recent Pioneer and Mariner missions are useful in studies of planetary analogs.

An important segment in the study of the Moon is the data derived from the samples. The samples delivered to the Lunar Receiving Laboratory in Houston were examined by a Preliminary Examination Team (PET). A numbering system, slightly different for each mission, was devised to inventory the samples. General catalogs of sample descriptions were produced by PET following each mission and later documents continue the precise cataloging of samples in greater detail. Many of the samples were cut or chipped into smaller parts and the records of these divisions are known as cutting diagrams. As a part of each sample's initial examination, six orthogonal photos are taken; copies of these photos, the cutting diagrams, and photomicrographs from thin sections are gathered into individual file folders hung in file cabinets. The most significant photo of each sample is filed in a counter-top viewing device consisting of plastic sleeves on a hinged rack, known as a "flip file." Scientists may view the samples in the flip files, refer to the individual sample folder for more detailed information, and if still more in-depth data is required, request access to the complete sample data pack maintained in the Curatorial Facility at the NASA Johnson Space Center.

In addition to the sample photos themselves, an integral part of any comprehensive sample study includes reference to the geologic descriptions and photography of the area from which the sample was taken. These descriptive documents and charts prepared by the U.S. Geological Survey, National Space Science Data Center and NASA are bound and maintained as part of the Sample Information Library Collection.

Figure 1. One Portion of the LSI Library Showing Photo Flip Files and Map Display Boards in the Background



The subject scope of the library collection is mainly in the fields of astronomy and geology. The book collection, which includes basic references in all the physical sciences, grows at the rate of about 500 titles per year. The books are cataloged according to the Library of Congress schemes, using LC cards whenever possible. The journals, currently about 130 titles, are filed alphabetically.

Since so much of the literature valuable in the study of the Moon is in the area we call "grey literature," a system was devised to make these documents accessible to our users while still fitting into the library system. A classification, patterned after the Library of Congress, puts all mission-related documents into class "M." The second alphabetic element indicates the particular mission program: "A" for Apollo, "O" for Orbiter, etc. The first numeric line is the mission number, and the Cutter number divides into the types of documents: sample, photo, geologic, etc. Thus a call number for the Apollo 14 Lunar Sample Catalog would be MA14.S32. This format was developed because no feature providing for a systematic grouping is common to all the documents. The expansion potential of this classification will allow for any new programs or missions added.

Library Services

In the development of a data center, one thought is usually universal in everyone's mind . . . keep track of the literature . . . do a bibliography. Because the literature of the Moon, particularly that published since 1965, is so inter-disciplinary, subject searching requires reference to many index sources. To gather the literature of the Moon into one data base, the Moon Literature Project was begun. Since a partial bibliography existed as a part of the Lunar Sample Analysis Data Base operated by the Curator's Office at the NASA Johnson Space Center, we entered into a cooperative agreement with them. Using our PDP-11 computer, we now have author and title key-word search capability on more than 2,000 references. It is planned to subject index the literature using a controlled thesaurus developed at the institute. Currently searches are made on request and the service is not limited to LSI staff.

The newest element in the Data Center is the Geophysical Data Library, a cooperative project of NASA, NSSDC, and the LSI. Primarily in microfilm or microfiche, the data sets cover the major 34 experiments which were space-borne on the Apollo Command Modules or left on the surface of the Moon as parts of the ALSEP. The data sets provide results of the reduction or analysis of data from a given experiment and supporting information (catalogs, ephemerides, etc.). Reviews of this data can give clues to the internal structure and composition of the Moon, composition of the atmosphere, genesis of surface features, and the state of the lunar interior. To make these data available to as many investigators as possible NSSDC and NASA have planned to establish Lunar Science Subcenters across the country. The Lunar Science Institute is the first of these subcenters.

Finding one's way through the maze of data which have emanated from the lunar exploration programs may be extremely confusing. To assist both the experienced principal investigator and the newcomer to the field, the Data Center has prepared a number of data user's

guides, which briefly outline the pertinent types of information, and how to use and obtain them. Some of the areas covered by these publications include lunar sample information, geophysical data, and cartographic data. Other aids, such as an educator's guide to lunar data and a guide to the lunar science literature, are planned.

In keeping with the emphasis on dissemination of information, institute personnel edit a Lunar Science Information Bulletin which is sent to approximately 1,700 interested persons. Regular features in the *Bulletin* are reports of conferences, publications, research opportunities, personnel changes of interest to the lunar science community, and a bibliography of current references.

Reprints of published research papers issued in the series LSI Contributions may usually be obtained from the Library. Other publications edited, published and distributed by the Institute include the Abstracts of Papers submitted to the annual Lunar Science Conferences and special topical conference reports. Through a contract with NASA, the LSI Editorial Office is responsible for editing and managing the publication of the Proceedings of the annual Lunar Science Conference.

The Data Center is only one of the projects supported by the institute. A Visiting Scientists Program offers opportunities for short- and long-term appointments for the use of the Data Center and to conduct research. Applications can be made to the director of the institute for positions at the associate professor, post-doctoral, and graduate fellow levels. For other visitors who wish to use the Data Center, arrangements may be made through the Administrative Office. For those who are unable to visit the institute, requests for information either by mail or telephone are accepted and encouraged from the scientific community.

Although the institute does not function as a distribution center, when a request involves the availability of materials such as maps, photos, or documents, the librarians will provide the name of a source, if possible. Assistance

can be given in the preparation of the proper forms required by such distribution centers as National Space Science Data Center, National Technical Information Service, or Government Printing Office. If the item is no longer in print, or while the requestor is waiting for his materials to arrive, loans from the Data Center collection can be arranged following the regulations of the National Interlibrary Loan code, 1968.

Through the knowledge and experience which the personnel of the Lunar Data Center have acquired, it is hoped that the lunar science information riddle can be solved for you.

Acknowledgment

This work was done while the authors were staff members at The Lunar Science Institute, which is operated by the Universities Space Research Association under Contract No. NSR 09-051-001 with the National Aeronautics and Space Administration. This paper is LSI Contribution No. 203.

Bibliography

1. Waranius, F. B. / Lunar Studies. *Science* 177:653 (1972).
2. Heiken, J. H. and F. B. Waranius / Lunar Data and Where It's At. *Geoscience Information Society Proceedings*, 1974. In press.

Received for review Dec 16, 1974. Manuscript accepted for publication Jan 31, 1975. Presented Jun 11, 1975, at a meeting of the Physics-Astronomy-Mathematics Division, during SLA's 66th Annual Conference in Chicago.



WARANIUS

Frances B. Waranius is librarian at the Lunar Science Institute, Houston, Texas. Jody H. Heiken now resides in Los Alamos, N.M.