

Title: THE CRITICALITY SAFETY INFORMATION RESOURCE CENTER
AT LOS ALAMOS NATIONAL LABORATORY

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ABSTRACT

The mission of the Criticality Safety Information Resource Center (CSIRC) at Los Alamos National Laboratory (LANL) is the preservation of primary documentation supporting criticality safety. In many cases, but not all, this primary documentation consists of experimentalists' logbooks. Experience has shown that the logbooks and other primary information are vulnerable to being discarded. Destruction of these logbooks results in a permanent loss to the criticality safety community.

I. INTRODUCTION

Over the past fifty years several thousand experiments have been performed to establish critical configurations of the fissile nuclides ^{233}U , ^{235}U , and ^{239}Pu . Many of these experiments were carried out to establish safe operating conditions for handling these materials outside of reactors, that is, for the purpose of criticality safety. The information gained from these experiments forms the basis of criticality safety analysis. Primary source material for criticality safety includes experimentalists' logbooks, notes, drawings, photographs, and material descriptions.

Beginning in the 1940's, major facilities for such experiments were established at eight sites within the United States. Only one such multi-purpose, flexible critical experiment facility continues in operation today. This facility is located at LANL. In order to preserve experimentalists' logbooks and other primary data from the eight critical mass laboratories and make this information available to all researchers, the CSIRC has been established at LANL.

Experimental details such as geometry and material compositions were first documented in the experimentalists' logbooks. In most cases these results were later summarized by the experimentalists in institutional reports or as papers in professional journals. Such reports and papers are considered to be relatively secure and available to researchers. The publication of the results of experimental programs in the open literature alone does not diminish the need to preserve the primary data. Primary data can be useful to present-day

researchers attempting to clarify discrepancies in published data, in locating previously unpublished data, in providing data vital to code validation and traceability, in planning for facility design and/or decommissioning, and in setting process limits.

Easy retrieval of data is almost as essential as preservation. The LANL archives facility and the ESH-6 group library provide proper storage for documents and easy accessibility for researchers. Current CSIRC holdings include historical documents from critical experiments performed at Brookhaven National Laboratory, Pacific Northwest National Laboratory (PNNL), the Rocky Flats Environmental Technology Site (RFETS), and LANL. CSIRC also contains current LANL documents and the collection of documents known as the LA-10860-MS REFSET.¹

II. THE OPERATION OF CSIRC

At the present time the effort at CSIRC is focused on the preservation process. CSIRC seeks to acquire original logbooks or high-quality copies of original material. Since preservation efforts were begun nearly a decade ago, several professional criticality safety practitioners have successfully retrieved information from the collected logbooks. Such information is, of course, more detailed than information available in journals or institutional reports provided by the experimenter. It is this more complete record that provides the meaning for the preservation of the logbooks. Examples of the ways in which the CSIRC has been used follow.

Researchers associated with the International Criticality Safety Benchmark Evaluation Project (ICSBEP) have made use of CSIRC. In one case, by using CSIRC documents, a LANL researcher was able to locate information on critical experiments for code cross-section validation that is not otherwise available. When researching THOR (an assembly of thorium-reflected plutonium), the researcher was able to document exact changes between original experimental data and that found in Hansen and Paxton's revisit of THOR.²

In another case, a researcher from the Savannah River Site who was associated with the ICSBEP Benchmark project needed to examine logbooks from experiments done in the past at PNNL. The experiments concerned plutonium polystyrene in one instance and plutonium nitrate solution slabs in another. The PNNL logbooks had previously been shipped from Hanford to LANL. With the help of LANL archives personnel, the researcher was able to locate original data sheets, notes, figures, and drawings from the experiments. This primary data was used to supplement internal reports and reports published in *Nuclear Technology*.³⁻⁴

An ICSBEP researcher from the Idaho National Engineering Laboratory used logbooks from PNNL located at CSIRC to supplement published information on critical experiments. This information concerned the early Jemima experiments: bare cylindrical configurations of enriched and natural uranium; water-moderated $U(2.35)O_2$ fuel rods in 2.032-cm square-pitched arrays; water-moderated $U(4.31)O_2$ fuel rods in 2.54-cm square-pitched arrays; water-moderated $U(2.35)O_2$ fuel rods in 1.684-cm square-pitched arrays (gadolinium water impurity); and water-moderated $U(4.31)O_2$ fuel rods in 1.892-cm square-pitched arrays (gadolinium water impurity). The additional primary data became incorporated into the *International Handbook of Evaluated Criticality Safety Benchmark Experiments*.⁵

A researcher from Oak Ridge National Laboratory (ORNL) has provided us with a different type of example illustrating the value of preserving the logbooks. In this case, the researcher discovered in logbooks his own experimental results which had never been published - not even as ORNL internal documentation. These experimental results were not recorded anywhere except in the ORNL logbooks. The researcher is now in the process of systematically publishing the results. Examples of current publications based upon historical research from ORNL logbooks can be found in articles by J. T. Mihalczo in the referenced issues of the *Transactions of the American Nuclear Society*.⁶⁻⁹

CSIRC operates under a cooperative arrangement between the LANL archives and the Nuclear Criticality Safety group (ESH-6) at LANL to provide access to primary source material. Primary documents are located in both places within LANL. Researchers who hold U.S. Department of Energy "Q" clearances can readily obtain access to both the LANL archives and to the ESH-6 group library. Researchers from outside the United States have access to the information through the Freedom of Information Act. Contact with original experimentalists will be arranged by the researcher directly. CSIRC does not carry out a research program. CSIRC does not endorse, review, supply funding, or provide technical assistance to the researcher.

An ad-hoc committee of criticality safety specialists

knowledgeable about archiving meets annually at LANL to oversee the work of CSIRC under the sponsorship of Thomas P. McLaughlin, LANL, ESH-6. At the present time the committee consists of R. Michael Westfall and Howard Dyer (ORNL); Brian Koponen (representing RFETS and Lawrence Livermore National Laboratory [LLNL]); E. Duane Clayton (PNNL); Robert Rothe (retired RFETS); and Norman L. Pruvost, Roger A. Meade, Roger W. Brewer, and Barbara D. Henderson representing criticality safety at LANL.

CSIRC is developing a database that will provide catalogued references to the CSIRC holdings. Discussion has begun on the establishment of an interface with the Nuclear Criticality Safety Center at LLNL. This collaboration will provide a state-of-the-art electronic interface to the criticality safety community.

At the present time funding for CSIRC is being provided by the Nuclear Criticality Safety group at LANL. With sufficient resources CSIRC plans to videotape original experimentalists as a way to augment the logbooks with commentary, and to complete the collection of original logbooks or high-quality copies. One experimentalist from RFETS has already compiled eight hours of video-taped documentation based on the RFETS logbooks.

IV. SUMMARY

CSIRC provides a central repository to ensure the preservation, completeness and traceability of historical experimental criticality safety information. At the present time the emphasis of CSIRC is on information preservation. The object of CSIRC is to assure the preservation of irreplaceable information which may be vulnerable to destruction. The location of CSIRC at LANL provides a single location for the study of the history of criticality safety. When complete, the CSIRC collection will contain the known body of U. S. experimental knowledge of criticality safety. Electronic availability of historical criticality safety documents is the aspiration of the CSIRC committee, but is dependent upon future funding.

ACKNOWLEDGEMENTS

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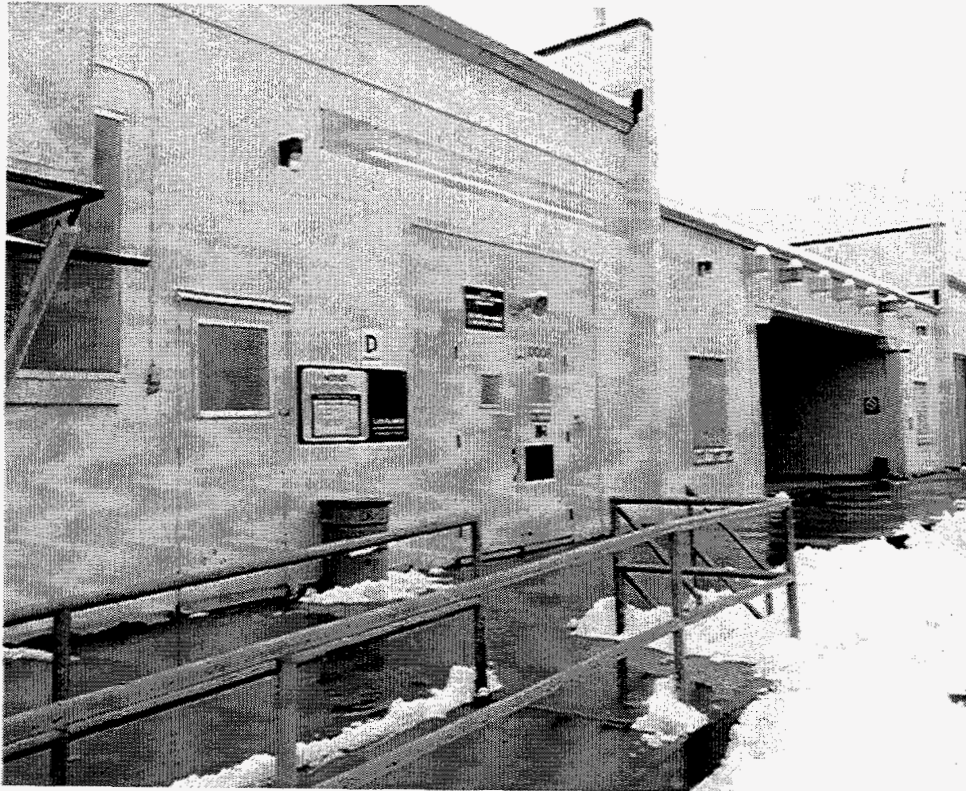


Fig. 1. The exterior of the Los Alamos National Laboratory Records Center and Archives building.



Fig. 2. Archivist Roger A. Meade in the interior of the Los Alamos National Laboratory archives.

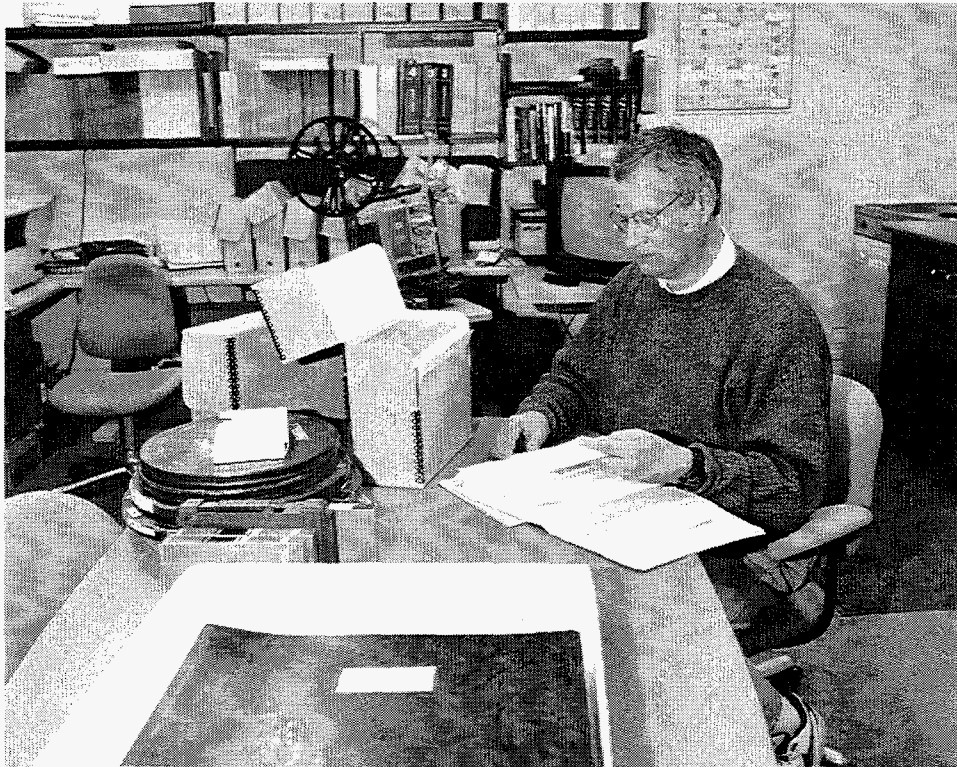


Fig. 3. Los Alamos National Laboratory Archivist Roger A. Meade in the archives.

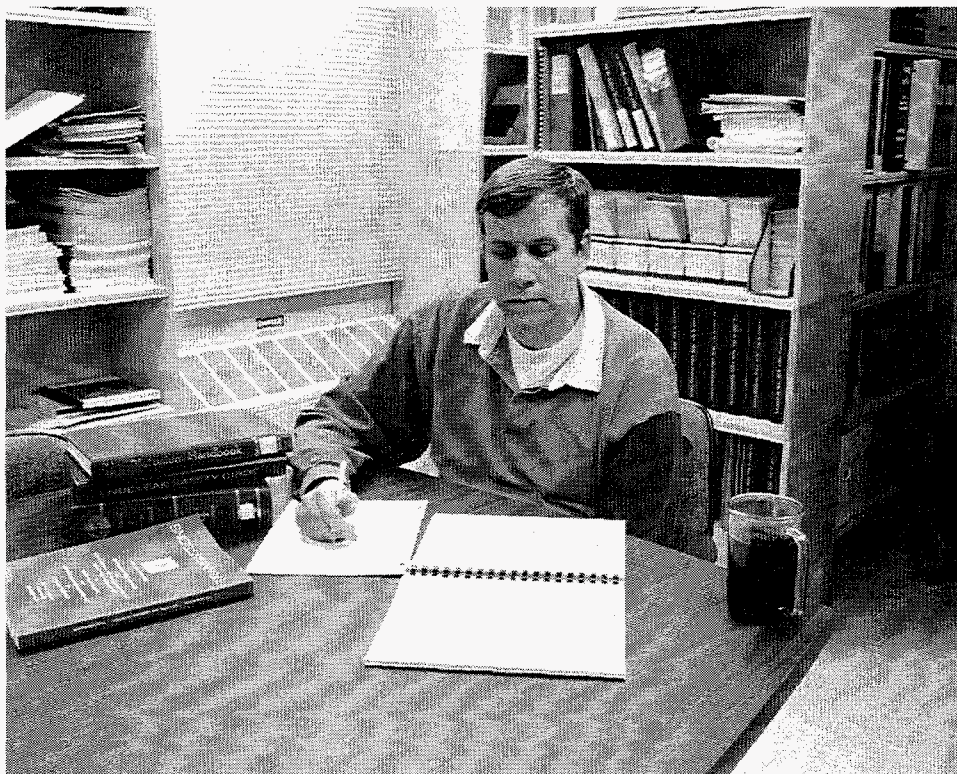


Fig. 4. Researcher Roger W. Brewer in the ESH-6 group library at Los Alamos National Laboratory.

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